Gulf War

Air Power Survey

Volume III

Logistics

and

Support

Washington, D.C.
1993

Gulf War Air Power Survey

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Foreword

From 16 January through 28 February 1991, the United States and its allies conducted one of the most operationally successful wars in history, a conflict in which air operations played a preeminent role. The Gulf War Air Power Survey was commissioned on 22 August 1991 to review all aspects of air warfare in the Persian Gulf for use by the United States Air Force, but it was not to confine itself to discussion of that institution. The Survey has produced reports on planning, the conduct of operations, the effects of the air campaign, command and control, logistics, air base support, space, weapons and tactics, as well as a chronology and a compendium of statistics on the war. It has prepared as well a summary report and some shorter papers and assembled an archive composed of paper, microfilm, and electronic records, all of which have been deposited at the Air Force Historical Research Agency at Maxwell Air Force Base, Alabama. The Survey was just that, an attempt to provide a comprehensive and documented account of the war. It is not a definitive history: that will await the passage of time and the opening of sources (Iraqi records, for example) that were not available to Survey researchers. Nor is it a summary of lessons learned: other organizations, including many within the Air Force, have already done that. Rather, the Survey provides an analytical and evidentiary point of departure for future studies of the air campaign. It concentrates on an analysis of the operational level of war in the belief that this level of warfare is at once one of the most difficult to characterize and one of the most important to understand.

The Survey was directed by Dr. Eliot Cohen of Johns Hopkins University's School of Advanced International Studies and was staffed by a mixture of civilian and military analysts, including retired officers from the Army, Navy, and Marine Corps. It was divided into task forces, most of which were run by civilians working temporarily for the Air Force. The work produced by the Survey was examined by a distinguished review committee that included scholars, retired general officers from the Air Force, Navy, and Army, as well as former and current senior government officials. Throughout, the Survey strived to conduct its research in a spirit of impartiality and scholarly rigor. Its members had as their standard the observation of Mr. Franklin D'Olier, chairman of the United States Strategic Bombing Survey during and after the second World War:

Acknowledgments

The Survey's members owe a great debt of gratitude to Secretary of the Air Force Donald B. Rice, who conceived of the project, provided it with resources, and set for it the highest standards of independence and objectivity. Many organizations and individuals gave generously of their resources and time to support this effort. Various branches and commands of the Air Force were particularly helpful in providing material for and, in some cases, personnel to conduct the study. The United States Navy, Marine Corps, and Army aided with this study in different ways, including the sharing of data pertaining to the air war. A number of the United States' Coalition partners also made available individuals and records that were vital to the Survey's work. Many participants in the war, including senior political officials and officers from all of the Services were willing to speak with the Survey and share their recollections of Desert Shield and Desert Storm. Private students of the Gulf War also made available their knowledge of the crisis and conflict. Wherever possible and appropriate such assistance has been acknowledged in the text.

The Survey's independence was its reason for being. Each report is the product of the authors who wrote it and does not necessarily represent the views of the Review Committee, the Air Force or the Department of Defense.

Security Review

The Gulf War Air Power Survey reports were submitted to the Department of Defense for policy and security review. In accordance with this review, certain information has been removed from the original text. These areas have been annotated as [DELETED].

Gulf War Air Power Survey
Reports

Summary Report

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(**Note:** Each of the two reports retained pagination independent of the other. Accordingly, the table of contents for each report accompanies each report independently of this table of contents).

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Logistics

Part I

Logistics

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Report Acknowledgements

The survey of logistics in the Gulf War brought together a formidable team with expertise that crossed every avenue of transportation, supply, maintenance, and the myriad aspects of logistics planning and coordination. Mr. Richard Gunkel was the Logistics, Support, and Space Task Force Leader, and Richard Olson led the authoring and development of the logistics report. The authors' efforts to sift, sort, analyze, and interpret were complemented by innumerable contributions of members on the Air Staff, at MAJCOMs, and in base-level organizations who managed and fought both within and outside the CENTCOM Area of Responsibility and who shared their experiences for the benefit of those who follow. The study director, Dr. Eliot Cohen, provided a major challenge with his constant urging to describe the essence of logistics without turning the "hapless reader" into a technician.

The authors met the challenge through a thematic approach by providing answers to questions of what happened. The basis for the story was laid in describing preparations for the war by Connie Graham, who provided new and original insights to the problems of theater logistics. Frank Cartwright provided special expertise on material might that could be focused in building a foundation for the conflict. Roger Coffey brought first-hand airlift experience to the description of deployment and positioning the force. Click Smith described the in-theater transportation and operational support with a special understanding of management and practice. Daniel Draper not only covered fuels, aerial refueling, as well as ground refueling, but brought reflections garnered from long hours in the Air Staff Logistics Readiness Center during the conflict. Dennis Dakan provided notable expertise to the essential aspects of munitions and arming the force. John Schade's intimate understanding of wholesale and retail supply provides keen insights to a massive undertaking of provisioning. Jim Forbes' penetrating analysis transcended the whole of the Logistics survey to describe maintenance accomplishments.

Lt. Gen. (Ret.) Anthony J. Burshnick contributed significantly through his introspective critiques of organization and content. Mr Alan P. Heffernan deserves real thanks for solving automation challenges; Ms. Anne H. Predzin accomplished inspired editing by reining in our propensity to be too technical; and Ms. Barbara L. Gardien brought imaginative style for layout and design. The anchor in the process, from the beginning to the end, was Ms. Cecelia French, whose immeasurable support with answers, typing, organizing, and retyping sustained us with her energy.

Introduction

This report discusses logistics in the Persian Gulf War as it applies to all military operations and in particular to air operations. Simply put, how did the United States equip its forces for Desert Shield and Desert Storm? Logistics also includes functions for maintaining an air base and support services. These aspects of logistics will be covered in the two parts of this volume.

One of the simpler, but nonetheless comprehensive, definitions of logistics was documented by Baron Antoine Henri Jomini subsequent to the Napoleonic Wars, when he defined logistics as the "practical art of moving armies."[1] A Joint Chiefs of Staff definition expands on Jomini's version, expressing logistics as

> The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with: a. design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; b. movement, evacuation, and hospitalization of personnel; c. acquisition, or construction, maintenance, operation, and disposition of facilities; and d. acquisition or furnishing of services. [2]

The Gulf War encompassed all of these aspects of logistics, and did so on a grand scale. One of the main reasons for success in this conflict was the ability of the U.S. military to respond logistically–to move, beddown, and sustain the combat forces. The primary focus of our survey was to examine airpower application in a theater devoid of prior operational presence. This unique environment presented airpower managers with severe challenges to assure efficient and effective application of combat force. We examine the state of logistics prior to the conflict; the characteristics of planning, the efforts to put combat and support elements in place, the support of air operations during combat; and in particular, how planners envisioned the role of logistics in supporting air forces to achieve Coalition objectives and execute military strategy.

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[1]Jomini, Antoine H. *The Art of War* (Harrisburg, Pa.: Military Publishing Co., 1958).

[2]Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 1 Dec 1989.

We structured several specific themes in framing our review. Some of them surfaced late in the 1970s after Vietnam, and some were still pondered as the air campaign unfolded in January 1991. First is the nature and substance of the predeployment planning and preparation. A massive resource base, vastly expanded in preparation for a global conflict with the Soviets, served as a basis. How did this mass play in the Gulf conflict? Where was the mass? All of the forces and most of the assets required in the Middle East had to be moved into position. Moving required lift resources as well as time. What then was the significance of five and a half months to position, to set up, to organize, to gain efficiency, and to train for what was to be accomplished?

A second theme focuses on planning that had been formulated, although a current, approved, and detailed plan did not exist. What was the evolution from the planning that existed, and what was the character of execution actions that took place in establishing the Desert Storm support structure of January 1991? Research showed that, for this theater, logistics operated without confirmation of priorities and with insufficient details to deploy efficiently. Was that important? If so, how were problems corrected? Our examination of Gulf War planning and execution confirms that the unique missions and institutionalized support processes of the major commands produced individualized support and organizational structures. How did these unique structures make a difference, if at all? This theme also addresses the level of chaos that existed, the improvisation that ensued, and the degree to which readiness and sustainability were affected.

A third theme concerns the degree to which command and control affected basic logistics concepts of operation. How did automated systems and equipment designed for deployed operations perform where called upon? To what extent were pace and effectiveness of specific logistics operations tied to availability of information processing and the accessibility of in-theater and global communications? Was information available outside the area of responsibility to provide necessary assistance and support?

Interwoven with these themes are some other fairly important questions. For example: Did the desert environment present unique problems? What were the relationships among the Services, and how were joint responsibilities for logistics in the theater assigned and accomplished? Since Gulf-related logistical efforts drained resources from other theaters, what were the airpower impacts outside of the Gulf War? How well were the forces prepared? What was the impact of precrises training on Gulf War logistics? Many examples show that training practices and exercises prepared the United States well for the Desert Shield/Desert Storm task. At the same time, there are also examples illustrating how lack of realistic conditions or overscripting of training and exercise scenarios masked problems later confronted in the Gulf. This is especially true for many areas of logistics.

As these themes suggest, the first report is focused on the substance and process of the plan and the benefits of a robust resource base, as well as the innovation required to respond to unforeseen contingencies as they arose. The themes are addressed within the following structure.

Overview and Readiness

Chapter 1, Logistics of the Gulf War, summarizes the achievements of airpower-related logistics during the Persian Gulf crisis and introduces basic concepts, while distilling everything in this volume.

Chapter 2, Preparation for a Southwest Asia Contingency, outlines the state of logistic planning for contingency on the eve of the invasion of Kuwait. Subsequent chapters discuss execution in detail. This chapter provides an overview of the facilities available in the theater and shows how prepositioning had been planned. Central to the discussion (and somewhat contrary to the usual perspective) is the idea of the wing/base rather than the aircraft squadron as the deployable unit.

Mobility

This section concentrates on logistical support delivered by air and on the logistics needed to sustain air operations. Sealift and ground transportation are considered, but only as they contribute to or affect air power.

Chapter 3, Deploying to the Theater, describes the effort required to deploy CENTCOM units from all Services and includes the Navy's deployment of carriers to the Persian Gulf and the Red Sea in context with the first USAF fixed-wing deployment in the Gulf War. This chapter also covers the deployment of airlift, the deployment of land-based aviation (including Army and USMC aircraft), and the significance of the politically difficult acquisition of landing and overflight rights within the theater and along the airlift route structure. The network of overseas bases played a significant role in combat readiness during the earliest phases of Desert Shield. The contributions of equipment, crews, the Civil Reserve Air Fleet (CRAF), and the mobilization of reservists is included in this chapter.

Chapter 4, Intra-Theater Lift, concentrates on airlift within the theater and also discusses land transport in support of air forces, the Army, and the Marines.

Chapter 5, Air Refueling, during the deployment as well as during the air campaign, identifies the degree to which air refueling is integral and essential in getting the forces in position and carrying out combat operations.

Sustainment

Chapter 6, Arming the Force, presents the munitions story, including special operations munitions, precision-guided munitions, and prepositioning. Efforts required to move munitions to the theater, lead times involved, and distribution problems within the theater are also covered. A sense of timing in readiness to fight is developed. Finally, the quantities of munitions transported to the theater and used during the war are summarized and interpreted.

Chapter 7, Supplying the Force, focuses on general supplies, including aircraft parts and petroleum products. Organizational and supply process innovations are considered, and the logistics role of TAC as CENTAF Rear is explored and compared with normal doctrine.

Chapter 8, Maintaining the Force, sketches the maintenance support posture for Desert Shield/Desert Storm, on the flightline, in and out of the theater, and in Europe and the United States. This chapter also provides a careful study of mission-capable (MC) rates and their meaning, explaining why a number of systems had high MC rates, and why overall, the MC rates initially reported were unintentionally inflated. The challenges of operating in a desert environment when problems were encountered are documented.

Conclusion

Chapter 9, Logistics Performance, explores in greater depth the themes raised in the introduction and in each chapter. It assesses logistics performance and implicitly raises issues for the future.

While this logistic study has attempted to survey those areas involved in the Gulf War that gave rise to significant events in logistical operations, relating those events to air power, it does not include every conceivable event or exhaust all sources of information. It does, nevertheless, include materials from the following sources:

- Interviews with key personnel,
- Written accounts from all levels, perspectives, and functional areas,
- Unit histories,
- DOD, JCS, and Service reports and studies,
- Situation reports, message traffic, briefings, and official reports,
- Air Force Remedial Action Program lessons learned,
- Joint Uniform Lessons Learned System (JULLS), and
- Relevant, publicly available books and articles.

To the greatest degree possible, this study is based upon research in primary sources. There were, however, some methodological issues that bear on the study of logistics in the Gulf War air campaign. The first point is that it is difficult (sometimes impossible) to obtain accurate information on the actions of the people and the organizations which comprised and managed logistics—especially during the August through mid-September 1990 time period. In this volume, after-the-fact testimony from participants has been used extensively, with full understanding that memories may be faulty or that the participants may have rethought or embellished their experiences. Second, a great majority of data that could have been generated and collected during Desert Shield and Desert Storm appears not to have even been written down; this situation is a result of extensive use of voice communication. It is also, in part, the failure of automated systems to work and provide source data capture for the benefit of management in the theater as well as the United States. In addition, many important messages are known to have been transmitted only by facsimile and sometimes lost to history.

The Gulf War Air Power Survey logistics effort nevertheless accumulated vast amounts of data available to provide a highly detailed account of the Gulf War. In fact, during the final weeks in preparing the final draft, researchers continued to uncover documentation that could have been pursued had time permitted. Other historians who follow can, we hope, use it to continue the analysis.

1

Logistics of the Gulf War

The first question Logistics asks is, "Where and when do you want to fight." When operational plans are executed, logistics activities must provide support where, when, how, for whom, and in sufficient quantities. In the Gulf War, logistics forces transported almost everything required to fight and sustain. The scenario began with mobilizing and deploying operations and support for Desert Shield and reached a crescendo of combat action in Operation Desert Storm. Key ingredients for eventual success were highly trained and very flexible personnel, capable and reliable weapon systems, a mature airlift system, the legacy of the 1980s spare parts buys, the Cold War force structure to draw upon, the Cold War thaw that permitted wide use of previously unavailable (for non-NATO and/or non-SIOP use) forces and equipment, an extensive air-refueling system, an unprecedented coalition of financial and force structure resources, prepositioned equipment and munitions, a Saudi air base structure to accommodate the buildup, and a cooperative enemy.

Significant Factors

Preparing for War in Southwest Asia

In early 1990, preparation for a Gulf War was not first priority for U.S. General Purpose Forces. The main level of effort focused on a potential war in Europe, and most planning and preparation reflected that focus. Certain expectations making sense for a European War did not for the Gulf War. Although the unmet expectations became opportunities to innovate and excel, in some cases they created problems that had to be resolved in the midst of Gulf War operations.

The Air Force recognized the concept of Bases and Lines of Communication as fundamental to its combat support doctrine. The basing structure on the eve of the Gulf Conflict was a product of the Cold War, and most of the bases were in either Europe or the continental United States (CONUS). Although the basing structure was rich, it was in the wrong place for a conflict in Southwest Asia (SWA) and placed a premium on lines of communication. Much of the preparations for war in SWA centered on solving those problems.

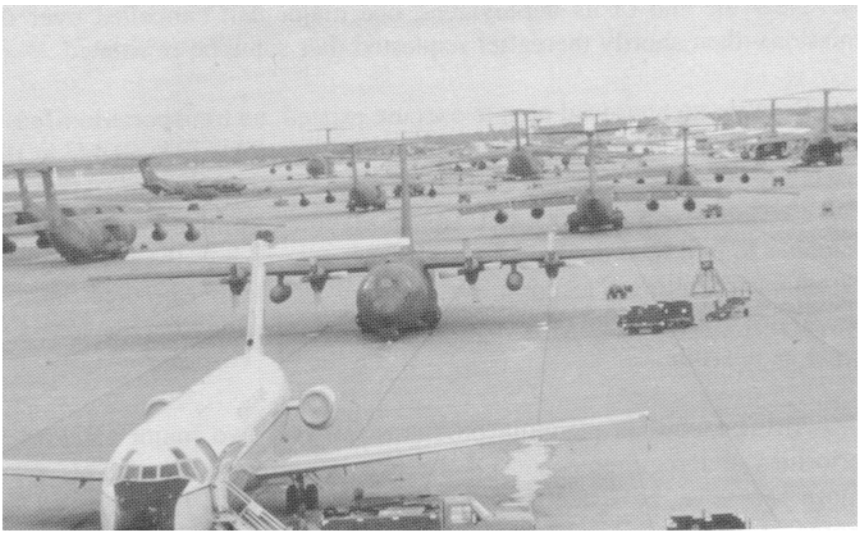
Traditionally, the aircraft squadron was viewed as a basic combat unit, and the concept of operations called for deploying aircraft squadrons from an operational base in the CONUS to another operational base somewhere overseas. That concept oversimplified logistics requirements for the SWA situation–an unprepared theater where almost all material had to be transported in and the pragmatic deploying unit was more nearly the wing and/or base itself. The concept of theater support for the Gulf War was a network of bare bases with host wings predominating. The host wings exercised authority over most functions in their respective locations, supported tenant wings, and prepared base support plans for bases to which they were deployed as hosts. Most support was initially furnished from homestation; but support remained linked to the CONUS, the reason why lines of communication were of paramount importance.

Although no U.S. facilities existed in SWA, numerous others developed according to U.S. standards were being used by Saudi defense forces or for civilian purposes. The primary air bases and air logistics centers had been built or augmented largely because of long-standing security assistance relationships or U.S. funding. U.S. Air Force, Central Command (USCENTAF) identified fourteen locations of sufficient merit to beddown 750 aircraft and support approximately 30,000 personnel.

Deploying to the Theater

The Air Force had prepositioned $1 billion worth of fuel, ammunition, and equipment in Oman, Bahrain, and aboard three ships. At the beginning of Desert Shield, two of these ships were at Diego Garcia and the third was off the coast of France. The ships immediately headed toward their designated offload ports. This prepositioning effort eliminated an estimated 3,500 strategic airlift missions. Overall however, the airlift savings were small compared with the unused capabilities afforded by complete use of strategic airlift aircraft, full mobilization of reserve and guard aircrews and support personnel, and all three stages of the Civil Reserve Air Fleet. Additionally, incomplete planning, onload processing limitations, throughput congestion at enroute bases, lack of a theater staging base, and mission handling equipment limitations contributed to delays and limited through put.

Despite prepositioned fuel, ammunition, and equipment, the magnitude of the airlift effort during Desert Shield and Desert Storm was unprecedented. By 10 March 1991, strategic airlift had moved over 500,000 people and 540,000 tons of cargo. At the height of the Desert Shield airlift, Military Airlift Command's (MAC's) cargo movement averaged 17 million ton-miles per day. By comparison, during the 1973 Arab-Israeli War, U.S. airlift moved 4.4 million ton-miles per day. Other historical comparisons include the World War II "Hump" at 0.9 million ton-miles per day, the Berlin Airlift at 1.7 million ton-miles per day, and Operation Just Cause at 2.0 million ton-miles per day.



The magnitude of the airlift effort during Desert Shield and Desert Storm was unprecedented.

From the moment Desert Shield began, the Military Airlift Command depended heavily upon the civil airline industry to fulfill its airlift requirements. Without the thousands of missions flown by civil air carriers, the Command's airlift fleet could not have moved required troops and cargo to the Arabian Peninsula by the time the United Nations deadline expired on 15 January 1991. The airline industry's readiness to participate in a major contingency such as Desert Shield was prearranged through a Civil Reserve Air Fleet program. Under the program, participating U.S. civil air carriers voluntarily commit their aircraft and other resources to support U.S. national interests when Department of Defense airlift requirements exceed the capabilities of the Command's organic fleet. In addition, the Command resorted to extraordinary measures to maximize its own aircrew availability in August and September 1990.

The deployment and use of airlift, particularly in the early days, was anything but well executed. Little information was available to deploying units about their possible beddown bases. Several locations were newly built, and others were bare bases. Changes to beddown bases further complicated unit deployment preparations and airlift prioritization. Beddown changes resulted from host nation sensitivities, ramp congestion, and mismatches between aircraft, munitions, and support equipment. Several units were never able to project their airlift requirements accurately. Near the end of its deployment, one major unit cancelled over 60 missions–then shortly thereafter requested that some be reinstated.

Because no approved plan to execute existed, no transportation-feasible time-phased force deployment document (TPFDD) was available as the basis for execution planning by MAC or Transportation Command. Central Command (CENTCOM) and Transportation Command had to work together to build the document (and have it entered into the Joint Operational and Planning Execution System) as it was being executed. MAC's initial tasking consisted of an unprioritized list of units to be deployed as soon as possible.

Airlift execution planning problems fell into two major categories: priorities and requirements. Of the two, requirements problems were more pervasive, persistent, and harder to understand. Hundreds of Air Force, Army, Navy, and Marine units were submitting data or making entries that wound up in the TPFDD. Entries contained so many errors that they were unreliable for determining airlift requirements. Common errors included major differences between stated and actual tonnage and passengers to be moved, failures to identify oversize and outsize cargo properly, wrong onload locations, and wrong available-to-load dates. As a result, some missions were sent to locations having no cargo or passengers to transport. For instance, MAC scheduled a Boeing 747 to fly from Paris to the East Coast to pick up 400 troops. The troops did not exist and the airplane returned to Paris empty. Other missions were scheduled and then cancelled because there were no real requirements, and numerous missions had to be added to cover understated requirements. As a result of requirements uncertainty, estimated airlift requirements for the first seven deploying units increased by sixty percent between 11 and 13 August. The increase forced the Command to schedule more sorties than originally planned for those units and to delay airlift for follow-on units.

A major Joint Operations and Planning Execution System shortcoming was an inability to track partially deployed Unit Type Cases (UTCs). Most deploying fighter squadrons did not receive all the airlift they required or expected. As a result, over half of the CENTAF TPFDD consisted of nonstandard UTCs created especially to capture cargo left behind by units otherwise considered closed. Each of these UTCs had to be individually entered into the Execution System database, and detailed information on its contents was unavailable. As a result, automatically tracking what was deployed and what was not became impossible. Manual tracking of the loads was manpower intensive and inherently error prone.

MAC's computer models could not provide reports to analyze the schedule and determine where the flow would exceed the throughput capacity. Consequently, bases became backlogged because they could not support the magnitude of the flow. As stations at flow points were "maxed out," the Command had no recourse except to interrupt the flow; that happened on several occasions.

Because CINCCENT decided to deploy combat units ahead of logistics support and sustainment cargo, CENTCOM did not allocate airlift resources to channel operations until 24 August; then, it allocated four C-141s per day. Consequently, backlogs of sustainment cargo routinely built up at CONUS aerial ports. Compounding the problem was the fact that cargo caught in the backlogs was often assumed lost and subsequently reordered by users. MAC took periodic initiatives to keep sustainment cargo from backing up at CONUS aerial ports. The fact that the initiatives were needed demonstrated that peacetime criteria used by airlift clearance authorities to enter cargo into the airlift system are not responsive to a combat commander's tonnage allocations and sustainment priorities. At one point in early September, fifty-two percent of sustainment cargo awaiting air shipment was coded at the top priority level.

Because locations and units involved were classified, much of the cargo shipped early in the operation was marked simply "Desert Shield"; most of it ended up at Dhahran. Due to USCENTCOM deployment priorities, only limited support forces at Dhahran were available to sort and distribute arriving cargo. Cargo backlogs at Dhahran exceeded 1,000 pallets and dwarfed backlogs at CONUS aerial ports.

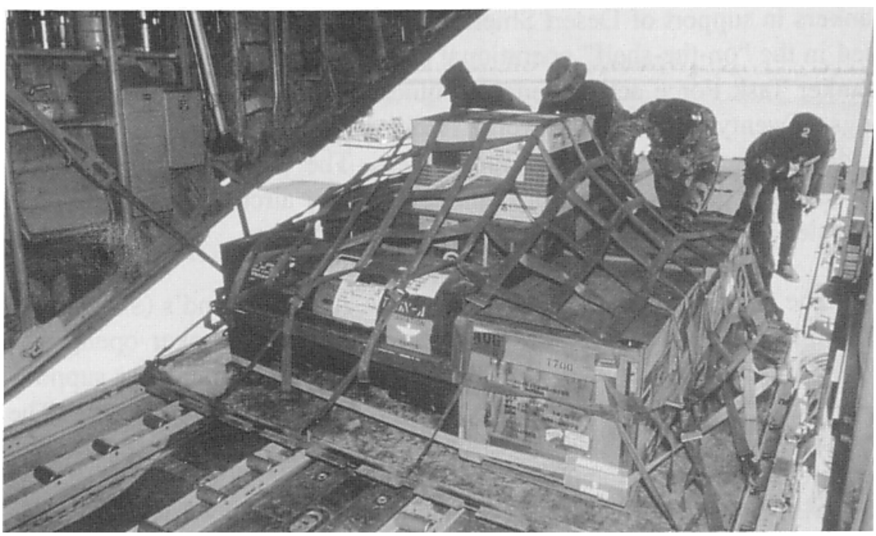
The innovative daily Desert Express mission for high-priority cargo achieved its objectives. At the end of 1990, Desert Express departure reliability from Charleston and Torrejon was one hundred percent, while arrivals at Dhahran and Riyadh averaged fifty minutes early. Desert Express cut response time for high-priority shipments from as much as two weeks to as little as seventy-two hours, and the users were very happy with the system. This splendid innovation was a fix to make up for serious problems with priorities and asset intransit visibility.

However, the showstopper Desert Express support incurred a tradeoff cost. To ensure Desert Express reliability, missions had priority to delay other flights, C-141s were placed on alert to ensure departure deadlines, and missions went with less than full loads at times.

Intratheater Lift

The need for a capability to distribute personnel, supplies, and equipment was immediate and of immense proportions. Strategic airlift delivered over 540,000 tons of cargo into the theater–fifteen percent of the approximately 3.5 million tons of dry cargo delivered during the deployment phase of Desert Shield and more than 500,000 passengers. Most of the cargo and personnel was delivered to four major aerial ports of debarkation. From there, cargo and passengers were forwarded throughout the area of responsibility (AOR) by intratheater airlift and surface transportation. As a result, the intratheater lift systems were an essential element of air power in the Gulf area; they were instrumental in the success of the entire Desert Shield/Storm operation. However, basic planning for intratheater distribution was marginal. The initial combat forces arrived before adequate combat service support and onward movement capability were established. The system did not cope well with the significant and cascading requirements, leading ultimately to a doubling of the force structure in the theater. The situation was lengthened by a

Cargo shipped early in the operation was marked simply "Desert Shield" (above). Cargo and passengers were forwarded throughout the area of responsibility (AOR) by intratheater airlift (below).



USCENTCOM decision to increase stockage levels in the theater from thirty to sixty days. Finally, the intratheater distribution problem was compounded by the poor in-transit cargo visibility capability of the various service systems.

To support the ground campaign, tactical airlift was called on to airlift the entire XVIII Airborne Corps from King Fahd and nearby bases to Rafha, a distance of over 400 miles. The flow into Rafha averaged one landing every seven minutes for the first thirteen days of the move. The C-130 fleet utilization rate for this period was 8.0, twice the planned wartime rate, and 14,000 personnel and over 9,000 tons of equipment were transported.

Air Refueling

Air refueling played a significant role in every phase of air operations in the Gulf War. It extended the range of deploying aircraft, involved innovative tactics to compress closure time in getting combat units in place, and formed an integral part of virtually all strike, reconnaissance, and airborne command and control operations. A majority of all combat sorties required air refueling, either inbound, outbound, or both from their targets. (The B-52s based at [DELETED] were among the few aircraft not requiring refueling on the way to their targets.)

Planning for air refueling was incomplete. The final commitment of tankers in support of Desert Shield far exceeded the requirements specified in the "on-the-shelf" operational plans, but continuous experience in Tanker Task Force activity enabled quick response to deployment taskings. Twenty-one bases in twelve foreign countries were used as tanker beddown locations for over 300 tankers. The planning, employment, basing, and daily numbers of committed tanker aircraft were constantly adjusted throughout Desert Shield and Desert Storm.

The aircrew manning level of Strategic Air Command's (SAC's) KC-135 and KC-10 tanker force had a direct impact on tanker operations. The KC-135 manning level was 1.27 and was based primarily on supporting SAC's Single Integrated Operations Plan (SIOP) commitment. The manning level of the KC-10 was more than sufficient to support the 2.0 AOR requirement. Although the Command was not explicitly tasked with an airlift role other than that associated with the dual-role KC-10, organic air movement proved necessary to move resources in support of B-52, KC-135, KC-10, RC-135, and U-2 aircraft because MAC's capability was saturated. The critical limiting factor affecting air refueling during Desert Storm was airspace. This problem was not confined to theater operations but was also a major factor on the Turkey/Iraqi border and in the Mediterranean. Because of the Airborne Warning and Control System's (AWACS') ability to view a large part of the air war through the use of its radar, and because procedures were established for the tactical checking of aircraft, many tanker aircrews believed AWACS was functioning like an air route traffic control center in the CONUS. Limitations to the AWACS' radar, computational capabilities, and workload of the personnel assigned do not allow the AWACS to function as an air traffic controller facility. In some instances, tanker crews, mistakenly believing they were under full radar coverage and flight-following protection, had near mid-air collisions with other Allied aircraft.

Arming the Force

The Air Force alone used over thirty kinds of munitions in Operation Desert Storm. Naval Air used nine varieties, and Army aviation units added thirteen to U.S. totals. Coalition air forces additionally employed some twenty-six unique types of their own munitions. As is true with other resources, the story of ammunition, conventional unguided bombs, cluster bomb units, precision guided munitions ("smart bombs"), and special operations munitions describes significant successes mixed with troubling disconnects.

The more than 48,000 short tons of munitions stocks prepositioned within Southwest Asia and aboard the three prepositioned ships were the only sources of munitions initially available to USCENTAF forces. The stocks represented a basic mix of conventional ordnance, with the inventory primarily consisting of MK-80-series general purpose bombs, Vietnam-vintage cluster bomb units ammunition, and laser-guided GBU-10 and -12 component resources. The munitions and components had been maintained, inspected, and renovated over several years by a combination of contractor and Air Force personnel. When Operation Desert Shield was initiated, the munitions were found to be fully serviceable and "combat ready."

To replenish prepositioned stocks, original planning factors for an Air Force, Central Command air campaign included approximately a forty-five-day "trip" to the Gulf. That estimate proved to be far too optimistic as Desert Shield unfolded. The movement of munitions from U.S. storage locations to the Gulf actually required from fifty-five to seventy-two days. In many cases, the munitions items did not reach their intended destination in the Gulf within that timespan. Often, it took that long to deliver the munitions to the Gulf explosives port.

Munitions movement within the Gulf was also difficult and required exceptional management actions. Dealing with host-nation drivers and vehicles was complicated, involving centuries-old distrust and national security concerns between the countries of Oman, United Arab Emirates, and Saudi Arabia. To solve this problem, CENTAF Logistics was afforded C-130 intratheater airlift to deliver critically short munitions and component stocks to Gulf locations.

Movement in the European theater was also a problem. Three major munitions depots were involved in supporting Desert Shield and Desert Storm: RAF Welford in the United Kingdom, Camp Darby in Italy, and Morbach in the Federal Republic of Germany. Each depot reported major problems with moving explosives over local roads and rail lines to ports, as well as problems with local national drivers accepting the responsibilities for handling munitions shipments. A shortage of explosives-capable semi-trailer trucks and experienced drivers in the United States also stymied movement of munitions to the two explosives-capable U.S. port facilities: Sunny Point in North Carolina and Concord in California.

An accurate accounting of munitions components was essential to understanding what munitions were on hand at the operational locations. Unfortunately, the inventories had to be created manually by arriving personnel because accurate, automated munitions-counting systems were not available to the in-place forces early in Desert Shield. During the conflict, the problem was compounded because the identification of munitions on arriving ships was the "mother of all mysteries"– another indication of the intractability of intransit visibility. The problems were not resolved during the conflict–inventory tracking of munitions components throughout Desert Shield and Desert Storm was done manually, resulting in significant inaccuracies in reported inventories, poor tracking of munitions in transportation channels, and lack of credible munitions information for senior Air Force managers. The nearly $100 million spent on the Combat Ammunition System since its inception in 1982 had not fully reached nor completely benefited the user.

An important positive lesson stems from the beneficial impact of the Air Force Combat Ammunition Center located at Sierra Army Depot, California. Lt. Gen. Leo Marquez established the center to replace vanishing Vietnam-era conventional combat ammunition skills. The first class graduated in the spring of 1985, and as of the start of Operation Desert Shield, nearly 3,000 students had completed the course. Center-trained personnel formed the backbone of munitions production teams throughout Southwest Asia.

Finally, the disparity between the quantity of munitions shipped and the quantity used is but one indication of how large the available set of resources was. Nearly 350,000 short tons of munitions were shipped by air and sea by the time the cease fire was called; of this amount, 69,000 short tons of munitions were expended. The cost of moving over 350,000 short tons of munitions to combat, then using only 69,000, also reveals an important problem–is it possible to improve estimates of requirements for neutralizing the enemy?

Supplying the Force

Using the bottom-line measure of mission-capable aircraft, all of the supply support concepts used were effective. Various sources, including the CENTAF Rear Director of Supply, have stated that no missions were lost during Desert Storm for lack of supply support. We have found no evidence to contradict that statement. During Desert Storm, the overall not-mission-capable supply rate for aircraft was less than four percent. By contrast, the de-facto standard for peacetime supply performance was five percent, and the standards for wartime performance was up to twenty-five percent at the end of thirty days of wartime activity. The high mission capability rates during Desert Storm were achieved, at least in part, in spite of poor preparation and planning. Some ways in which planning either worked or did not and the kinds of innovations instituted are recounted below.

The basic supply concept of operations in support of air power called for preplanned requirements driven by specific threat assumptions. While primary spares support for aircraft in the AOR initially came from war readiness spares kits and mission support kits deployed with the units, other support concepts evolved. One of the earliest and biggest was SAC's establishment of contingency supply support centers at Moron

Air Base in Spain, Andersen AFB, Guam, and later at RAF Fairford in the United Kingdom. Another major spares support concept was the development and deployment of follow-on spares kits built on the fly by Headquarters Tactical Air Command. Strategic Air Command also developed and deployed additional packages of spares to augment the war readiness spares kits and other spares at the operating bases and the contingency supply support centers. These spares packages were similar in concept to follow-on spares kits.

During Desert Shield and Desert Storm, all direct mission support requirements were ordered using Urgency of Need Designator A. As a result, all such requisitions translated to UJC/Priority Designator 01 (the highest value allowed) or 02, both of which translate to the highest transportation priority, Priority Group One. Hence, the relative needs of forces committed to Desert Shield and Desert Storm could not be distinguished until the Uniform Military Management and Movement Indicator System was for all intents and purposes overridden by dedicated airlift (Desert Express, European Express) and other on-the-spot innovations. Combined with aggressive spares sourcing and a nominal 72-hour delivery time to the AOR, Air Force, Central Command Logistics reported that

> . . . grounding mission-critical parts (MICAPs) decreased from over 500 for 750 aircraft on 1 Oct 90, to 219 for 1229 aircraft on 17 Jan 91, the day Operation Desert Storm began, and a not-mission-capable supply rate of four percent. This was an unprecedented achievement.

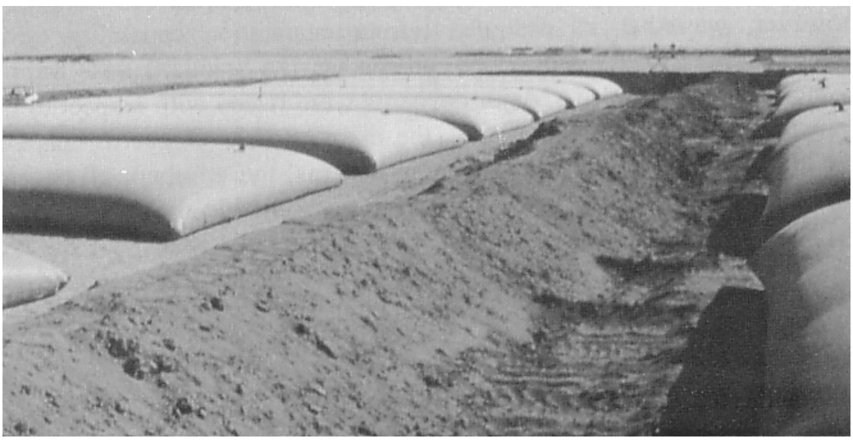
In the early portions of Desert Shield, destination codes were not provided to the field–everything was shipped to Dhahran. As a result, hundreds of pallets sat in the Aerial Port facility at Dhahran; no one knew their intended destination or relative priority. The embedded deficiencies of the supply and transportation systems related to intransit visibility exacerbated the situation. While both systems had reasonably good tracking capabilities, visibility was often lost as an item moved from the supply system into the transportation system. Within the supply system, items were tracked by their requisition numbers. However, item movement within the transportation system was tracked by transportation control numbers. For shipping efficiency, many supply requisitions were consolidated into a single transportation movement unit. As a consequence, detailed traceability was often lost. When items needed for support of immediate mission requirements became delayed or lost within the system, it was difficult, and often impossible, to track them down and expedite their movement to the point of need. To help resolve this problem, the Air Force Logistics Information File was developed. The Air Force file was patterned after an Army Logistics Information File that had been in use for several years. However, the Air Force file became operational only in the latter part of Desert Storm and could not have helped intratheater transport.

At the time the first aircraft units were deployed to the theater, a traditional approach to deployed asset accounting was envisioned. That approach specified that each deployed unit would use the deployable combat supply system initially. Then the unit would return to its home-station for support; final transition would be to a full Standard Base Supply System "mainframe" environment within the theater. The deployable combat supply system was a stand-alone computer processing system that performed essential supply inventory management processes. The system was actually very limited in capability–doing little more than accounting for what was on hand. Perhaps its most serious limitation, however, was that its designed telecommunication capability never worked properly. As deployment proceeded, the Standard Base Supply System was abandoned. Major concerns were raised with respect to the transportable shelter systems (i.e., the mainframes). Concerns centered on the configuration of the computer systems, the numbers of systems that were available, and the ability of the transportable shelter systems to withstand a move to the desert. Before the end of August 1990, the idea of establishing mainframe support within the theater was scrubbed and replaced with a new plan envisioning a single CONUS mainframe supporting all theater supply accounts.

By the end of the war, the resulting CENTAF Supply Support Agency (CSSA) comprised the largest Air Force retail supply account on record; the account listed 288,290 items with an asset value in excess of $1.5 billion. That total included most of the aircraft kits, but only fifty to sixty percent of nonaircraft kits such as combat communications. Many nonaircraft spares packages and most equipment, however, remained to be picked up, and the major task of establishing and maintaining operating stock levels for the full range of base support items was never executed.

The MICAP Asset Sourcing System, which had recently been installed at Tactical Air Command, proved to be effective in supporting MICAP requirements and was a noteworthy exception to preexisting systems that did not work. The new system provided worldwide visibility of assets, allowing the CSSA MICAP controllers to locate and request shipment of available assets quickly. Approximately forty-five percent of MICAP incidents were satisfied through lateral support actions requested through the CSSA.

Approximately 8.5 million barrels of fuels were available before Desert Shield. However, about 4.1 million barrels of the storage were malpositioned outside the AOR, and most of the fuel in the AOR was not in the right place. Also, prepositioned fuel and equipment in or near the AOR were not adequate to support all forces eventually deployed during Desert Shield/Desert Storm; however, they did provide initial fuels capability and supplemented the primary source.



Fuel bladder storage in AOR.

Fuels support provided to U.S. and Coalition aircraft during Desert Shield/Desert Storm was an enormous undertaking. A total of 44,825,480 million barrels (1,882,670,174 gallons) of petroleum products was consumed during Operation Desert Shield/Desert Storm. At the height of the war, the Air Force issued approximately 15 million gallons of jet fuel per day. This included over 11 million gallons per day issued in the AOR, and 4 million gallons per day issued to aircraft operating out of Europe.

In all, over 111,000 U.S. and allied combat sorties were flown without a single refueling delay or incident. Over 120 R-14 air transportable hydrant refueling systems, 220 R-9 refueling vehicles, 679 50,000-gallon fuel bladders, and over 926 fuels personnel were employed to store and issue this much fuel.

Unsuccessful negotiations with the Saudi Government to allow U.S. storage in Saudi Arabia had been going on for years. Therefore, a significant amount of reliance on host nation support would be required to provide adequate refueling capability. In the absence of any signed agreements, much of this support was based on hand shakes and assumptions. Host nation support was, however, a major contributing factor to the success of the fuels operation. All ground fuels and most of the jet fuel except for JP-5 (for Navy aircraft) and JPTS was provided from within the theater. Saudi Arabia, United Arab Emirates, and Oman contributed 41,835,132 barrels (1,757,075,564 gallons) of fuel for land, sea, and air operations. (Saudi Arabia and the United Arab Emirates donated the fuel free of charge.) Otherwise, extensive sealift would have been required, exposing the inadequacy of the U.S. tanker fleet. The dollar amount of the contribution (calculated in U.S. dollars at $1.20 per gallon) is approximately $2 billion. Additionally, commercial airport contractors provided plane refueling support, host military provided aircraft refueling at military bases, and host nation trucks and drivers provided most of the inland distribution of fuel from refineries and depots to the bases. These actions removed a major burden from Army Central Command, which was responsible for bulk fuel inland distribution and had committed most of its truck companies to moving fuel for ground forces.

By contrast with the combat-trained munitions personnel, most fuel supervisory personnel had little or no knowledge on locating and setting up a bare base fuels management support equipment system. For example, at one location with over one-hundred fuels personnel, the R-14 mobile fuel hydrants were out of service because no one knew to flip the reset switch. Many individuals had no contact (i.e., training) with the equipment in over ten years. This lack of experience and knowledge required that Air Force, Central Command establish a special team to set up fuels management support equipment systems at most of the beddown locations.

Maintaining the Force

Maintenance during Desert Shield and Desert Storm was generally without critical, mission-limiting problems. Even when problems arose, they were ameliorated by the relatively healthy supply and innovative procedures. With some exceptions, mission-capable rates during both Desert Shield and Desert Storm were roughly the same as peacetime rates or slightly lower, although variations occurred from month to month and from one type of aircraft to another. Other services had similar experiences with their flying units.

The tooth-before-tail (fighters before supply units, for example) nature of the deployment had a differential effect on mission-capable rates that varied with maintenance concept. During the first month of deployment, F-15 forces suffered a drop in combat-ready aircraft of between nine and fifteen percent compared to peacetime rates. The F-16 and A-10 forces, for which intermediate maintenance is less of a concern, did not experience that drop.

Where maintenance methods used during Desert Shield and Desert Storm differed sharply from anticipated methods (e.g., establishing intermediate maintenance support in Europe rather than in theater), imbalances between maintenance and other logistics factors appeared quickly. The most prominent imbalance was with transportation and was aggravated by the lack of in-transit visibility.

Most Tactical Air Command (TAC) and TAC-gained Air National Guard and Air Force Reserve Units deployed to the AOR received engine and avionics intermediate support from U.S. Air Force Europe locations. Strategic Air Command established similar capabilities in Europe and at Andersen in Guam. Compelling reasons for establishing centralized support centers outside the AOR included (a) the resulting reduction in people and equipment in a theater with an already-strained bare-base support structure and (b) increased efficiency of an established facility. The European facilities were underutilized. Their limiting factor was the lack of retrograde components and engines on which to work.

The desert environment appears to have had little persistent effect on equipment reliability. Major exceptions were T-64 and T-700 helicopter engines (used on the CH/MH-53 and MH-60 helicopters, respectively).

As a result of sand erosion problems, the engines achieved reliability levels approximately one-tenth that of peacetime levels. The T-64 unreliability was compounded by a two-level maintenance concept predicated on the normal reliability level.

Maintenance men and women accounted for approximately thirty-eight percent of all Air Force personnel deployed to the AOR and, in terms of numbers, were the single largest manpower element, although an accurate count will probably never be available. The actual tail-to-tooth ratio was larger, since Desert Shield and Desert Storm maintenance was also supported from the European theater, Guam, and the continental United States. There is no evidence, however, that too many maintenance personnel were deployed in the AOR; in fact, the evidence indicates that the Air Force went to war with fewer personnel than it would have planned. There were actually thirty-three percent fewer personnel in the AOR than usually required to support and properly maintain the number of aircraft there. A study of eight primary bases is included in chapter 8.

Both the base-level and industrial-level capacities exceeded demands generated by the Gulf conflict. At the industrial level, the number of repairable units produced was constrained primarily by lack of retrograded units on which to work. The acceleration of aircraft through programmed depot maintenance provided for almost 1,000 additional flying days. However, the additional flying days were not fully used. Military Airlift Command only used approximately one-third of the 174 additional flying days made available for C-141 aircraft.

An impression apparently created during the Gulf Conflict and remaining afterwards is that U.S. Air Force aircraft had mission-capable rates "equal to or better than" peacetime rates–often with an emphasis on "better than." The mission-capable rates were generally good but they were not *that* good. Mission capability rates appear to have been approximately the same or lower than peacetime rates. The appearance of improvement was an illusion caused by the differences between peacetime systems and the largely ad hoc reporting systems of Desert Shield/Desert Storm.

Automated maintenance management support to the theater was not available until late in the war (roughly December 1992). Absence of aircraft status information hampered attempts by various headquarters to ascertain the health of the fleet (although phone calls and messages helped). The absence of configuration data, especially on engines, compromised the ability to perform maintenance, although again other factors such as healthy spares stocks prevented critical shortfalls.

Measuring the Results

Logistics Performance

No single factor made logistics support of air power a successful element of the Gulf War. The reality of what happened and how end results were achieved make an instructive story of serious problems and timely solutions.

Fundamentally, but with some important exceptions, the resource requirements of the Gulf Conflict did not stress the resources and processes available at its inception. Basically, the needs of the conflict were satisfied by an existing logistics capability originally sized for a much larger conflict and augmented by significant host nation support, payment in kind, and other unplanned support.

Logistics performance has some obvious measures, such as mission-capable rates, that are intermediate and partial indicators at best. For example, maintenance and supply may create a *mission-capable* aircraft, but correct ordnance may not be available. Operations requirements are, to a degree, determined by expectations of actual logistics capabilities–hence, the visible requirement may not be the "real" requirement. Unfortunately, a number of measures, including mission capability, inevitably involve a "who gets the blame" component–leading to inaccurately reported results.

However, at least a provisional picture of logistics performance in the Gulf War can be drawn by using an evaluation framework from the four levels-of-war schema described in the *Effectiveness* report.[1] The four levels of war follow:

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[1]This schema is also consistent with proposed joint logistics doctrine. Joint Test Pub 4-0, Doctrine for Logistics Support of Joint Operations, Jun 1990, p I-1. The "test" publication promulgates the proposed doctrine.

Political - decisions and actions that set war objectives and overall conflict parameters

Strategic - decisions, actions, and efforts bearing directly on the achievement of war aims

Operational - decisions, actions, and efforts focused on the orchestration of the theater from the Commander-in-Chief's view, and

Tactical - decisions, actions, and efforts concerning how to plan or execute particular scenarios.

The logistics discussion concentrates on the operational and strategic levels of support. At the operational level, relevant questions center on (a) what did the Commander-in-Chief U.S. Central Command ask for and (b) to what extent did logistics satisfy or not satisfy the requests.

Beginning with direct operational support: did the combination of intertheater airlift and sealift deliver the force where and when it was supposed to be? The Commander-in-Chief U.S. Central Command initially directed deployment of a force package consisting of an Army Corps, a Marine Division, three carrier battle groups, the 1st TAC Fighter Wing, and twelve follow-on fighter squadrons. With a lack of initial unit prioritization plus desired closure dates of "now," a cumulative movement requirement represented an airlift demand six to seven times normal capability. The initial deployment goal was quickly modified but continued to change rapidly as the perceived threat changed.[2] Thus, a realistic view is that requirements matched capability rather than capability matched requirements. However, the issue is more complicated, since the airlift provided was constrained by a combination of self-imposed limits (i.e., the timing and extent of reserve call-up and Civil Reserve Air Fleet activation), a limited number of off-load locations in the AOR, and nearly useless automated information systems.

Air refueling was provided on demand and was available with few exceptions when and as needed. There were two primary operational

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[2]Clayton H. Snedeker, *Operation Desert Shield – Desert Storm:* Also, *The Vernon J. Kondra Notes, 24 Aug - 31 May 1991*, Apr 1992, p 2.

efforts: refueling during deployment and combat sortie refueling in the AOR. An increased tempo of Tanker Task Force activity on a grand scale characterized the deployment; it required, however, a furious level of coordination to marry tankers and receivers while simultaneously acquiring beddown and overflight rights for the deployment route structure. Within the SWA theater, the single greatest limiting factor affecting air refueling was the availability of air space. During the heaviest flying period in Desert Storm, virtually no room existed in the air for additional refueling tracks. Nevertheless, more than four receivers for every boom or drogue were in the air at any time.

In phase I of Desert Shield, CINCCENT requested and received six squadrons of C-130s as intratheater airlift. A seventh squadron was considered but not ordered up because a beddown site was not available. Utilization overall was less than expected for wartime (3.71 sorties per day in Desert Shield and 3.42 during Desert Storm versus the wartime planning factor of 4.0), but the difference is easily understood. First, the SWA theater was quite large. The flying time from Riyadh to Tabuk, as an example, is over five hours. Additionally, assigned aircraft were withheld for potential air evacuation of casualties, and those aircraft are counters when calculating overall utilization rate. The most intense test of intratheater airlift occurred during the "Hail Mary" movement of XVIII Airborne Corps before the ground war. In that fourteen-day period, C-130s flew over eight sorties per day–twice the wartime planning factor.

With regard to munitions, the evidence indicates that all missions requiring armament received it when they needed it. Not all missions received munitions preferred however. In particular, CBU 87/89s, Paveway II, and GBU 27 munitions were in short supply and rationed. Management of munitions was not that much different from previous wars–it was done manually.

The Air Combat Command Director of Supply made what appeared to be an astounding claim that not a single Desert Storm sortie had been lost due to supply. In the process of achieving this performance, however, supply revamped its planned use of the Combat Supply System and Standard Base Supply System, substituting the CENTAF Supply Support Agency in their place. Problem items included chemical gear, Halon, and personal weapons; lack of those items could have had a serious impact had the war taken a different turn. Further, the excellent supply performance did not always extend to support of communications equipment, Harvest sets, and other airbase functions. But the bottom line is that supply produced sorties.

Overall, maintenance also produced the sorties requested. The detailed narratives indicate that aircraft were ready.[3] If sorties were lost, it was because of ground and air aborts. Desert Shield aborts occurred at approximately the same rate as in peacetime; Desert Storm rates were only slightly higher.[4] Additionally, mission capability rates were generally excellent, even if they were about the same as peacetime rates rather than better. Battle damage rates were very low, and the repair rates were consistent with expectations of the ABDR program.

In answering the question, what did the Commander-in-Chief (CINC) require and get, intertheater airlift arose as the only possible exception to a general conclusion that what was required was provided, when it was needed. Even in the intertheater case, however, there was no firm set of requirements against which to measure performance; therefore, the strategic view must be examined to create a holistic perspective.

A strategic view raises the following questions: How "stretched" was logistics? Where were the long and short poles in the logistics tent? Where was there margin and how much? What was the reserve capability to fight an extended war or another war? From this view, a conclusion that intertheater airlift did not produce would make even less sense because its full capability was not exercised. First, the Civil Reserve Air Fleet III was never activated and Fleet II only partly utilized (an average of only fifteen commercial aircraft were needed and tasked per day[5]). Reserves were not called up until 22 August, and even then the call-up was partial for maintenance skills. An average of sixty C-141 and fifteen C-5 aircraft were withheld each day[6] to support missions other than the

[3]As an example: Ltr, Col Ralph J. Templin, 363 TFW(P)/DCM to AF/LEY/LEYM, subj: The war from an F-16 maintenance perspective, nd.

[4]Tactical Air Command, *Desert Shield Desert Storm Logistics Data* (Langley AFB, VA: TAC/LGP, Sep 1991), pp A-9 and A-10.

[5]MAC History, Appendix 7.

[6]Lt Col Bill Ewing and Lt John Walker, *Eight Months of Desert Shield/Storm*, (Scott AFB, IL: Hq MAC Command Analysis Group, Jun 1991), p 44.

Gulf War. Thus, despite the fact that the Gulf War airlift effort dwarfed the Vietnam and Berlin airlift efforts, it did it with reserve capacity.

As was true for intertheater airlift, only part of the then-existing refueling capability was committed to the Gulf War; forty-four percent of the KC-135 and eighty-one percent of the KC-10 tankers force. The balance of tankers was withheld to support the Single Integrated Operations Plan and other normal missions, and both KC-135 and KC-10 aircraft were used for intertheater airlift. Beyond that, it is not at all clear whether committing more tankers to Desert Storm would have been productive; airspace in the theater was saturated.

A maximum of 149 C-130s were deployed to the theater during Desert Storm where they airlifted 154,000 short tons of cargo and 184,000 passengers during Desert Storm, a substantial accomplishment. However, 149 C-130s represented only one-third of the Air Force's C-130 fleet.[7] It must be concluded that a robust capability to expand intratheater airlift was available if there had been a need.

During Desert Storm, 69,000 short tons of ammunition were dropped on the enemy. A much larger total of nearly 350,000 short tons was shipped by sea and air by the time hostilities ceased; most of the difference represented munitions in the sealift pipeline at the time the conflict terminated. It must be concluded that a robust capability was available to extend the war beyond 28 February if the need had arisen– although the amount of remaining armament varied by type.

This chapter previously stated that no record was found of a sortie having been lost because of a supply problem. There are several reasons for this level of success. First, the size of the war readiness spares kits deployed to the theater had been determined on the assumption that no resupply and very limited intermediate maintenance would occur in the first thirty days; however, resupply began almost immediately and intermediate maintenance was available. Hence, an interruption in supply would actually have been planned and would not have been viewed as a serious problem. Second, worldwide resources were available to the war effort, and the combination of supply information systems with

[7]All but one squadron of the active C-130 force were in the theater. The other two-thirds of the fleet were in the Reserves.

Desert Express demonstrated a reliable capability to move those resources to the user in three to four days. Since the most valuable supplies (and also the components most likely to cause a grounding condition) were repairable rather than consumable, the question then becomes maintenance's ability to repair rather than supply's ability to stock, store, and issue. The above reasons are also indicators of supply's capability to have supported the conflict at higher levels or under different circumstances.

What then was maintenance's reserve capability? The evidence (except for the C-5) is reasonably convincing–the operational tempo was less than maintenance's capability at all three levels: organizational, intermediate, and depot/industrial. Although the evidence at the organizational level is fragmentary, as indicated earlier, it is fairly conclusive at intermediate and depot levels. At the intermediate level in the AOR for example, one avionics shop per wing was deployed compared to the planned one per squadron.[8] Although direct evidence of the intermediate workload at Air Force avionics shops in Europe was not uncovered, a basis exists for concluding that engine shops were underutilized. Depot-level capability was clearly in excess of that demanded. The depot was able to accelerate program depot maintenance beyond operation's requirements, and only selective surging of repairables was needed.

Evaluating the Results

The final values of the measures of merit for each logistics functional area are without question positive (and would hardly be credible otherwise–we won the war). Below the macro levels described previously, a combination of successes and serious problems appear to signal trends in at least five areas: precrisis preparation, precrisis planning, precrisis training (especially to the degree a combat-experienced nuclei demonstrated), logistics command and control, and improvisation. Each is summarized below:

Precrisis preparation was one of the most important factors underlying the achieved success in the Gulf War. Prepositioning, as an example, saved the equivalent of over 3,500 strategic airlift sorties for Air Force-

[8]In addition, however, the peak maintenance manpower requirements in the theater never exceeded sixteen percent of total active duty Air Force Maintenance manning, and a full callup of reserve maintenance personnel was not exercised.

related equipment alone, and a total of greater than 10,000 sortie missions overall. The importance of this prepositioning can be grasped by noting that only approximately 5,000 intertheater airlift sortie missions were flown during the phase I deployment. The prepositioned tonnage was equal to approximately one-half of the amount eventually dropped. Supply preparation, focused as it was on a potential central European war, provided a robust source of repairables and consumables for the Gulf War. More broadly, the sizing of air power, motivated as it was in general by a postulated central European conflict, entailed an across-the-board level of preparation that was more than adequate when compared with the demands of the Gulf War. The allied contribution of fuels, subsistence, vehicles, and construction equipment, among other needs, further enhanced the favorable supply situation.

Chapters 2 and 3 make the points that deliberate, detailed TPFDD-level planning for a war in SWA did not yet exist in August 1990, the Joint Operations Planning and Execution System (JOPES) was immature, and not enough time was available to set up, load, and schedule missions using FLOGEN (a flow generation model). These circumstances are fact. However, to then conclude that had there been a complete TPFDD, a mature JOPES, and time to run FLOGEN, all would have been well is a mistake because the hidden assumption is that an adversary, allies, and even weather are willing to follow the planned script. In how many wars has that been the case?

Unrealistic assumptions, planned capabilities that did not materialize, and providential capabilities already in place led to a series of improvisations during the conflict. Some have been touted with good reason as successful innovations; they can be viewed alternatively as necessary workarounds.

Some of the major logistics improvisations follow:

- Desert Express helped ensure an adequate level of transportation supporting essential resupply. Users loved it, and it materially reduced backorders. It helped to fix a broken priority system that viewed all movement requests as equally urgent.

- The CENTAF Supply Support Agency became a fast, effective instrument for perceiving need for and source of critical parts. It relieved problems with the combat supply system designed for an out-of-date, unusable tactical shelter system.

- Establishing the CENTAF Rear at Tactical Air Command at Langley AFB took advantage of in-place, knowledgeable capability. It eliminated the impossible requirement that CENTAF (9AF) move forward and, at the same time, create CENTAF Rear.

- The BlueBall Express expedited the movement of supplies from ports to in-theater bases. It made up for the Army inability to mount line haul–"teeth before tail" kept support assets in the CONUS.

- The Air Force Logistics Information File linked transportation and supply together to provide intertheater in-transit visibility. It helped correct the problem of losing track of parts as soon as they entered the transportation system.

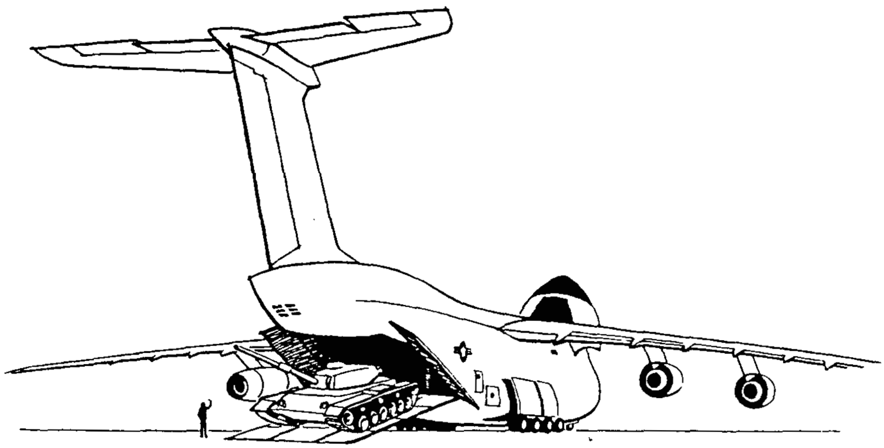
- Putting intermediate-level maintenance in Europe and the Pacific took advantage of in-place, mature technical capability. That action solved difficulties with facilities and with moving intermediate level maintenance from CONUS to the AOR. It provided relief for the cap imposed on the growing military population in the AOR.

Relying upon Military Airlift Command requirements augmentation was not an innovation, but a reversion to manual methods. The inability of JOPES and FLOGEN to handle rapidly changing requirements and tracking munitions manually were also not innovations, but reversions to traditional methods because alternatives were lacking.

No single thread ties all of the improvisations together, but two themes (or evils) dominate: unrealistic prior planning assumptions and an inflexible command and control apparatus that stumbled in the face of change: The themes are not original with the Gulf Conflict and may be as old as war itself.[9] In fairness to the "unrealistic" planners and architects of "inflexible" command and control systems, those themes are a lot

[9]Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (New York: Cambridge University Press, 1977), pp 202-211. van Creveld further states that a clear connection between amount of prior preparation and success or failure does not appear to exist.

easier to discern in retrospect. Why, however, did they not impact the outcome? The answer is: a superb resource base plus five and one-half months to prepare. Now the resource base that made the difference is being reduced; future wars may or may not be preceded by nearly six months in which to prepare. The potential outcome with a different mix of resources and time deserves consideration.



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Preparation for a Southwest Asia Contingency, 1 August 1990

The introduction to this report defined logistics as ". . .planning and carrying out the movement and maintenance of forces." This chapter focuses on precrisis actions with emphasis on creating forces and preparing for their sustained support in a Southwest Asia (SWA) contingency. Since air forces use complex weapon systems and are sustained from bases connected by lines of communication (LOCs),[1] understanding air power logistics preparation involves examining the four components: forces, weapons, bases, and lines of communication–as well as planning for their employment in war. Preparation timeframes are relatively long, particularly for weapon systems, for which preparation takes decades rather than years. Because timelines are long, the historical horizon for this chapter stretches back to the 1970s and earlier.

The chapter is divided into three parts. The first part focuses on preparation per se. The second section describes planning for war and includes the planning process and the status of logistical plans for a war in Southwest Asia. The final part summarizes the results of late 1980s exercises and readiness assessments as a way of clarifying the prevailing perception of air power logistics readiness on the eve of the Gulf War.

Preparation

The introduction to the *Planning* report notes that planners viewed the Gulf as essentially the right flank of NATO and placed primary emphasis on a war with the Soviet Union. The 1987 USAF War and Mobilization Plan, in fact, defined the most demanding 1990 scenario for the Air Force as a worldwide war, centered in Europe, and involving the Soviet Union. Thus the U.S. force structure and resources to support it were oriented towards the Central European scenario.

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[1] AFM 1-1, *Combat Support Doctrine*, 1 Apr 1987, p 1-2.

Table 1 compares the number of U.S. Air Force aircraft in the inventory with the number that were actually deployed and with the number projected to be used in the SWA theater during a worldwide war with the Soviets. The point of the table is that, in terms of the overall numbers, the Air Force had prepared for a much larger conflict than the Gulf War turned out to be. For example, only fifteen percent of F-15 aircraft in the force were deployed; the remaining eighty-five percent were a source of spare parts through cannibalization, and a ready maintenance manpower pool and other resources were available (not to mention enormous fire power). As the *Support* report and later chapters in this report show, however, important imbalances arose.

Other reports (especially in the *Weapons, Tactics, and Training* report) discuss the direct combat capability implications of Coalition aircraft and munitions quality. The issue of quality has important meaning for combat support as well–particularly quality as it is demonstrated through reliability and maintainability (R&M). Published reports generally credit R&M investments during the 1980s with reducing the investment needed in spare parts and other resources.[2] Actually, sustained, successful investment in R&M goes back much farther. Figure 1 shows the failure rates of USAF fighter aircraft as a function of the year of introduction.[3] The F-15E, with not quite double the reliability of the F-15A, is a product of the 1980s; the F-15C and F-16 aircraft were designed in the 1970s. All of the later designs are twice as reliable as Vietnam-era F-4 series aircraft. As is discussed more fully in the maintenance chapter, the improved reliability permitted planned and unplanned operation for 30 days or more without significant maintenance and resupply.

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[2]For examples see Department of Defense, Final Report to Congress: Conduct of the Persian Gulf War, Apr 1992, p 399; Michael M. Self, "Air Force Logistics Command Operations in Desert Storm," (AFMC/XPOX: Wright-Patterson AFB, OH, Jul 1991).

[3]There are various ways of measuring reliability. Type 1 maintenance actions are by definition caused by some failure in hardware; they do not include can-not-duplicates (type 1) or induced failures (type 6). Because they exclude can-not-duplicates and induced failures, the type 1 maintenance actions are a reasonable indicator of design reliability. Sources of data: Air Force Maintenance and Operational Data Access System data for Sep 90-Aug 92 (for type 1 maintenance actions); Jane's All the World's Aircraft 84-85, 86-87, 89-90, 92-93 (for years of introduction).

Table 1
United States Air Force Aircraft
Inventory versus Quantity Committed to Gulf War

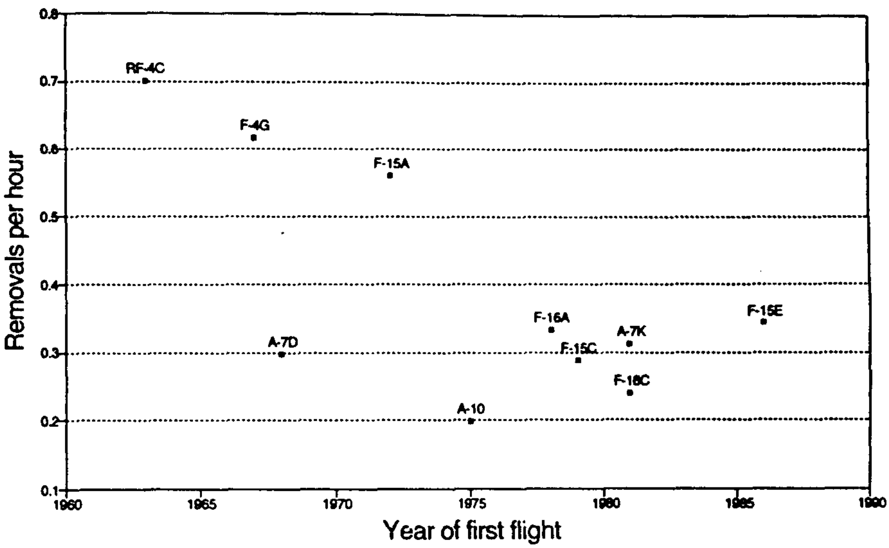
Aircraft	Worldwide Inventory USAF, ANG, AFR	Planned	AOR 1 Aug 90	AOR 14 Jan 91	Proven Force	Gulf War Total	Percent of Worldwide Inventory in Gulf War
F-4E	247					0	0%
F-4G	113			48	12	60	53%
F-16	1623			208	36	244	15%
F-15	781			96	24	120	15%
F-15E	104			48		48	46%
F-117				36	18	54	
F-111	285			64		64	22%
A-10	572	[DELETED]		144		144	25%
AC-130	20			4		4	20%
B-52 (DIEGO GARCIA, SPAIN, UNITED KINGDOM)	230			20		20	9%
RF-4	236			18		18	8%
EF-111	42			14	6	20	48%
E/H/MC-130	104			21	10	31	30%

Table 1 (Continued)
United States Air Force Aircraft
Inventory versus Quantity Committed to Gulf War

Aircraft	Worldwide Inventory USAF, ANG, AFR	Planned	AOR 1 Aug 90	AOR 14 Jan 91	Proven Force	Gulf War Total	Percent of Worldwide Inventory in Gulf War
RC-135	19	[DELETED]		6	2	8	42%
JSTAR	IN DEVELOPMENT			2		2	
E-3	34			10	2	12	35%
TR-1/U-2	23			9		9	39%
KC-135	633		2	194	12	206	33%
KC-10	59			22		22	37%
C-130	568			128		128	23%
C-20	13			1		1	8%
C-21	83			8		8	10%
MH-53	41			8	5	13	32%
MH-60	24			8		8	33%
TOTALS	5854		2	1117	127	1244	21%

Note: These figures came from several sources. The fourth column, figures for 1 Aug are from "The Persian Gulf War, an Air Staff Chronology of Desert Shield/Desert Storm, Volume on Desert Shield, p 5. The next two columns (Forces in the Gulf just before the war) are from the *Statistical Compendium* of this survey. The AOR forces are as of 14 Jan 90, the Proven Force forces are as of 19 Jan 90. The F-117 force went to 42 aircraft on the 26 of Jan. The B-52 force went to 36 on 19 Jan and 66 on 9 Feb. The figures for the planned European War, with the Soviets, are from the USAF War and Mobilization Plan dated 1 Jul 87, Volume 3, Part 1; specifically, the forces shown available for a war on 1 Oct 90 were used (pp e I 91-1 thru e I 91-40.) Forces were included if they were available on or before day 30. The figures in the Worldwide Inventory were provided by AF/PEI, the Programs Integration Division, Ms. Rita Johnson, 2 Oct 92.

Figure 1
USAF Fighter Aircraft: Type 1 Failures/Hour Versus Year of First Flight



The 1970s after Vietnam have been aptly described as an era of putting rubber on the ramp while postponing procurement of support resources until later.[4] That strategy was largely responsible for the aircraft inventory shown in Table 1. "Later" turned out to be the early through the mid 1980s, when the Air Force provided healthy funding levels for supplies. The results made the relationship between investment and capability abundantly clear. Figure 2 shows aircraft spare parts funding for fiscal years 1980 through 1990.[5] The absolute level of funding is more important than the comparison between requirement and amount funded because in the early 1980s, requirements were computed by

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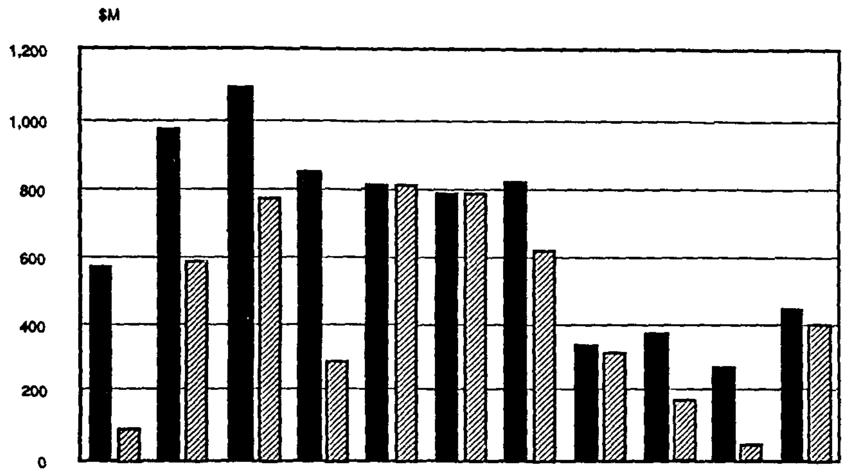
[4]Lt Col David C. Rutenberg, USAF, and Jane S. Allen, eds., *The Logistics of Waging War* (Gunter AFS, AL: Air Force Logistics Management Center, circa 1984), p 170.

[5]Hq Air Force Aircraft and Missile Support Division (AF/LGSW).

Figure 2
Aircraft Spare Parts Funding FY 80-90 (BP15,WRM)
($ in Millions)



Fiscal Year	80	81	82	83	84	85	86	87	88	89	90
Requirement	579.2	990.3	1,118.8	877.4	828.4	798.6	822.1	347.3	379.9	265.4	457.5
Funding	87.1	596.8	776.8	291.3	828.4	798.6	615.0	316.4	187.1	53.2	401.1

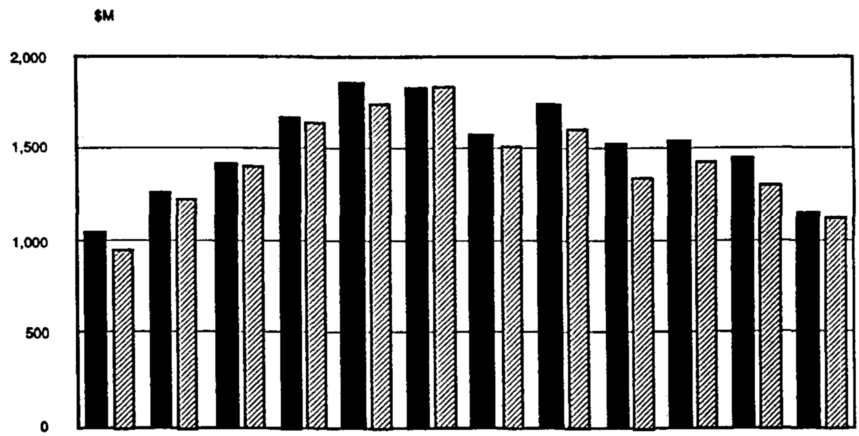
using a simple "flying hours times usage factor" method; later in the decade, capability-based methods were introduced.[6] Coincident with the wave of spare parts funding were increases in war readiness spares kit (WRSK) funding and in funding for exchangeable repair–i.e., the repair of broken spare parts (Figure 3).[7] The impact of changes in spares and exchangeables funding (both increasing and decreasing) is clearly evident in mission capability rates (Figure 4). The roughly three-year lag time

[6]Intvw, Mr. James A. Forbes with Col (Ret) Frank C. Cartwright, 6 Jan 1992. Col Cartwright was the Chief of the Air Forces Logistics Resources Integration Office (AF/LEXI) from 1983 to 1985.

[7]The various types of spares are described in chapter 7.

between a change in funding and a change in capability is also evident.[8] Funding peaked in the 1985 timeframe; capability peaked just before the Gulf War. This is one of many indicators showing that Iraqi leadership chose a propitious time (for the United States) to initiate hostilities.

Figure 3
Exchangeable Repair Requirement/Funding FY 80-91
($ in Millions)

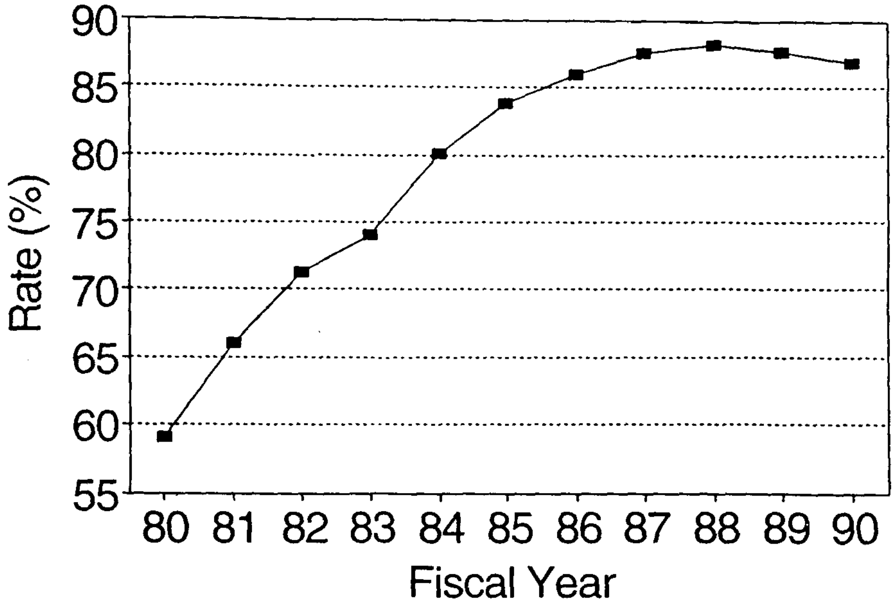


Fiscal Year	80	81	82	83	84	85	86	87	88	89	90	91
Requirement	1,044.7	1,240.7	1,430.7	1,696.2	1,862.0	1,848.6	1,585.9	1,743.1	1,524.6	1,542.8	1,479.0	1,159.6
Funding	966.9	1,228.8	1,426.8	1,672.4	1,757.2	1,848.6	1,501.0	1,608.7	1,347.4	1,441.6	1,331.5	1,155.7

Requirement   Funding

[8]The calculated R^2 (explanatory power) of a linear relationship between the mission capability curve and the exchangeables funding curve with a three-year offset is 0.87. That is, 87% of the change over time in mission capability is "explained" by a previous change in exchangeables funding.

Figure 4
Tactical Operational Fighters Mission Capability Rates



There was a similar investment in munitions (Figure 5) where the majority of the funding was in 1985, 1986, and 1987. The investment returns would prove to be vital to the supply of preferred munitions in the Gulf War.

The Air Force formally recognized the concept of Bases and Lines of Communication as fundamental to combat support doctrine.[9]

> Bases are the sites from which operations are originated or supported (or both), while the lines of communication (LOC) are the routes for transmitting resources between bases. Bases are the

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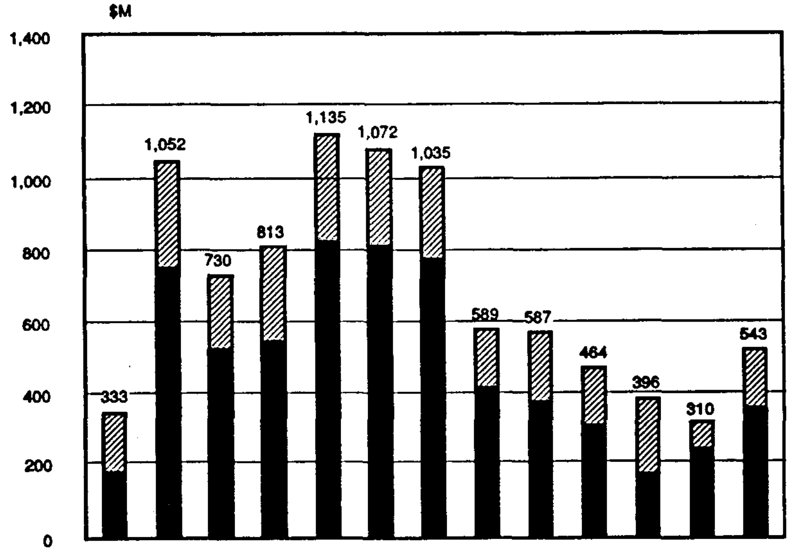
[9]AFM 1-1, p 1-2.

Figure 5
Munitions Funding FY 81-93
($ in Millions)



Fiscal Year	81	82	83	84	85	86	87	88	89	90	91	92	93
Training	160	309	217	268	310	254	250	178	200	166	230	76	179
WRM/Other	173	743	513	545	825	818	785	411	387	298	166	238	364

WRM/Other   Training

critical junctures at which aerospace power is most dependent. For it is at the base that resources are concentrated in order to manifest combat power.

The basing structure in existence on the eve of the Gulf War conformed to Air Force doctrine, which categorized bases as operational, support, or industrial. Strategic bomber bases and forward fighter bases were examples of operational bases.[10] Operational bases did not sustain themselves indefinitely, but had to be supported by the other two categories of bases through the lines of communication. The Air Force active basing structure as of August 1990 is shown in Table 2.

Table 2
Air Force Active Basing Structure

Area	Bases	Comment
CONUS	97	Includes 5 Air Logistics Centers
Europe	26	Included Support Group Europe (SGE) at RAF Kemble which provided some industrial type support to the area bases (Kemble closed October 1990)
Southeast Asia	8	
South and Central America	1	Howard AFB
Southwest Asia	0	Diego Garcia was a British installation with a U.S. Navy cadre.
Pacific	9	Includes 2 in Hawaii and Kadena which provides some industrial type support to the bases in the area.
Atlantic area	2	Includes Thule and Lajes

It should be clear from Table 2 that the extant basing structure was a product of the Cold War, with most of the bases either in Europe or in the United States proper. Although the basing structure was rich, it was substantially in the wrong place to support a conflict in Southwest Asia. U.S. Air Force, Central Command (USCENTAF) had identified 14 potential operational base locations within the area of responsibility (AOR) with a

[10] *Ibid.*

capability to support a population of approximately 30,000 personnel.[11] All, however, were just that: potential locations. By comparison, there were 9 in-place U.S. air bases in the Pacific, 26 (some of which were in the process of being closed) in Europe, 2 in the Atlantic region, and one major base in Panama.[12]

Although no U.S. operational facilities were located in SWA, numerous facilities had been developed according to U.S. standards but used by Saudi Defense forces or for civilian purposes. The primary Saudi airbases and air logistics centers were built or augmented largely through long-standing security assistance relationships or with the backing of U.S. funding.[13] Dhahran was even used during World War II as a resupply point for U.S. forces in Asia.[14] The U.S. Army Corps of Engineers rebuilt the Dhahran Airfield in 1956 and constructed a civil terminal in 1961.[15] A formal agreement that the Corps would furnish certain support for the Ministry of Defense and Aviation (MODA) was executed in 1965 and is still in existence at the time of this writing.[16] The agreement paved the way for construction of the King Faisal and the King Abdul Aziz Military Cantonments and King Khalid Military City. Other key projects completed under this agreement included separate headquarters for the Royal Saudi Air Force and MODA, the port at Ras al Mishab, and several schools.[17] A network of other facilities and bare base setups, too lengthy to enumerate, were constructed as part of an overall Saudi defense program. The details and existence of some of the facilities were

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[11]Col William Rider, CENTAF/LG After Action Report, ca Mar 1990, p 19.

[12]1991 Air Force Almanac, *Air Force Magazine*, May 1991, Vol. 74, No. 5.

[13]"Defense Exports in the Post Desert Storm Environment," *DISAM Journal*, Summer 1991, Vol. 13, No. 4, p 12.

[14]Maj Jim Dart, USAF, "USMTM: Point Guard on the Arabian Peninsula," *DISAM Journal*, Winter 1991/1992, p 2.

[15]U.S. Army Engineers had a long-standing relationship with Saudi Arabia, and participated in numerous projects and facilities within and external to security assistance programs. Lt Gen Henry J. Hatch and Janet A. McDonnell, "Corps of Engineers: Laying the Groundwork for Theater Operations," *Military Review*, Vol. LXXII Mar 1992, No. 3, p 3.

[16]*Ibid*, p 3.

[17]*Ibid.*

unknown to the United States at the time of the Gulf War, and planning factors were not accurate for some of the known facilities.[18]

Although the United States did not have large, established bases in the AOR, it did have contingency sites, used largely by the U.S. Navy. A small U.S. Middle East Task force had been established at Seeb, Oman, since the 1940s, but it and other Navy activities were fairly low-visibility operations.[19] Although not in the immediate vicinity, Diego Garcia was a prominent toe-hold in the region. Leasing facilities on the island from the British beginning in 1965 enabled the United States to build runways suitable for B-52 and C-5 operations as well as docks that accommodated prepositioned ships.[20]

The Air Force described support bases somewhat tautologically as representing the "depth of combat support activity." Air logistics centers, program offices and laboratories, headquarters, ports, and training centers were considered support bases.[21] In 1990, Air Force Systems Command (AFSC) designed and acquired aerospace vehicles and systems. Air logistics centers (ALCs) were responsible for supply, repair, distribution, and sustaining engineering under the direction of Air Force Logistics Command (AFLC). The Miliary Airlift Command (MAC) was responsible for peacetime management of various aerial ports worldwide,[22] while the training centers were managed by Air Training Command (ATC).

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[18] *Ibid.*

[19] (S/NF/WN) William T. Y'Blood, *The Eagle and the Scorpion*, Center for Air Force History, United States Air Force, Washington, DC, 1992, p 7.

[20] (S) *Ibid*, p 7.

[21] AFM 1-1, p 1-3. This particular view of support bases unfortunately introduces terminological confusion because the work performed at a depot (one kind of support base) is generally thought of as *industrial* maintenance. Further, other support bases might only provide intermediate-level maintenance–that is, intermediate between depot/industrial-level and unit/organization-level. We will use the three-fold distinction: operational, intermediate level support, and industrial-level support when discussing maintenance and as otherwise necessary to minimize the confusion.

[22] MAC's global missions were accomplished through an airlift system which had 78,000 people and 800 aircraft at 300 locations in 25 countries. MAC operated 13 bases in the United States and controlled facilities at Lajes and Rhein Main Air Base, GE. AF Almanac 1991.

AFLC and its ALCs provided supplemental logistics support to the operational commands. ALCs released materiel to base supply (thought of as a wholesale transaction); in turn, base supply released the materiel to consuming organizations on base (retail). AFLC defined requirements for weapons systems support and obtained resources from the national industrial base. During the decade before the Gulf War, AFLC made organizational changes and significant investments to better serve the needs of combat and support forces. AFLC had combined its heavy maintenance organizations with buying agencies and those that provided technical support. This "integrated" management approach was intended to ensure that all logistics needs were considered for a particular aircraft type; one individual for each major system was accountable for ensuring integration.[23]

During the 1980s, AFLC invested over $130 million in aircraft maintenance facilities. At Warner Robins ALC, new hangars were constructed for performance of heavy maintenance and modification on C-141B aircraft. The new construction enabled aircraft repairs around the clock during the Gulf War. Expansion of engine overhaul facilities at San Antonio and Oklahoma City expedited Gulf War aircraft engine overhaul.[24]

Two air logistics support bases were located in the AOR. The first, called PM-SANG, resulted from a U.S. Air Force-sponsored program to help the Saudi Air National Guard (SANG) develop an industrial-level ALC similar in function to Air Force ALCs.[25] The second, the Defense Fuel Supply Point in Bahrain, was managed by the Defense Logistics Agency. The next nearest industrial-level support base to the AOR was RAF Kemble in the United Kingdom. It was home base for the European Distribution System (EDS), which routed high-priority cargo through the European Theater. RAF Kemble was in the process of being closed.

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[23]Michael Self and Edward Kozlowski, *AFLC White Paper*: "Operations in Desert Storm," Jul 1991, p 11.

[24]Self and Kozlowski, p 4.

[25]Maj Jim Dart, USAF, "USMTM: Point Guard on the Arabian Peninsula," *DISAM Journal*, Winter 1991/1992, p 4.

The final type of base, the national "industrial base," included government and private research institutions, industrial plants, transportation and communications systems, the civilian labor force, and raw materials.[26] The industrial bases of the United States, its allies, and SWA countries were favorably postured to support a gulf war.[27] SWA countries had rich, oil-based economies; NATO Allies had a high level of preparedness; and Japan was a major provider of important technologies.[28]

Tying the bases together in peace and war were lines of communication.[29] Air Force Combat Support Doctrine identified four LOC types: land, sea, air, and space.[30] Two LOC types, sea and air, were part of a mobility triad of airlift, sealift, and prepositioning.[31]

After World War II, the primary strategic sealift mission was to move men and equipment to Europe rapidly for defense against a Soviet-Warsaw Pact attack. Sealift was a Navy responsibility, and sealift in support of the central front was to have been provided by over 600 NATO merchant vessels combined with the U.S. merchant fleet of 578 major ships (as of 1978). On the eve of the Gulf War, however, this figure had dropped to 367 active ships despite an investment of $7 billion in sealift during the

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[26]John T. Correll and Colleen A. Nash, "Declining, Diversifying, and Disappearing," *Air Force Magazine*, Vol. 74, No. 10, Oct 1991, pp 36-40, p 38.

[27]Since then, as is well understood, the U.S. defense-related industrial base has been in decline. The Joint Chiefs of Staff estimated in 1991 that two to four years would be required to regain levels of production achieved in 1990. John T. Correll, and Colleen A. Nash, "Declining, Diversifying, and Disappearing," *Air Force Magazine*, Vol. 74, No. 10, Oct 1991, pp 36-40, p 36.

[28]John T. Correll and Colleen A. Nash, "Lifelines Abroad," *Air Force Magazine*, Vol. 74, No. 10, Oct 1991, pp 42-47, p 44.

[29]To reemphasize, communication in this sense meant the pipelines or conduits through which resources were transmitted rather than electronic communication.

[30]AFM 1-1, p 1-3.

[31]Capt Robert N. Kestlefoot, USN, "Force Projection by Sea: Cornerstone of Contingency," from *Defense 85*, Aug 1985, pp 16-23. Published monthly by AFIS, Arlington, VA, in *Air War College Associate Programs*, Vol I, 2nd Ed, Lsn 19, p 474.

1980s.[32] As a result, the goal set for sealift in moving materiel to the AOR would be difficult to achieve, given the decline of capabilities.[33]

Sealift was grouped into three categories: prepositioned, surge, and resupply. Assets prepositioned in ships close to the conflict allowed for near-immediate access, while surge shipping allowed for the movement of most of the equipment and initial sustaining supplies from the continental United States (CONUS). In resupply shipping, where the sea lines of communication (SLOC) figured prominently, shipments followed surge shipping to provide sustainment stocks at rates determined by growth of force levels.[34]

The Military Sealift Command (MSC) operated peacetime shipping and provided the nucleus of sealift capability. The Sealift Readiness Program (SRP) was a voluntary commitment of some carriers to contingencies. During emergencies, the President could authorize the Secretary of Transportation to draw on additional U.S. flag shipping for crisis or wartime needs. The next source of support beyond the MSC and U.S. charter assets was the Ready Reserve Force (RRF) ships. The Maritime Administration managed the RRF for the U.S. Navy. The force was part of the National Defense Reserve Fleet (NDRF), and its assets were categorized in incremental readiness statuses of five, ten, or twenty days notice. RRF ships were activated by a request from the Navy to the Maritime Administration.

There were two other sources of sealift. The first, the aforementioned 600-ship NATO pool, was managed by the NATO National Shipping Authority, which was authorized to reallocate ships among NATO member

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[32]This investment included 96 Ready Reserve Force ships (RRF), 25 Maritime prepositioned ships (MPS) for the Marine Corps, Afloat Prepositioned Ships (APS) for the Army and Air Force, eight fast sealift ships, (FSS), two 1,000-bed hospital ships, and two aviation logistics ships. *The United States Navy in Desert Shield/Desert Storm*. Department of the Navy, Office of the Chief of Naval Operations, Washington, DC, 15 May 1991.

[33]Sealift planning factors assumed little or no port facilities because ships were able to offload through the use of self-sustaining barges discharged from the ships, lighterage (which were sets of self-powered ferries configured for landing), and other such arrangements. Capt Robert N. Kestlefoot, USN, "Force Projection by Sea: Cornerstone of Contingency," from *Defense 85*, Aug 1985, pp 16-23. Published by AFIS, Arlington, VA, in *Air War College Associate Programs*, Vol I, 2nd Ed, Lsn 19, p 475. Also, see the CINCCENT's assessment of lift later on in this chapter.

[34]Kestlefoot, p 474, in *Air War College Associate Programs*.

nations. The second was called the "Effective U.S.-Controlled Fleet" ships. These ships were owned by U.S. corporations although registered under the flags of Liberia, Panama, Honduras, and the Bahamas. They were available to the United States because the countries of registry did not have laws precluding the requisitioning of ships.[35]

The air lines of communications were an Air Force responsibility through its Military Airlift Command.[36] They were designed to "close"[37] first but with a lesser throughput capacity than sealift. The 1981 Congressionally Mandated Mobility Study (CMMS) established an airlift goal of 66 million ton-miles per day, which represented a target objective for effectively executing four specific warfighting scenarios developed in conjunction with the study.[38] In 1987, considering all available airlift (including the Civil Reserve Air Fleet, discussed below), only 48 to 51 million ton-miles per day were achievable.[39] Moreover, the CMMS pointed out that one-third to one-fifth of the needed airlift would not be available for the first fifteen days for any of the four scenarios analyzed.[40] In light of the diminishing Soviet threat, the Secretary of Defense revised the goal to 48 million ton-miles per day in April 1990. The new goal was not incorporated into long-range planning efforts before the Gulf War but made capability and requirements essentially the same.[41]

The Civil Reserve Air Fleet (CRAF) was a significant part of airlift. When Desert Shield began, CRAF comprised five segments: long-range international, short-range international, aeromedical evacuation, domestic, and Alaskan. CRAF was further organized into three stages that could be activated incrementally to support DOD airlift requirements. The succes-

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[35]Kestlefoot, p 475.

[36]Kestlefoot, p 474.

[37]That is, reach the port of debarkation.

[38]Lt Col Robert Kaufman, USAF, "The Airlift Strategy: A Credible Deterrent and Our Most Effective Mobility Option," in *Air War College Associate Materials*, Vol I, 2nd Ed, Lsn. 16. p 232.

[39]Lt Col Kaufman, p 233.

[40]Kaufman, p 231.

[41]J.A. Forbes, Memo for the Record, subj: Airlift Capability on the Eve of Desert Shield, 5 Nov 1992. The memo summarizes results of discussions with Mr. Lowell Jones, ANSER Area Leader for Special Operations Forces, Airlift, and Training. Original source of these figures is AF/XOFM.

sive stages, each with an increasingly larger number of aircraft, were intended to enable the Commander in Chief Military Airlift Command (CINCMAC) to tailor the size and composition of the strategic airlift force to meet expanding transportation requirements.[42]

CINCMAC was authorized to activate CRAF Stage I. Upon activation, Stage I carriers had twenty-four hours to respond to HQ MAC tasking.[43] Stage II, which the Secretary of Defense was authorized to activate, had 177 aircraft enrolled. It was to augment MAC organic aircraft for the next higher level of emergency. Stage II carriers also had twenty-four hours to respond to airlift tasking. Stage III had 506 commercial aircraft at the end of fiscal 1990. Following a Stage III call-up, the commercial carriers had forty-eight hours to begin supporting DOD airlift requirements. Stage III would only be activated "short of a defense oriented national emergency" as determined by the President or the Congress. Even without activating any stage of the CRAF, member airlines often volunteered aircraft when military airlift requirements became especially great. MAC paid for these flights using MAC uniform negotiated rates.[44] Civil air carriers electing to participate committed varying numbers of their aircraft to the CRAF, sometimes in return for a proportionate share of DOD peacetime airlift contracts. If the entire CRAF had been activated in late 1990 to support military transportation requirements during a major national emergency, its aircraft would have formed more than thirty-two percent of MAC's cargo transport capability and ninety-three percent of the Command's passenger airlift.[45]

On 2 August 1990, the day Iraq invaded Kuwait, MAC's strategic aircrews available for mission tasking were as shown in Table 4.[46] As can be seen, almost half of the strategic airlift aircrews originated from the reserves.

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[42]Rpt, MAC DCS Comptroller/ACIB, "MAC Airlift Services Management Report, FY 90," nd, p 15.

[43]Airlift Services Management Report, pp 15-16.

[44]Airlift Services Management Report, p 15.

[45]Rpt, MAC DCS Comptroller/ACIB, "MAC Airlift Services Management Report, FY 90," nd, p 15.

[46]Intvw, J. W. Leland, MAC History, with Mr. J. M. Ledden, MAC DCS Operations and Transportation/AXO-S, 28 Jan 1991.

Table 3
Civil Air Carrier Volunteers
Before CRAF Stage I Activation[47]

American Trans Air	Hawaiian Airlines*
Air Transport International	Pan American World Airways
Continental Airlines	Rosenbalm Aviation
Connie Kalitta	Southern Air Transport
Delta Airlines*	Trans International Airlines*
Eastern Airlines*	Tower Air
Evergreen International Airlines	United Airlines
Federal Express	World Airways

*Volunteers who did not have a Stage I commitment.

Table 4
Aircrews Available for Desert Shield
on 2 August 1990

	Aircrews		
Aircraft	**Active Duty**	**Reserve**	**Total**
C-5	139	113	252
C-141	463	424	887

Source: CATD Log (S/Decl OADR), Entry for 032200Z Aug 90.

[47]Memo, MAC DCS Plans and Programs/XPXO, "Air Carrier Volunteers Prior To CRAF Stage I Activation," nd.

Reserve manpower augmentation actually exceeded that of the active duty force in some Air Force specialty codes. In the entire Military Airlift Command, for example, approximately 18,000 aerial port specialists were authorized. Of those, nearly sixty percent were assigned to units of the Air Reserve Components (ARC).[48] Similarly, more than ninety percent of MAC's aeromedical evacuation specialists were assigned to the ARC, while sixty percent of MAC tactical airlift personnel belonged to the Air National Guard and Air Force Reserve.[49] Before the invasion, twenty percent of reserve associate aircrews were flying MAC missions on a typical day. It should be clear that activating large portions of MAC's ARC resources during a major conflict was both necessary and expected–failure to do so would have imposed an immediate constraint on airlift.[50]

The third part of the mobility triad was prepositioning. In the absence of established bases, having material close at hand diminished the need to stoke a long pipeline. All military services and theaters participated in some form of prepositioning as a strategy to reduce air and sealift dependencies. Table 5 presents the worldwide status of prepositioned equipment and supplies.[51]

A special set of housekeeping equipment and facilities designed for the CENTAF austere desert environment was called Harvest Falcon. It included hardwall shelters, tent expandable modular personnel tents, equipment, and vehicles; provided power, water, facilities, and vehicles; and was air transportable. It could support up to 55,000 people and 750 aircraft–thirteen bases and one forward operating location.[52] According

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[48]Intvw, with Ledden.

[49]Intvw, J. W. Leland, MAC History, with Mr. W. J. Bush, MAC Command Section/CSB, 8 Oct 91; point paper, MAC DCS Plans and Programs/XPB/XPMRM, "Air National Guard (ANG) and Air Force Reserve (AFR) Forces in MAC, FQ4/91," 10 Jul 1991, Sup Doc 3-28.

[50]Ltr (S/Decl OADR), MAC DCS Plans and Programs/XPX to MAC History Office, "Review of Chapter III of 1990 MAC History, Operation DESERT SHIELD," 6 Sep 1991, info used.

[51]Although this table is dated as of FY 1992, information is similar to FY 1990-91, on the eve of the gulf war, *JCS Mobility Requirements Study*, 23 Jan 1992, page IV-8.

[52]Air Force Regulation 400-24, *War Reserve Materiel Policy*, 31 Jul 1990, p 42. Harvest Falcon equipment was divided into 37 squadron-level sets, 14 independent (standalone) and 23 dependent sets, which were required to be paired with a dependent set.

Table 5
Worldwide Status of Prepositioning[53]

Command	Army	Air Force	Navy	USMC
Global (Note 1)	4 APS Ships Diego Garcia	4 APS Ships 2 Med, 2 Diego	1 APS Ship Diego Garcia	3 MPS Squadrons (Listed Below)
USEUCOM (Note 2)	POMCUS Sets (GE, NE, BE ARMS (IT)	NATO Prepositioning Procurement Package		MEB Equipment (NO) MPS (4 ships) in Atlantic+
USCENTCOM (Note 3)	Equipment at sites under various programs, (HNS, WRS)	Same		MPS (5 Ships) in Indian Ocean)
USPACOM	Same as above	Same		MPS (4 ships) in West Pac
USSOUTHCOM	Most in CONUS	Same	Same	Same

Note 1: Three prepo tanker ships at Diego Garcia are not included because they supported all services.

Note 2: POMCUS=Prepositioned organizational material; collected in unit sets. Six heavy brigade sets and an Armored Cavalry regiment set. A heavy brigade set is located in Italy.

Note 3: HNS=Host Nation Support, WRS=Wartime Reserve Stocks.

[53] Although this table is dated as of FY 1992, information is similar to FY 1990-91, on the eve of the Gulf War. *JCS Mobility Requirements Study*, 23 Jan 1992, p IV-8.

to the last CENTAF Operations Plan (OPLAN) in place before the beginning of Desert Shield, Harvest Falcon storage and aggregation units were located as shown in Table 6.[54]

Table 6
Harvest Falcon Storage[55]

[DELETED]

In the summer of 1990, eighty-two percent of the assets were in the CONUS, but by 6 August, seven sets were located in the AOR in sufficient quantities to support five squadrons totalling 10,800 people along with two more squadrons totalling 4,400 personnel if the last two squadrons had some other augmentation.[56]

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[54]Annex D, COMUSCENTAF OPLAN 1002-88.

[55]Annex D, p D-4, COMUSCENTAF OPLAN 1021-88.

[56]Y'Blood, p 24.

The Marine Corps concept of operations for deploying aviation forces was to send the aircraft and personnel packages forward and then marry them with spares and sustainment on board specially prepositioned ships. The Marine Corps Maritime Prepositioning Ships (MPS) program involved thirteen ships, which were organized in three squadrons. MPS squadrons had tanks, artillery, vehicles, supplies, food, fuel, and water to sustain a single 16,500-man brigade for thirty days.[57] MPS-1, the first squadron, was deployed in 1984 to the Eastern Atlantic and was later associated with the 6th Marine Expeditionary Brigade (MEB).[58] MPS-3 was deployed in December 1985 and sent to the Western Pacific to be associated with the 1st MEB. MPS-2 deployed in 1986 and was sent to Diego Garcia and aligned with the 7th MEB.[59]

Without the use of the MPS, the Marine Corps estimated that 4,400 C-141 sorties would have been required to airlift each Marine Expeditionary Force (MEF) of the type associated with the MPS plus 250 C-141 missions to carry MEF personnel.[60] The Navy indicated that contents of three prepositioning ships from MPS-2 were equivalent to 3,000 C-141 flights for the 7th Marine Expeditionary Brigade. Had all equipment on the MPS ships destined to sustain the 1st Marine Division been used, 2,100 C-5A sorties would have been required.[61]

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[57]HQ USMC Requirements and Programs Division, *Concepts and Issues*, Feb 1989, pp 1-1 to 1-16.

[58]A Marine Expeditionary Brigade has 8,000-18,000 Marines and sailors, is commanded by a General Officer, and carries 30 days sustainment. It is normally built around a reinforced infantry regiment and a composite aircraft group. *Ibid.*

[59]Maj Thomas C Linn, USMC," MAGTF Capabilities in an Uncertain World," *Extract Marine Corps Gazette*, May 1990, pp 33-37. Copyright 1990 by the Marine Corps Association.

[60]*Ibid.*

[61]*The United States Navy in Desert Shield/Desert Storm*, Department of the Navy, Office of the Chief of Naval Operations, Washington, DC, 15 May 1991.

Planning

In contrast to the Marine Expeditionary Force concept, the Air Force organization for both peace and war revolved around the wing/base and, hence, its planning for war did also. The wing was the primary self-sustaining operational unit in the Air Force. All U.S. Air Force main operating bases (MOBs) and most collocated operating bases (COBs) were run from a wing support structure.[62] A base would typically support one wing, although some supported two. The wing commander exercised command over all wing activities on the base through deputy commanders, a support group commander (who was responsible for the airfield, personnel, and similar common functions), subordinate division chiefs, squadron commanders, and section and detachment commanders.

The Air Force's most common combat wing/base organization form was the trideputy organizational structure comprising a wing commander, deputy commander for operations, deputy commander for maintenance, and deputy commander for resources.[63] Volume V discusses the purely operational preparation–those actions pertinent to the deputy commander for operations.

The squadron was the deployable unit in the Air Force. War plans tasked organizations by squadron, not by wing,[64] and support revolved around providing for, employing, and sustaining squadrons. A typical aircraft squadron usually required the equivalent of twenty C-141s for transporting the personnel and equipment. For purposes of deployment, squadrons were organized as dependent or independent units. Independent squadrons could deploy to form a wing at a given location, or dependent squadrons could deploy to augment existing wings and independent

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[62]The material on wing organization is excerpted from AFP 400-77, *USAF Wartime Logistics Organization and Decision making*, 2 Jan 1990.

[63]There were actually two basic wing structures. The first was the trideputy, as described. The second was the dual deputy wing. The dual deputy wing had deputy commanders for operations and logistics plus a combat support group commander. The chief of maintenance and the chief of supply were subordinate to the deputy commander for logistics. Transportation, contracting, and the comptroller came under the combat support group. AFP 400-77, *USAF Wartime Logistics Organization and Decision making*, 2 Jan 1990. p 9-B-1.

[64]The fighter squadron was the archetype.

squadrons. In this manner, the Air Force planned to share resources to avoid redundancies in deploying equipment and personnel.

Each Air Force operational squadron maintained a designed operational capability (DOC). In simple words, the DOC described the mission of the unit. For fighter squadrons, a DOC statement might indicate air-to-air combat, or air-to-ground combat. In addition to DOC statements, squadrons, along with all other units, were aligned in unit type codes (UTCs). The codes represented specific capabilities. Each unit had a UTC, units did not normally possess unique UTCs, and all units having the same code had notionally identical characteristics. As an example, the unit type code HEDAL represented intermediate maintenance support for sixteen C-130E aircraft. It included 244 passengers and 32.9 short tons of equipment.[65]

Above the wing level in peacetime were numbered air forces and major commands. On the eve of the Gulf War, the Tactical Air Command (TAC), as part of the tactical air forces, had three numbered air forces, three specialized centers, and the 28th Air Division (controlling the Airborne Warning and Control Center) with which to "organize, equip, and train" tactical air forces. U.S. Air Forces Europe (USAFE) and Pacific Air Forces (PACAF) maintained tactical units and bases in their respective theaters. Air Reserve Components augmented active duty forces to fill out tactical air forces capable of being sent to unified commands for employment against various threats.

One of the numbered air forces, the Ninth Air Force at Shaw AFB, was specifically dedicated to supporting SWA operations. The Ninth AF had ten wings but did not have air divisions like other TAC numbered air forces. Ninth AF was expected to "employ" and "support" during wartime as CENTAF, the Air Force component of Central Command (CENTCOM). During peacetime, the role of the Ninth Air Force was to plan for the transition from peacetime to wartime. The transition would prove quite difficult, and at least some of the seeds of this difficulty can be appreciated in retrospect. In accordance with AFP 400-77, *USAF Wartime Logistics Organization and Decision Making,* CENTAF was responsible for tracking the deployment plan and monitoring the reception, beddown, and regenera-

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[65]HQ USAF/LGXX (LRC) MEFPAK Summary Report, 3 Sep 1992.

tion of forces.[66] However, it does not clearly identify the activity responsible for the *actual* beddown, reception, and regeneration of forces.[67]

Like TAC, MAC was required to "organize, equip, and train" forces that could deploy to the AOR in support of MAC missions. This was a dual role. MAC was a supporting activity to CENTCOM because it was required to provide airlift for all CENTCOM forces. It did so as the air component of Transportation Command (TRANSCOM). The Commander-in-Chief (CINC) of MAC dual-hatted as CINCTRANS. In the deployed AOR, MAC's senior officer in CENTCOM was the Commander, Airlift Forces (COMALF). The COMALF, however, was not an organizational commander, since the term "airlift forces" did not connote a clear and distinguishable unit. The COMALF was responsible for coordinating airlift activities in theater. He was a member of the CENTAF's staff, but in planning, he had no administrative control over deployed MAC forces.[68]

The Strategic Air Command was tasked for two types of missions. Logistics preparations for the first, involving the Single Integrated Operations Plan (SIOP), differed from those involving SAC's other mission, conventional warfare as required for support of CENTCOM. Most tasking for SIOP entailed in-place fighting using the homestation as a base of operations. This had important deployment implications. Units tasked only for the SIOP did not have deployable war readiness spares kits (WRSKs).[69] The net result was that fewer tanker WRSKs were available than deployed tankers and employment locations. The few available were configured for five, ten, and fifteen primary authorized aircraft (PAA) deployment packages.[70] Combinations of the packages were formed to

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[66]AFP 400-77, *USAF Wartime Logistics Organization and Decision Making,* 2 Jan 1990.

[67]*Ibid.*

[68]Ltr, Col B. G. Hawley, MAC Staff Judge Advocate, to MAC DCS Plans and Programs/XPMO, "Organization of Airlift forces for Operation Desert Shield," 5 Oct 1990, Sup Doc 3-52; staff summary, MAC DCS Plans and Programs/XPPD, "Operation Desert Shield Command Relationships and Legal Issues," 2 Oct 1990, w/Atch, Sup Doc 3-53.

[69]They were authorized base-level self-sufficiency spares (BLSS) kits, which were composed of different items than the WRSK kits. (S/NF) Intvw, Dr. Theodore R. Jamison, with Maj Gen Charles J. Searock Jr., SAC's Deputy Chief of Staff for Logistics, Subject "Operation Desert Shield/Desert Storm, Aug 1990 to Mar 1991," 4 Mar 1991, p 11.

[70]Primary authorized aircraft are primary in the sense that backup aircraft are not included. Deployments were universally sized in terms of PAA.

support deployments of varying sizes at the numerous operating locations.[71] Bomber WRSKs were also in short supply and did not have good fill rates. Mission support kits (MSKs) would need to be formed for both bombers and tankers from other peacetime operating stocks and AFLC stocks to support aircraft in their deployments.

Planning Processes

The time available determines the planning process used. Deliberate planning for the Gulf War was used when time permitted; preparation and coordination of a deliberate plan took eighteen to twenty-four months. Time-sensitive or crisis action planning took place during emergencies. The time-sensitive planning process paralleled deliberate planning, but was more flexible to changing events.[72] Figure 6 lists the five formal phases of the deliberate planning process.

Figure 6
Deliberate Planning Process

I. Initiation

II. Concept Development

III. Plan Development

IV. Plan Review

V. Supporting Plans

Origin: Joint Strategic Capabilities Plan (JSCP)

[71](S/NF) Intvw, Dr. Theodore R. Jamison, 4 Mar 1991, p 2.

[72]Because of the amount of detail, both deliberate and crisis planning were computer intensive. The volume of data was large enough that during deliberate planning, only the deployment phase was considered. AFSC Pub 1, pp 6-3, 6-4, 6-5, 6-12.

To support initiation of planning involving a SWA scenario as required by the Joint Strategic Capabilities Plan (JSCP), commanders-in-chief (CINCs) prepared operation plans in abbreviated concept format (CONPLAN) or[73] full concept format (OPLAN). CONPLANs were developed because many situations did not warrant detailed preparation. They were tasked when the contingency was not crucial to national security, great demands on U.S. resources were not expected, the probability of occurrence was low, or flexibility was desired.[74] The logistics summary was abbreviated in a CONPLAN.[75] Computer support was usually not required, since detailed support was not calculated and strategic movements were not simulated.[76]

An OPLAN fully developed the CINC's concept of operations. It specified the forces and support needed to execute the plan and the transportation schedule required to move those resources. OPLANs were required when the situation was critical to U.S. national security, or when the military response would tax U.S. force, supply, or transportation capabilities.[77]

In the plan development phase, the combatant CINC's staff and service component staffs developed a detailed flow of resources into the theater to support the approved OPLAN concept. After forces were selected and timed-phased, support requirements determined, and transportation computer simulated, the detailed planning information was generated and stored as a time-phased force and deployment data (TPFDD) file.[78] If the strategic transportation simulation indicated that forces and support could not be moved in time, then planners developed and incorporated compromises.[79]

Once concepts of operations were documented, the CINC forwarded them to the Chairman of the Joint Chiefs of Staff for review.[80] The

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[73]*Ibid*, p 6-12.

[74]*Ibid*, p 6-14.

[75]*Ibid*, p 6-28.

[76]*Ibid*, p 6-15.

[77]*Ibid*, pp 6-14, 15.

[78]*Ibid*, p 6-10.

[79]*Ibid*, p 6-60.

[80]*Ibid*, p 6-29.

Joint Staff reviewed the concepts for sufficiency to accomplish the assigned task, valid plan assumptions, and compliance with guidance.[81] CONPLANs and OPLANs received different reviews. The final review of each CONPLAN determined adequacy and feasibility. For each OPLAN, the Joint Staff performed a concept review to determine adequacy; concepts were approved for "continued planning only."[82]

Each subordinate and supporting commander assigned a task in the plan prepared a supporting plan, which was submitted for review and approval. The CINC's plan was not ready for implementation until the supporting mobilization, deployment, and employment plans were complete.[83] In the SWA case, the deliberate planning process never ended because the plans were regularly updated.

The joint deployment system (JDS) was designed to support the joint deployment and execution committee (JDEC).[84] Although the JDS was designed for both deliberate and crisis planning, it was of most use during crisis planning because it allowed rapid translation of operations plans and associated time-phased force deployment documents into executable operations orders. Figure 7 illustrates the relationship between crisis and deliberate planning. It shows that the JDS is used in both types of planning but that deliberate planning stops at Phase V, while crisis planning goes through to execution.

During planning to support postulated scenarios involving SWA, information was entered into JDS terminals using preformatted screens, that could be updated via tape or computer disk. Output was received in the form of reports, scheduling messages, or TPFDD tapes. The JDS database was the prime repository of deployment-related information. It was maintained at Scott AFB, Illinois (although other sites could serve as a backup or have additional information pertaining to unique site requirements). The database contained narrative information on plan scope,

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[81] *Ibid*, p 6-75.

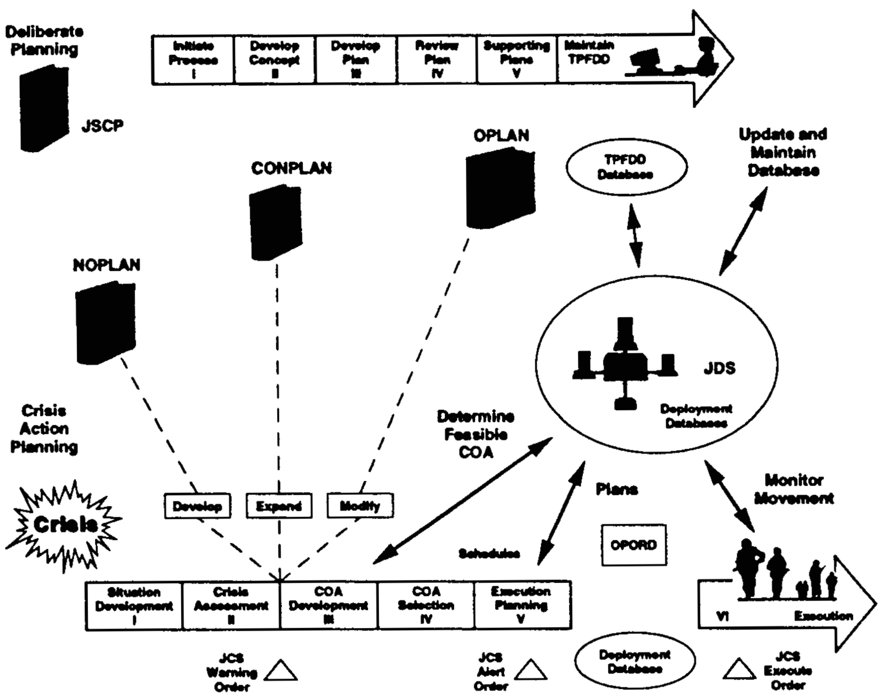
[82] *Ibid*, p 6-29.

[83] *Ibid*, p 6-10.

[84] The JDS is a real-time, transaction-oriented database, which can be updated by a customer. The update can be transmitted over the WWMCCs Intercomputer Network, or WIN. The WIN can also be used for teleconferencing.

concept, and status; time-phased force and sustainment requirements; hypothetical information for notional taskings; actual unit information; and movement requirements that could be used to prepare a transportation schedule and manifest. Accessing various databases and reference files, planners created TPFDDs to support proposed COAs. TPFDDs could also be accessed via the Joint Operations Planning System (JOPS). JOPS was designed for deliberate planning, but the JDS could access some of the JOPS files for other planning purposes.

Figure 7
Joint Planning Summary



The Joint Operational Planning and Execution System (JOPES) Version 1, released in November 1989, was the first step toward a "true" joint operation planning and execution system. It started the process of bringing together the Joint Operational Planning System and the Joint Deployment System into a single system.[85] It gave the user a single entry point to access either JOPS or JDS. Some JOPS files were on-line, and there was one-way interface between JOPS and JDS.[86]

JOPES Version 2, released in April 1990, made possible the crosslink between systems. It allowed users to sign on to one system (JOPS or JDS) and use data resident in the other, use applications programs in the other, or transfer control to the other without having to go through sign-on/sign-off procedures.[87]

Planning for the Gulf War

In reality, crisis planning was used for the Gulf War because the actual situation differed substantially from the scenario postulated by the most recent planning for the area. Planning for the Gulf War was a challenge. CENTCOM's headquarters was thousands of miles from the theater. The Command had no standing forces or forward bases.[88] The infrastructure of the U.S. European Command (EUCOM) was intended to offset CENTCOM's adverse position of not having U.S. forward bases.[89]

A few key bases and airfields were available, but few formal country-to-country and host-nation agreements existed because of cultural reluctance to execute formal arrangements. In general, Arab nations were reluctant to allow permanent basing of U.S. forces within the AOR because they wished to keep non-Arab influences at a minimum. Notable exceptions to this lack of presence were the long-established security assistance programs. Saudi Arabia and Egypt were two of our Nation's largest foreign military sales customers, and they were among our staunchest allies during the Gulf War.

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[85]*Ibid*, p 8-7.

[86]*Ibid*, p 8-8.

[87]*Ibid*, p 8-8.

[88]White, Lt Col Gerald L., USAF, "US Central Command," from *Air War College Associate Programs*, Vol. II, lsns 3132, introduction to lessons, p 1.

[89]*Ibid*.

The Gulf States were blessed with abundant petroleum stores and the related income, leading to high standards of living. Local shops were well stocked with necessities and luxuries of great variety. Large pools of third-country nationals performed vital but menial services, and Saudi Arabia, in particular, was used to dealing with and supporting huge surges of exogenous population during holy seasons.

Joint Logistics Doctrine, in draft format at the time of the conflict, stated:

> To exercise control at the strategic, operational and tactical levels of war, commanders must also exercise control over logistics. For a given area and for a given mission, a single command authority should be responsible for logistics, especially in the joint operational environment. The logistics support system must be in harmony with the structure and employment of the combat forces it supports. This unity of effort is best attained under a single command authority...Commanders must be able to call forward in a timely manner those assets needed to initiate and sustain war.[90]

However, for reasons mentioned elsewhere in this report, CENTCOM theater logistics operations in support of available and draft plans were based on the premise that each service would train, equip, and sustain its own forces in the AOR.[91] Common user support, (such as water, food, etc.) would be provided by the component having the greatest presence, which in most instances, was the Army.[92] Host nations would also be called upon to provide support.

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[90]Joint Chiefs of Staff Publication Joint Pub 40, *Doctrine for Logistics Support of Joint Operations*, para e, p IV6.

[91]Current Joint Doctrine is ambiguous on a concept of theater logistics. On one hand, the draft JCS publication 4-0, "Joint Logistics Doctrine," states that logistics is a function of command and should be under a single command authority. Yet, elsewhere in the same directive, it allows the services to train, equip, and sustain respective forces in the theater and otherwise provide for its forces.

[92]Support therefore, remained the purview of the military service while the CENTCOM staff "monitored" logistics to a large extent. The CINC, if he chose, could combine certain common support requirements with a single service as executive agent, at his discretion. During all phases of combat, Joint and Air Force logistics agencies and staffs "monitored" and "assisted." No office or function was charged with (and staffed for) command or orchestration of CENTCOM logistics at the overall theater level.

The Joint Planning and Execution Community (JPEC) maintained certain tools to use in planning for contingencies and executing war plans. The preparation of war plans was a cyclic process, and a plan was categorized and numbered on the basis of the theater, the threat, and the year. For example, U.S. Commander-in-Chief U.S. Central Command (USCINCCENT) OPLAN 1002-88 was the CENTCOM regional contingency involving Iran, while the USCINCCENT 1021-88 plan involved a global Soviet invasion of Iran.

On 16 October 1989, the Chairman, Joint Chiefs of Staff instructed CINCCENT to redirect planning from OPLAN 1021 (Soviet invasion of Iran) to a major revision of OPLAN 1002 (defense of the Arabian peninsula) with Iraq as the opponent. In November 1989, CINCCENT ordered the revision of 1002-88 (Defense of the Arabian Peninsula). The first draft of the revised OPLAN was scheduled for completion in July 1990.

On 16 April 1990, an outline plan for USCINCCENT OPLAN 1002-90 (Operations to Counter an Intraregional Threat to the Arabian Peninsula) was published. The contingency embodied in the plan was an Iraqi invasion of Kuwait and Saudi Arabia. The plan assumed [DELETED] warning and [DELETED] deployment time before the commencement of hostilities. The plan was completed in April 1991 (Draft USCINCCENT OPLAN 1002-90 (S/NF), April 16, 1990).

On the eve of the Gulf War, the second draft for OPLAN 1002-90 was circulating for comment. The plan was based on a regional conflict, did not involve the Soviets directly, and was to be executed with the assumption that all tasked forces would be available when required. It did not yet have a TPFDD. The TPFDD normally provides the deploying unit, the beddown location, and the supporting host. Because it was still in draft form, CENTAF had not developed its supporting plan.[93]

The Air Force was required to prepare several plans. MAC was tasked to prepare a plan in a supporting role context as one of the components of the mobility triad. CENTAF, a component of CENTCOM, was required to plan for its forces. SAC was originally tasked to prepare a supporting plan for managing and deploying its conventional forces, but over time,

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[93](S) *A Chronology of the Gulf War*, Gulf War Air Power Survey (GWAPS), Mar 1992 (draft).

SAC forces were to "chop" to CENTAF. CENTAF was to provide for all forces under its immediate control plus support the Air Force component of Special Operation Forces (SOF).

Concepts of Operation

A review of OPLANs for the AOR indicates that the concepts of operation did not significantly differ logistically between versions. The basing might be different, or the numbers of aircraft might have varied, but the Air Force planned to support its units according to doctrine. A network of bare bases would be linked initially to homestation for support; each wing commander would make the decisions on support provided for the base. Follow-on support would be phased in as soon as possible. Aircraft maintenance was provided according to type of aircraft, but management was centralized at each base. The support concept was "remove and replace" for most aircraft and "remove, repair, and replace" for some.

Basing

The concept of theater support called for a network of bare bases with host wings predominating. These host wings would exercise authority over most functions for their respective locations. Host wings were required to support tenant wings and to prepare base support plans for bases to which they were deployed as hosts. The component headquarters staff, CENTAF, was very small and served primarily as advisor and monitor of functional areas. Most support would be initially furnished from homestation, but in any case, support remained linked to the CONUS–the reason why the lines of communication were of paramount importance. Although all plans assigned the lion's share of hosting responsibilities to 1 TFW (Tactical Fighter Wing) at Dhahran; other wings were also tasked to serve as hosts. Some air reserve wings were initially scheduled to host locations with active tenants. Many of those bases had no buildings suitable for air force base operations or for living arrangements.

The concept of operations outlined in the basic plan stated that the Commander, Airlift Forces (COMALF), would establish an airlift control center (ALCC) at Dhahran, designate a host wing commander (for MAC forces) at a given base, and conduct intratheater airlift when directed. The Commander, Strategic Air Command was required to provide a

Director of Strategic Forces (STRATFOR) and to designate host SAC wing commanders at two bases, usually Cairo IAP and Diego Garcia.

Special equipment and portable facilities accommodating an austere desert environment were designed for CENTAF; they were called Harvest Falcon equipment. Much of the equipment was prepositioned in or near the AOR and was air transportable. It provided intermediate and organizational level support for power, water, facilities, and vehicles.

Logistics Support

The concept of logistics support in the basic plans stated that initial supply support was to be provided from deployed war reserve kits, mobility bench stock, and mobility equipment at theater locations. Resupply was to be from home supply units until supply accounts were established in the AOR. Airlift would provide resupply from around C+3 (three days after deployment) until the sea lines of communication were established. Supply support was to be provided by homestations. USEUCOM would provide lateral support until a supply system was established in the AOR. Regular supply accounts (SRANS) were to be established for each base; by the last period, mobile supply computers were to be deployed, with remote devices at operating locations. Accountability for all items remained with homestation until the theater supply system was established, although shortfalls were to be reported to CENTAF/ Logistics (LG), with an information copy for the Major Air Command (MAJCOM). A combat supply system (CSS) on microcomputers was to be used until a mobile computer mainframe was deployed.[94] Three phases of Concept of Supply Operations were identified. The Initial phase consisted of using resources from war readiness spares kits, with mission-critical parts (MICAP) needs being filled from homestation. Information copies of messages asking for spares and other items from homestations were to be sent to CENTAF/ LG. The transition phase began when combat supply support activities (CSSAs) would be established. The CSSAs would operate manually, requisitioning both base and mission support items. Each CSSA was to be headed by a senior supply officer and comprised all supply personnel at the location, regardless of MAJCOM. The final phase occurred when the mainframe and

[94](S) Annex D, p D-6, COMUSCENTAF OPLAN 1021-88.

remote devices arrived. Additional personnel also were scheduled to arrive to augment the CSSA and to make it automated and operational.

Responsibilities

Although the CENTAF/LG was charged with control and direction of CSSA units, the host wing CSSAs were the main players. They would maintain supply accountability, manage funds, obtain supplies, and function as chiefs of supply.

Maintenance

Maintenance support required units to be self-supporting because of bare base conditions. Maintenance organizations were to be aligned under AFM 66-1 procedures, and requests for depot level maintenance assistance would be routed through CENTAF/Logistics Maintenance (LGM). Oil analysis capability would be deployed in the initial maintenance support echelon. Aircraft and aircraft engine battle damage repair teams would be deployed by AFLC, would be under the operational control of CENTAF/LG, and would report to lead unit deputy chiefs of maintenance (DCMs).[95] The CENTAF/LGM was a staff advisor to deployed wings. Each base/installation having more than one wing would have a lead unit DCM, who would appoint senior tenant wing maintenance officers as assistant DCMs. Collocated units were to be prepared to form joint maintenance operations centers (JMOCs) and job control (JC) units.

Munitions

Prepositioned munitions at Seeb [DELETED] Masirah and Thumrait was to be moved [DELETED]. Units were expected to account and prepare for munitions storage in their base support plans. Munitions being prepositioned in the AOR were to be air and sealifted to the AOR from the CONUS and other CINCs for use by CENTAF at specific employment locations. Air Force munitions were available on three prepositioned ships. The MAC airlift command element (ALCE) was scheduled to offload

[95](S) Appendix 10, Annex D, COMUSCENTAF OPLAN 1021-88.

airlifted munitions at each employment location, while U.S. Army Forces, Central Command (ARCENT) was to line-haul munitions from seaport to employment location.

Fuels Support

Strategic airlift assets would arrive in-theater with sufficient fuel to return to points outside the AOR. CENTAF was required to coordinate requirements for intratheater airlift of bulk petroleum for the other components, and in turn was required to meet ARCENT's fuels ground transportation requirements. Units would deploy with packaged fuel products sufficient for thirty days. Commercial fuels could be used, and in anticipation of this, units were required to deploy with ten days supply of fuel additives. ARCENT was tasked to schedule fuels resupply shipments.[96]

Comptroller Support

Deployed units would be fiscally sustained by home units until funding authority was granted to CENTAF. Support was to be limited to disbursing agents until comptroller operations would commence and sustaining personnel would be available at various theater locations. Units would be self-sustaining through their combat support elements (CSEs), and were required to deploy with funding documents and a recommended imprest funding document authority of $2,000,000 for CSE units and $1,000,000 for other units. Eventually, ARCENT would assume responsibilities as the central funding agent. Its duties consisted of obtaining U.S. currency and military payment certificates for the theater.

Each component provided medical service for its own forces. Air Force care was organized into four echelons. Bases were responsible for the first echelon of care, and commanders were required to ensure that medical personnel deployed with the unit.

Contracting Support

Although CENTCOM was ultimately responsible for a properly coordinated acquisition program, the bulk of the contracting effort remained with each component. The Director of Contracting for logistics

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[96](S) Annex D, p D-6, COMUSCENTAF OPLAN 1021-88.

(CENTAF/LGC) performed staff functions in issuing policy, procedures, and guidance to base-level contracting officers, who performed work at their locations under the authority of the base combat support group commander. Contracting personnel were required to deploy as part of the combat support group UTC. At multiwing locations, the host wing was tasked to provide a senior contracting officer. Contracting officers were expected to deploy with their warrant and civilian clothing to counter the assumed reluctance of the host population to deal with the U.S. military.

Lines of Communication

Sea lines of communication (SLOC): As previously stated, bases/units were expected to be self-sufficient until the closure of the SLOC. Units were expected to be self sustaining for 30 days. During this window, and before the establishment of the SLOC, logistics supplies were to be transported via MAC airlift. By then, normal sustainment and resupply would be expected to have begun and would be furnished via SLOC. However, ARCENT was tasked to furnish supply classes I, III, IV, and V; all other classes would be furnished on a "pull" basis (i.e., they had to be requisitioned). The Air Force was tasked to furnish its own Class I until ARCENT was tasked to provide it.

Transportation windows planning called for minimum windows between the earliest arrival date (EAD) and the latest arrival date (LAD). Five days were allotted for air movements and ten days for movement by sea. Theater stockage levels were specified for most classes of supply. No refrigerated rations were to be shipped for a specified time unless refrigerated storage was locally obtained.[97] In Sealift/Water Port Operations, SLOCs were expected to close first. U.S. military and civilian ships would carry out sealift operations. Forces and equipment moving by sea would normally use surface transportation to reach beddown locations.

Ninety percent of resupply was expected to move by sealift. Resupply cargo from seaports was to be moved primarily by surface transportation. Planning factors for air shipments intratheater were: TAC airlift would move twenty percent of resupply cargo coming from aerial ports of debarkation (APODs) and a sea/air interface would be required for five percent of cargo coming from Sea Ports of Debarkation (SPODs). Vehicles

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[97](S) Annex D, p D-5, COMUSCENTAF OPLAN 1021-88.

were to be obtained from many sources: homestation, host nation, and war reserves. Host-nation support was the preferred means. Main operating base resources provided vehicle maintenance for geographically separated units.

CENTCOM had a small joint staff to manage all of the responsibilities of the AOR from a great distance. CENTCOM had no forces assigned until C Day, at which time forces would be requested from the supporting components. As previously mentioned, the CINC planned to preposition assets in the AOR as an offset for the lack of presence.[98] Also, host-nation support in the AOR was part of the CINC's plan for regional contingency planning, since he had confidence in the capabilities and willingness of the countries to provide this support, should it be required.

In the draft OPLAN 1002-90, CINCCENT identified host-nation support that could be provided in the following categories: POL, water, food and messing support; long haul trucking and mission handing equipment at airheads, warehouses, and stevedores; buses for troop movement; and 3,000 hospital beds.[99] CENTCOM was also forced by the lack of forward presence and small size to delegate many theater responsibilities normally provided by the CINC to its subordinate components.[100]

The CENTCOM components were CENTAF, which was derived from 9th Air Force, a numbered Air Force subordinate to Tactical Air Command. CENTAF had the responsibility for theater field exchanges, intratheater airlift, and the mail, plus sustaining and supporting its own forces.[101] ARCENT was furnished by the Third Army and was subordinate to FORSCOM - the Army equivalent of TAC. With the largest representation in the AOR, ARCENT had the responsibility for planning and providing for common-user supply support, food, water, intratheater transportation, vehicles, engineering, fuels pipelines, and graves registration services.[102]

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[98](S) *Ibid*, p 74

[99](S) USCINCCENT 1131215Z Aug 1990 Message, Logstat No. 001.

[100]The CINC's position was in direct contrast to that of the more robust warfighting CINCs such as CINCEUR with headquarters in the AOR, large, dispersed regional support staffs, and assigned forces.

[101](S/NF) USCENTCOM OPLAN 1002-90 Draft, Annex D.

[102](S/NF) USCENTCOM OPLAN 1002-90 Draft, Annex D.

U.S. Navy, Central Command (NAVCENT) was originally to be supported by the Commander, Middle East Force (CMEF), and U.S. Marine Corps, Central Command (MARCENT) was furnished from the 1st Marine Expeditionary Force.[103]

The Air Force Headquarters, USCENTAF ADVON (advanced echelon), consisted of 117 personnel in OPLAN 1021-88, later swelling to 314 in the later OPLANs.[104] The ADVON was responsible for command and control of deployed air forces in the AOR. The size of the CENTAF staff, and particularly the Logistics staff, would figure prominently in the establishment of CENTAF (REAR) in the CONUS.

Exercises, Assessments, and War Games

The results of exercises, simulations, readiness assessments, wargames, and feedback to the planning process, all provided important windows through which to view logistics readiness as it was perceived before Desert Shield.

Exercises

SAC attributed one exercise as being particularly beneficial in terms of logistics equipage and training. The 1988 Bull Rider held at Clinton-Sherman AFB in Oklahoma led SAC to set up B-52 WRSKs configured for seven Primary Aircraft Authorized (PAA) aircraft packages rather than fourteen PAA packages. The smaller packages provided greater deployment flexibility. The Bull Rider exercises also provided an empirical basis for calculating wartime demand for shares. Further, Bull Rider taught SAC to develop a WRSK for consumables and to obtain spare parts for auxiliary ground equipment (AGE) and support equipment.[105]

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[103]Title V Report to Congress Chapter K.

[104]The staff was later increased to 314 positions in the MEFPAK portion of the WMP 3 at the time of the conflict. The Headquarters UTC was 9AABAA (the CENTAF AFFOR) and other augmenting UTCs.

[105](S/NF) Intvw, Dr. Theodore R. Jamison, with Maj Gen Charles J. Searock Jr, SAC's Deputy Chief of Staff for Logistics, subj: "Operation Desert Shield/Desert Storm, Aug 1990 to Mar 1991," 4 Mar 1991, pp 11-12.

The TAC equivalent to Bull Rider was Coronet Warrior. Three Coronet Warrior exercises represented the end result of a ten-year TAC effort to examine its ability to support a war.[106] Complementing these efforts were two exercises called Leading Edge I and II in the 1983 timeframe, which had examined alternate methods for assembling munitions. The Coronet Warrior exercises were born out of a diversity of opinion on wartime spares requirements. Dyna-METRIC, an optimizing spares model developed by RAND, was perceived to hold promise for providing a more credible means of determining spares requirements. However, the model lacked a credible combat environment data base. The F-15 Coronet Warrior exercise in 1987 isolated an F-15 aviation package (i.e., aircraft, crews, maintenance, and other deploying resources) at homestation with a representative spares package and then tasked the unit at wartime sortie rates for thirty days. The F-16 exercise in 1988 and A-10 exercise in 1989 did likewise. The results were much better than expected as illustrated by Figure 8,[107] primarily because the rate at which parts failed was much lower than expected and repair rates were higher than expected. In fact, demands for repairs were less than half of the expected number. Coronet Warriors II and III replicated these results, as summarized in Table 7, although the difference between prediction and actual fully-mission-capable rate was not the four-to-one ratio of Coronet Warrior I. The results foreshadowed those that would be achieved during the Gulf War.

[106]The three exercises were

- Coronet Warrior I (F-15s), July-Aug 1987.
- Coronet Warrior II (F-16s), May-June 1988.
- Coronet Warrior III (A/OA-10s), Apr-May 1989.

This Coronet Warrior discussion is based on brfg, "Coronet Warrior: A WRSK Flyout," Maj Gen Henry Viccellio, Jr., Hq TAC/LG, ca Sept 1987; Hq TAC/LG Brfng "Coronet Warrior II: An F-16 WRSK Flyout," ca Aug 1988; Hq TAC/LG Brfg, "Coronet Warrior III: An A-10/OA-10 WRSK Fly-Out," 24 Jul 1989; telephone intvw, Mr. James A. Forbes with Mr. Ed Merry, Hq ACC/LGY, 6 Jan 1993.

[107]Notation for the three lines is as follows: "D0-29 Demands" is the fully mission capable (FMC) rate as predicted by Dyna-METRIC based on demand data in the Air Force's D0-29 supply system. The "CW demands" line is the model prediction based on the actual demand rates experienced during the exercise. "Actual" is the experienced FMC rate. To oversimplify only slightly, the difference between the D0-29 and CW lines is demand rate effects; the difference between the CW and actual lines is repair rate effects.

Figure 8
Coronet Warrior

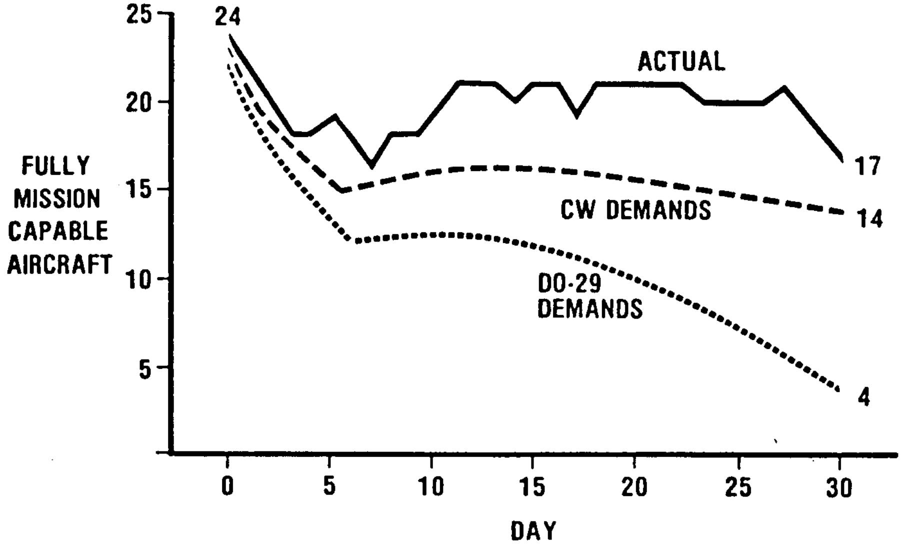

Table 7
Coronet Warrior Exercises
Expected and Actual Number of
Fully Mission-Capable (FMC) Aircraft

Coronet Warrior	Predicted FMC Aircraft at the End of 30 days	Actual FMC Aircraft
I (F-15, 1987)	4	17
II (F-16, 1988)	14	21
III (A-10, 1989)	18	27

Within CENTCOM, Exercise Internal Look was a command post computer-based exercise held in early July 1990 at Eglin AFB in Florida. Internal Look's scenario was an invasion of Kuwait and Saudi Arabia by an unnamed country from the north. Although military forces were not involved, the exercise provided "significant information on the flow, reception and beddown of U.S. air and ground forces in the AOR."[108] Internal Look was designed to test the operational concept of USCINCCENT 1002-90 and the outcome was timely and beneficial by testing the feasibility of 1002-90. In fact, while the plan had not been officially validated by the JCS, it was so organized and so specific in the requirements that its implementation would be a relatively easy matter.[109]

Assessments

The unit readiness assessment reporting system was called SORTS-the Status of Resources and Training System. Active and ARC unit commanders were required to assess their unit capabilities based on wartime tasking. SORTS was a method by which higher headquarters and the Joint Chiefs of Staff could determine which organizations were combat ready, were converting to another weapons system and therefore unavailable for tasking, and had readiness or training problems. SORTS required each unit commander to assess his readiness by comparing fully trained personnel, aircraft in commission, and personnel and equipment levels with certain standards. The standard for each unit was the most stringent designed operational capability (DOC).[110] The commanders were required to assign C-ratings that reflected their best judgment of their capability to go to war. The commanders then sent the C-ratings, along with associated data to the JCS. Theoretically, SORTs would provide an accurate picture of the readiness of each unit.[111] The following tables show the resources available to CENTCOM in 1990 along with their readiness ratings. Table 8 summarizes SORTS readiness ratings of seventy flying organizations.

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[108]James P. Coyne, Airpower in the Gulf (Air Force Association: Arlington, VA), 1992.

[109](S/NF) William T. Y'Blood, *The Eagle and the Scorpion*, Center for Air Force History, United States Air Force, Washington, DC, 1992, p 25.

[110]Or most stringent Unit Type Code (UTC) requirement for a non-flying unit.

[111]After the conflict, the GAO criticized SORTS for not being realistic, real-time, flexible or practical in its report *Operation Desert Storm: War Highlights need to Address Problems of Nondeployable Personnel*, GAO Code 391145.

Table 8
WMP-3 Forces Available for Regional Plan 1990
CENTCOM Region

And C-Rating for July 1990 compared to total MDS Rating Having C-1

MDS	PAA	UTC	Unit	Location	C-RAT	MDS

[DELETED]

Table 8 (Continued)
WMP-3 Forces Available for Regional Plan 1990
CENTCOM Region

And C-Rating for July 1990 compared to total MDS Rating Having C-1

MDS	PAA	UTC	Unit	Location	C-RAT	MDS

[DELETED]

Table 8 (Continued)
WMP-3 Forces Available for Regional Plan 1990
CENTCOM Region

And C-Rating for July 1990 compared to total MDS Rating Having C-1

MDS	PAA	UTC	Unit	Location	C-RAT	MDS

[DELETED]

Table 8 (Continued)
WMP-3 Forces Available for Regional Plan 1990
CENTCOM Region

And C-Rating for July 1990 compared to total MDS Rating Having C-1

MDS	PAA	UTC	Unit	Location	C-RAT	MDS

[DELETED]

Table 9 illustrates that in July 1990, the percent of flying units claiming C-1 status was sixty-nine percent.

Table 9
Rated Air Force Units

Rating	C-1	C-2	C-3	C-4
Number	582	159	97	5
Percent	69	19	12	1

The next table provides the July 1990 ratings for specific areas of personnel, supplies, equipment condition, and training.

Table 10
Measured Area Summaries

	Personnel	Supplies	Condition	Training
C-1	721 (86%)	524 (64%)	699 (84%)	702 (84%)
C-2	104 (12%)	205 (25%)	123 (15%)	79 (9%)
C-3	7 (1%)	79 (10%)	7 (1%)	53 (6%)
C-4	0 (0%)	13 (2%)	0 (0%)	3 (0.3%)

SORTS was an ongoing, quite detailed, and fairly mechanical assessment process.

Command Assessments

The CINCs, on a yearly basis, also assessed readiness. General Johnson, who was CINCMAC and CINCTRANS, provided a TRANSCOM Preparedness Assessment Report to the Joint Chiefs of Staff in 1989. This report was nearly identical to that of his predecessor in the preceding year.[112]

[112]United States Transportation Command History, 1989, p 6.

General Johnson assessed TRANSCOM as "Only Marginally prepared" to perform its mission, because all CINC operational plans were constrained by transportation. Some command plans were considered "grossly feasible" for transportation because planning estimates made adjustments for what was possible within lift and force constraints. Other plans were not adjusted and command assessments found "dramatic shortages in lift."[113]

In TRANSCOM, lift concerns were divided into two categories, air and sea. It was pointed out that sealift suffered from a lack of a national policy and strategy to provide a viable U.S. maritime capability.[114] Support for this rationale was the large percentage of sealift to be obtained through the civilian National Defense Reserve Fleet (NDRF) and the Ready Reserve Force (RRF). A comparable analogy would be to have most of the Military Airlift Command's potential assets in the Civil Reserve Air Fleet. There were also concerns expressed about NDRF and RRF deterioration.

For airlift, it was noted an overall improvement in ton-mile capability had been realized, but the Military Airlift Command had still been unable to meet strategic airlift objectives. The CINCTRANS advocated acquisition of the C-17 as a solution to airlift needs.[115] Another part of the TRANSCOM assessment noted the improvement of airlift command and control capability. To improve information support, however, funding was required for further Joint Operations Planning and Execution System updates.[116] A major decline was noted in the number of trained pilots and merchant mariners. They lacked chemical/biological defensive protection, which further limited their capability. Finally, assessments indicated that the amount of prepositioned fuel in the AOR for jet aircraft was insufficient and posed a serious deficiency in strategic airlift capability.

CENTCOM assessments highlighted lift, sustainability, and communications issues as vital to successful defense of Southwest Asia. Examples were given by General H. Norman Schwarzkopf, USCINCCENT, when

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[113]*Ibid.*

[114]General Johnson categorized ships, skilled mariners and shipyards as part of sealift as a capability. United States Transportation Command History, 1989, p 6.

[115]United States Transportation Command History, 1989, p 7.

[116]*Ibid.*

he presented his assessment of CENTCOM capabilities to the Senate Armed Services Committee (SASC) on 20 April 1989. These statements served as background for his 1990 budget submissions. While Gen. Schwarzkopf did not identify unit readiness problems, the status of other significant factors were of serious concern.[117]

CENTCOM assessments projected a shortfall in sealift and airlift that complemented the concerns of TRANSCOM. (Figure 9 illustrates lift resources.)[118] It was estimated that CENTCOM planned deployments would use fifty percent of the 66 million ton-miles per day goal, even though only seventeen percent of the national force would be deployed to SWA. The large lift demand was exacerbated by the great distances involved. The CENTCOM assessment of sealift showed that only eighty-nine percent of the sealift requirements were available to move a million short tons of equipment to Southwest Asia within ninety days. It was further noted that because of the weight and cube of units and supplies, ninety percent of CENTCOM's requirements were expected to go by sealift. There were major concerns about the sealift shortfall as opposed to the airlift differences, since no projected long-term fix was available for sealift shortages.[119]

Due to strong congressional support for military construction (MILCON), much progress had been made in alleviating facilities shortfalls. From a CENTCOM view, the FY 88 program largely completed requirements at Diego Garcia and allowed a steady improvement in the prepositioning posture of the Gulf region. The proposed 1990 MILCON program had six projects totalling $53 million, which were to allow airfield deficiencies to be corrected at two strategic locations, and additional warehouses to be built for Army and Air Force needs. Additional hydrant fueling upgrades at Lajes would improve a critical strategic airlift and deployment enroute support location. In general terms, Central Command

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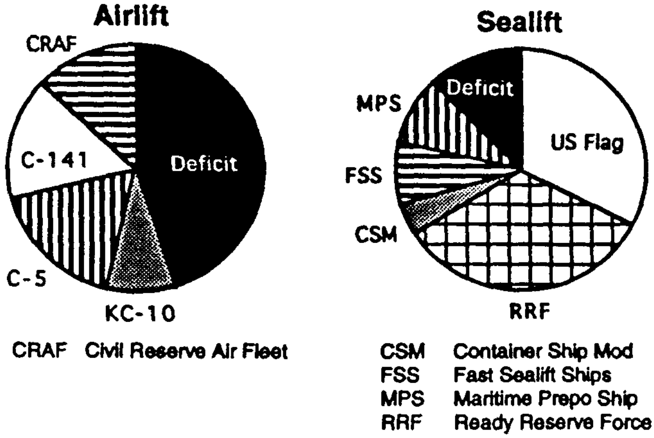
[117]Schwarzkopf, General Norman H., *Witness Statement Before the Senate Armed Services Committee*, 20 Apr 1989. In *Air War College Associate Materials*, Volume II, 2nd ed, Lesson 32, pp 98-102.

[118]Schwarzkopf, pp 98-102.

[119]According to the Schwarzkopf statement, a deficit of ready reserve crews, decline of shipyard facilities and skilled workers, and the decline of the Merchant Marine will double to 22% by the year 2000.

had reduced its facility deficit, which once stood at $1.4 billion to $200 million by the end of 1990.[120]

Figure 9
Lift Capability



CINCCENT defined sustainability as staying power, once a military force is deployed. The CENTCOM assessment indicated that there were shortages of major end items, medical supplies, repair parts, bulk petroleum, preferred munitions, and air-to-air missiles (Figure 10). A major shortcoming was a projected seventy percent shortfall in adequate medical facilities and equipment.[121] Another area of concern was logistics over the shore (LOTS) capability–the ability to load, offload, and transfer equipment and supplies from ship to shore. The indicated capability was 9,800 short tons per day against the goal of 21,000 short tons per day.

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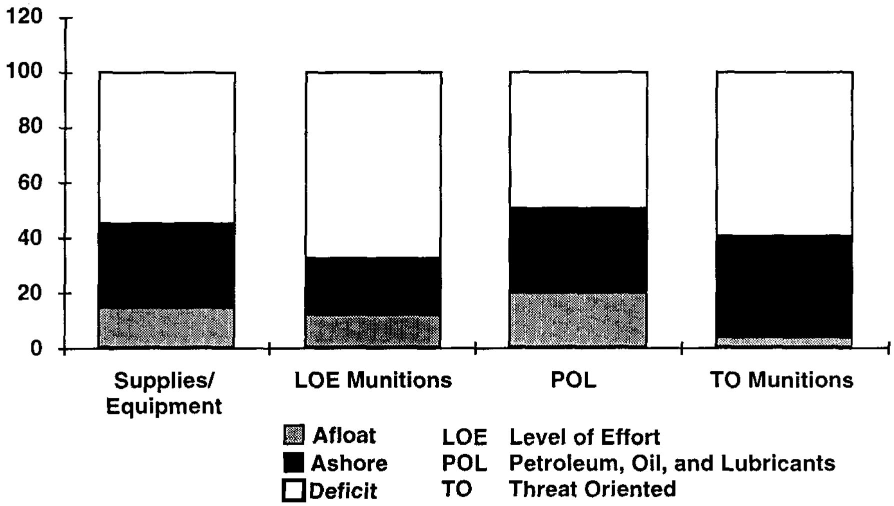
[120]Schwarzkopf, pp 98-102.

[121]*Ibid.*

Figure 10
Sustainability



On-going efforts were geared to improve CENTCOM's prepositioning posture by adding approximately 1.2 million square feet of storage space, 6,000 short tons of munitions, and 5 million barrels of petroleum."[122]

In addition, prepositioning was employed to provide robust, survivable, theaterwide communications capability for effective command and control of assigned forces. Up to that time, the Defense Communications System Western edge had stopped at Turkey and the Eastern edge at the Philippines. CENTCOM, however, had successfully prepositioned equipment to support the Joint Task Force Middle East (JTFME) and United States embassies, among other units, in the AOR. The CENTCOM assessment presumed an actual deployment would be gradual and that the prepositioned equipment was located near planned communications sites.[123]

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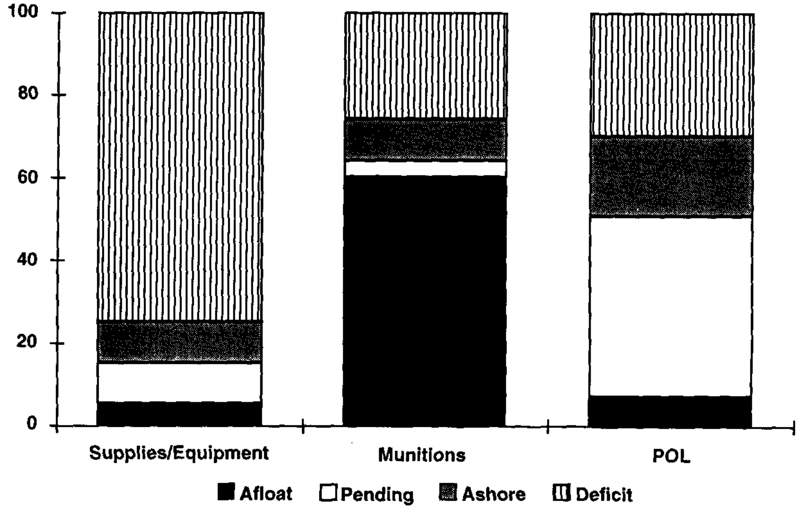
[122] *Ibid.*

[123] *Ibid.*

Figure 11
Prepositioning



War Games

In a prelude to the Gulf War, the Naval War College Center for Naval Warfare Studies developed a global war game scenario involving an invasion of Kuwait by Iraq in the year 1996. Saudi Arabia was threatened in this scenario, and the Saudis requested military assistance but did not offer access. Limited access was granted for tactical aircraft, the AWACS, tankers, and reconnaissance assets.[124]

The use of the time-versus-effectiveness quotient as a measure became a common thread in the exercise. Although economic measures were initiated early on in the crisis, the sanctions received only moderate support from the international community. Political considerations pro-

[124](S) *Global War Game (GWG -1990)*, Naval War College Center for Naval Warfare Studies, Section III Part 3.

moted domestic and international support for overall U.S. objectives. Efforts to secure world cooperation became more difficult as the energy crisis continued.[125]

A key issue was the declaration of the national emergency and an associated partial mobilization of the reserves. Due to an increasing amount of combat, combat support, and combat service support being placed in the reserves:

[DELETED][126]

The time-distance continuum was paramount to military options. Because the National Command Authority (NCA) did not decide to deploy military power immediately, Saudi oil production facilities could not be defended: this time-distance issue caused the CINC to reevaluate his course of action. [DELETED][127]

Conclusions

Although preparation and planning efforts had been directed towards a rapidly diminishing Soviet threat, a war in the Persian Gulf area was

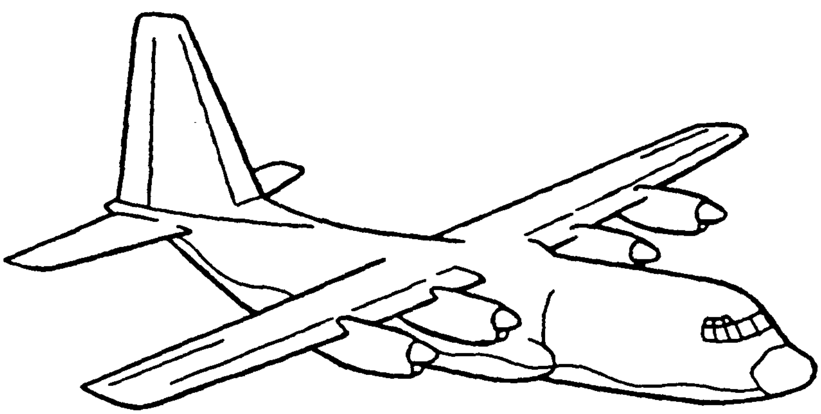
[125](S) *Ibid.*

[126](S) *Ibid.*

[127](S) *Ibid.*

not unexpected. Due to political sensitivities, however, the United States was more constrained in this AOR than in most other theaters. Innovations and force multipliers were devised to offset this lack of presence. As an example, prepositioning of sustainment assets was designed to avoid approximately 10,000 airlift sorties.

CENTCOM and subordinate components were well aware of specific shortfalls in sustainment, lift, and impediments in force structure. Much of the logistics and lift support was available in the reserve components, and it was therefore imperative to mobilize those components early in the effort to allow CENTCOM plans to be viable. Although all similar conflict theaters rely on the military components to sustain operations, the Gulf theater required the entire force to "move in" before any operations could begin. The Army, in particular, would be hard pressed to provide theater support. Any war fought in CENTCOM's AOR would be fought under lean, austere conditions, and with a long logistics pipeline. Having completed a major global war game and Exercise Internal Look, in July, just before the Gulf War, the defense community was in the position to know that a gulf war would be a marathon and not a sprint. The exercises and war games had primed thinking for the Gulf War and provided opportunities to examine the "fitness" of the force. On the eve of the Gulf War, the United States was logistically prepared, albeit faced with a major challenge to transport the forces and support the operational campaign.



3

Deploying to the Theater

On 5 August 1990, Generals Schwarzkopf and Horner flew to Saudi Arabia as part of a team led by Secretary Cheney. There the team briefed Saudi officials, discussed deployment of U.S. forces, and worked out an agreement for those deployments. On 6 August, King Fahd formally requested U.S. help. Most of the team then returned to Washington. General Schwarzkopf would lead deployment execution from the continental United States (CONUS); General Horner, designated Central Command (CENTCOM) Forward Commander, remained behind to lead the effort in the CENTCOM Area of Responsibility (AOR).[1]

The deployment wasn't a typical reinforcement of forward deployed forces; it was the movement of an entire fighting force–air, land, and sea–to an environment with many bare bases. The planning task was complicated by (at least) four additional significant factors.

First, there were no preexisting agreements for basing rights on the Arabian Peninsula. Saudi Arabia and other Persian Gulf nations were somewhat reluctant initially, but they eventually approved basing of U.S. (and other allied) troops. Similarly, essential en route basing rights were not necessarily ensured. For example, before the invasion of Kuwait, Spain had authorized Strategic Air Command (SAC) basing for only five tankers (with five more allowed for short periods of training). On 8 August, Spain authorized basing for an additional ten, but ten was not enough to support upcoming fighter deployments. SAC advocated raising the total to fifty. On 17 August, following discussions with Air Force and State Department officials, Spain agreed to a total of thirty. Negotiating for bases and other support continued throughout Desert Shield and was often conducted on a case-by-case basis.[2]

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[1](S) William T. Y'Blood, *The Eagle and the Scorpion, The USAF and the Desert Shield First-Phase Deployment 7 Aug-8 Nov 1990*, (Washington, DC: United States Air Force, Center for Air Force History, 1992), pp 29-30.

[2](S) Y'Blood, *The Eagle and the Scorpion*, pp 2, 57. Strategic Air Command, *History of the Strategic Air Command 1 Jan - 31 Dec 1990* (Offutt AFB, NE: HQ SAC/HO, 1991), p 339.

Second, the Time-Phased Force and Deployment Data (TPFDD) file had not been developed for CENTCOM Operation Plan (OPLAN) 1002-90.[3] Detailed transportation planning is accomplished during deliberate planning, where staffs for the supported Commander-in-Chief (CINC) and the Service components develop a flow of resources into the theater. If computer simulations indicate that forces and essential support cannot be moved to meet the CINC's timetable, planners revise forces, logistics, and transportation data until the TPFDD file supports a feasible and adequate OPLAN.[4] TPFDD conferences for CENTCOM OPLAN 1002-90 were scheduled for November 1990 and February 1991, but they were, obviously, overtaken by events.[5]

Third, the Commander-in-Chief, Central Command's (CINCCENT's) preliminary force package overwhelmed MAC's airlift capability. On 3 August, General Schwarzkopf directed his staff to plan for an Army corps, a Marine Division, three carrier battle groups, the 1st Tactical Fighter Wing, and twelve follow-on fighter squadrons. The staff itself estimated that airlift requirements for the first few days exceeded MAC's organic airlift capability by a factor of six to seven.[6]

Finally, when faced with imminent combat, nobody wanted to "travel light." Units rushed to enter deployment data into the Joint Operation Planning and Execution System (JOPES) database for Desert Shield. They started with what they already had, which in most cases was old information from old plans. As time passed, they tended to add to their deployment packages. Estimated airlift requirements for the first seven deploy-

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[3]A TPFDD is the computer-supported database portion of an OPLAN and contains time-phased force data, non-unit-related cargo and personnel data, and movement data for the OPLAN. Information includes in-place units, prioritized arrival of units deployed to support the OPLAN, routing of forces to be deployed, movement data associated with deploying forces, estimates of non-unit-related cargo and personnel movements to be conducted concurrently with the deployment of forces, and estimates of transportation requirements. Armed Forces Staff College, AFSC Pub 1, *The Joint Staff Officer's Guide 1991* (Norfolk, VA: National Defense University, Armed Forces Staff College, 1991), pp I-34, -35.

[4]AFSC Pub 1, pp 6-10, -60, -70.

[5]Department of Defense, *Conduct of the Persian Gulf War* (Washington, DC: Department of Defense, Apr 1992), p 352.

[6]Douglas Menarchik, *Powerlifting–Getting to Desert Storm; Strategic Transportation and Strategy in the New World Order* (unpublished draft manuscript, prepared while a fellow at the Center for International Relations, Harvard University, 1992), pp 82-83.

units increased by sixty percent between 11 and 13 August. MAC had to schedule more sorties than originally planned for these units and delay airlift for follow-on units.[7]

The deployment couldn't wait for these factors to be resolved, so CINCCENT presented Transportation Command (TRANSCOM) with a list of nine combat units to move. He wanted the 1st Tactical Fighter Wing and the 82d Airborne Division deployed first; the rest of the list was unprioritized. CENTCOM and its supporting commands set about the process of building a TPFDD file even as deployment was being executed. For the first week, the task was even more challenging. The initial deployment order from the Joint Chiefs of Staff (JCS) did not allocate lift, so CENTCOM could not apportion lift to its supporting commands. TRANSCOM gave CENTCOM daily lift availability estimates until JCS began allocating lift on 13 August.[8]

CENTCOM planning cells started working on the TPFDD file in one-day and three-day increments. On 10 August, CENTCOM froze the TPFDD file for 12-17 August. For 18 August and beyond, CENTCOM froze the TPFDD files the preceding day. No changes greater than 2.5 tons or ten passengers were allowed without general officer approval. Even so, on 12 August, changes were still so numerous and frequent that JOPES operators could not maintain a current database. Nevertheless, planners had to continue. On 14 August, CENTCOM published a TPFDD file in enough detail to give TRANSCOM and MAC their first look at the full scope of the operation. CENTCOM acknowledged that its airlift requirements for 12-15 August exceeded MAC's capability by 200-300 percent. In fact, CENTCOM airlift requirements continued to exceed MAC's capability for the first forty days.[9]

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[7](S) RAND, *Assessment of Desert Shield Deployment*, pp 57-58. (U) Intvws and anecdotal evidence suggest that units of all Services deployed more equipment and supply items than would have been specified by a completed CENTCOM OPLAN 1002-90. GWAPS did not undertake a unit by unit comparison of airlift missions actually used for deployment with airlift missions that would have been required by a completed OPLAN. Using a sample of eight bases in the AOR, GWAPS did find that USAF aircraft maintenance personnel actually deployed totalled only two-thirds the number that would have been specified in a completed OPLAN. (See Chapter 8.)

[8]*Powerlifting*, p 85. (S) Y'Blood, *The Eagle and the Scorpion*, pp 2, 44.

[9]*Powerlifting* pp 83, 91. (S) Y'Blood, *The Eagle and the Scorpion*, p 72.

Problems keeping JOPES up to date can be attributed to several factors. The software was still under development, the system was not user friendly, and TPFDD preparation was a demanding process. Only a few operators were trained to use JOPES, and some became overwhelmed by the workload.[10] And the workload was increased by the necessity to create new Unit Type Codes (UTCs) for the TPFDD file.[11] Some units had to develop new UTCs because their deployments were not based on an existing OPLAN and TPFDD. Other units had to develop new UTCs because JOPES could not track partially deployed Unit Line Number (ULNs)–JOPES considered a ULN either awaiting transportation or closed.[12] As the deployment progressed, TRANSCOM directed MAC to give a unit only the airlift allocated by CENTCOM. Once the allocated airlift was used, a ULN was considered closed. Many units were not allocated enough airlift to move their complete deployment packages; they therefore created nonstandard UTCs to request airlift for the remaining passengers or cargo. Each nonstandard UTC had to be individually entered into the JOPES database, and detailed information was not available on the UTC's contents. Automatically tracking what was really deployed and what was left behind became impossible.[13]

Order came gradually. By 22 August, CENTCOM was able to validate requirements two to three days ahead. JOPES came back on line on 24 August. Around 28 August, the TPFDD was stable enough to use as a basis for planning, and JOPES could start being used for some of its

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[10]JULLS NUMBER: 91055-65325 (00141), submitted by HQ MAC CAT Director.

[11](S) *History of the 35th Tactical Fighter Wing (Provisional): Operations Desert Shield and Desert Storm 2 August 1990 - 2 August 1991* (George AFB, CA: 35 FW/HO, 14 Apr 1992), pp 19-20. (U) A UTC is a code associated with each type of unit and allows the organization to be categorized into a kind or class having common distinguishing characteristics. A unit may have several UTCs to describe its capabilities. Many UTCs reflect a basic capability tailored for a particular task or environment.

[12]A ULN is a code that uniquely identifies each force requirement in the TPFDD.

[13]JULLS NUMBER: 91154-50811 (00109), submitted by USCENTAF Rear/LG. (S) RAND, *Assessment of Desert Shield Deployment*, pp 55-56, 110. [DELETED]

intended functions. On 10 September, airlift mission numbers could finally be matched against ULNs in the TPFDD.[14]

Executing the TPFDD necessitated obtaining diplomatic clearances for aircraft overflight and landing rights. The sudden increase in requests nearly overwhelmed the units that had to prepare the requests and the embassy staffs that received them. The process was expedited by international support for U.S. and Coalition action. Several key nations (France, Italy, Greece, and Egypt) en route to the Arabian Peninsula and on the Arabian Peninsula (Saudi Arabia, Bahrain, Qatar, the United Arab Emirates, and Oman) either issued blanket clearances or streamlined their procedures for granting permission to fly through their airspace.[15] Switzerland and Austria also granted more frequent overflights. Later in the operation, several East European countries granted overflight rights.[16] Thailand and India granted overflight rights for Desert Shield missions through the Pacific.[17]

Throughout the operation, Spain required individual clearance requests and standard lead times. For a time, France allowed into its airspace only two aircraft per hour departing from Rhein-Main. A "work action" in the Santa Maria Oceanic Control Zone (which included Lajes) slowed air traffic there. Italy required notice for any U.S. military flights through Sigonella.[18]

Germany restricted overflight and landing of munitions cargos to one ton per commercial flight and three tons per military flight. The German

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[14]*Powerlifting*, pp 83, 91. (S) Y'Blood, *The Eagle and the Scorpion*, p 44.

[15]JULLS NUMBER: 21758-46626 (00055), submitted by 306 SW/CC.

[16]*Powerlifting*, p 113.

[17]Lt Gen Vernon J. Kondra, *Operation Desert Shield-Desert Storm: The Vernon J. Kondra Notes, 24 August 1990-31 May 1991*, transcribed by Clayton Snedecker, 21st Air Force Historian (McGuire AFB, NJ: 21st Air Force, 1992), pp 16-17. Then-Maj Gen Kondra served initially as MAC DCS/Plans and then as MAC DCS/Operations during Operations Desert Shield and Desert Storm.

[18](S) Y'Blood, *The Eagle and the Scorpion*, p 43. Spain initially required a 48-hour lead time for each diplomatic clearance request. Eventually, the requirement was reduced to 24 hours. Telecon with Mr. Tom Wellmon, 9 Dec 1992. During Desert Shield and Desert Storm, Mr. Wellmon worked for the 21st Air Force DCS/Operations and was the individual principally responsible for requesting diplomatic clearances for MAC missions.

Government waived its restrictions for the first week of the surge, but Spain had fewer restrictions overall; therefore, munitions were normally routed through Spain. Later in the operation, German authorities enforced noise abatement restrictions that limited twilight and night departures from several airfields. At civilian fields, departures to the AOR were limited because MAC had to share takeoff times with civil traffic.[19]

The Desert Shield deployment unfolded in two phases. Phase I lasted from 7 August until early November. It was designed to deploy enough forces to deter further Iraqi aggression, prepare for defensive operations, and conduct combined exercises and training with multinational forces. At the end of October, the President authorized building an offensive force capable of ejecting Iraqi forces from Kuwait with minimal U.S. and Coalition casualties. Phase II began on 8 November with the President's announcement that the United States would increase its presence in the theater by approximately 200,000 personnel.[20]

CINCCENT made a crucial decision early in Phase I. Because the Iraqis greatly outnumbered Coalition forces, he decided to accelerate deployment of antiarmor forces while delaying arrival of theater logistics forces and sustaining supplies. The decision placed arriving units in a somewhat precarious logistics position. Some ground combat units experienced supply shortages before the theater logistics structure matured in mid-November. Phase II deployments saw a greater balance between combat forces and logistics support.[21]

The remainder of this chapter first describes MAC strategic airlift operations in support of deploying units from all U.S. military Services and then describes deployment of air power to the CENTCOM AOR. De-

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[19]*Powerlifting*, p 113. John Lund and Ruth Berg, *Strategic Airlift in Operation Desert Shield and Desert Storm: An Assessment of Operational Efficiency* (Santa Monica, CA: RAND WD-5956-AF, 1992), p 34. (The second source is a working draft. Wherever it is cited in this chapter, the material has been reviewed by the Air Mobility Command staff and no exceptions taken.)

[20]*Conduct of the Persian Gulf War*, pp 381, 387. There is not universal agreement on the start date for PHASE II. In (S) *The Eagle and the Scorpion*, Y'Blood identifies 9 November as the last day of Phase I. TRANSCOM and MAC have identified midnight, 10 November 1990, as the end of Phase I. This chapter uses 8 Nov, the date from *Conduct of the Persian Gulf War*.

[21]*Conduct of the Persian Gulf War*, pp 34-35.

ployment descriptions cover sea-based air power of the U.S. Navy and the land-based air power of the U.S. Air Force, the U.S. Marine Corps, and Coalition allies.

Strategic Airlift

Airlift Planning

The primary goal of strategic airlift planning was to satisfy CINCCENT's requirements by employing airlift resources effectively. To meet the goal, planners had to consider the entire airlift system and its interrelated parts. Aircraft had to arrive where they were needed when they were needed. Each stop along the way had to have adequate runways, taxiways, ramps, and support facilities. Nonproductive ground time had to be minimized. The necessary equipment and trained personnel had to be on hand to load and unload passengers and cargo. Likewise, the necessary supplies, equipment, and trained personnel had to be on hand to service and maintain the aircraft. Where crew changes were required, a sufficient number of qualified and properly rested aircrews had to be available. If a necessary en route stop was denied, missions had to be air refueled. Command and control needed to be capable of monitoring mission progress, adjusting for problems, and responding to crises.

On 2 August, a Crisis Response Cell (CRC) assembled in the MAC Command Center at Scott AFB, Illinois, to prepare for possible deployment operations. On 3 August, the CRC developed several routing options to the Gulf using Torrejon Air Base in Spain and Rhein-Main and Ramstein air bases in Germany as the principal en route bases. To check the status of the airlift system, the Cell inventoried strategic airlift aircraft and aircrews assigned to the active duty force, the Air Force Reserve (AFRES), and the Air National Guard (ANG). The Cell also checked on resources belonging to commercial airlines participating in the Civil Reserve Air Fleet (CRAF).[22]

MAC activated its full Crisis Action Team (CAT) on 5 August. The pace of activities picked up when the MAC liaison officer at Headquarters CENTCOM advised the CAT Director to anticipate deployment for "a very

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[22](S) Military Airlift Command, *MAC History 1990*, Chapter 3 (Scott AFB, IL: HQ MAC/HO, 1991), pp 12-13.

large air campaign." CINCMAC reviewed and approved plans to flow the airlift through Torrejon, with missions operating as required through Rhein-Main and Ramstein plus Zaragoza Air Base in Spain. He also wanted the first airlift missions be air refueled en route and flown non-stop to the Gulf.[23]

To begin a large deployment to the Arabian Peninsula, the airlift system needed additional support capability at several key locations. Airlift control elements (ALCEs) were tasked for Pope and Langley AFBs and for Dhahran and Riyadh in Saudi Arabia. Manpower augmentation was tasked for Torrejon.[24]

JCS advised the CAT to expect a deployment order at approximately 2400Z on 6 August. The CAT Director suggested that the numbered air forces put their aircrews on alert; 21st Air Force placed all its aircrews on BRAVO standby, and 22d Air Force placed fifteen C-141 crews and five C-5 crews on BRAVO standby. The order was dated 7 August at 0050Z and directed that the deployment begin on 7 August at 1700Z.[25]

CENTCOM airlift movement priorities flowed to the CAT through TRANSCOM. The CAT then determined the number of military and commercial airlift missions required, including any advance missions necessary to position ALCEs and cargo handling equipment. After assessing the availability of military and commercial aircraft, the CAT developed a daily airlift mission schedule.

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[23](S) *MAC History 1990*, Ch 3, p 13.

[24]Dave Davis and Orson Gover, *Operation Desert Shield Desert Storm MAC Logistics* (2nd draft) (Scott AFB, IL: Headquarters Military Airlift Command Deputy Chief of Staff for Logistics and Engineering, 15 Mar 1991). An ALCE provides en route support as well as command and control for airlift flows at stations not normally frequented by MAC. The manpower and equipment packages needed to support an off-line location are tailored to meet its specific requirements. An ALCE cadre comes from an airlift wing's Airlift Control Squadron. Its purpose is to supervise the deployed augmentees. The augmentees are detailed from among the various functions within an airlift wing as deemed necessary for a particular deployment. ALCEs typically range in size from 10 to 350 people with accompanying equipment.

[25](S) *MAC History 1990*, Ch 3, p 14. (S) RAND, *Assessment of Desert Shield Deployment*, p 53. (U) Crew members on BRAVO standby are given 12 hours of pre-standby crew rest and then can be alerted. A crew must be capable of launching within approximately three hours after alert.

Assigning missions to commercial aircraft was handled at the MAC level. The schedule for military aircraft was relayed to the numbered air force CATs to obtain necessary diplomatic clearances, task wings for aircraft and crews, and ensure that extra crews were properly positioned to keep missions moving without interruption. The 21st Air Force at McGuire AFB, New Jersey, executed the airlift with support from 22d Air Force at Travis AFB, California. Responsibility fell upon 21st Air Force to manage the flow through European stage bases. A subordinate unit of 21st Air Force, the 322d Airlift Division at Ramstein, acted as the "spigot," attempting to limit the flow from Europe to levels that would not exceed the capacities of offload bases in the AOR.

The massive airlift effort also required organizations to coordinate movements in the AOR. The first Commander, Airlift Forces (COMALF), was Brigadier General Frederic N. Buckingham, the Vice Commander of 21st Air Force. The COMALF managed theater-assigned airlift forces for CENTAF through an airlift control center (ALCC). From the ALCC, he also monitored MAC strategic airlift flights transiting the AOR. Under the ALCC, he had a number of ALCEs from various airlift wings.[26]

Once the airlift began, execution planning problems fell into two major categories: requirements and priorities.

Of the two, requirements problems were more pervasive, persistent, and harder to understand. Hundreds of Air Force, Army, Navy, and Marine units were submitting data or making entries that wound up in the TPFDD. Entries contained so many errors that they were unreliable as a basis for determining airlift requirements. Common errors were major differences between stated and actual tonnage and passengers to be moved, failures to properly identify oversize and outsize cargo, wrong onload locations, and wrong available-to-load dates.[27] As a result, some

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[26]In mid-October, Brig Gen Edwin E. Tenoso, Vice Commander of 22d Air Force, became the COMALF. General Buckingham returned to 21st Air Force to assist in the management of the airlift flow. Intvw, HQ MAC and HQ TRANSCOM staff, Scott AFB, IL, Feb 1992. Chapter 4 will provide more details on the COMALF, ALCC, and intratheater airlift.

[27]Oversize cargo is air cargo that exceeds the usable dimensions of a 463L pallet loaded to the design height of 96 inches, but it is air transportable on C-130, C-141, DC-10, Boeing 747, C-5, or C-17 aircraft. Outsize cargo exceeds the dimensions of oversize and requires the use of a C-5 or C-17 aircraft.

missions were sent to locations having no cargo or passengers to transport, other missions were scheduled and then cancelled because there were no real requirements, and numerous missions had to be added to cover understated requirements.[28]

To improve the accuracy of requirements data, the CAT established a "requirements augmentees" cell which telephoned deploying units and attempted to verify their TPFDD requirements before MAC scheduled their airlift. Information obtained by telephone was more reliable than JOPES information, but several units still couldn't project their airlift requirements accurately. Near the end of its deployment, one major unit cancelled over sixty missions–then shortly thereafter requested that some be reinstated.[29]

While some inaccuracies in TPFDD airlift requirements can be attributed to JOPES, others can be attributed to the joint operation planning process itself. Because of the work involved, no more than the first thirty days of OPLAN air and sea movement requirements normally undergo the intensive management needed to ensure database accuracy.[30] Consequently, rapid response units (such as Air Force fighter squadrons, the 82d Airborne Division, and the 1st and 7th MEBs) were the only ones for which current transportation feasibility information was available.[31]

Priority problems also disrupted airlift execution planning. Understandably, CINCCENT's movement priorities were established, reconsidered, and changed on the basis of the situation in the AOR. For example, between 13 and 16 August, the 82d Airborne Division's priority dropped from first to thirteenth. Such rapidly changing priorities disrupted efficient use of airlift. At times, MAC was ordered to divert airborne missions to respond to new priorities. Under such conditions, MAC could not provide users adequate warning of arriving sorties, causing delays in marshalling loads. Previous planning efforts were sometimes negated and aircrews, aircraft, ALCEs, and material handling equipment ended up in

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[28]JULLS NUMBER: 91055-65325 (00141), submitted by HQ MAC CAT Director.

[29]*Ibid*; *Kondra Notes*, p 2.

[30]AFSC Pub 1, p 6-80.

[31]*Conduct of the Persian Gulf War*, p 375.

the wrong location. Some units received unexpected airlift support; the airlift support of others was preempted in mid-deployment.[32]

At first, MAC could project ahead only about twelve hours. There was not enough time to set up, load, and schedule missions using MAC's FLOGEN model. FLOGEN, an airlift flow generator, is a computerized tool for preparing and deconflicting airlift mission schedules. Unable to use FLOGEN, MAC and its numbered air forces resorted to personal computer spreadsheets and pencils to produce airlift schedules. While the situation improved somewhat, MAC could never look ahead more than three to five days.[33]

Additionally, MAC's computer models could not provide reports to analyze the schedule and determine where the flow exceeded the throughput capacity of the base structure.[34] Consequently, too many aircraft were passing through some parts of the system at one time, and bases became backlogged. MAC had to halt the flow on several occasions.[35]

In one effort to reduce backlogs, MAC and 21st Air Force planners developed "slot times" for departures from Europe to the AOR. The number and frequency of slot times were based on the throughput capacity of individual offload locations. Planners then matched missions against slot times to establish flow control.[36]

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[32](S) RAND, *Assessment of Desert Shield Deployment*, pp 58-59. JULLS NUMBER 31959-04622 (00352) and JULLS NUMBER 31962-13204 (00353), both submitted by HQ ATC/LGT, highlight problems associated with airlift aircraft arriving with little or no advance notice.

[33]JULLS NUMBER: 91055-65325 (00141), submitted by HQ MAC CAT Director. *Kondra Notes*, p 2. *Powerlifting*, p 86. FLOGEN is being replaced by ADANS (Airlift Deployment Analysis System).

[34]Maximum number of aircraft on the ground, or MOG, is a commonly referenced measure of throughput capacity. MACR 55-28 defined MOG as "the highest number of aircraft being used in an operation which will be allowed on the ground during a given span of time based on simultaneous support."

[35]Bruce Babb, "Desert Shield: Experiences on the MAC Crisis Action Team," *Airlift*, Winter 1990-1991, reprinted in *Air Mobility School Supplemental Reading Text*, 21st edition (Scott AFB, IL: Air Mobility School, 1992), p 409-2.

[36]"Desert Shield: Experiences on the MAC Crisis Action Team," p 409-2.

A typical mission departed a MAC home station (such as McGuire, Dover, Charleston, McChord, Travis, or Norton) and proceeded to its CONUS onload location. After onload, the aircraft continued to a base in Europe. If more fuel was necessary to reach Europe, the aircraft either air refueled or stopped en route. In Europe, the aircraft was serviced, repaired as necessary, and provided a different crew.[37] The aircraft then flew to the AOR, offloaded, and returned to Europe. For the trip from Europe to the CONUS, the aircraft was again serviced, repaired as necessary, and provided a different crew.

Figures 12, 13, and 14 characterize the MAC airlift effort in terms of missions flown, short tons delivered, and passengers delivered. The workhorses of the airlift were the C-141 in terms of missions flown, the C-5 in terms of tons delivered, and commercial air in terms of passengers delivered. All three figures reflect the initial surge to establish a defensive posture, a brief respite, and a larger surge to build an offensive capability and support combat operations.

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[37]This prepositioning of crews is called "staging." Staging is essential to keep aircraft moving without interruption, and it requires several crews for each aircraft. Aircrew stages normally operate on a directional basis. With some exceptions, crews are alerted in sequence of arrival time, provided missions are available during the period when the crews can be alerted. The concepts of directional and nondirectional stages can be illustrated with an example based on Operations Desert Shield and Desert Storm.

The stages in Europe were nondirectional. Crews were prioritized for alert and assigned to missions as they became available without regard for direction. Some crews arriving from the CONUS returned to the CONUS without shuttling to the AOR. Other crews made multiple shuttles to the AOR before returning to the CONUS. If the stages in Europe had been directional, crews arriving from the CONUS would have entered an eastbound stage and would have normally flown to the AOR next. Crews arriving from the AOR would have entered a westbound stage and would have normally flown to the CONUS next.

A nondirectional stage provides greater flexibility in manning missions. A directional stage ensures a more uniform distribution of workload among crews and facilitates cumulative flying time management for the entire aircrew force.

Figure 12
Desert Shield/Desert Storm MAC Missions
7 August 1990 - 10 March 1991

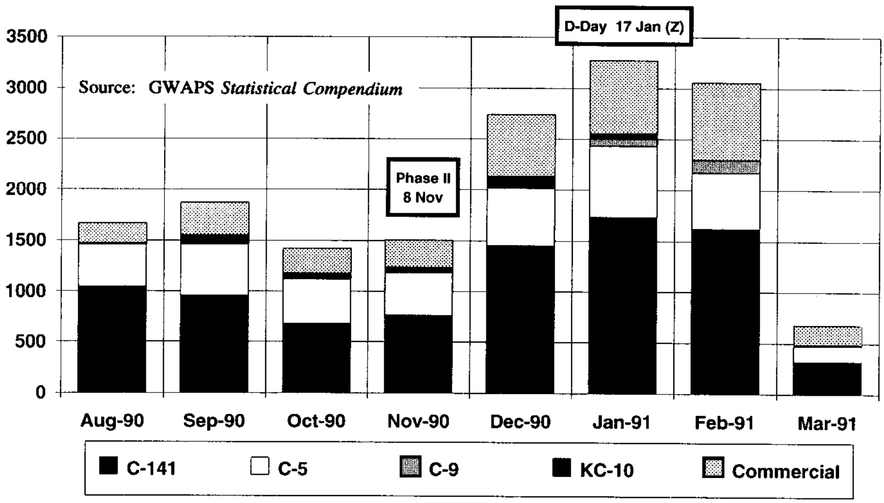


Figure 13
Desert Shield/Desert Storm MAC Cargo
7 August 1990 - 10 March 1991

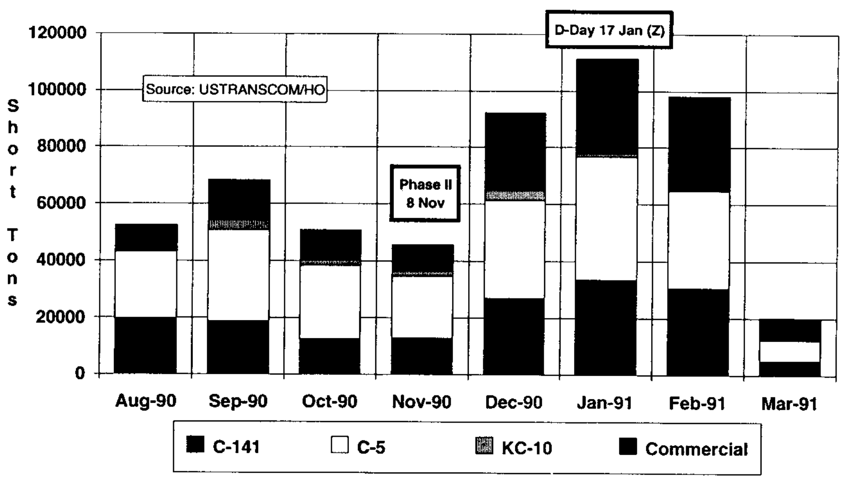
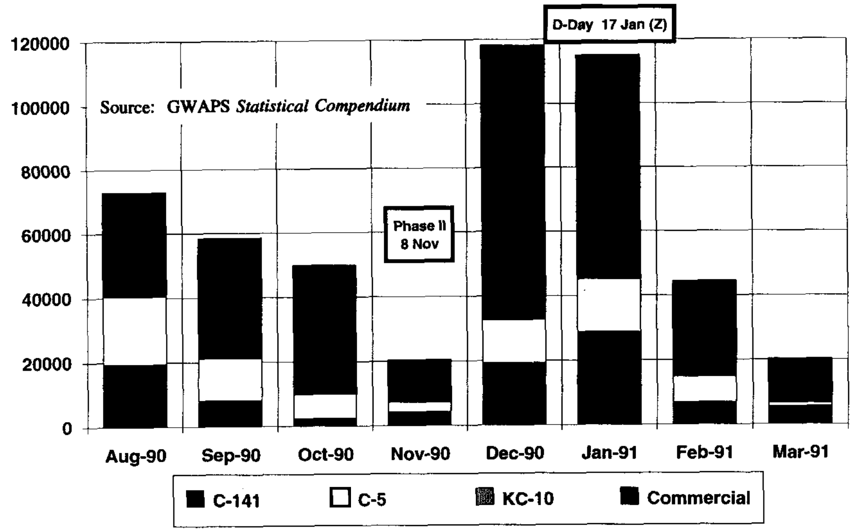


Figure 14
Desert Shield/Desert Storm MAC Passengers
7 August 1990 - 10 March 1991



Desert Shield Phase I

From mid-August to mid-September, MAC was challenged to deploy combat units as rapidly as possible. The pace slowed on 19 September, when deployments of the largest troop contingents were completed. By the end of September, the focus had shifted from deploying forces to sustaining the forces already deployed. During the reduced Desert Shield flying activity between 1 October and Thanksgiving, MAC caught up on deferred maintenance. The Command also used a limited number of C-5s and C-141s to fly missions to other areas of the world.[38]

Maximizing Availability

To meet the extraordinary demands for airlift at the start of Desert Shield, MAC took a number of steps to maximize aircrew availability. Premission crew rest was cut from 24 to 12 hours; postmission crew rest was waived altogether; the maximum crew duty day for a basic aircrew was extended from 16 to 20 hours;[39] the crew qualification requirement for the extra pilot on an augmented crew was reduced from first pilot to copilot;[40] the maximum flying for a consecutive thirty-day period was raised from 125 to 150 hours;[41] and after completing 12 hours of premission crew rest, all crews were placed on permanent BRAVO standby.[42]

All "aircrew training requirements, currency events, and flight evaluations" were also waived for the duration of Desert Shield and Desert Storm and for sixty days thereafter. The waivers applied to aircrew members current and qualified as of 1 August 1990. On a case-by-case basis, the MAC Deputy Chief of Staff for Operations could grant waivers for crew members not current and qualified on that date.[43]

The backlogs that plagued the airlift system at the start of Desert Shield meant that crews were working long duty days. Most C-5 and C-141 missions from the CONUS to Europe lasted between sixteen and eighteen hours, but some missions were longer.[44] Discussing the missions

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[38](S) *MAC History 1990, Ch 3*, pp 22-23.

[39]Normal crew duty time limitations (unless otherwise specified in the governing OPORD/OPLAN) are 16 hours for a basic crew and 24 hours for an augmented crew.

[40]An augmented crew normally requires an additional pilot who is at least first pilot qualified, an additional loadmaster, and a more highly qualified complement of flight engineers.

[41]Normally, crew members are not scheduled to fly or perform crew duties when they will exceed flying time limitations of AFR 60-1 (125 hours per 30 consecutive days and 330 hours per 90 consecutive days).

[42](S) *MAC History 1990,* Ch 3, pp 23-25. The requirement to have all crews on BRAVO standby was later relaxed.

[43](S) *Ibid.*

[44](S) *Ibid.*

from Europe to the AOR and back, the MAC Deputy Chief of Staff for Operations said:

> . . . if everything went perfectly it was about a twenty-two hour crew duty day. Then you throw in a nine hour wait for fuel . . . you just went past the twenty-four hour crew duty day. We had people, in the initial stages, who went up to thirty-six hours.[45]

The length of the round trip from Europe to the AOR necessitated the use of augmented aircrews on every mission. Using augmented crews was a mixed blessing. It gave Headquarters MAC considerable scheduling flexibility because it enabled an aircraft to onload at virtually any CONUS location and fly to Europe without a crew change. It also caused crew members to accrue flying time so rapidly that many were projected to exceed the ninety-day limit of 330 hours. (Some actually did and were temporarily grounded.)[46]

A rear area recovery base in the Middle East region would have eliminated the need to use augmented crews between Europe and the AOR, thereby increasing the capability of the aircrew force. The MAC Deputy Chief of Staff for Operations worked with CENTCOM for nearly a month attempting to arrange for a staging base in Saudi Arabia for crew changes and aircraft refueling. For various reasons, CENTCOM denied MAC's request, so MAC continued to investigate other options for alleviating crew burn-out problems.[47]

MAC also took a number of maintenance management actions to maximize availability of its organic aircraft. (See Chapter 8.)

Route Structure Saturation

Onload Base Saturation

Because airlift operations continue around the clock in peacetime, MAC can shift to its wartime operating tempo on short notice. In the early stages of most deployment operations, MAC can generate airlift

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[45]*Kondra Notes*, p 3.

[46](S) *MAC History 1990*, Ch 3, p 25.

[47]*Kondra Notes*, pp 8, 34.

missions faster than deploying units can generate loads. Desert Shield produced two noteworthy examples of airlift missions arriving at locations faster than cargo loaders could handle, resulting in ramp saturation and extensive loading delays.[48]

Loading problems developed at Langley AFB during deployment of the initial F-15 squadron from the 1st Tactical Fighter Wing. MAC had scheduled aircraft arrivals every half hour. Nine C-141s and three C-5s arrived in the first six hours, and delays started with the first mission. By 0500Z on 8 August, ten aircraft (three C-5s and seven C-141s) sat waiting to be loaded, and it took between six and twelve hours to launch them. Over a day and a half, eighteen of twenty-two missions experienced delays attributed to the deploying unit.[49]

Sustainment cargo stored on flightline at Dover AFB.

[48]JULLS NUMBER: 91055-85701 (00059), submitted by HQ MAC, CAT Director.

[49](S) HQ TAC/DOXRB briefing, 12 Apr 1991. *Strategic Airlift in Operation Desert Shield and Desert Storm*, Figure 8, pp 31-32.

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To deploy the second F-15 squadron from Langley, MAC and the Tactical Air Command (TAC) reduced the arrival rate to approximately one airlift aircraft per hour; departure reliability improved significantly.[50]

The 1st Tactical Fighter Wing (TFW) received enough airlift to deploy completely during the first few days of the operation. Aircraft were diverted from Pope AFB to Langley when Army units weren't ready to deploy. With extra airlift, the 1st Tactical Fighter Wing was able to move two C-5 loads of munitions plus its identified deployment requirements.[51]

MAC began deploying the 82d Airborne Division from Pope on 8 August. The initial plan was to send one airlift aircraft an hour into Pope. Beginning at 1700 EDT on 10 August, MAC increased the flow to two an hour. Over the next few hours, the unit couldn't generate cargo fast enough to keep pace with the arriving aircraft.[52]

By 0600 EDT the next morning, sixteen strategic airlift aircraft were on the ramp. Most had already exceeded their scheduled ground times; all eventually missed their scheduled departure times. Fifteen of the sixteen delays were attributed primarily to the deploying unit. Adding to the confusion was the fact that a squadron of C-130s also deployed from Pope on 11 August. To reduce the congestion and confusion, MAC began diverting aircraft to other fields. After interrupting the flow for about twelve hours, MAC resumed flying one mission an hour into Pope. Delays became less frequent and less severe.[53]

Experiences at Langley and Pope helped convince MAC that scheduling more than one aircraft an hour into an onload base was counterproductive.[54]

In some instances, MAC contributed to congestion problems at its own bases. The Command initially planned to route all resupply cargo through Dover AFB. In August, it also started routing mail through

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[50]*Strategic Airlift in Operation Desert Shield and Desert Storm*, p 32.

[51](S) RAND, *Assessment of Desert Shield Deployment*, pp 110-111.

[52](S) *MAC History 1990*, Ch 3, p 18. *Strategic Airlift in Operation Desert Shield and Desert Storm*, p 29.

[53]*Strategic Airlift in Operation Desert Shield and Desert Storm*, Figure 6, p 30.

[54]*Strategic Airlift in Operation Desert Shield and Desert Storm*, p 32.

Dover. However, Dover's aerial port–by far MAC's largest in terms of tonnage processed–was already saturated with other high priority cargo. The added tasks made the situation untenable. The photograph below shows cargo stored on the flightline at Dover AFB because no other acceptable place was available. To alleviate some of the congestion, MAC established additional resupply routes through Charleston, McGuire, and Tinker AFBs as well as Norfolk Naval Air Station. In October, MAC made McGuire the major east coast mail departure point.[55]

MAC's CONUS aerial ports were the onload bases for most sustainment cargo. Because of CINCCENT's decision to deploy combat units ahead of logistics support and sustainment cargo, CENTCOM did not allocate airlift to channel operations until 24 August, when it allocated four C-141s per day.[56] Consequently, backlogs of sustainment cargo frequently built up at CONUS aerial ports. Compounding the problem was lack of in-transit visibility over cargo in the airlift system. Cargo in these sustainment backlogs was often assumed lost and subsequently reordered by users.[57]

MAC took periodic initiatives to keep sustainment cargo from backing up at CONUS aerial ports. The initiatives highlighted the fact that peacetime criteria used by airlift clearance authorities to enter cargo into the airlift system are not responsive to a combatant CINC's tonnage allocations and sustainment priorities. One check in early September revealed that over half of all sustainment cargo awaiting air shipment was coded at the top priority level. Much of the cargo in the aerial ports really didn't need to go by air. In December, CENTCOM established "SWAT teams" headed by O-6s that went into aerial ports, identified cargo that didn't need to go by air, and designated it for sea transport.[58]

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[55]Intvw with Lt Gen (Ret) Anthony J. Burshnick, former CINCMAC/CV, Arlington, VA, 30 Nov 1992. (S) *MAC History 1990*, Ch 3, pp 59-60.

[56]A channel mission provides common-user airlift service on a scheduled basis between two points. A requirements channel serves two points on a scheduled basis depending on the volume of traffic. A frequency channel is based on mission essentiality and moves on a scheduled basis regardless of traffic volume.

[57](S) RAND, *Assessment of Desert Shield Deployment*, p 68. JULLS NUMBER: 00344-63454 (00091), submitted by AFLC/DSTTX.

[58]JULLS NUMBER: 31952-58451 (00218), submitted by Jerry Riffe. (S) RAND, Assessment of Desert Shield Deployment, p 68. Kondra Notes, p 67.

En Route Base Saturation

From August 1990 through January 1991, eighty-four percent of MAC's C-5 and C-141 missions from the CONUS to the AOR staged through just four European bases: Torrejon, Rhein-Main, Zaragoza, or Ramstein. The remaining missions either staged through other European bases or air refueled en route to the AOR. During the period, approximately 8,000 C-5 and C-141 missions transited the bases: forty-four percent through Torrejon, twenty-seven percent through Rhein-Main, twenty percent through Zaragoza, and nine percent through Ramstein.[59]

On 15 August, Rhein-Main supported 138 arrivals and departures. At one point, sixty-eight aircraft were on the ramp even though Rhein-Main had parking spaces for only fifty-six aircraft. The wing CAT responded by parking aircraft "everywhere they would fit safely." Frequently, aircraft had to be towed into and out of parking spots.[60]

Billeting and food service facilities at European stage locations were also quickly overwhelmed. Emphasizing that extraordinary measures were required, CINCMAC personally intervened at some locations to get better support for airlift aircrews. By mid-October, billeting and food service had improved considerably.[61]

Offload Base Saturation

While congestion was bad in the CONUS and at en route bases, it reached critical proportions on the Arabian Peninsula. From August to November 1990, eighty-two percent of all MAC missions offloaded at just four locations: sixty-one percent at Dhahran, eleven percent at Riyadh, seven percent at Jubail, and three percent at King Fahd (which did not open for MAC use until September). In those first four months, Dhahran handled slightly over thirty MAC aircraft a day. Ground forces preferred

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[59](S) *MAC History 1990*, Ch 3, pp 15-16.

[60](S) *Ibid*, Ch 3, p 20.

[61](S) *Ibid*, Ch 3, p 26.

to arrive at Dhahran because its location facilitated onward movement of troops and cargo into the theater.[62]

Airlift throughput capability at Dhahran was constrained by refueling problems. The main problem was getting fuel from storage to the aircraft. Not enough fuel pits, fuel trucks, or drivers were available. Once the problem was recognized, CENTCOM sent a storage system and fuel trucks to Dhahran. After the U.S. trucks arrived, it was discovered that their couplings did not match Saudi couplings; however, the problem was soon overcome.[63] On 21 August, refueling capacity was saturated; a backlog of twenty aircraft awaited fuel. Departure delays were as long as eight hours–even longer if crew rest was required. European departures were held to alleviate saturation.[64] To reduce the strain on Dhahran's refueling capacity, MAC scheduled some missions to offload at Dhahran, then depart for refueling at another base in the AOR.[65] To further reduce ground refueling delays, C-5s and C-141s were sometimes air refueled just before landing or shortly after takeoff. However, a relatively small number of strategic airlift missions were actually air refueled during the first two weeks because Strategic Air Command (SAC) tankers were heavily committed to refueling fighter aircraft deploying to the Gulf.[66]

Dhahran was saturated with cargo as well as aircraft. Because locations and units involved were classified, a considerable amount of cargo shipped early in the operation was marked only "Desert Shield." Most of this cargo ended up at Dhahran. Due to CENTCOM deployment priorities,

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[62]Source: Military Air Integrated Reported System (MAIRS) data. MAIRS is a subsystem of the MAC Integrated Management System (MACIMS) and thus a part of the World-wide Military Command and Control System (WWMCCS). MAIRS is used to follow missions and aircraft, determine schedule deviations, and evaluate mission execution. Data recorded in *Strategic Airlift in Operation Desert Shield and Desert Storm*, Table 6, p 36.

[63]*Powerlifting*, p 102. Also (S) *MAC History 1990*, Ch 3, p 17 and *Kondra Notes*, p 3.

[64]Davis and Gover, *MAC Logistics*. Lt Gen Kondra recalls that on one day, MAC had 28 aircraft on the ground awaiting fuel. *Kondra Notes*, p 3.

[65](S) *MAC History 1990*, Ch 3, p 17.

[66](S) *MAC History 1990*, Ch 3, p 16. (U) Air refueling was not an option for every mission. Due to budget constraints, not all strategic airlift aircrews were air refueling qualified. Intvw with Lt Gen (Ret) Anthony J. Burshnick, former CINCMAC/CV, Arlington, VA, 30 Nov 1992.

limited support forces were available to sort and distribute arriving cargo.[67] Chapter 4 of this report addresses cargo distribution problems within the theater.

Both aircraft and cargo congestion could have been relieved if arriving airlift missions had been granted access to a larger number of offload bases. MAC lobbied for more offload bases from September to November. CENTCOM and the host nations made some new offload bases available, most notably King Fahd in September, but deploying ground forces were reluctant to use them.[68]

Figure 15 shows offload base distribution in the AOR from August 1990 through February 1991. For this period, fifty percent of all strategic airlift missions offloaded at Dhahran.[69]

Capability Shortfalls

Command and Control

Command and control deficiencies contributed to route structure saturation. MAC did not have the capability to determine where aircraft were on a real-time basis. The Global Decision Support System (GDSS), a distributed networking system supporting MAC's command and control structure, was supposed to provide such a capability. However, most units had no capability to enter information into the system. GDSS served as an after-the-fact source of data. Further, no single element of the MAC

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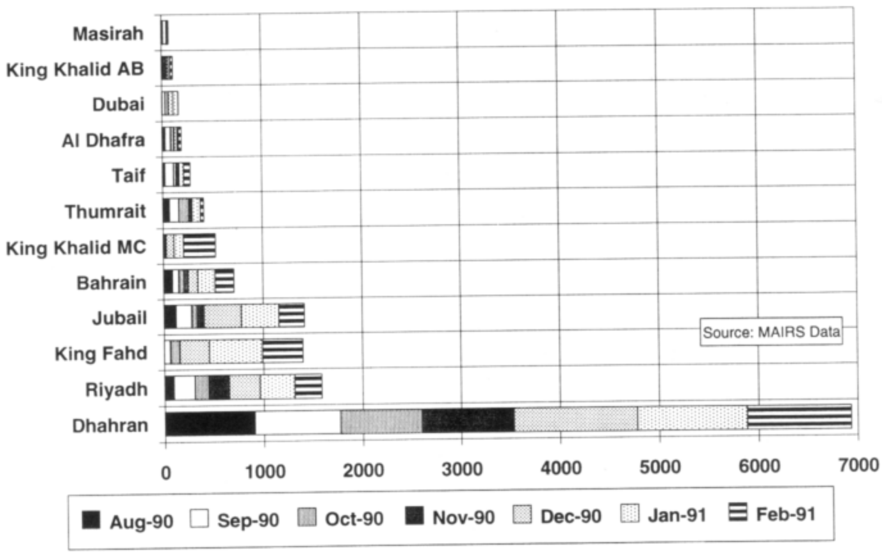
[67](S) RAND, *Assessment of Desert Shield Deployment*, p 69. Davis and Gover, *MAC Logistics*, entry for 21 Aug 1990.

[68]Because of its proximity to the seaport at Ad Ammam, Dhahran remained the Army's airport of choice for cargo and passengers. On 10 December, despite the fact that Dhahran was already operating at maximum capacity, the Army was still validating 75 percent of all its cargo for that destination. It was difficult to convince the Army that closure would be expedited by sending some passengers and cargo to other destinations and then moving them over land to Dhahran. *Kondra Notes*, p 68. Similarly, it was difficult to convince the Army to use all available seats on every C-5 departing Europe during the heavy passenger airlift portion of Phase II. *Kondra Notes*, p 79.

[69](S) *MAC History 1990*, Ch 3, p 21.

command and control system had the communications necessary to control the airlift fleet.[70]

Figure 15
MAC Strategic Airlift Missions by Destination in AOR
August 1990 - February 1991[71]



For commercial aircraft, the carrier's own operations center was responsible for monitoring mission progress and updating the MAC numbered Air Force. There were some problems with this arrangement. Commercial aircraft sometimes arrived unannounced or on very short notice, causing confusion and occasional congestion at locations throughout the airlift system. Disruption was especially significant at onload locations when aerial port personnel had to drop what they were doing to prepare loads for unexpected arrivals. Sometimes no parking spots were

[70]Intvw with Lt Gen (Ret) Anthony J. Burshnick, former CINCMAC/CV, Arlington, VA, 30 Nov 1992.

[71]MAIRS data recorded in *Strategic Airlift in Operation Desert Shield and Desert Storm*, p 36.

available for unexpected arrivals. Such communication breakdowns frustrated the deploying units, the commercial carriers, and MAC.[72]

Many commercial aircraft had difficulty communicating with their operations centers while between Europe and the AOR. Aircrews were particularly concerned that they would be unable to receive orders to divert in the event their destination airfield was under attack.[73]

Computers and communications weren't the only problems. MAC command and control organizations needed extra people to perform several vital tasks. Examples include the requirements augmentees cell at the MAC CAT and the augmentees who helped process the massive number of diplomatic clearance requests at 21st Air Force.[74] MAC also tasked its airlift wings to augment command and control functions at nearly all levels. Wing augmentees deployed with the ALCC to the AOR and with ALCEs to the CONUS, Europe, and the AOR. Wing augmentees also performed aircrew management and mission planning functions at numbered air force headquarters and en route staging bases. In addition, the increased workload at homestation was more than wings could accomplish with their assigned operations staff personnel. In many cases, aircrew members were a wing's primary source of personnel for these additional taskings.[75]

Aircraft and People

From the beginning, MAC had access to all of its military aircraft, including those belonging to unit-equipped Air Reserve component units. Figure 16 illustrates how heavily those aircraft were tasked. For the most part, if a C-5 or C-141 was mission capable, it flew. Not every aircraft was committed to Desert Shield and Desert Storm–MAC flew a limited number of other high-priority missions during the same time period. When an aircraft was committed to a Desert Shield or Desert Storm mission, it

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[72](S) RAND, *Assessment of Desert Shield Deployment*, pp 74, 81-82.

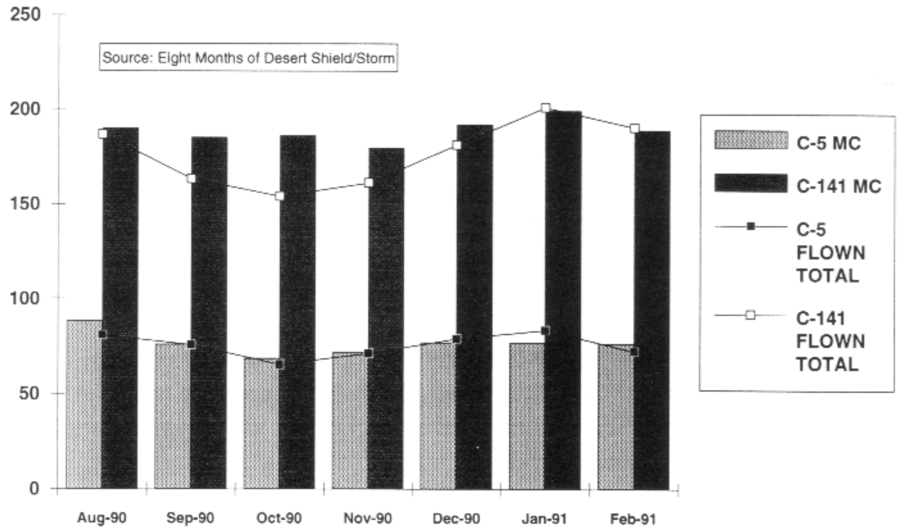
[73](S) *Ibid*, p 82.

[74](S) *Ibid*, pp 59-60.

[75]Lt Col Bill Dudley, "Desert Shield and Desert Storm Strategic Airlift," briefing for Air War College Course 6328, Maxwell AFB, AL, 2 Apr 1992.

flew hard. C-5s flying on these missions averaged over nine daily flying hours, and C-141s averaged nearly eleven daily flying hours.[76]

Figure 16
Mission Capable (MC) Aircraft and Aircraft Flown
(Daily Averages)[77]



While MAC had access to all its aircraft, it did not have access to all its people. For the C-5, the Air Reserve components possess approximately sixty percent of the aircrews and fifty-five percent of the maintenance personnel. For the C-141, the Air Reserve components possess approximately fifty percent of the aircrews and forty percent of the maintenance personnel. When fully mobilized, the Air Reserve components provide nearly sixty percent of MAC's wartime aerial port forces. MAC started the operation with only active duty personnel, reserve personnel performing required periodic active duty, and some reserve volunteers. Without additional people, MAC could not continue surge sortie rates for a sustained

[76]Lt Col Bill Ewing and Lt John Walker, *Eight Months of Desert Shield/Storm* (Scott AFB, IL: HQ MAC Command Analysis Group, Jun 1991), pp 10, 43-44.

[77]This chart does not mean that MAC sometimes flew more aircraft than were mission capable. Differences in accounting systems are responsible for this appearance.

period. In mid-August, the MAC Command Analysis Group calculated that unless additional crews were called up, the C-5 and C-141 crew forces would use up permitted flying hours before the end of August.[78]

Material Handling Equipment (MHE)

CENTAF took two weeks to release prepositioned MHE for MAC operations. According to CENTAF, one factor in the delay was that MAC couldn't specify quantity and type needed by location. According to MAC, that was impossible because a war plan detailing the information had not been implemented. During the standoff, the Airlift Control Center experienced serious difficulty in meeting offload requirements and frequently had to move material-handling equipment (MHE) around within the AOR. No shoring was stored with the MHE prepositioned at Thumrait, Seeb, and Masirah, so shoring had to be obtained before MHE could be distributed by C-130s.[79]

Onload and offload operations were hampered by MHE shortages and breakdowns. For MAC organic aircraft, the biggest problem was the 25K loader. For KC-10s and commercial wide bodies, the biggest problem was the wide body loader.[80]

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[78] Letter, 24 Jun 92, HQ AMC/XPB to HQ AMC/XPY, Subject: RAND Study, "Strategic Airlift in Operation Desert Shield and Desert Storm: An Assessment of Operational Efficiency" by John Lund and Ruth Berg. *Powerlifting*, pp 80, 94. *Kondra Notes*, pp 6-8. *Strategic Airlift in Operation Desert Shield and Desert Storm*, pp 27-28.

Achieving planned wartime airlift aircraft flying hours normally requires that all aircrews be available. For each active duty strategic airlift unit, there are slightly fewer than two line-assigned active duty basic crews for each primary authorized aircraft, and slightly fewer than two Associate Reserve basic crews. For each unit-equipped Air Reserve component strategic airlift unit, there are slightly fewer than two Air Reserve component basic crews for each primary authorized aircraft. Using all augmented crews instead of all basic crews reduces by approximately a third the total aircraft flying hours the crew force can provide.

[79] JULLS NUMBER: 91335-10118 (00216), submitted by HQ MAC, CAT Director. JULLS NUMBER: 31450-27300 (00088), submitted by HQ USAF/LGT. Shoring is material placed under cargo to prevent damage to the aircraft. A common example is plywood placed under small wheels so that item weight is distributed over a larger area rather than being concentrated at a few points on the floor.

[80] JULLS NUMBER 92155-13673 (00023), submitted by USCENTAF Rear/LG. Intvw, MAC logistics and operations staffs, Scott AFB, IL, 1 Oct 1991.

On 10 September, the COMALF reported that the poor condition of MHE was limiting the throughput capacity of some key bases. When the MAC Deputy Chief of Staff for Operations visited Dhahran in late September, five of ten 25K loaders were broken. The MHE spare parts kits shipped from storage sites in the AOR and through normal CONUS channels were inadequate in number and contents. Although providing and supporting MHE was a theater responsibility, MAC prepared an MHE spare parts kit for Dhahran.[81]

To preclude adverse mission impact, wide-body loaders and staircases required intensive management and movement between air terminals. At the start of Desert Shield, the equipment was scattered around the world to support both peacetime and contingency requirements. It was limited in supply and difficult to move. Availability of wide-body equipment limited the number of airfields that could be used for Civil Reserve Air Fleet (CRAF) and KC-10 missions.[82]

The availability of pallets and nets also came close to limiting airlift operations. At one point, only 35,000 pallets (out of 140,000 known to be in use) could be accounted for. AFLC directed release of all war readiness stocks worldwide to MAC and initiated emergency buys. The problem was that deploying units kept pallets as they moved forward. The units then abandoned the pallets, used them for construction material or storage, or retained them for redeployment. Recovery efforts met with limited success.[83]

Increasing Capability

Activating CRAF and the Reserves

Recognizing that airlift requirements were outstripping the combined capability of the MAC organic force and volunteered commercial aircraft,

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[81](S) RAND, *Assessment of Desert Shield Deployment*, p 51. *Kondra Notes*, p 46. JULLS NUMBER: 31540-01700 (00089), submitted by HQ USAF/LGT.

[82]Paper concerning aerial port limitations, Lt Col Emmet Lung, HQ MAC/XORP, 27 Sep 1991.

[83]*Ibid.* JULLS NUMBER: 02536-86362 (00063), submitted by HQ MAC, CAT Director.

CINCMAC activated CRAF Stage I on 17 August. This marked the first time that any stage of CRAF had been activated. Aircraft activated included seventeen passenger and twenty-one cargo aircraft. Because commercial carriers were already volunteering most of these aircraft, only ten were actually added to the total available. More importantly, however, twelve of the thirty-eight aircraft were Boeing 747 wide bodies, and activating Stage I gave MAC unilateral authority to schedule the aircraft.[84]

On 22 August, the President approved a limited callup of reserves. Between 25 August and 4 September, the Air Force activated all eight Air Reserve Component C-5 squadrons (one ANG unit equipped, two AFRES unit equipped, and five AFRES Associate). Between 25 August and 10 September, the Air Force activated six Air Reserve Component C-141 squadrons (one ANG unit equipped, one AFRES unit equipped, and four AFRES Associate). This callup came just as some aircrew members were reaching their maximum flying time limits. On 21 September, a limited contingent of reserve strategic airlift maintenance personnel were activated to help support increased operations at their home stations. Only one aerial port squadron was activated during Phase I, and it was deployed to Dover AFB.[85]

Reducing Use of Augmented Crews

In early October, MAC instituted a procedure that eliminated the need to use augmented crews on CONUS onload missions. The key feature was having C-5s depart for Europe from Westover AFB and C-141s from McGuire AFB. From their CONUS onload locations, C-5s and C-141s proceeded to these bases for refueling and a crew change. On the westbound leg from Europe to the CONUS, C-5s returned to Dover AFB and C-141s normally returned to Charleston AFB.[86]

The new pattern of eastbound staging complemented another aircrew management policy begun in early October. To slow the rate at which aircrews were accruing flying time, MAC created C-5 and C-141 pilot pools at Torrejon, Zaragoza, Ramstein, and Rhein-Main. C-5 and C-141

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[84](S) *MAC History 1990*, Ch 3, p 65.

[85](S) *Ibid*, Ch 3, p 34 and Table 3-6.

[86](S) *Ibid*, Ch 3, pp 26-27.

pilots from throughout MAC went to European stage bases on three-week TDY assignments. From there, they augmented missions between European bases and the AOR.[87]

Eastbound staging from Westover and McGuire coupled with pilot pools eliminated routine use of augmented crews, except on mission legs between Europe and the AOR.[88] The cumulative impact of activating reserve crews and establishing pilot pools was that crew burn-out was no longer a significant issue after September.[89]

Using Tankers as Airlifters

SAC tankers played a vital role in cargo and passenger movement. KC-10s and KC-135s moved more than 4,800 tons of cargo and 14,200 passengers in SAC self-support operations. KC-10s flying dual-role missions moved more than 1,600 tons of cargo and 2,500 passengers while providing air refueling support for deploying Air Force and Marine Corps fighter units. At times, up to twenty KC-10s were allocated to MAC for airlift missions, moving more than 3,800 tons of cargo and more than 4,900 passengers.[90]

Because of heavy air refueling requirements, the full twenty KC-10s were not made available to MAC until January. Even then, it took

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[87](S) *Ibid,* Ch 3, p 27.

[88](S) *Ibid,* Ch 3, p 27.

[89]During August 1990, average flying time was 94.7 hours for line-assigned active duty C-5 aircrew members and 50.9 hours for Associate Reserve C-5 aircrew members. During September 1990, average flying time was 67.5 hours for line-assigned active duty C-5 aircrew members and 93.6 hours for Associate Reserve C-5 aircrew members. After September, the highest monthly average for either category was 77.6 in January 1991 for active duty aircrew members. The highest monthly average for the entire period for line-assigned C-141 aircrew members was 78.1 in August 1990 for active duty aircrew members. Data were not available for unit equipped Air Reserve Component squadrons, but averages are estimated comparable to Associate Reserve squadrons. (These averages are not broken out by crew position and do not focus on the limiting crew positions for each type aircraft. They include crew members who were not flying because they were detailed to perform nonflying duties. While these averages do not tell a complete story, they are useful as general trend indicators.) *Eight Months of Desert Shield/Desert Storm,* Appendix E.

[90]*Conduct of the Persian Gulf War,* p 413.

CINCMAC's personal intervention to get twenty KC-10s committed to MAC airlift. After the air war began in mid-January, MAC didn't again get twenty KC-10s for airlift until late April 1991.[91] SAC was not manned to operate the KC-10 in a dedicated airlift role–it had not called up reserve crews and lacked experience in operating an aircrew stage.[92]

Desert Express

On 30 October 1990, MAC inaugurated a special mission called Desert Express. A C-141 flew daily from Charleston to Torrejon to the AOR, providing overnight delivery of "show stopper" logistics parts. The Air Force, Army, Navy, and Marines each had a quota of pallet positions for each day's flight. Allocations were adjusted periodically as missions and force compositions in the AOR changed. Initially, Dhahran was the only offload point, but Riyadh was added after one week. Arriving parts were taken to their final destinations by surface transportation or theater-based C-130s.[93]

From 19 January to 14 March 1991, Desert Express operated twice daily out of Charleston AFB. On 15 April, the Desert Express operation moved to Dover AFB, where it continued until 19 May. Desert Express cut response time for high-priority shipments from as much as two weeks to as little as seventy-two hours.[94] There was a tradeoff cost, however, for providing this support that made up for the serious problems with priorities and asset intransit visibility. To assure Desert Express reliability, missions had priority to delay other flights, C-141s were placed on

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[91](S) *MAC History 1990*, Ch 3, p 79.

[92]*Kondra Notes*, p 29. These are primarily MAC's observations. See Chapter 5 for SAC's observations on using KC-10s as airlifters. Activation of Air Mobility Command should eventually lead to a single perspective on this issue.

[93](S) *MAC History 1990*, Ch 3, pp 53-56. *Conduct of the Persian Gulf War*, pp 415-416.

[94](S) *MAC History 1990*, Ch 3, p 56. *Kondra Notes*, p 96. *Conduct of the Persian Gulf War*, p 416. (U) Some transportation experts contend that the need for Desert Express type of missions could be obviated by a better system for assigning priorities to cargo coupled with better in-transit visibility over cargo once it enters the transportation system. Intvw with Lt Gen (Ret) Anthony J. Burshnick, former CINCMAC/CV, Arlington, VA, 30 Nov 1992.

alert to assure departure deadlines, and missions occasionally went with less than full loads.

Desert Shield Phase II

MAC's Phase II concept of operations incorporated many lessons from Phase I. Commercial air carriers remained the primary means for moving troops. Commercial cargo aircraft and KC-10s were used principally on channel cargo missions. Wide-body loaders needed to support these aircraft were most readily available at major aerial ports where the channel missions originated: Dover, Tinker, and Travis AFB and Naval Air Station at Norfolk, Virginia.[95]

The Phase II strategic airlift flow to the AOR was built around the following maximum daily missions per location: sixty to Dhahran, twenty to Jubail, sixty to King Fahd, and twenty to King Khalid Military City.[96]

The daily average of airlift missions offloading in the AOR grew from 88 in December to 106 in January and 109 in February.[97] While some of these extra missions were routed to places like Bahrain and King Khalid Military City, eighty-two percent still offloaded at the same four bases: forty-two percent at Dhahran, twelve percent at Riyadh, fifteen percent at King Fahd, and thirteen percent at Jubail. Average arrivals at Dhahran were up to forty a day in December.[98] The increased throughput was primarily a result of a concerted effort to reduce ground times.[99]

CENTCOM's 15 January deadline for troop deployment made passenger movement MAC's greatest challenge in Phase II. During December and January, MAC carried over 237,000 passengers. Most traveled on commercial aircraft, but CRAF Stage I and contracted aircraft couldn't meet the total requirement. In late December and January, MAC converted some C-141s to passenger configuration. The numbers of passengers

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[95](S) *MAC History 1990*, Ch 3, p 51.

[96](S) *Ibid*, Ch 3, pp 51-52.

[97]GWAPS, *Statistics of the Gulf War*, Chapter 3.

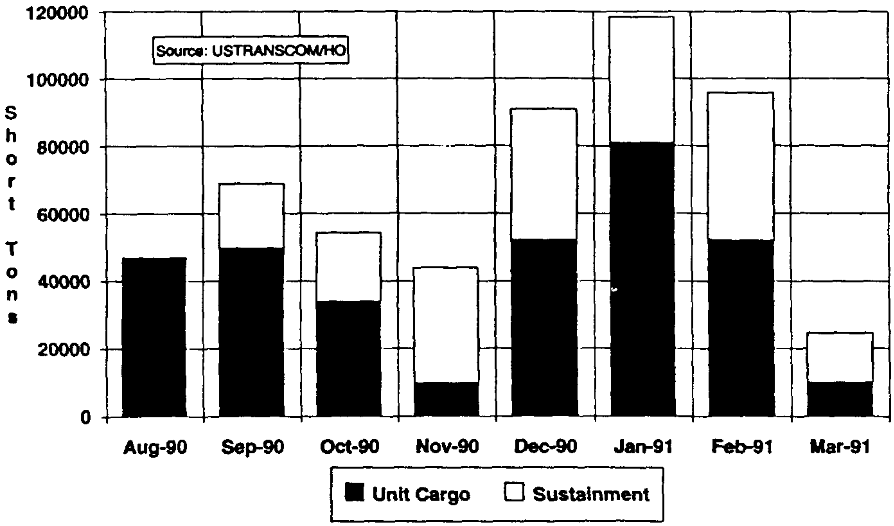
[98]Source: Military Air Integrated Reported System (MAIRS) data recorded in *Strategic Airlift in Operation Desert Shield and Desert Storm*, Table 6, p 36.

[99]*Kondra Notes*, pp 101-102.

carried on C-5s, C-141s, and commercial aircraft all increased in December and January.[100]

As Desert Shield and Desert Storm progressed, sustaining forces became increasingly important. Between 7 August 1990 and 10 March 1991, airlift delivered approximately twenty-three percent of all sustainment cargo moved by TRANSCOM–slightly over twice the amount anticipated before the crisis.[101] Figure 17 illustrates the breakout of unit and sustainment cargo during the deployment.

Figure 17
Desert Shield/Desert Storm MAC Cargo: Unit and Sustainment



Discussions about a stage base in the AOR began again at the beginning of the Phase II deployment. CENTCOM proposed Cairo West but stipulated that if war broke out, MAC would have to leave within twenty-

[100] GWAPS, *Statistical Compendium*, Chapter 3.

[101] USTRANSCOM/TCHO briefing chart, "Desert Shield/Desert Storm Strategic Lift Summary Passengers and Cargo (As of 10 Mar 1991)," updated 21 Apr 1992.

four hours so that higher priority weapons could base there. MAC didn't consider it prudent to adopt a concept of operations that would have to be abandoned at such a critical time. The pilot pools were already operational and working well, so MAC declined CENTCOM's offer.[102]

During Phase II, additional reserve activations included six aerial port squadrons, three mobile aerial port squadrons, and one mobile aerial port flight. Also activated were over 600 personnel from the 439th Military Airlift Wing (AFRES) at Westover AFB.[103] Extensive staging of eastbound C-5s through Westover would not have been possible without activation of those maintenance personnel.[104]

The Phase II buildup drew a large number of American forces from Germany, creating a need for overnight delivery of high-priority spare parts from Europe to the AOR. MAC responded by initiating the European Desert Express on 8 December 1990. This daily C-141 mission onloaded cargo at Rhein-Main and offloaded at Dhahran. The European Desert Express was discontinued on 9 March 1991.[105]

Desert Storm

The start of the war certainly didn't diminish the requirements for airlift. January was MAC's busiest month for both cargo and passengers. February was MAC's second busiest month for cargo.[106]

Because of additional cargo requirements, the Secretary of Defense activated CRAF Stage II on 17 January, providing access to another fifty-nine passenger aircraft and seventeen more cargo aircraft. Because commercial air carriers were volunteering more aircraft than required by Stage I, activating Stage II actually made only nine more cargo aircraft available.[107]

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[102]*Kondra Notes*, pp 33-34. (S) *MAC History 1990*, Ch 3, p 28.

[103](S) *MAC History 1990*, Ch 3, Table 3-6.

[104]Intvw with Lt Gen (Ret) Anthony J. Burshnick, former CINCMAC/CV, Arlington, VA, 30 Nov 1992.

[105]*Conduct of the Persian Gulf War*, pp 416-417.

[106]GWAPS, *Statistical Compendium*, Chapter 3.

[107]*Conduct of the Persian Gulf War*. p 420.

During Operations Desert Shield and Desert Storm, DOD also received donated commercial airlift support from South Korea, Kuwait, and Italy. Japan provided funding to lease commercial airlift from U.S. carriers.[108]

The possibility of chemical attacks on airfields in the AOR concerned both MAC and commercial carriers. At first, civilian crews didn't have chemical warfare defense ensembles, and MAC didn't issue them any. MAC's plan was to give chemical gear to civilian crews when they landed in the AOR. After the outbreak of hostilities, MAC began issuing chemical gear to civilian crews before they left Europe.[109]

Once Scud attacks started, several commercial carriers refused to fly to Dhahran, and several major carriers refused to fly to the AOR at night. No commercial aircraft were flying to King Khalid Military City because it was too far north. MAC scheduled all commercial flights to avoid the "Scud window" of 1600Z-2100Z. (Organic aircraft were scheduled during those times.) Because of restrictions at German civil airfields, MAC had difficulty in matching acceptable commercial aircraft departure times from Europe with acceptable arrival times in the AOR.[110]

Early in the war, Iraq launched Scuds against Israel. President Bush responded by ordering deployment of Patriot missile batteries. MAC and the Army had the first fire units deployed and ready for operation within twenty-nine hours of verbal notification. MAC used thirty-seven C-5s (for the outsize equipment) and eight C-141s (for missiles and other equipment) to support the move.[111]

Other vital cargo airlifted during January included heavy mobility equipment transports (HMETs) and heavy equipment transports (HETs) needed by armored units to prepare for the ground war. C-5s onloaded these outsize items in Peoria, Illinois, and moved them quickly to the

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[108](S) *MAC History 1990,* Ch 3, pp 69-74.

[109]*Kondra Notes*, pp 10, 55, 90. Interview with Lt Gen (Ret) Anthony J. Burshnick, former CINCMAC/CV, Arlington, VA, 30 Nov 1992.

[110]*Kondra Notes*, pp 84, 111, 114. *Strategic Airlift in Operation Desert Shield and Desert Storm*, pp 22-23.

[111]*Kondra Notes*, pp 99-100. *Strategic Airlift in Operation Desert Shield and Desert Storm*, pp 13-14. *Conduct of the Persian Gulf War*, p 389.

desert. In February, MAC organic airlift moved the newly developed GBU-28 guided bomb to the Gulf. Throughout the war, strategic airlift regularly demonstrated its flexibility and responsiveness by moving high priority items on short notice.[112]

During Desert Shield and Desert Storm, MAC accounted for over ninety-nine percent of all passengers and nearly fifteen percent of all dry cargo delivered by TRANSCOM.[113] MAC strategic airlift was clearly the predominant source of air transportation for deploying units, but it wasn't the only source. MAC C-130s provided most of the airlift for their own deployments. For some fighter deployments, SAC KC-10s provided both airlift and air refueling support. SAC tankers sometimes carried cargo and passengers to support tanker and bomber deployments. SAC's RC-135s carried passengers to support their own deployments. With the exception of carrier-based air power, airlift–whatever the source–was a common thread running through all the deployments described below.

Navy Component, Central Command (NAVCENT) Deployments

On 2 August 1990, the *Eisenhower* carrier battle group was in the Mediterranean, nearing the end of a scheduled six-month deployment. The *Independence* carrier battle group was near Diego Garcia, just starting a scheduled Indian Ocean deployment. After Iraq invaded Kuwait, both battle groups were ordered to the crisis area. As early as 5 August, the *Independence* could have launched long-range air strikes. By 8 August, both battle groups were on station, under CENTCOM control, and ready to conduct air strikes–*Eisenhower* from the Red Sea and *Independence* from the Gulf of Oman.[114]

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[112]*Kondra Notes*, pp 97, 123. *Strategic Airlift in Operation Desert Shield and Desert Storm*, pp 13-14.

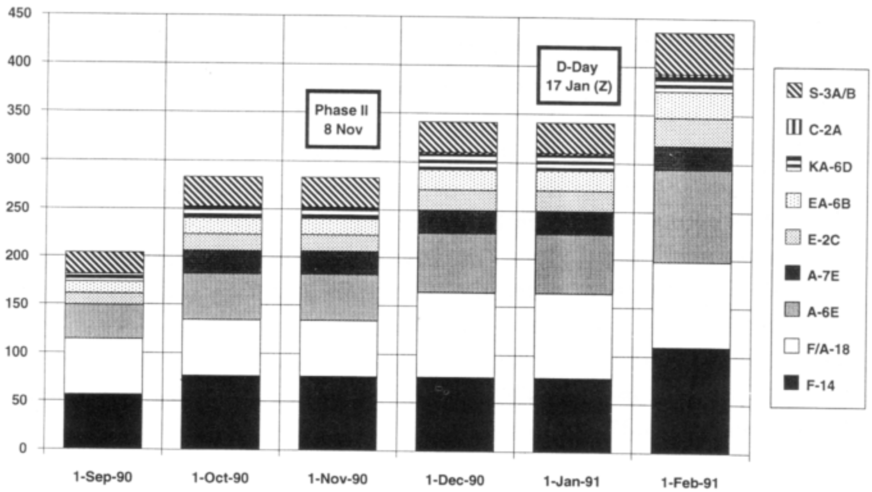
[113]GWAPS, *Statistical Compendium*, Table 20, "Gulf War Strategic Lift Summary by Transportation Mode Plus Cargo Type," Chapter 3.

[114]Department of the Navy, *The United States Navy in "Desert Shield" "Desert Storm"* (Washington, DC: Department of the Navy, Office of the Chief of Naval Operations, 15 May 1991), pp 7, 11.

The *Independence* and *Eisenhower* delivered the first U.S. combat aircraft to the AOR, ready for sustained operations upon arrival. Each battle group carried fuel and ordnance for its aircraft plus a complete intermediate maintenance facility with spare parts, test equipment, and maintenance personnel. These carriers provided more than one hundred fighter and attack aircraft plus early warning, electronic warfare, and surveillance aircraft.[115]

While Air Force combat aircraft began arriving in the AOR on 8 August, and the Air Force ultimately provided the majority of fixed-wing aircraft, the Navy remained a key element of U.S. air power.[116] On D-Day, six battle groups were on station. Figure 18 depicts the NAVCENT buildup of fixed-wing aircraft over the course of Desert Shield and Desert Storm. (Totals do not include Marine aircraft, which will be addressed later.)

Figure 18
NAVCENT Buildup: Fixed Wing Aircraft



Source: GWAPS *Statistical Compendium*

[115]*Ibid*, p 12.

[116]*Ibid*, p 13.

Air Force Component, Central Command (CENTAF) Deployments

When Iraq invaded Kuwait, U.S. Air Force presence in the AOR consisted of a small MAC support detachment in Dhahran plus pilots and support personnel assigned to U.S. Military Training Mission-Saudi Arabia. As part of exercise Ivory Justice, two KC-135 tankers were operating in the United Arab Emirates.[117]

An advance echelon (ADVON) group led by Major General Thomas R. Olsen, CENTAF deputy commander, left Shaw AFB on 7 August and arrived in Riyadh on 8 August. On 9 August, General Olsen officially established CENTAF Forward headquarters in the Royal Saudi Air Force headquarters building.[118]

On 8 August, airlifters and deploying U.S. Air Force aircraft began arriving in the AOR. The rapid buildup of combat and combat support aircraft continued throughout August and early September. Phase I deployments were essentially complete in mid-September. Essential to the success of the deployment was $1 billion worth of fuel, ammunition, and equipment that the Air Force had prepositioned in Oman, Bahrain, and aboard three ships.[119] Figure 19 shows the beddown of CENTAF aircraft at the end of Desert Shield Phase I.

Phase II deployments started in earnest at the end of November. In early December, the Iraqis began test-firing their Scud missiles and intelligence sources reported increased Iraqi forces in Kuwait. CENTCOM and CENTAF developed a stronger sense of urgency concerning deployment of Phase II units. Arrival dates were moved up. On 14 December, CENTAF requested all additional units be in place by 12 January. On 15 December, General Schwarzkopf authorized General Horner to deploy air

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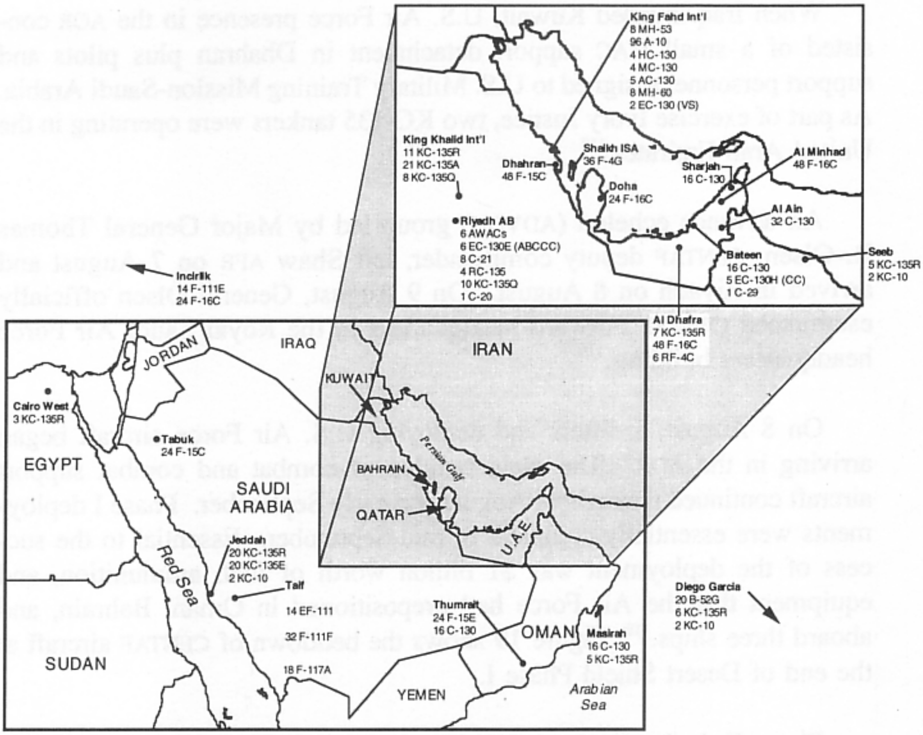
[117] *Conduct of the Persian Gulf War*, pp E-21,22.

[118] (S) Y'Blood, *The Eagle and the Scorpion*, pp 40-41.

[119] *Conduct of the Persian Gulf War*, pp E-14,15. (S) Y'Blood, *The Eagle and the Scorpion*, p 24. See Chapter 2 of this volume for a discussion of the Air Force prepositioning program and Chapter 4 of this volume for a discussion of distributing prepositioned materiel within the AOR.

Figure 19
CENTAF Aircraft Beddown at End of Phase I



Source: (S) Steven B. Michael, *The Persian Gulf War: An Air Staff Chronology of Desert Shield - Desert Storm,* Washington, DC: United States Air Force, Center for Air Force History, 1991.

assets as fast as airlift could support the moves.[120] Figure 20 shows the beddown of CENTAF aircraft at the end of Desert Shield Phase II.

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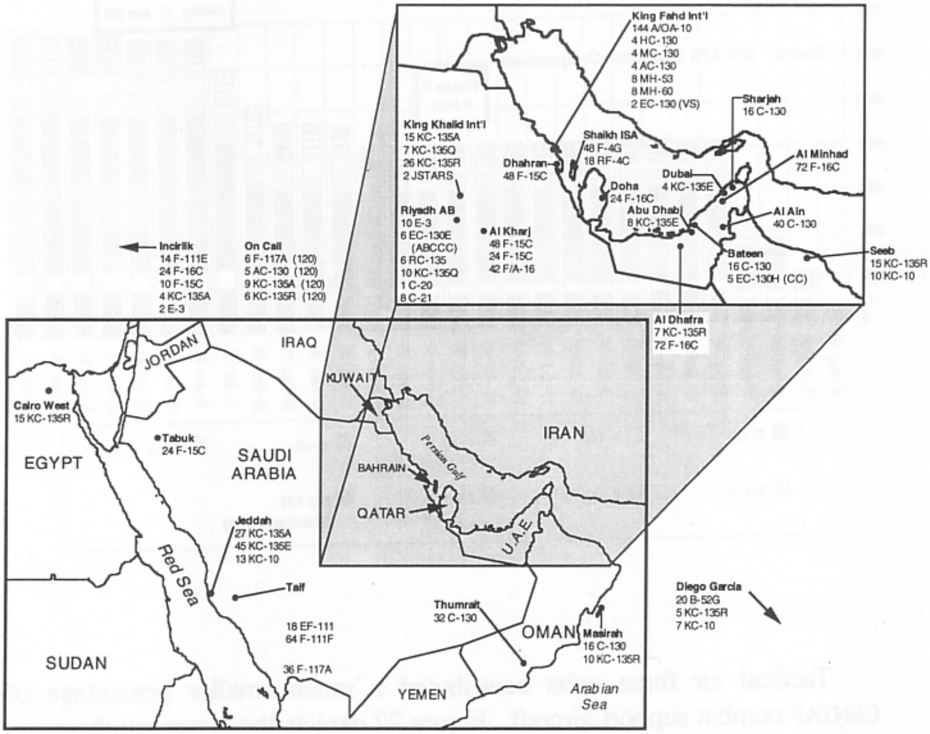
[120](S) William T. Y'Blood, *Sharpening the Eagle's Talons, The USAF and the Desert Shield Second-Phase Deployment Nov 9, 1990-Jan 17, 1991* (Draft) (Washington, DC: United States Air Force, Center for Air Force History, 1992), p 18.

Figure 20
CENTAF Aircraft Beddown at End of Phase II

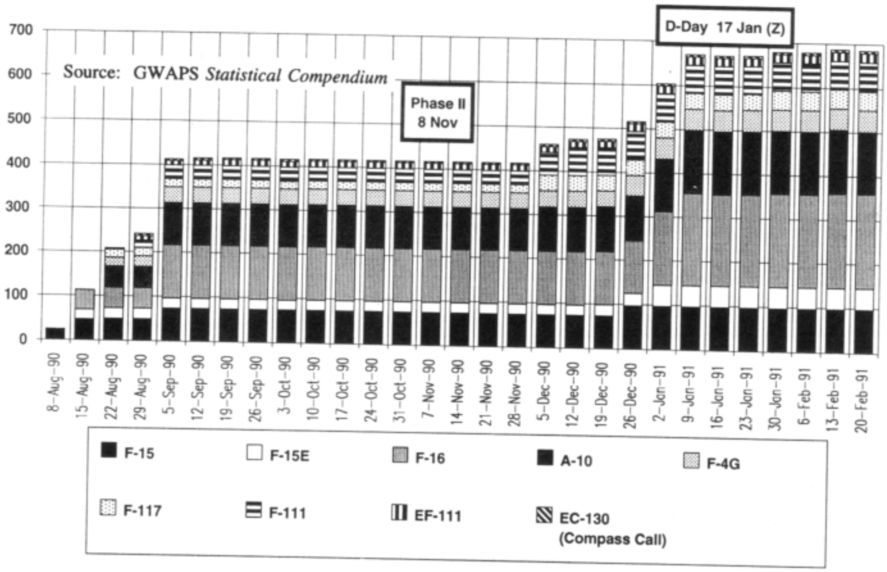


Source: (S) Steven B. Michael, *The Persian Gulf War: An Air Staff Chronology of Desert Shield - Desert Storm*, Washington, DC: United States Air Force, Center for Air Force History, 1991.

Tactical Air Force Unit Deployments

Tactical air force (TAF) units provided the majority of CENTAF combat aircraft. Figure 21 depicts the rapid CENTAF buildup of TAF combat aircraft over the course of Desert Shield and Desert Storm. Phase I aircraft deployments, including sixteen tactical fighter squadrons from the CONUS and four from Europe, were essentially complete within four weeks. Phase II aircraft deployments, including six tactical fighter squadrons from the CONUS and six from Europe, began slowly in late November and then picked up sharply toward the end of December.

Figure 21
CENTAF Buildup: TAF Combat Aircraft



Tactical air force units contributed a much smaller percentage of CENTAF combat support aircraft. Figure 22 depicts the lower numbers and the slightly slower CENTAF buildup of TAF combat support aircraft over the course of Desert Shield and Desert Storm. Principally as the result of RF-4C arrivals, the number of TAF combat support aircraft in the AOR doubled in the first two weeks of January.[121]

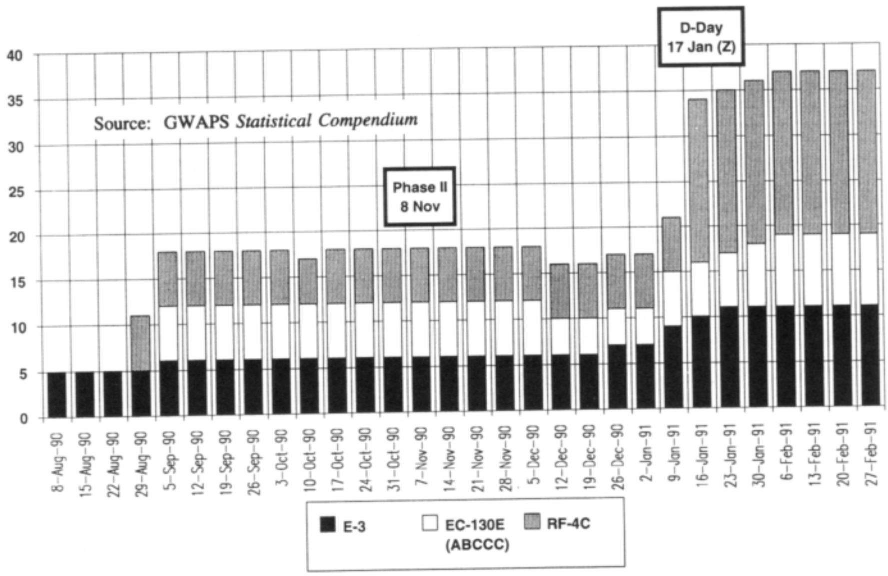
Tactical Air Force Deployment Planning

Tactical Air Command/XPX had peacetime responsibility to develop TPFDDs for U.S. tactical air force deployments. Because of the close-hold nature of Desert Shield initial planning, XPX had negligible involvement before C-Day. After C-Day, Generals Horner and Olsen were both in the AOR, and no general officers were at CENTAF Rear. Plans anticipated that

[121] GWAPS, *Statistical Compendium*, Table 6.

as the CENTAF staff deployed, reserve personnel from 10th Air Force would be activated to backfill CENTAF Rear positions. The expected reserves were not activated. TAC and CENTCOM agreed to move CENTAF Rear to Langley AFB, where TAC/XPX assumed the unfamiliar responsibility for both building and executing a TPFDD for a contingency in progress.[122]

Figure 22
CENTAF Buildup: TAF Combat Support Aircraft



During the early stages of the deployment, lack of usable information from JOPES precluded use of automatic data processing systems for planning.[123] Communication by secure telephone, facsimile, and electronic mail was essential for planning unit moves.

[122](S) RAND, *Assessment of Desert Shield Deployment*, pp 105-107. Intvw with HQ TAC staff, Langley AFB, VA, May 1992. (S) JULLS NUMBER: 41028-63422 (00380), submitted by RAND PAF.

[123]Documented in detail by MAC in JULLS NUMBER: 91055-83676 (00129), submitted by HQ MAC, CAT Director.

TAC subordinate units had access to JOPES terminals. These units could make authorized changes to their databases; they could also make inadvertent or unauthorized changes to the TPFDD.[124] Consequently, XPX maintained one JOPES database that subordinate units could access and another that was frozen daily for XPX planning. Each day, XPX would use the frozen data to develop a deployment plan for the next seven-day window. When units added to their deployment packages without realizing that XPX no longer updated their JOPES database, they sometimes ended with less airlift than they needed. This led to partially deployed ULNs, which JOPES could not track. TAC estimated that over half of its TPFDD consisted of nonstandard UTCs reflecting cargo left behind by units which were otherwise considered closed.[125]

XPX tried to plan deployments seven days in advance so it could coordinate airlift, tanker support, and diplomatic clearances. At the start of the deployment, XPX's efforts were thwarted by inability to obtain clear planning factors concerning daily apportionment of airlift and by CENTCOM's continually changing priorities. Changing priorities also meant that not all deploying units received the type of airlift aircraft for which they had planned their loads. Many deploying units had difficulty finding out types of aircraft and arrival times for their airlift support.[126]

TAC/DOXD was responsible for all TAC peacetime deployment exercises. During this deployment, DOXD prepared flight plans, arranged tanker support, and obtained diplomatic clearances for all TAC fighter aircraft as well as for U.S. Air Force Europe (USAFE) and Marine aircraft. DOXD began drawing up tentative routes on 5 August, and TAC settled on a single route for the majority of Phase I deployments. The single route simplified air refueling planning by allowing SAC tanker task forces to operate from the same locations. The nonstop route from CONUS to the AOR minimized requirements for diplomatic clearances and overflight rights. Most deploy-

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[124]Intvw with HQ MAC and HQ TRANSCOM staff, Scott AFB, IL, Feb 1992. JULLS NUMBER: 32365-38550 (00360), submitted by PACOPS/DOU.

[125]Intvw with HQ TAC staff, Langley AFB, VA, May 1992. (S) RAND, *Assessment of Desert Shield Deployment*, pp 55, 110.

[126](S) RAND, *Assessment of Desert Shield Deployment*, p 110. (U) Intvw with HQ MAC and HQ TRANSCOM staff, Scott AFB, IL, Feb 1992, substantiated that this problem was widespread. Essentially the same problem is pointed out in JULLS NUMBER: 90737-22888 (00123), submitted by OC-ALC/IG.

ing fighters overflew Egypt only, but A-10s and Marine fighters made an en route stop in Spain. Nonstop flight times from the CONUS were fifteen to sixteen hours.[127]

Fighters normally deployed with a load of armament; the extra weight and drag necessitated refueling more frequently than normal. F-4Gs were the most difficult deployment to plan, with each aircraft requiring fifteen air refuelings between the East Coast and the AOR. Fifteen was the maximum number the TAC air refueling flight planning system could handle. Fortunately, it was also the maximum number used by any squadron on a single day. The TAC flight planning system did not interface with air refueling planners at either at Headquarters SAC or SAC numbered air forces. Even so, TAC and SAC planners usually required no longer than twelve to fourteen hours to agree on air refueling plans.[128]

To illustrate the principal fighter deployment route from CONUS to the AOR, Figure 23 shows the F-4G refueling plan, with four refuelings between George AFB and Seymour Johnson AFB, then fifteen more on the nonstop leg to the AOR.

A goal of Phase II deployment planning was to place less demand on the tanker force. No CONUS-based aircraft were initially scheduled to deploy nonstop to the AOR. A-10s were to stop for a day at both Lajes and Sigonella. Other fighters were to stop for a day at Moron. USAFE-based A-10s deploying to the AOR were to stop for a day at Sigonella, but other USAFE-based fighters were to deploy nonstop to the AOR. Not all fighter deployments went as initially planned. In early December, an F-117 squadron deployed nonstop from Langley to Saudi Arabia, requiring ten additional KC-10s on the Atlantic Bridge and ten more KC-135Rs in the AOR.[129]

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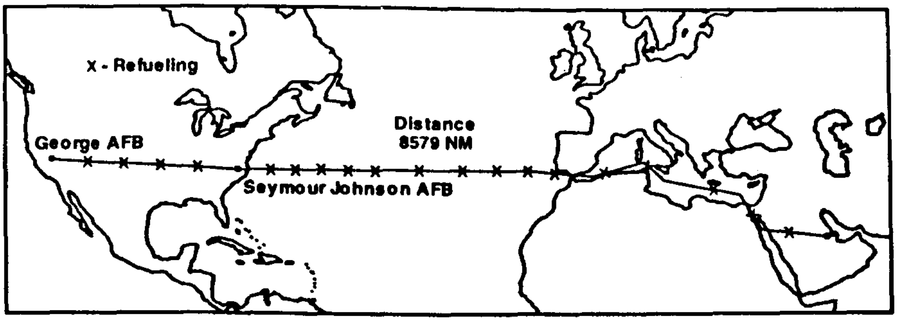
[127]Intvw with HQ TAC staff, Langley AFB, VA, May 1992. (S) RAND, *Assessment of Desert Shield Deployment*, pp 104-105, 108-109. See this Chapter 5 of this volume for a more extensive discussion of the "Atlantic Bridge."

[128](S) RAND, *Assessment of Desert Shield Deployment*, p 109.

[129](S) *History of the Strategic Air Command 1990*, pp 355-356. See Chapter 5 for further discussion of air refueling operations.

Figure 23
F-4G Air Refueling Track



Tactical Air Force Deployment Execution

Unlike the 1st Tactical Fighter Wing (TFW), most fighter units did not get all the airlift they requested. The experience of the 23d TFW from England AFB, which deployed closer to the end of the Phase I fighter surge, was more typical. The first squadron of A-10s departed on 27 August and arrived at King Fahd on 31 August. The second squadron departed on 29 August and arrived on 2 September. Airlift support for the first squadron was fairly timely; the second squadron waited seven to ten days for its airlift to close.[130]

The 35th TFW from George AFB experienced changes in its departure date, airlift availability, and beddown location. In addition, the wing did not know until the last moment whether it would be the host unit or a tenant at its beddown location–and whether the beddown location would be a bare base. Airlift for the wing was spread out between 16 August and 16 November. During the period, George AFB personnel loaded fourteen C-141s, seven C-5s, one DC-10, and one L-1011. Both commercial passenger aircraft arrived on 20 August with almost no prior notification. To

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[130](S) RAND, *Assessment of Desert Shield Deployment*, p 111.

deal with the unpredictable airlift schedule, base personnel set up a cargo loading plan with C-141 and C-5 silhouettes on the ramp. When aircraft dropped in unannounced, base personnel simply filled the corresponding silhouette with the appropriate pallets from the "shopping row" cargo marshalling area.[131]

Tactical Air Force Basing Decision Impacts

Some units were informed of their beddown bases just before departing for the AOR; beddown locations for others had changed while the units were en route. Changes to beddown bases complicated unit deployment preparations and airlift prioritization. Beddown changes resulted from host-nation sensitivities, ramp congestion, and mismatches between aircraft, munitions, and support equipment.[132]

On 9 August, a squadron of F-15Es from the 4th TFW left Seymour Johnson AFB for Seeb, Oman. While over the Mediterranean, the squadron was told to divert to Dhahran. The fighters and three of the C-141s carrying squadron equipment landed at Dhahran. After two hours, they were on the move to Thumrait, Oman. The airlifters carrying the remainder of the squadron's personnel and support equipment received more timely notification and went to Thumrait. Additional logistics efforts were required when base support equipment at Thumrait did not match what had been expected at Seeb.[133]

Similarly, a squadron of F-16C/Ds from the 363d TFW at Shaw AFB had its destination changed in midflight from Sharjah to Al Dhafra in the United Arab Emirates (UAE). The squadron arrived on 10 August; another followed on 11 August. While the two squadrons were soon declared combat-ready, they were short on air-to-ground munitions, corrosion prevention fuel additives, materials to build living quarters and squadron facilities, and drinking water.[134]

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[131](S) *History of the 35th Tactical Fighter Wing (Provisional)*, pp 9, 12-13, 19.

[132](S) RAND, *Assessment of Desert Shield Deployment*, p 112.

[133](S) *4th Tactical Fighter Wing in Southwest Asia*, p 18. (S) RAND, *Assessment of Desert Shield Deployment*, pp 16-18, 111-112.

[134](S) Y'Blood, *The Eagle and the Scorpion*, pp 51-52.

Concerned over the conditions at Al Dhafra, General Olsen instructed his logistics planners to send a Prime BEEF (Base Engineer Emergency Forces) team there immediately. He delayed arrival of additional people and equipment while expediting two C-141s and sixteen C-130s carrying Harvest Falcon assets. Due to uncertainty over other beddown locations, and to give MAC time to finish missions supporting earlier deployments, CENTAF also delayed additional unit departures for three days.[135]

SAC Unit Deployments

SAC designated Brigadier General Patrick P. Caruana, commander of the 42d Air Division at Grand Forks AFB, North Dakota, as Commander, STRATFOR.[136] On 7 August, General Caruana and the rest of his team left Barksdale AFB, Louisiana, aboard four 2d Bomb Wing (BMW) KC-10s. En route to Riyadh, the tankers performed a dual mission of escorting and refueling the initial group of F-15s sent to Saudi Arabia. General Caruana's contingent arrived in Riyadh on 8 August.[137]

Figure 24 depicts the buildup of SAC bombers, reconnaissance aircraft, and tankers over the course of Desert Shield and Desert Storm.

SAC Deployment Planning

Special access restrictions limited the number of SAC staff members involved in deployment planning. On 9 August 1990, the Chairman of the Joint Chiefs of Staff designated the deployment of U.S. forces to Southwest Asia as Operation Desert Shield and downgraded the classification to Secret. Removal of special access restrictions allowed participation of the full SAC staff and subordinate units.[138]

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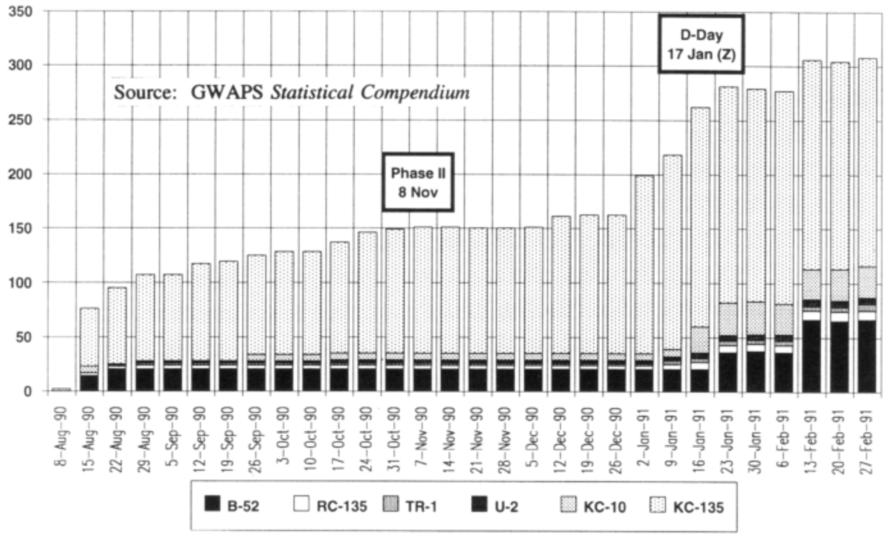
[135] *Ibid*, pp 52-54.

[136] STRATFOR (Strategic Forces Advisor) was a staff planning group consisting of people knowledgeable in conventional operations.

[137] (S) *History of the Strategic Air Command 1990*, pp 331-332.

[138] (S) *History of the Strategic Air Command 1990*, p 337.

Figure 24
CENTAF Buildup: SAC Aircraft



CENTCOM based most of its planning on its OPLAN 1002-90, but SAC had made limited inputs to this plan. SAC began initial aircraft movements based on SAC OPLAN 1002-88, a regional support plan for Southwest Asia operations that included sections dealing with prepositioned assets and employment of aircraft from Diego Garcia. OPLAN 1002-88 had a JOPES database that planners could use and update, and it listed intended lead units, aircraft types, and forward operating locations. Most actual Desert Shield assignments differed from OPLAN 1002-88, but the plan nevertheless provided a valuable starting point.[139]

JOPES did not extend down to the unit level in SAC. Headquarters used AUTODIN and telephone to transmit TPFDD information to deploying units. This was a lengthy process and much information was out of date by the time the unit received it. Units could not update the TPFDD, causing airlift

[139](S) Y'Blood, *The Eagle and the Scorpion*, p 39.

problems. MAC sometimes arrived at an installation only to find cargo had already been moved.[140]

SAC Tanker Deployments to the AOR

During Desert Shield and Desert Storm, SAC successfully performed a juggling act with its tanker force to meet strategic commitments, support CENTCOM air refueling and airlift requirements for deployments to the AOR, and provide air refueling support for CENTCOM training and combat operations within the AOR. Tanker deployment orders changed daily in August as various commanders and staffs established force deployment priorities, levels of logistics support, and beddown locations. Different fighters had different refueling requirements, and their order of deployment affected the number of tankers needed on the Atlantic Bridge and in the AOR.[141]

On 12 August, SAC identified a growing need for KC-10s to support planned B-52, F-117, A-10, F-4G, and AV-8 deployments. With MAC heavily committed to Army unit movements, the KC-10 cargo capacity could be put to valuable use moving fighter en route maintenance packages. MAC and TRANSCOM agreed that KC-10s should be employed in their dual-role capacity; SAC therefore requested JCS to release KC-10s from the AOR. When JCS approved SAC's request on 14 August, forty-two KC-135s and ten KC-10s were in the AOR. The JCS approval also authorized SAC direct liaison with CENTCOM for future tanker requirements. This gave SAC greater influence and flexibility in meeting tanker requirements in the AOR. SAC retained operational control of the tankers while SAC, STRATFOR, and CENTCOM worked together to resolve basing issues. The KC-10s were out of the AOR by 16 August, but the KC-135 total continued to grow as more bases became available. In addition, six KC-10s returned to the AOR at the end of September. By the end of Phase I, the USAF tanker force in the AOR totaled 116 KC-135s and 6 KC-10s.[142]

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[140]JULLS NUMBER: 21443-56794 (00169), submitted by HQ SAC/LGXX. AFRES expressed a similar complaint about JOPES deployment in JULLS NUMBER: 03057-60563 (00371), submitted by HQ AFRES/LGXP.

[141](S) *History of the Strategic Air Command 1990*, p 345.

[142](S) *History of the Strategic Air Command 1990*, pp 346-347. GWAPS, *Statistical Compendium*, Table 6.

By the end of Phase II, the USAF tanker force in the AOR had grown to 202 KC-135s and 24 KC-10s. Planning for this expansion was a daunting task for SAC and STRATFOR. Since SAC forces did not typically deploy to the AOR as complete units, SAC designated "lead tanker units" at each beddown base to provide most of the support personnel and equipment.[143]

In the early days of the deployment, SAC dealt with limited basing options by placing its most capable tankers–KC-10s and KC-135 Rs–in the AOR. The KC-135R has better takeoff performance and fuel offload capability than other model KC-135s. It also requires less logistics support than KC-135As. When the KC-10s were withdrawn from the AOR in mid-August, they were initially replaced by KC-135Rs. As more bases became available, KC-135Rs were in turn replaced by greater numbers of KC-135As and KC-135Es. [DELETED][144]

SAC Bomber Deployments to the AOR

On 8 August 1990, CENTCOM asked for twenty-eight B-52Gs to perform conventional operations. Requested deployments to Diego Garcia were five aircraft by 16 August, fourteen more by 24 August, and nine more by 6 September. A day later, JCS ordered SAC to deploy nine aircraft by 24 August and five more by 6 September. Actual deployments were seven aircraft on 12 August, seven more on 13 August, and six more on 15 August. The final eight B-52s requested by CENTCOM were not deployed because not enough additional ramp space was available at Diego Garcia and CENTCOM could not find an alternative beddown base within the theater. All aircraft deployed with forty-five M-117R general-purpose bombs.[145]

By 22 August, SAC had four spare B-52Gs at Andersen AFB, Guam. This allowed Diego-based B-52Gs to rotate regularly through Guam for corrosion control treatment at the intermediate level maintenance facility. To keep twenty combat-ready aircraft in place, an Andersen-based

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[143](S) *Ibid*; (S) RAND, *Assessment of Desert Shield Deployment*, p 99.

[144](S) *History of the Strategic Air Command 1990*, pp 347, 349.

[145](S) *History of the Strategic Air Command 1990*, pp 197, 199, 460. (S) RAND, *Assessment of Desert Shield Deployment*, p 100.

B-52G landed at Diego before a Diego-based B-52G took off for Guam. This regular rotation aided in the munitions resupply of Diego Garcia.[146]

Over the next several weeks, SAC strove to obtain a second forward operating location. The main base under consideration was [DELETED], because of its outstanding facilities and collocation with other SAC assets. On 23 August, the SAC Support Battle Staff (SBS) learned that [DELETED] military authorities had tentatively approved basing fourteen B-52s at [DELETED]. Six days later, STRATFOR advised the SBS that the approval had been withdrawn. CENTCOM encouraged SAC to look toward RAF Fairford or Moron Air Base.[147]

On 2 October 1990, the Secretary of Defense halted efforts to find another B-52 base in the AOR, stating that such efforts were not to resume unless hostilities broke out. Nevertheless, [DELETED] officials maintained contact with STRATFOR concerning [DELETED]. On 13 October, SAC learned that the host government had approved basing fourteen B-52Gs [DELETED]. Once Desert Storm commenced, active operations began [DELETED]. By the cease-fire, the number of bombers on the ramp had grown to nineteen.[148]

On 9 January 1991, Spain formally approved basing B-52s at Moron Air Base as long as there was no publicity and local authorities would receive advance notice of operations at the base. Initially, six B-52s were stationed there. By 24 January there were ten, and in early February, there were twenty-two aircraft–eighteen conducting strikes against Iraq and four undergoing intermediate level maintenance.[149]

On 1 February, SAC learned that the United Kingdom had approved basing B-52s at RAF Fairford. On 4 February, eight aircraft were directed to deploy, and they began conducting operations from Fairford on 9 February.[150]

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[146](S) *History of the Strategic Air Command 1990*, p 199. (S) RAND, *Assessment of Desert Shield Deployment*, p 100.

[147](S) *History of the Strategic Air Command 1990*, pp 582-584.

[148](S) *Ibid*, p 585.

[149](S) *Ibid*, p 589.

[150](S) *Ibid*, pp 586-587.

SAC Reconnaissance Deployments to the AOR

Almost immediately after Iraq invaded Kuwait, SAC was tasked to design R-135 reconnaissance tracks in Saudi Arabia. After receiving the necessary overflight clearances, the first Rivet Joint mission launched from Hellenikon, Greece, on 9 August and recovered at Riyadh. By 10 August, another RC-135 from Hellenikon and one from Offutt AFB had relocated to Riyadh. By 11 August, these three aircraft were providing twenty-four-hour reconnaissance coverage from tracks within Saudi Arabia.[151]

Support personnel deployed on the RC-135s. Support equipment and supplies deployed on two C-141 sorties and one C-5 sortie.[152] Total RC-135s in the AOR grew to four at the end of August, seven in January, and nine in February.[153]

The 9th Strategic Reconnaissance Wing at Beale AFB was notified of proposed U-2 movements on 4 August. Two U-2s were supposed to arrive in the AOR on 13 August, but they were held at RAF Alconbury until ground support equipment had been airlifted into the AOR. The first U-2 arrived at [DELETED] on 17 August and the second arrived a day later. Reconnaissance missions began on 20 August.[154]

On 23 August, two TR-1s from RAF Alconbury arrived at Taif. Their support equipment arrived aboard C-5s on 27 August. TR-1 reconnaissance missions commenced on 29 August.[155]

Total U-2s in the AOR increased to three in mid-October, five in mid-January, and six in early February. Total TR-1s in the AOR increased to four in mid-January and six in late February.[156]

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[151](S) RAND, *Assessment of Desert Shield Deployment*, p 102. (S) Y'Blood, The Eagle and the Scorpion, p 28.

[152](S) RAND, *Assessment of Desert Shield Deployment*, p 102.

[153]GWAPS, *Statistical Compendium*, Chapter 3.

[154](S) Y'Blood, *The Eagle and the Scorpion*, pp 37-38.

[155](S) *History of the Strategic Air Command 1990*, p 467. (S) RAND, *Assessment of Desert Shield Deployment*, p 103.

[156]GWAPS, *Statistical Compendium*, Chapter 3.

SAC Organic Airlift

SAC OPLAN 1002-88 called for a Pacific Bridge, but it never materialized as planned. What ultimately became known as the Pacific Bridge was an organic airlift effort to supply the B-52 force at Diego Garcia.[157]

The effort began when SAC requested thirty-three C-141 sorties to move bare base equipment to Diego Garcia. The request was denied because of CENTCOM priorities, and SAC took action to help itself. On 15 August, cargo and passengers began moving across the Pacific Bridge. The first order of business was to move a Harvest Eagle kit aboard KC-10s. The rest of the operation settled into a daily routine. A KC-135A would fly from Castle AFB to Andersen AFB, where the cargo and passengers were transferred to either a KC-135R or a KC-10 for the longer leg from Guam to Diego Garcia. (After the Harvest Eagle kit delivery was completed, KC-10 participation in the Pacific Bridge was strictly limited.)[158]

Except for oversize or outsize cargo, SAC supplied most of its own airlift needs through the end of September. At the end of September, Pacific Bridge departures were reduced to three a week. MAC airlift support for SAC picked up in October, but SAC organic airlift still carried significant amounts into November.[159]

MAC Unit Deployments

When Desert Shield began, MAC's first priority was managing the massive strategic airlift flow. Within a very short time, however, deploying a significant number of C-130s to the AOR became essential. In August 1990, CENTCOM established a Phase I requirement for ninety-six aircraft–six squadrons with sixteen aircraft each.[160] The first two squadrons to deploy came from the 317th Tactical Airlift Wing (TAW) at Pope AFB. One squadron left Pope on 9 August and arrived at Masirah, Oman, on 11 August. The second squadron left Pope on 11 August and arrived in Thumrait, Oman, on 13 August. The third squadron to arrive in the

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[157](S) *History of the Strategic Air Command 1990*, p 342.

[158](S) *Ibid*, pp 342-343.

[159](S) RAND, *Assessment of Desert Shield Deployment*, p 97.

[160](S) *MAC History 1990*, Ch 3, pp 38-39.

AOR came from the 314th TAW at Little Rock AFB and arrived in Bateen, UAE, on 16 August.[161]

The first three squadrons deployed relatively quickly; some difficulty occurred with identifying and confirming beddown locations for the next three squadrons.

On 16 August, a squadron from the 435th TAW left Rhein-Main for the AOR before all beddown issues had been resolved. After three aircraft landed at Thumrait, the COMALF turned back the remaining C-130s, and they landed at Cairo West or returned to Rhein-Main. After some negotiations, CENTAF and the UAE agreed upon Al Ain as a beddown site. The squadron closed at its new home on 28 August.[162]

The next unit to begin arriving in the AOR was the 94th Provisional Tactical Airlift Wing (PTAW), an AFRES unit with aircraft and crews from five different locations. The 94th PTAW arrived at RAF Alconbury on 18-19 August and was held there awaiting a decision on beddown. Sharjah, UAE, was finally selected, but due to ramp space limitations, the 94th PTAW's arrival was spread from 30 August to 11 September.[163]

The final Phase I deployment was the 130th PTAW, an ANG unit, also with aircraft and crews from five different locations. After waiting for some time at Lajes, it moved to Aviano on 5 September, and then to Al Ain on 7-9 September.[164]

Phase II saw thirty-two more C-130s deployed to the AOR in early January. Eight each went to Al Kharj and Al Ain; sixteen went to

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[161](S) *MAC History 1990,* Ch 3, pp 39-40, Table 3-10. (S) Y'Blood, *The Eagle and the Scorpion*, pp 54-55. (S) RAND, *Assessment of Desert Shield Deployment*, p 86.

[162](S) 1630 TAW(P), *History of Airlift in the Desert: Circumventing the Iraqis* (Al Ain AB, UAE: 1630 TAW(P)/HO, 23 May 1991), p ix. (S) *MAC History 1990,* Ch 3, Table 3-10. Y'Blood, (S) *The Eagle and the Scorpion*, pp 81-82.

[163](S) *MAC History 1990,* Ch 3, Table 3-10. Y'Blood, (S) *The Eagle and the Scorpion*, p 108.

[164](S) *MAC History 1990,* Ch 3, Table 3-10. (S) Y'Blood, *The Eagle and the Scorpion*, p 108.

Thumrait. After Desert Storm commenced, sixteen more C-130s arrived in late January. Eight each went to Al Kharj and Thumrait.[165]

MAC C-130 units provided most of their own airlift, but they needed help to move headquarters and support personnel and equipment.[166] Figure 25 depicts the CENTAF buildup of MAC aircraft over the course of Desert Shield and Desert Storm. Chapter 4 will provide more details on the MAC role in the AOR.

Special Operations Force Unit Deployments

Planning for deployment of Air Force special operations forces (SOF) began on C-Day when Headquarters Air Force Special Operations Command (AFSOC) sent a liaison officer to Headquarters U.S. Special Operations Command (SOCOM).[167] AFSOC representatives left Hurlburt Field, Florida, on 9 August to find a location to house AFSOC Central Command (AFSOCCENT) headquarters and an airfield for launching Air Force special operations missions. They settled on King Fahd International Airport, a nearly completed airfield just northwest of Dhahran.[168]

As of 11 August, Riyadh, not King Fahd, was the designated beddown location for AFSOC forces. The 1st Special Operations Wing (SOW) at Hurlburt Field launched an ADVON team with two MH-53 helicopters plus a command element, support equipment, and personnel. Carried by two C-141s and one C-5, the team arrived in Riyadh on 13 August. Within two hours after the first C-141 landed, the team learned that their beddown location had been changed to Dhahran–still not King Fahd. Acting quickly, the ADVON team kept the other two aircraft from unloading, squeezed as much extra equipment on them as possible, and had the crews fly them to Dhahran.[169]

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[165] GWAPS, *Statistical Compendium*, Chapter 3.

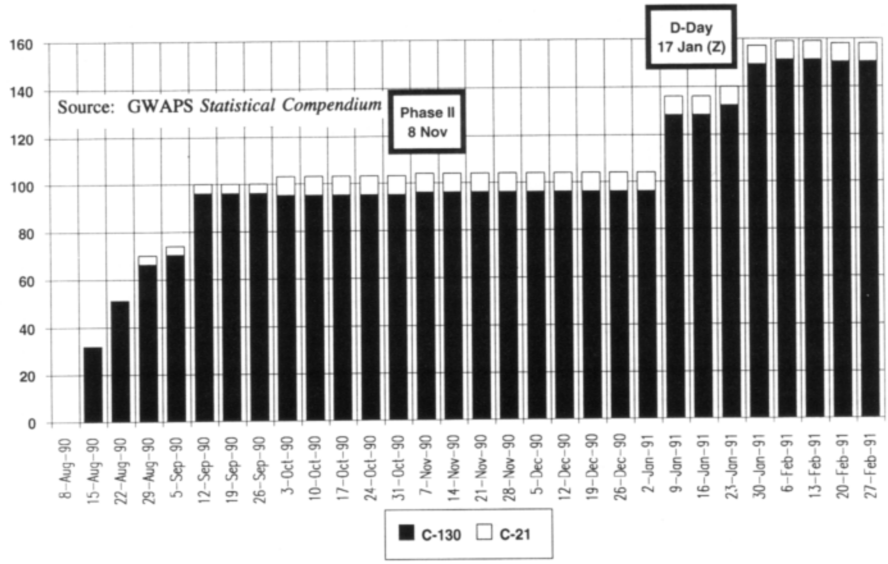
[166] JULLS NUMBER: 03054-86057 (00101), submitted by HQ AFRES/LGXP.

[167] Air Force Special Operations Command, *Air Force Special Operations Command in Operations Desert Shield and Desert Storm (Draft)* (Hurlburt Field, FL: HQ AFSOC/HO, 1991), p 4.

[168] *Air Force Special Operations Command in Operations Desert Shield and Desert Storm (Draft)*, p 4.

[169] *Ibid*, pp 5-6. (S) Y'Blood, *The Eagle and the Scorpion*, p 73.

Figure 25
CENTAF Buildup: MAC Aircraft



Two more MH-53s were delivered to Dhahran by 15 August. However, AFSOC did not receive the support equipment because SOF airlift was preempted for higher priority moves. As a result, they had no guns, munitions, or spare parts. AFSOCCENT received guns and ammunition on 20 August, but spare parts were not fully stocked for another month.[170]

Also on 11 August, the 1st SOW launched four MC-130s and four HC-130s for the AOR. The aircraft were held at RAF Woodbridge when their airlift was preempted. Using opportune airlift, they managed to complete their moves to Dhahran between 20 and 23 August.[171]

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[170]*Air Force Special Operations Command in Operations Desert Shield and Desert Storm (Draft)*, p 8.

[171](S) Y'Blood, *The Eagle and the Scorpion*, pp 73, 97.

In late August, the 1st SOW was directed to move to King Fahd. This location became the consolidated beddown site for all SOF air assets in the AOR.[172]

Figure 26 depicts the CENTAF buildup of AFSOF aircraft over the course of Desert Shield and Desert Storm. Total AFSOCCENT aircraft in the AOR peaked at just under forty in late February.[173]

Marine Component, Central Command (MARCENT) Deployments

U.S. Marine Corps aviation deployed to the theater in three increments. The fly-in echelon consisted of aircraft, initial spares and supplies, and support personnel. Elements brought in on prepositioned ships consisted of ordnance, support equipment, aviation fuel, and other items. Aviation logistics support ships provided maintenance and repair to sustain aircraft readiness.[174]

Figure 27 depicts the buildup of Marine fixed-wing aircraft during the course of Desert Shield and Desert Storm.

TAC/DOXD had the responsibility to plan air refueling for Marine aircraft deployments but did not have the necessary information on flight parameters for Marine aircraft. Information was obtained directly from the Marines using secure voice communications.[175]

Other Force Deployments

Figure 28 illustrates aircraft deployed to the AOR by other nations contributing to coalition air forces.

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[172]*Air Force Special Operations Command in Operations Desert Shield and Desert Storm (Draft)*, p 7. (S) Y'Blood, *The Eagle and the Scorpion*, pp 73 -74.

[173]GWAPS, *Statistical Compendium*, Chapter 3.

[174]*Conduct of the Persian Gulf War*, p E-21.

[175](S) RAND, *Assessment of Desert Shield Deployment*, p 109.

Figure 26
CENTAF Buildup: AFSOF Aircraft

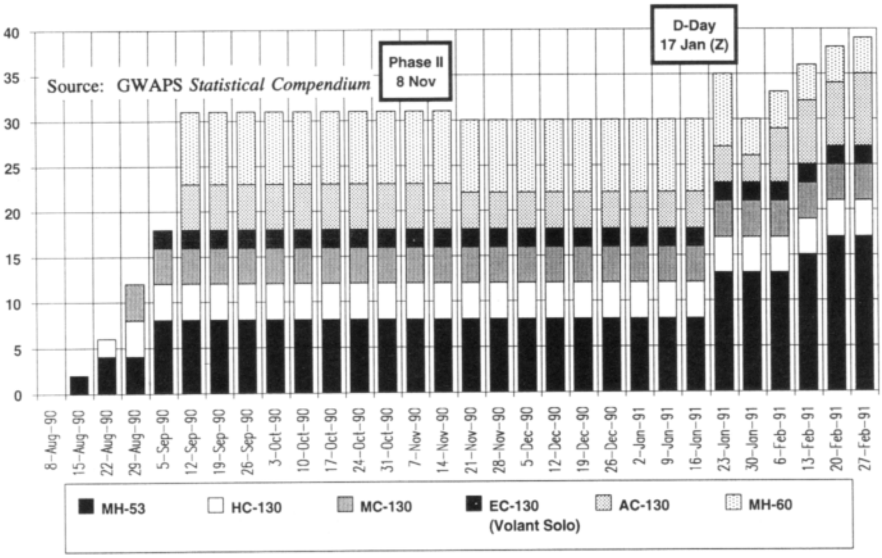

Figure 27
MARCENT Buildup: Fixed Wing Aircraft

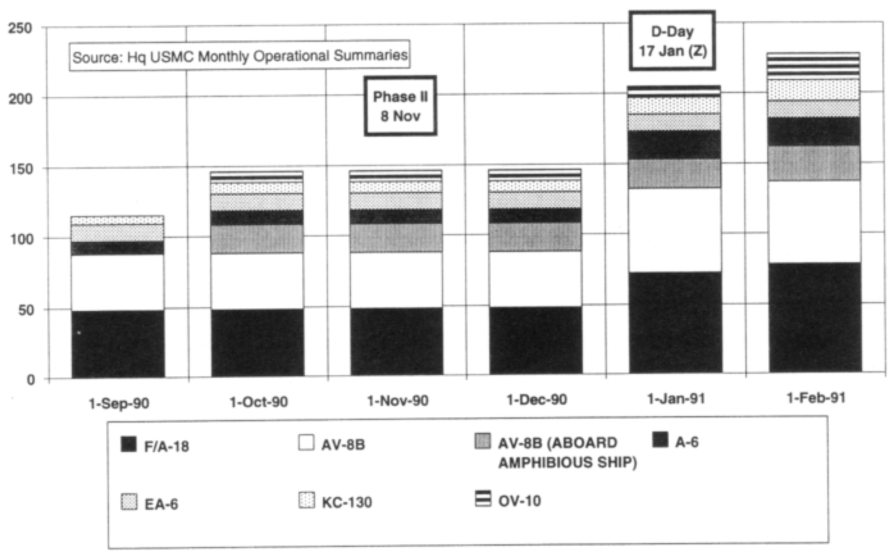

Figure 28
Coalition Member Aircraft[176]

[DELETED]

Assessment

The deployment to the Persian Gulf was the fastest buildup of conventional air power in history, and it challenged all facets of our Nation's strategic mobility capability. The challenge was lessened somewhat because allies granted access to essential airspace and facilities en route to the Gulf and because host nations in the Gulf had good infrastructure and plentiful resources. U.S. forces also had time to overcome numerous difficulties associated with expanding CINCCENT's operational concept into a workable deployment plan. The most vexing problems were changing deployment priorities, poorly defined lift requirements, and automated planning systems that couldn't keep pace with actual events.

Sea-based air power was first on the scene, followed shortly thereafter by land-based air power. Deployment of land-based airpower was

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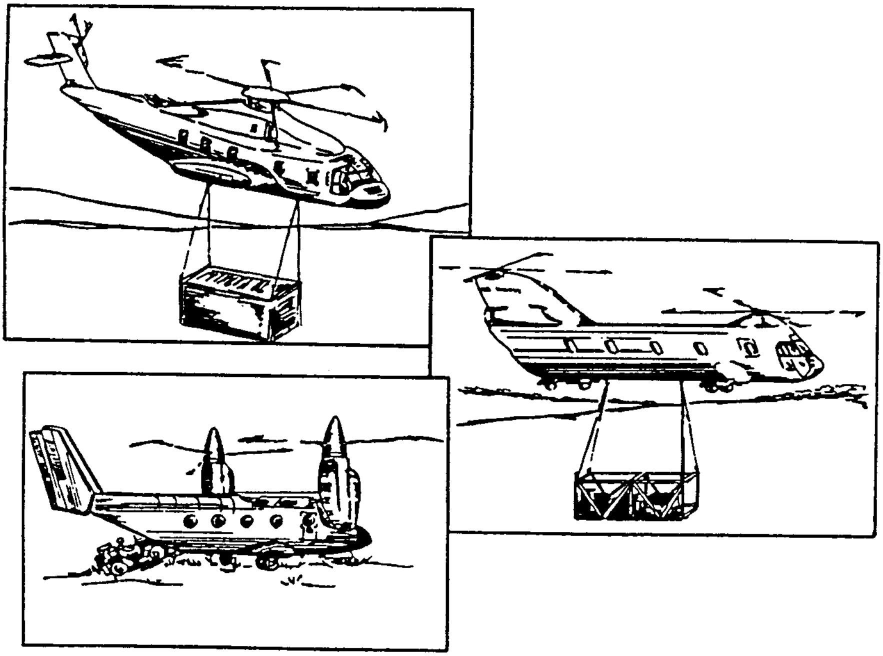
[176](S) GWAPS, *Statistical Compendium*, Chapter 2, Allied Air Order of Battle. Totals are as of 1 Dec 1990.

impacted by availability of beddown locations, air refueling, and airlift. Availability of airlift appears to have been the pacing factor.

During Desert Shield and Desert Storm, MAC C-5s and C-141s flew at an unprecedented rate. Early in Desert Shield, a shortage of aircrews threatened to cripple the airlift system, but reserves were activated in time to limit disruption. Reserve participation was essential because the Air Reserve Components represent approximately half of MAC's military strategic airlift capability. MAC's military strategic airlift aircraft were augmented by CRAF Stages I and II plus volunteers from domestic and a few foreign commercial carriers. This commercial participation was likewise essential. From 7 August 1990 to 10 March 1991, commercial aircraft carried sixty-four percent of all passengers and twenty-seven percent of all cargo delivered by MAC strategic airlift. Additionally, MAC C-130s and SAC tankers made limited airlift contributions to the deployment effort.

Deployment and sustainment efforts highlighted a number of problems in the airlift system, including command and control deficiencies, airfield congestion, equipment shortages, and units that weren't ready to move. Time allowed MAC to solve–or work around–most of its problems. Time also allowed MAC to deliver the support needed to build air power in the Gulf from a thin line in the sand to an effective, sustainable fighting force.

As a result of deployment-related lessons learned during Desert Shield and Desert Storm, many problems have already been solved; some are being solved now, and others will be solved in the future. For the solutions to be of lasting value, they must be implemented with thoughtful consideration of two essential facts. First, the United States can *never* be certain exactly how long it will have to complete future deployments. Second, the Nation can *always* be certain that future deployments will not flow exactly as called for by any on-the-shelf plan. (The Gulf War was not the first conflict to surface these facts, but it certainly highlighted them.) Once a deployment is in progress, a theater commander will adjust deployment priorities as the evolving situation dictates. A plan will simply be a baseline from which to make changes. Flexibility and responsiveness must be the watchwords for future operation planning and execution processes as well as for future transportation resources.



4

Intratheater Lift

Intratheater Movement

The need for a capability to distribute personnel, supplies, and equipment was immediate and of immense proportions. In addition to 501,000 passengers, strategic airlift delivered into the area of responsibility (AOR) over 544,000 tons of cargo or about fifteen percent of the approximately 3.5 million tons of dry cargo delivered by all modes during the deployment phase of Desert Shield.[1] The vast majority of the effort was delivered to four major aerial ports of debarkation APODs. From there, the cargo and passengers were forwarded throughout the AOR by intratheater airlift and surface transportation.

Although prepositioning of Air Force assets saved over 3,500 strategic airlift sorties, arriving forces needed to have the assets moved to new positions as soon as possible.[2] Supporting this enormous requirement for surface and air distribution within the AOR required many innovations and was crucial to the success of Desert Shield and Desert Storm. Moving cargo and passengers from aerial and sea ports of debarkation and from prepositioning sites to base camps and initial operating bases was essential to achievement of combat capability.

Intratheater movement was accomplished in two ways: intratheater airlift and land transportation. Draft Operational Plan (OPLAN) 1002-90

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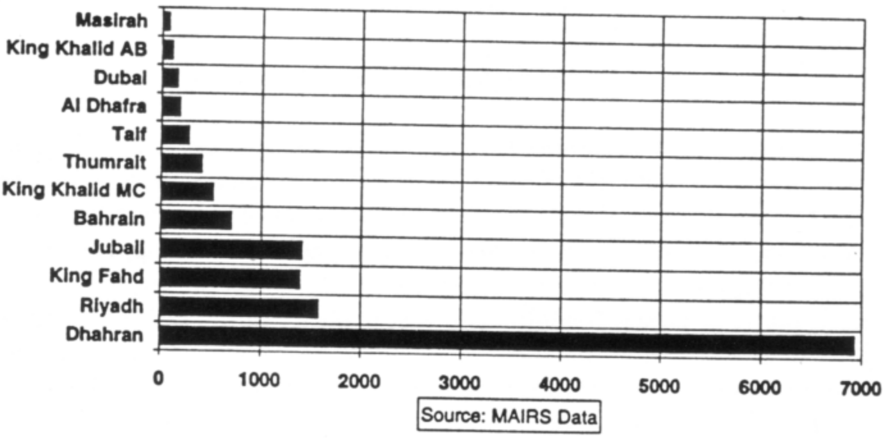
[1]NDTA Fourth Transportation Symposium Oct 1991, Airlift and Sealift Panels. (Presentations made by Lt Gen Vernon Kondra [then Maj Gen Kondra], MAC DO during Desert Shield/Desert Storm, and Vice Admiral Frank Donovan, Commander, Military Sealift Command during Desert Shield/Storm.) Also, (S) rpt MAC Historian, *Operation Desert Shield Desert Storm*, Scott AFB, IL, p 165.

[2]Department of the Air Force, *Reaching Globally, Reaching Powerfully: The United States Air Force In The Gulf War* (Washington, DC: Department of the Air Force, Sep 1991); and HQ USCENTAF/Logistics Plans (LGXM). Also, see Appendix 4A for a list of prepositioned Air Force equipment in the theater.

Figure 29
MAC Strategic Airlift Sorties by Aerial Ports of Debarkation (APODs)
August 1990- February 1991[3]



established base line planning for intratheater distribution. [DELETED] Primary airlift tasks would be deployment and resupply until the sea line of communication (SLOC) closed. Although Central Command (CENTCOM) planned to deploy more C-130 squadrons, actually it deployed only six during the deployment phase of Desert Shield because of beddown problems. The land transportation part of the plan called for host nation support (HNS) consisting of land vehicles to augment U.S. Army organic line haul capability.[4] [DELETED]

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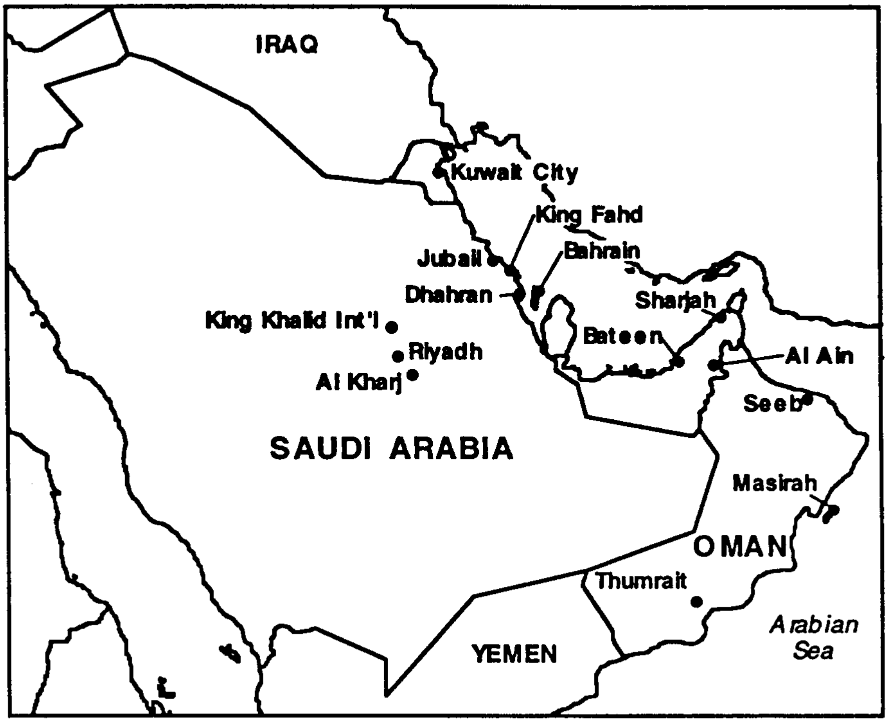
[3]Source: MAC Military Air Integrated Reporting System (MAIRS).

[4](S/NF) OPLAN 1002-90, Mobility and Transportation, Appendix 4 to Annex D, 18 Jul 1990, U.S. Central Command, MacDill AFB, FL, pp D-4-9, D-4-10.

Figure 30
Aerial and Sea Ports of Debarkation and Prepositioning Sites



The intratheater transportation system was overwhelmed for several reasons. First, the initial deployment of large combat forces arrived before adequate combat service support and onward movement capability were established. Second, USCENTCOM changed the supply stockage levels of food and munitions from thirty days to sixty days. Third, the cargo items could not be adequately identified once the containers or pallets arrived in theater because of poor in-transit cargo visibility provided by the information systems of the Services. To cope with the seemingly endless flow of equipment and personnel, the Services made the best use of HNS by renting thousands of heavy trucks, employing more than 2,000 civilian drivers, and creating an intratheater airlift channel system, which additionally serviced the strategic airlift "Desert Express" channel. Also, Air Force, Central Command (CENTAF) created an organic line haul capability known as the "Blueball Express."[5]

Intratheater Airlift

Intratheater airlift helped establish a defensive posture from the very beginning of Desert Shield and then reforged that capability into an offensive force for Desert Storm. U.S. C-130s were among the first forces to deploy to the Persian Gulf. Concurrent with the deployment of troops from Fort Bragg, North Carolina, the first squadron of sixteen C-130s from the 317th Tactical Airlift Wing (TAW) at neighboring Pope AFB deployed to Masirah Island, Oman, on C+04 (11 August 1990). By C+23 (the 30th of August 1990), a total of ninety-six C-130s had arrived at locations in the United Arab Emirates (UAE) and Oman. Figure 31 depicts a map of the beddown locations.

Operating from the UAE and Oman, the C-130s immediately began flight operations. They were tasked initially by the CENTAF airlift control center (ALCC)[6] to transport Harvest Falcon and Eagle equipment[7] and munitions from prepositioned stocks to the beddown locations (initial operating bases of arriving forces). The C-130 force also interfaced with APODs, such as Riyadh and Dhahran, for the onward movement of cargo and passengers to final destination sites. In January and February 1991, another forty-eight C-130s plus five C-130s from the Republic of South Korea deployed to the AOR. The C-130 augmentation was necessary to support the increased force structure deployed into the theater before the

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[5]Intvw, with Lt Col Robert E. Edmisten, Director of Transportation, HQCENTAF, Shaw AFB, SC, 8 Aug 1992.

[6]See Appendix 4B for a discussion of the Airlift Control Center.

[7]Harvest Falcon and Harvest Eagle assets are two of the Air Force's three bare base systems. For more information, refer to Chapter 2.

air and ground campaigns began. Thus, a total of 149 C-130s were under CENTAF control during peak operating times. Table 11 shows the original and final beddown sites for the C-130 force.

Figure 31
Tactical Airlift Forces Beddown Locations

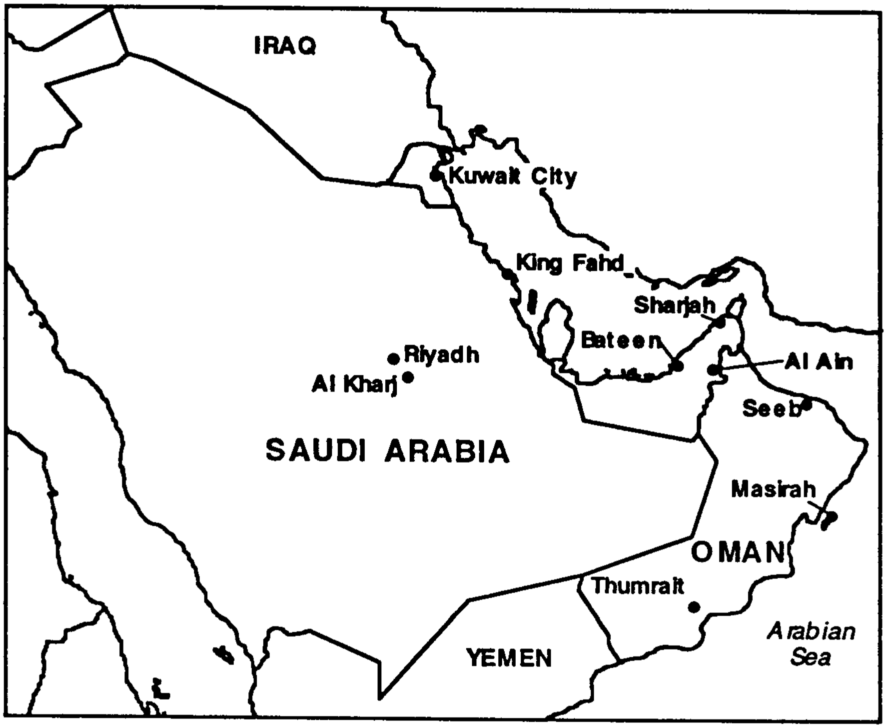

Table 11
Airlift Forces Beddown[8]

Squadron	Base	Number of Aircraft	Location
40 TAS	Pope	16	Masirah
41 TAS	Pope	16	Thumrait (King Fahd 12 Jan 91)
50 TAS	Little Rock	16	Bateen
37 TAS	Rhein Main	16	Al Ain
772 TAS	Dyess	8	Al Kharj
345 TAS	Yokota	8	Thumrait (King Fahd 19 Feb 91)
ANG	Charleston, WV	8	Al Ain
	Dallas, TX	8	Al Ain
	St Joseph, MO	8	Al Ain
	Wilmington, DE	8	Al Kharj
AFRES	Niagara, NY	8	Sharjah
	Selfridge, MI	8	Sharjah
	Willow Grove, PA	8	Thumrait
	Rickenbacker, OH	8	Thumrait
ROK	Republic of Korea	5	Al Ain (King Fahd 19 Feb 91)
TOTAL		149	

(NOTE: 41 TAS, 345 TAS, and the 5 ROK C-130s transferred later to King Fahd)

[8]Col David Davis, MAC/LEMM; Mr. Orson Gover, MAC/LERW; *Operation Desert Shield Desert Storm MAC Logistics History*, Headquarters, Military Airlift Command, Scott AFB, IL: 15 Mar 1991 (2d Draft).

C-5s, C-141s, and Civil Reserve Air Fleet (CRAF) aircraft flew between the United States and the AOR but remained under the control of U.S. Transportation Command (USTRANSCOM). C-130s deployed as partial units to the AOR,[9] and operational control was passed to the theater commander-in-chief (CINC), who operated them within the theater through his air component commander, the commander of CENTAF. The CENTAF commander in turn, delegated command of the C-130 force to the Commander, Airlift Forces (COMALF).

The COMALF, a Military Airlift Command (MAC) Brigadier General, exercised command and control of the intratheater airlift forces. He worked for Lieutenant General Charles A. Horner, Commander of CENTAF, who was also the Joint Force Air Component Commander under CENTCOM. He provided command and control of airlift forces through the ALCC; he also managed the aerial ports, the air evacuation (air evac) system, and CENTAF combat control teams.[10]

The COMALF and his staff were in place shortly after General Horner and his CENTAF staff arrived in theater from Shaw AFB, South Carolina. COMALF personnel, who are MAC assigned, came from all MAC units. For example, Brigadier General Buckingham, the first COMALF for Desert Shield, was the 21st Air Force Vice Commander; his successor, Brigadier General E. Tenoso, was the 22d Air Force Vice Commander. The COMALF and CENTAF staffs worked closely together to coordinate schedules, validate airlift requests, allocate airlift assets, and improve the operational suitability of theater airfields.[11]

By the end of September 1990, personnel deployed to the AOR represented virtually every MAC career specialty. Unit cohesion and discipline were becoming problems for the COMALF because MAC-sourced commanders did not have administrative or disciplinary control over personnel deployed from other MAC units in the United States to augment their units

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[9]For example, the 317th Tactical Airlift Wing out of Pope AFB, NC, deployed about one-third of the total wing organization to the AOR. Once in the AOR, the unit had to be augmented. Source: Briefing, by Col Maxwell C. Bailey, Commander 317th Tactical Airlift Wing, to the Chief of Staff of the Air Force, 19 Jul 1991.

[10]AFP 400-77, "USAF Wartime Logistics Organization and Decision Making," Revision 1, 2 Jan 1990. p 6-A-6.

[11]Refer to Appendix 4B for more information on theater airlift management.

in the AOR. MAC's policy of deploying personnel by Unit Type Code[12] rather than by organizational unit was one cause of the problem. Also, the relatively few MAC commanders deployed to the Middle East were not commanding the officers and enlisted personnel they had commanded in the states. The absence of MAC units and commanders meant that disciplinary infractions committed by MAC personnel in the AOR could not be adjudicated under the Uniform Code of Military Justice (UCMJ) without direct referrals to appropriate organizational commanders in the continental United States. Similarly, nonjudicial punishment, an administrative action for minor infractions of regulations, could not be implemented by the operational commander in the AOR. The resulting delays in judicial action and in nonjudicial punishment action disturbed the organizational integrity of the units and degraded morale. The situation was unacceptable to Gen Horner, Commander of CENTCOM's tactical air forces. He wanted disciplinary infractions resolved in theater. The Commander-in-Chief MAC (CINCMAC) approved activation of a MAC provisional organizational structure placing all MAC-sourced personnel under the administrative and disciplinary authority of MAC commanders in the AOR. The Air Force Reserve (AFRES) and Air National Guard (ANG) commanders concurred in this new organizational structure.[13] (Figure 32 depicts the CENTAF airlift provisional wing structure.)

Although the theater airfields were large, the infrastructure was not equipped to support the massive influx of people and equipment. Part of the COMALF's job was to manage the aerial ports and ensure the rapid throughput of cargo and people. The ramps filled up quickly. Fuel became a limiting factor. Materiel handling equipment (MHE) was sometimes not sufficient to download the arriving aircraft quickly.[14] In addition, vehicles

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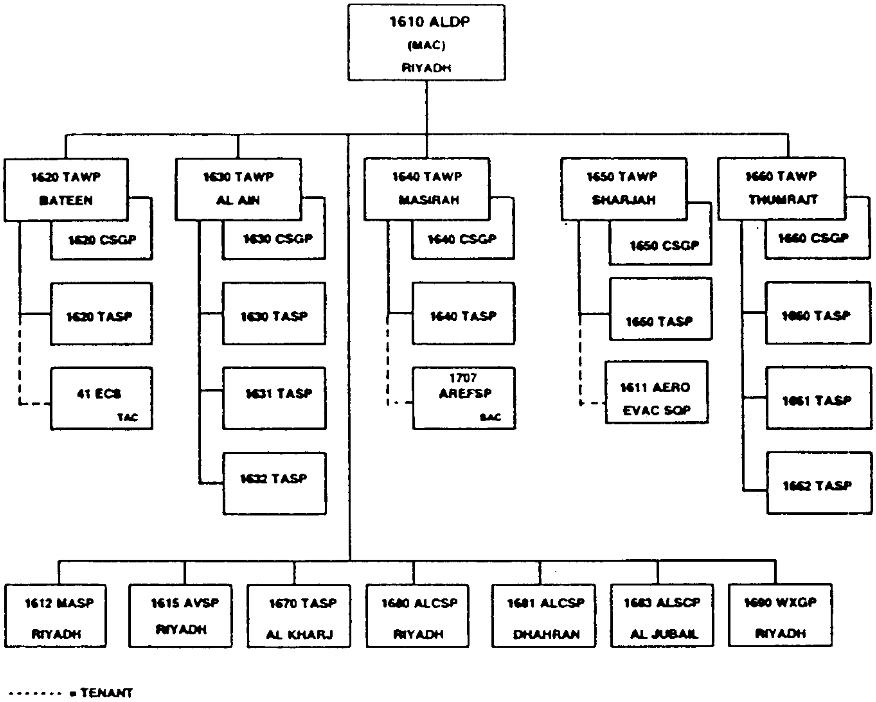
[12]MAC used Unit Type Codes (UTCs) on airlift manifests to deploy individuals to the Gulf theater, as opposed to organizational codes because entire organizational units did not deploy. Therefore, when the individuals arrived in theater, they were placed in partial units which had deployed, but did not have organizational identity. CENTAF had operational control but not administrative or disciplinary control over these units.

[13]MAC History, pp 45, 46.

[14]Material handling equipment (MHE) is the term for cargo handling equipment used to load and offload cargo aircraft. It may be forklifts for small airlift loads, or it could be 40K loaders, which are the large 40,000 pound capacity self-propelled loaders used to handle large cargo aircraft such as C-141s, C-5s, and CRAF cargo aircraft.

Figure 32
Airlift Organization, Bases, and Units[15]



NOTE: On 23 January 1991, the 1610 Airlift Division (Provisional) (ALD[P]) formed the 1675 Tactical Airlift Wing (Provisional) (TAW[P]), later designated the 1690 TAW(P) at King Fahd airbase, a Forward Operating Location (FOL). The wing was made up of C-130s from Thumrait and supported by C-130s from the 1630 TAW(P) Al Ain (see Table 11). These aircraft were the first to be used in airlifting the XVIII Corps and U.S. Marine Corps, Central Command (MARCENT) forces into their tactical assembly areas after the air campaign started.[16]

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[15]GWAPS *Statistical Compendium, USCENTAF Bases and Units*, HQ TAC/XPM, as of 15 Jan 1991. Also, refer to Appendix 4C for definitions of provisional units.

[16]SMSgt James R. Ciborski, "History of Airlift in the Desert: Circumventing the Iraqis," 23 May 1991, Al Ain, United Arab Emirates (UAE), pp 26, 27.

parked in the sun for long periods were prone to blown seals and gaskets as a result of heat deterioration. Constantly blowing sand and dust added to maintenance problems.[17]

One of the initial challenges was sorting out the hundreds of pallets that the C-141s, C-5s, and CRAF 747s left on the ramp. At first, some of the cargo was marked simply "Desert Shield," with nothing to identify the Service or the unit that the cargo was intended for. Many of the cargo pallets arrived with only one identifying transportation control number (TCN) showing and with the primary APOD as the final destination. In fact, pallets often contained cargo loaded for multiple destinations within the theater; they had to be broken down and their cargos resorted to coincide with the intended destinations. The resulting workload significantly slowed down the efficiency of the terminal cargo transfer operation. Therefore, it was necessary to control the flow into certain bases to prevent gridlock on the ramps and in the aerial ports.[18] Another problem caused by the lack of in-transit cargo visibility was frustration on the part of units waiting for the cargo, whether it be nonunit cargo or resupply parts ordered to support the units' combat capability. As a result, some parts were double ordered, and priorities on some items were overinflated.[19] Finally, CENTCOM changed the supply stockage level of food and munitions desired from thirty days to sixty days. This action significantly increased airlift and sealift cargo requirements, and the cargo problem at the ports continued throughout Desert Shield and Desert Storm.[20]

The Saudis had not anticipated the large supplies of fuel required by Coalition forces and the large numbers of aircraft that would be flying daily in their air traffic control system. Thus, their refueling capability and their air traffic control system were inadequate. To solve these problems, CENTAF deployed R-9 refuelers into some bases (for example, King Fahd and King Khalid airfields) and negotiated with the Saudis to procure more fuel. Also, CENTAF deployed air traffic control assets into

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[17]Brig Gen Edwin E. Tenoso, "A COMALF Perspective," speech at Air Force Association Briefing Session VII, St Louis, MO, 2 Aug 1991.

[18]*Ibid.*

[19]See Chapter 7 for more discussion on supplying the force.

[20]Briefing, by Lt Col Brad Christy, USAF ACP, 27 Nov 1991. Also, Department of Defense, "Conduct of the Persian Gulf War," (Washington, DC: Department of Defense, Apr 1992), Appendix F, p F-19.

the AOR to control the arriving air forces.[21] Another problem was lack of sufficient APODs for the reception of forces. Initially, Dhahran and Riyadh received forces; in mid-August, Jubail was made available. In September, CENTAF negotiated with the Saudis to allow King Fahd and King Khalid airfields to receive forces and cargo. This action was necessary to alleviate some of the congestion at Dhahran and Riyadh. However, it entailed considerable effort on the part of the major commands supporting the forces. For example, MAC had to send additional Airlift Control Element (ALCE) and support personnel to facilitate the throughput of cargo and passengers. Tactical Air Command (TAC) and Strategic Air Command (SAC), on the other hand, had the responsibility for air base support at King Fahd and King Khalid airfields, respectively. However, MAC, through TRANSCOM, was not able to secure an additional recovery and staging base in the immediate AOR for the strategic airlifters.[22]

A major priority item was an intratheater airlift system; immediately after it was set up, both frequency and requirements channels were established. The frequency channels ran on a given schedule, so the users knew when airlift was available. The channels were called Stars and Camels; Star missions hauled people and Camel missions flew mostly cargo. Figure 33 depicts typical routes providing airlift for Army, Navy, Air Force, Marines, and Coalition forces.[23]

In addition to moving personnel, Camel Star, the joint intratheater airlift operation, had as its primary mission moving mail and time-sensitive information between numerous operating bases on the Arabian peninsula. The Camel Express missions providing daily cargo service throughout the theater of operations were planned so that the movement of cargo

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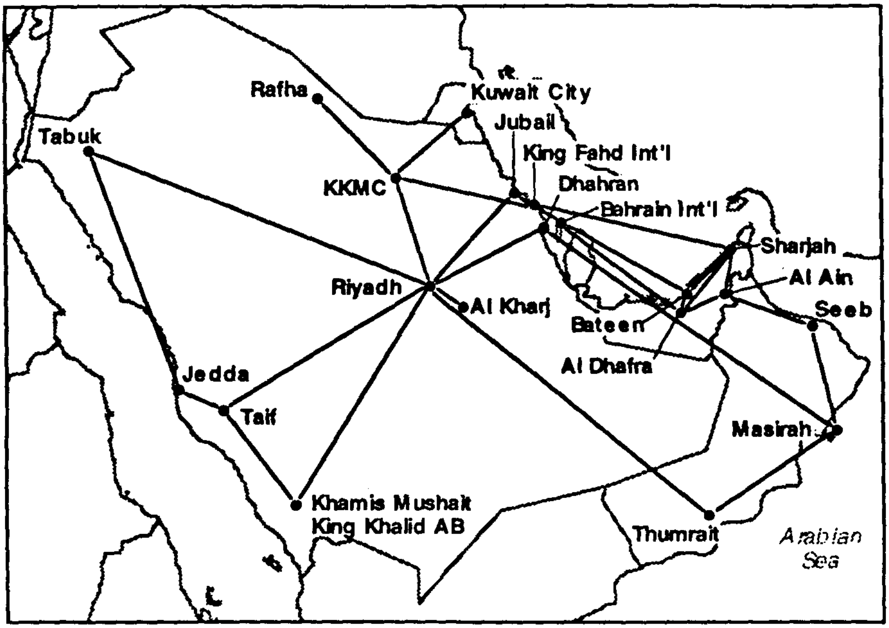
[21]"A COMALF Perspective."

[22]Lt Gen Vernon L. Kondra Notes, "Operation Desert Shield - Desert Storm, 24 Aug 1990 - 31 May 1991." pp 33, 68. (Lt Gen Kondra, then Maj Gen, was the MAC Director of Operations during the period of his notes.) After much negotiation, Cairo West was offered to MAC as a stage base. However, it was rejected when the MAC DO was told that MAC would have to vacate within twenty-four hours after the war started.

[23]"A COMALF Perspective."

Figure 33
Camel and Star Routes



in theater was aligned with the arrival of strategic airlift missions at the principle APODs Dhahran and Riyadh.[24] However, as previously mentioned, King Fahd, Jubail, and King Khalid airfields were made available early in the deployment phase, but they were not twenty-four-hour certified in the beginning.[25] Several Camel missions were scheduled to coincide with the arrival of the C-141 Desert Express missions from the CONUS to ensure expeditious distribution of critically required "show

[24]MAC History, p 214.

[25]Kondra notes, p 68. The COMALF coordinated the installation of lights and other facility standards with the TAC and SAC host base commanders in order to obtain a twenty-four hour airlift operational capability.

stopper" parts. Approximately twenty-five Camel missions were run daily in support of operations.[26]

In addition, some requirements channels responded specifically to user periodic needs. Because airlift was in great demand, a priority system was followed. A user's request was first validated by his unit and service validator and then forwarded to CENTCOM for prioritization. Specifically, the CENTCOM/J4, through the Joint Movement Control Center (JMCC), prioritized requirements. By matching requirements with C-130 capability, the JMCC was able to meet top priority requirements. When the JMCC had decided which missions were to be flown, it passed the information to CENTAF, which combined airlift missions into the daily air tasking order (ATO) along with fighter, bomber, and tanker sorties. That tasking was then passed to the ALCC for further tasking to the units.[27] Approximately thirty-three percent of the C-130 fleet was deployed, and during Desert Shield, intratheater airlift moved 142,000 short tons of cargo and 134,000 passengers, thus satisfying over 3,500 airlift requests from units in the AOR.[28] During Desert Storm, over 21,000 hours and 13,000 sorties were flown, and a total of 159,000 short tons and 184,000 passengers were deployed. Sortie rates could have been higher, but the average flying time from Thumrait to Riyadh was three hours and fifteen minutes, and from Riyadh to Tabuk, five hours. These flying times made achieving more than one sortie per aircraft difficult in a given crew day. Utilization rates for the C-130 fleet averaged 3.71 hours for Desert Shield and 3.42 for Desert Storm.[29]

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[26]When the Desert Express C-141 landed (normally in the late afternoon), the cargo was quickly downloaded, resorted for final destinations, pelletized, and loaded aboard the first C-130, which departed within one hour and thirty minutes after the C-141 landed. A C-130 departed every thirty minutes after the first C-130 departure until all Desert Express cargo was on its way. These flights were all primarily night missions to accommodate the C-141 schedule.

[27]"A COMALF Perspective."

[28]Lt Col Robert E. Edmisten, Headquarters USCENTAF, Director of Transportation," USCENTAF Desert Shield/Desert Storm Transportation: Milestones in the Sand," *Defense Transportation Journal* (Jun 1991), p 58.

[29]Bailey briefing. Utilization rate is the hour per day flying time utilization of the C-130 fleet. The numbers given were averaged out over the reporting periods. The planned wartime utilization rate is 4.0. One of the reasons that the overall Desert Storm utilization rate is relatively low in spite of hours flown, is that low casualty rates made 36 C-130s apportioned to the air evacuation role by COMALF relatively unproductive.

During the September-December period, COMALF concentrated on opening up new bases such as King Khalid Military City, where KC-135s and EC-135s were to be bedded down, and Al Kharj, where F-15s, F-16s, and additional C-130s were to be bedded down. Al Kharj was a bare base, with no fuel, billeting, communications, or lights.[30] CENTAF requested C-5 support to move outsize cargo for the F-15E-equipped 4th TFW, which was moving from Thumrait to Al Kharj. Although the request was not approved by TRANSCOM, C-130s flew 147 missions and moved 1,270 tons of cargo and 598 passengers in support of the move.[31]

As the force continued to build, support systems became the limiting factor. Basics such as cots, tents, and latrines were in short supply. Acquiring fuel and a fuel distribution system were paramount. Bladders were installed on the ground and filled as rapidly as possible. Also, MHE and support equipment was brought in as fast as the airlift priority system allowed.[32]

Even after the MHE equipment was in place, significant effort was needed to keep it operating. For example, of the ten 25K loaders that were in place at Dhahran, five were out of commission in September 1990. CENTAF was not able to get the MHE equipment fixed at the major APODs, so MAC sent spares and technicians to repair them. MHE reliability was a continuing problem throughout the theater and had to be aggressively managed.[33]

During the war, the C-130 played a vital role in resupplying forward Army logistics bases and Air Force FOLs. For example, they delivered approximately 600,000 gallons of fuel to these bases. Also, C-130s delivered critical munitions and cargo to forward forces. Landing on narrow strips of road in northern Saudi Arabia and southern Iraq, the C-130s ran daily shuttle missions between staging areas and the forward logistics bases. (Figure 34 presents an example of such activity.)

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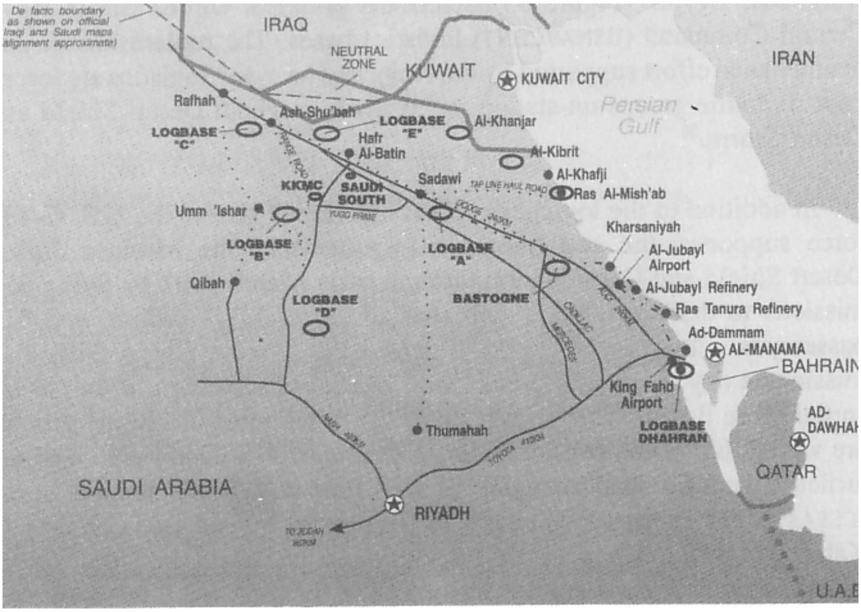
[30]Kondra notes, p 30

[31]Bailey briefing.

[32]"A COMALF Perspective." (See Chapter 7 for more discussion on the priority system.)

[33]Kondra notes, p 46.

Figure 34
Theater Main Supply Routes and Logistics Bases



The Army assisted in resupplying its forces by flying five C-23B Sherpa transport aircraft over 250,000 miles during Desert Shield and Desert Storm. These small turboprop aircraft airlifted critical Army combat weapon system repair parts from Abu Dhabi, Dhahran, and King Khalid Military City to forward locations in northern Saudi Arabia. They flew over 1,400 hours and airlifted 800,000 pounds of Army cargo and 400 passengers. However, they were limited to operating from improved runways.[34]

The Navy and Marine Corps operated their own intratheater airlift to provide service-unique support within the theater. With twenty-five C-130s (five Navy, twenty Marine Corps) and various helicopters, the Navy and Marines linked with the principle MAC supply APODs to move

[34]U.S. Army Aviation Center, *Operation Desert Shield/Storm After Action Report*, Fort Rucker, AL, 22 Nov 1991.

critically required assets to forward deployed forces and to carrier on-board delivery and vertical on-board delivery pick-up points for shipboard delivery. Pick-up points were in Bahrain, Jeddah, Saudi Arabia, and Hurghada, Egypt.[35] Figure 35 depicts the principal United States Navy Central Command (USNAVCENT) logistics bases. The replenishment and maintenance effort supported by the Navy and Marine "logistics air force" kept six battle groups on-station and ready throughout Desert Shield and Desert Storm.[36]

In addition to the logistics support mentioned above, the U.S. C-130 force supported the sustainment requirements of the Marines during Desert Shield and Desert Storm through early March 1991 by flying 351 missions to deliver 1,076.7 short tons of cargo, 1,071 pallets, and 616 passengers. The CENTAF JMCC allocated the Marine Corps thirty-five missions a day during the ground war, but only an average of five to six sorties were flown. The reasons given for this limited use of air support are varied, but prime considerations were the expeditionary nature of the airfields and the displacement of the combat service support areas (CSSAs). For example, when the forward CSSA moved from Mishab to Kabrit and then to Khanjar, flight operations were halted until expeditionary airfields were constructed and certified for use. Each of the moves caused C-130 air cargo movement to cease for five to nine days while the process of construction and certification was accomplished. Even after certification, the thresholds of the airfields at Kabrit and Khanjar eroded after several C-130 landings and had to be regraded and rerolled. The refurbishing caused a halt in C-130 operations varying from six to thirty-six hours. The Marine commanders deemed ground transportation as more reliable because of weather factors, the constant movement of units, the reliability of the Logistics Vehicle System (LVS), and the amount of cargo it could carry in a tandem tow configuration. For these reasons, the use of air assets for the movement of air cargo was underutilized.[37]

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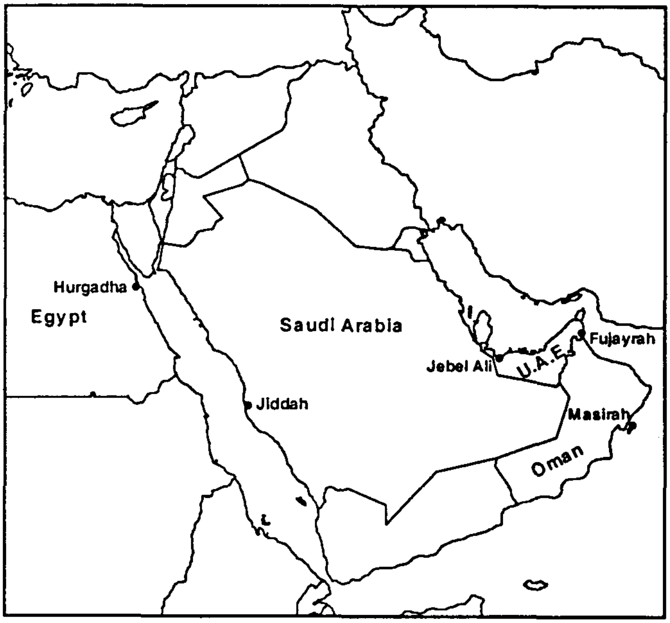
[35]Department of the Navy, *"The United States Navy in Desert Shield/Desert Storm"* (Washington, DC: Department of the Navy, Office of the Chief of Naval Operations, 15 May 1991), p 31.

[36]*Ibid.*

[37]Department of the Navy, United States Marine Corps, *Combat Service Support Operations in Southwest Asia, Battle Assessment Interim Report #1*, edited by Lt Col Robert T. Forte (Quantico, VA: Marine Corps Operations Analysis and Assessment Group, 28 Aug 1991), p 81.

Figure 35
Principal NAVCENT Logistics Bases



Another intratheater airlift asset used in theater was the C-21. By October, eight C-21s were in the AOR; the CENTAF staff used them to fly the ATOs to air bases where CENTAF air assets were stationed. Since ATOs were classified and secure communications to all bases were insufficient, ATOs were delivered by couriers in the C-21 Lear Jets.[38]

Since all of the C-130 flying during the deployment phase was airland[39] and because most of the bases had wide, 10,000 ft runways, the COMALF was concerned that the crews would lose their tactical proficiency: i.e., short runway takeoffs and landings, airdrops, formation flying, and low-altitude flying and navigation. Consequently, COMALF initiated

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[38]GWAPS *Statistical Compendium*. Also, Kondra Notes, p 82.

[39]Airland is the airlift term for flying to an airfield and landing before discharging passengers and cargo as opposed to air dropping the passengers and cargo.

a rigorous training program that included short-dirt-strip takeoffs and landings, low-level navigation training routes, and equipment drops on improvised drop zones.[40]

Integration is always important, and the C-130s practiced with fighters, tankers, helicopters, Coalition aircraft, the E-3 Airborne Warning and Control System (AWACS), and the EC-130E Airborne Battlefield Command and Control Center (ABCCC) to perfect operational procedures. Airspace control with a concern for the potential threat of a midair collision constituted one of the greatest challenges for the COMALF and CENTAF operational staffs. In the long run, safe airspace control turned out to be one of many major accomplishments by the CENTAF staff.

New airdrop procedures were devised. Water was obviously going to be important. However, the large rubber bladders that, in the past, were used to air drop water were no longer in the inventory. Since bottled water was readily available, the C-130 crews practiced until they were able to air drop without breaking the bottles. Fuel would play an important part in a mobile battlefield, so bladders brought into the AOR could be carried in the C-130s. The C-130 crews practiced transferring fuel to ground units under austere desert conditions. Under emergency situations, fuel could have been air dropped to units in fifty-five gallon drums.[41]

Tactical airlift had its most rewarding test after the air war started. To prevent the Iraqis from shifting their forces, General Schwarzkopf directed that both XVIII Corps and VII Corps remain in their base camps until after the air war started and Iraq's ability to detect CENTCOM's movements had been degraded. As a result, after the air campaign started, tactical airlift forces were called on to airlift the entire XVIII Airborne Corps from King Fahd and nearby bases to Rafha, a distance of over 400 miles. The original plan called for seventy-two aircraft, with one aircraft landing at Rafha every ten minutes, twenty-four hours a day for fourteen days–a flow of over 2,000 sorties. In actuality, the flow into Rafha averaged one landing every seven minutes for the first thirteen days of the move; 14,000 personnel and over 9,000 tons of equipment were transported. The C-130 fleet utilization rate for this period was 8.0–twice the

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40. "A COMALF Perspective."

41. *Ibid.*

planned wartime rate. After the XVIII Airborne Corps was closed,[42] the relocation allowed the Corps to participate in what General Schwarzkopf called the "Hail Mary Pass" when the XVIII Airborne Corps drove north to the Euphrates River and then east to encircle the Iraqi Republican Guard. After closing the XVIII Airborne Corps, C-130 airflow was turned to building up logistic bases by hauling fuel, food, water, parts and supplies, and ammunition to places like "Log Base Charlie," which was just a strip beside a highway adjacent to the Trans-Arabian oil pipeline in the vicinity of Rafha.[43]

About the same time, Lieutenant General Boomer, Commander of Marine Forces, decided that because of the Iraqi defenses in Kuwait, the Second Marine Division should be shifted to the northwest to penetrate Kuwait "at the bend in the elbow."[44] The C-130 force accomplished the shift with approximately 500 sorties from Kabrit to Khanjar.[45] [Figure 36 shows the Kabrit and LZ 83 (Khanjar) areas and their positions relative to the Trans-Arabian pipeline.]

Once the ground war started, a new factor for the U.S. C-130 force was added–airdrop. The first major call was for the C-130s to resupply VII Corps with ammunition. Because of bad weather, supply trucks had become mired in the mud, requiring an emergency resupply by air. The second and final major airdrop was to the 101st Division on patrol along the Euphrates River. The division had out run its supply lines, so the C-130s air dropped one hundred tons of food and water to it. Because the war lasted only one-hundred hours, over ninety percent of the C-130 air drops, however, were for water and MREs. The purpose, of course, was to feed the unexpectedly large number of Iraqi POWs.[46]

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[42] This is the term given to completion of transporting a unit or organizational entity and its equipment from one point to another.

[43] Bailey briefing.

[44] Gen Boomer is referring to the sharp turn in the demarcation line between Saudi Arabia and Kuwait. Also, David L. Dittmer, "U.S. Marine Corps Operations in Desert Shield/Desert Storm," Vol: "Overview and Summary": Center for Naval Analyses, Alexandria, VA, Aug 1992, p 20.

[45] "A COMALF Perspective."

[46] *Ibid.*

C-130 Taking Off at "Log Base Charlie."

The COMALF had allotted thirty-six C-130s for the air evac role on the basis of an estimated 3,000 casualties per day. Air Force medical personnel, mostly Guard and Reserves, performed well. Many were at austere bases near the Iraqi-Kuwaiti border to help interface with the Army and Marine hospitals. Over 1,400 Air Force medical personnel were in theater. Although only a small portion of their capability was used, they did process over 12,000 patients during Desert Shield/Desert Storm.[47] (See Figure 37 for map of the air evacuation system.)

After the war, the C-130 force's main task was to help the Army, Marines, and Air Force redeploy their troops and equipment to the main ports. The goal was to get the troops home as quickly as possible. TRANSCOM's scheduling of CRAF worked very well, and CENTCOM began redeploying the troops home by the thousands. The goal was about 6,000 a day. The C-130s' work in the theater was not over, however. They continued to fly food, water, and supplies to POWs and refugees. One of the last big C-130 airlifts brought the last 6,000 refugees out of Safwan, Iraq, to relocation camps in Saudi Arabia. The UN took responsibility

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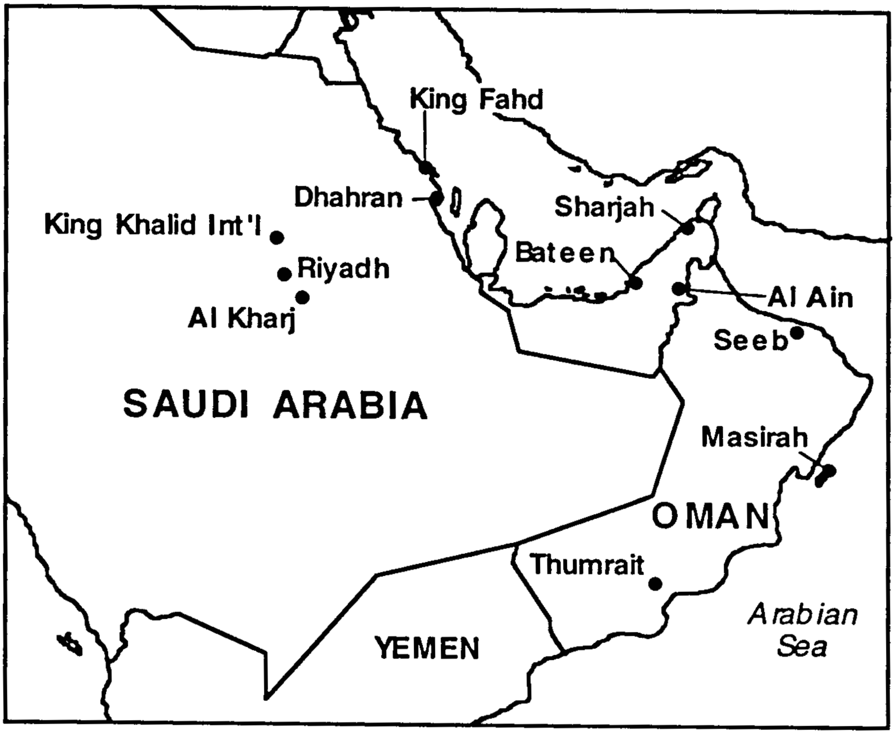
[47] *Ibid.*

for the demilitarized zone between Iraq and Kuwait only after all the refugees had been airlifted out.[48]

Figure 36
MARCENT Area



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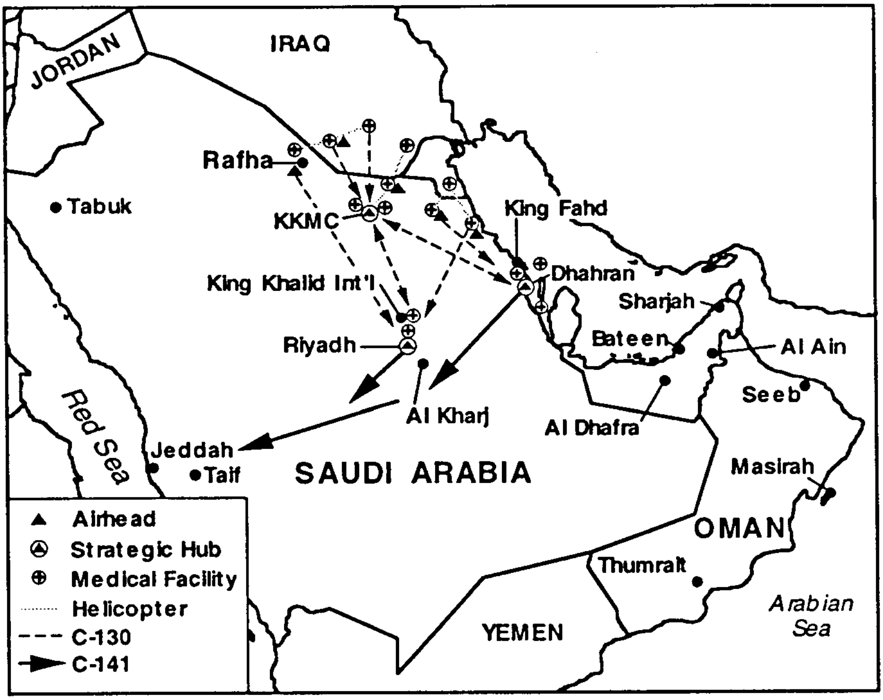
[48] *Ibid.*

Figure 37
Aeromedical Evacuation



Land Transportation

Common-user land transportation was the responsibility of the U.S. Army, which found itself unprepared to meet the needs of the other component services because of the priority given to deploying combat units.[49] The arrival of the Army's 7th Transportation Group on 11 August 1990 provided relief. Some of the personnel were assigned airport and seaport operations duties, and the robust transportation staff was able

[49]Headquarters, Department of the Army, *Desert Shield/Desert Storm After Action Report,* Volume II: Main Report, Sep 1991, U.S. Army Concepts Analysis Agency, p VII-Employment-101.

to satisfy the immediate requirement for buses and trucks to move equipment out of the ports. However, throughout the operation, vehicle requirements far exceeded vehicle availability.[50] For example, the cargo backlogs at the APODs and SPODs were so great that, on C+38 (14 September), U.S. Army Forces, Central Command (ARCENT) Support Command (Provisional) declared a crisis, and 500 more trucks were ordered.[51] Initial U.S. Air Force ground assets were provided from prepositioned sites in theater and the Air Force prepositioned ship "Advantage." In addition to vehicles deployed with the units, nearly 3,400 vehicles were distributed from prepositioned assets to support the first phase of arriving forces. But the realization that the available assets were being overwhelmed called for innovation by the CENTCOM logistics staff. The staff looked to contracting, host nation support, and other donor

Prepositioned Vehicles at Thumrait, Oman.

[50] U.S. Army Center for Military History, *Gulf War History of U.S. Army Operations,* edited by Mr. Mickey Shubert, ND, p 3-17.

[51] *Gulf War History of U.S. Army Operations,* pp 3-25, 3-26.

assistance for relief. The result was that most vehicle shortfalls were filled by over 2,700 rentals and approximately 2,000 vehicles contributed by Japan and the Saudi Assistance in Kind program.[52]

Because the deployment flow emphasized the early arrival of combat forces, ARCENT could not meet the demands for common-user land transportation. In particular, delay in munitions movements caused an excessive backlog at the ports. As previously mentioned, the problem was accentuated by an early CENTCOM decision to increase stockage levels of food and munitions in theater from thirty to sixty days. Containers and munitions piled up at the ports, numerous ships "in the stream" awaited offload, and numerous pallets had inadequate identifications at the APODs. Contracting and HNS solved some of the problems, but individual Services had to arrange to augment their own surface transportation requirements. The Army was overextended in filling its own overland lift requirements, and the Marines' organic line haul capability was fully committed. CENTAF began contracting for its own line haul capability through ARCENT's Support Command (Provisional).[53]

During the deployment and sustainment phases of Desert Shield and Desert Storm, CENTAF transporters sourced and allocated nearly 10,000 Air Force vehicles to support twenty-five Air Force beddown locations.

Rapid distribution of vehicles was first priority among steps to increase combat readiness. Early in the deployment phase, a twenty-one-man Air Force team was formed to depreserve and service the Southwest Asia (SWA) prepositioned fleet. At one of the preposition sites, the team made over 2,148 Air Force vehicles mission-ready in only twenty-one days, an average of 102 vehicles a day. Additionally, 244 vehicles were expeditiously downloaded from the Air Force prepositioned ship "Advantage" and provided crucial vehicle support for the entire western region of Saudi Arabia. Movement of all commodities was CENTAF's next concern.[54]

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[52]"AFLC Operations in Desert Storm," Air Force Logistics Command white paper, Jul 1991.

[53]Intvw, with Lt Col Robert E. Edmisten.

[54]USCENTAF "Milestones in the Sand," p 58.

CENTAF requested C-141 strategic airlift support early in September to assist in moving oversized prepositioned equipment from Oman to bed-down bases in Saudi Arabia. Because of CINCCENT's deployment priorities, the Commander-in-Chief, Transportation Command (CINCTRANS), denied the request, and surface transportation moved the oversized cargo.[55] The C-130 fleet supported the distribution of the remaining items.[56]

Because highways were limited within the theater, intratheater C-130 airlift became the vital link for moving personnel, equipment, and mission-critical items throughout Southwest Asia. The CENTCOM JMCC validated all theater airlift requests generating the airlift movement discussed earlier in the chapter. Also, two Joint Airlift Clearance Authorities (ACAs) at major APODs monitored and expedited all service ship ments. The ACAs tracked over 6,857 actions and expedited movement of 822 critical Air Force sustainment and Army war-fighting cargos.[57]

Blueball Express Trucks at Al Kharj Enroute to Taif.

[55]Intvw, with Lt Col Robert E. Edmisten; Kondra notes, p 35.

[56]Bailey briefing.

[57]USCENTAF "Milestones in the Sand," p 58.

With the commencement of hostilities, most third-country nationals walked off the job–nearly crippling CENTAF's contracted line-haul distribution. This was anticipated by the planning documents, and so it was not a surprise. The CENTAF logistics staff took immediate action to develop and implement the first-ever sustained Air Force line haul operation, the Blueball Express. This operation entailed the use of 200 Air Force drivers from nearly every Air Force specialty code and 100 leased tractor trailers. During the war, Blueball Express primarily transported munitions and aviation fuel to sustain the air campaign and subsequent ground offensive. They operated out of four independent operating locations: Al Kharj (F-15s, F-16s, and C-130s), Jeddah (KC-135s and KC-10s), Riyadh (KC/RC-135s, E-3s, C-21s, EC-130 ABCCCs and E-8s), and King Fahd (A-10s, AC/EC/MC/HC/C-130s, MH-53s,and MH-60s). The Express delivered nearly twenty million pounds of sustainment and ammunition cargo directly to support Desert Storm combat air operations. During Desert Shield and Desert Storm, over 150 million pounds of cargo were line hauled by a combination of commercial, Army, and Blueball Express assets.[58]

Accountability and control of transportation resources throughout Southwest Asia were quickly solved by the ingenuity of experienced transporters on the CENTAF logistics staff. CENTAF transporters locally developed real-time vehicle database management programs to control and track assigned vehicles. They also developed extensive computerized personnel management systems to provide information on manning strength at each beddown site. The capability to access resource information instantaneously was invaluable in enabling responses to short-notice requests for support of forward operating locations.[59]

When Desert Storm ended, the Blueball Express mission changed. American troops were being deployed to CONUS and bases were marked for closure. The Harvest Falcon and Eagle assets from those bases had to be moved to the reconstitution sites, primarily Al Kharj and Thumrait, where they would be inventoried, repaired, packed, and stored. The Blueball Express was tasked to transport much of the cargo, a task that could be done more effectively and efficiently if resources were combined. Consequently, the entire operation was consolidated and moved to the more centrally located Riyadh. Operating from Riyadh, the surface transportation

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[58] *Ibid.*

[59] *Ibid.*

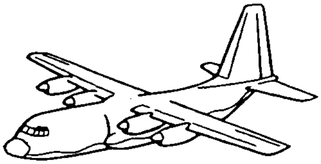
task continued through September 1992. By this time, the majority of Harvest Falcon and Eagle assets had been transported from the deployed sites to the reconstitution sites, and the Blueball Express began to scale down operations. Today, transportation line haul assets have been identified to meet future contingency requirements in Southwest Asia; they will be part of CENTAF's continuing prepositioning program.[60]

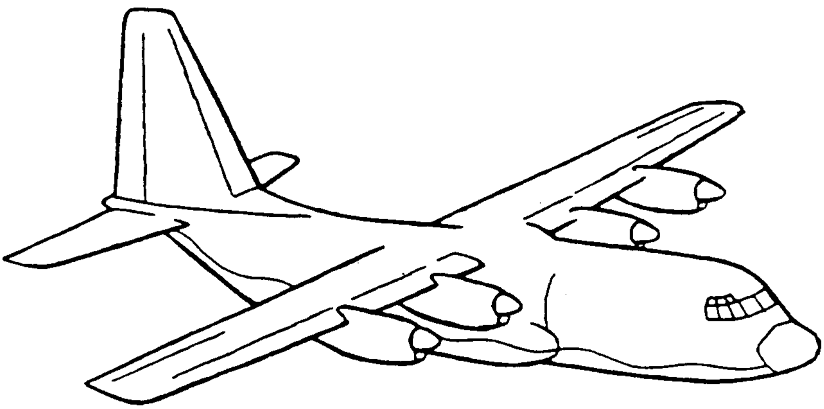
Summary

The intratheater lift systems were an essential element of air power in the Gulf area and vital to the success of the entire Desert Shield and Storm operation. However, basic planning for intratheater distribution was marginal. It did not cope with the significant and continued cascading requirements, which ultimately led to a doubling of the force structure in the theater. The APODs and SPODs were overwhelmed at the beginning because a conscious decision was made to load combat forces ahead of supporting forces. The situation was exacerbated by a CENTCOM decision to increase stockage levels of food and munitions in the theater from thirty to sixty days. And finally, the intratheater distribution problem was compounded by the poor in-transit cargo visibility capability of the various Service systems.

Despite the problems, intratheater transportation systems were successfully implemented because of several factors. Additional C-130s were made available during the air and ground phases of the war to support the increased force structure in the theater. Generous support from host nations, Coalition members, and other donors helped satisfy increased requirements for surface transportation. And time was available to dedicated personnel for ad hoc planning and development of innovation solutions to transportation flow and in-transit cargo visibility problems.

[60]Intvw, with Lt Col Robert E. Edmisten.



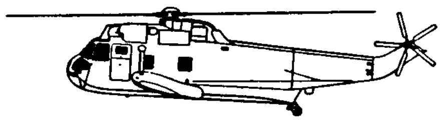


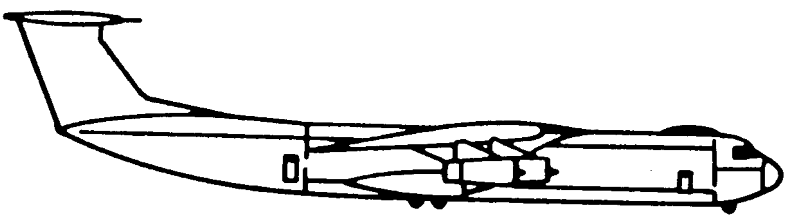
Appendix 4A

Theater Prepositioned Equipment

	S/T (000)	C-141s*
Bare Base	14.7	655
Vehicles	12.8	570
Medical	1.0	90
Munitions	42.5	1,888
Trap	.4	19
Rations	3.9	171
Fuels Equipment	.7	29
Comm Equipment	-	-
Totals	76.0	3,422

*C-141 Equivalents





Appendix 4B

Theater Airlift Management

Within the AOR, airlift supported air operations under the Joint Force Air Component Commander (JFACC), also known as the Air Force Forces Commander (AFFOR).

The Tactical Air Control Center (TACC) performed as the senior command and control element and coordinated all air movements and airspace control. As a subordinate element of the Tactical Air Control System (TACS), the Commander of Airlift Forces (COMALF) with Airlift Control Center (ALCC) and Airlift Wing Operations Centers (WOCs) operated as a command and control core for airlift forces. The TACC and ALCC were collocated.

The COMALF was dual-hatted. As the AFFOR's Deputy Chief of Staff for Airlift, he was the central manager for all theater airlift assets and was responsible for providing common-user airlift support for joint customers. He was also responsible to CINCMAC for monitoring and managing MAC forces that transited the theater.

The ALCC was a MAC command and control element specifically tailored for a given scenario and deployed with the COMALF to provide airlift management and tasking. The ALCC director was directly responsible to the COMALF for all aspects of airlift operations.

The ALCC had three primary divisions:

- Airlift Operations Division (DOO). Prepared the Airlift Mission Schedule (ALMSNSCD), a detailed mission summary, from preplanned airlift requests.

- Command and Control Division (DOC). Responsible for flight-following and executing the ALMSNSCD. Coordinated operations with WOCs, deployed ALCEs, and CCTs.

- Combat Operations Division (DOX). Responsible for coordinating of immediate airlift requests. Coordinated airfield and airspace issues with DOO and DOC. Managed ALCE and CCT deployments and planned tactical events.

The ALCC also had several supporting staff elements:

- Communications. Managed MAC organic communications and coordinated nonorganic communications requirements.

- Intelligence. Kept ALCC functional areas informed of enemy ground and air threats that affected present and future operations.

- Aeromedical Evacuation Control Center (AECC). Medical liaison. Coordinated airlift response for theater medical movement requirements and movement of wounded from theater.

- Aerial Port Control Center (APCC). Liaison. Controlled and allocated aerial port resources while monitoring unit capability and workload.

- Ground Liaison Officer (GLO). Liaison between Army Air Ground System and ALCC. Advised on Army tactics and employment matters.

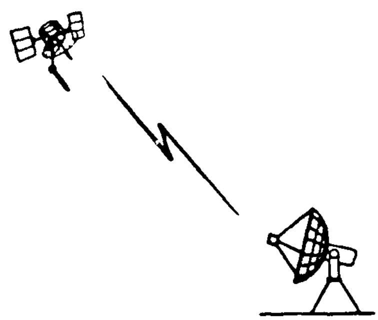
- Logistics Readiness Center (LRC). Monitored and expedited movement and repair of airlift aircraft, aerospace ground equipment (AGE), and war readiness spares kits (WRSK).

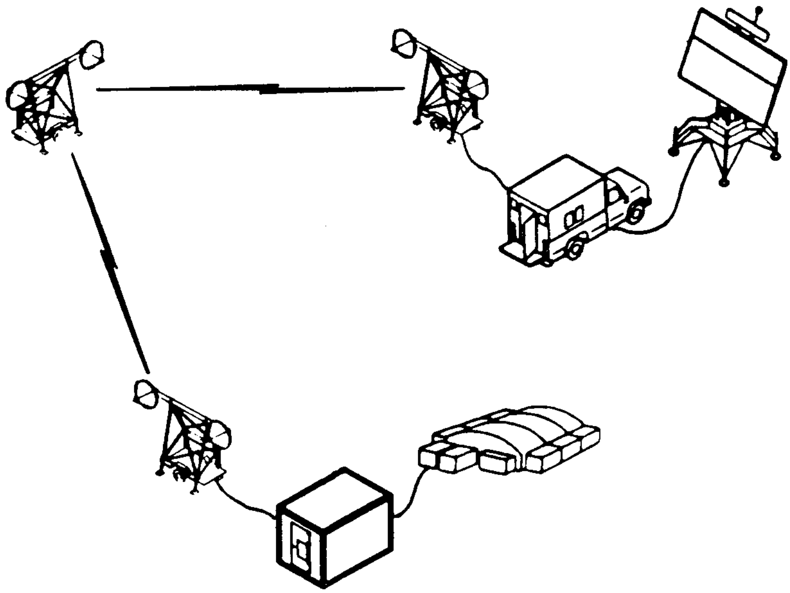
- Weather. Provided current and forecast weather support for COMALF and ALCC.

Within the AOR, two basic types of airlift requests occurred; they differ in time available to satisfy a movement requirement.

- Preplanned. Normally more than twenty-four hours to plan, coordinate, and execute through the ALMSNSCD. Request for common-user airlift support passed up through service chain to Joint Movement Center (JMC), which reviewed, prioritized, and validated the requirement. ALCC executed validated requests in priority sequence until capability was saturated. The requirements were listed in DOO's ALMSNSCD, and missions were tasked in the Air Tasking Order (ATO).

- Immediate. Movement required in less time than preplanned request, outside the ALMSNSCD publishing cycle. Like preplanned, service validated requirement (normally, immediate request traveled through operations channels instead of logistic), which was sent to JMC for joint validation. Because of time compression, field-assigned Theater Airlift Liaison Officer (TALO) and TALOs at each higher level informed the ALCC of the pending request through the Advanced Airlift Request Net (AARN). Therefore, when validation was received from the JMC, DOX had already planned the mission, including airspace, and DOC executed either by aircraft diversion or alert sortie. USMTF formatting is now the standard airlift request for both preplanned and immediate.

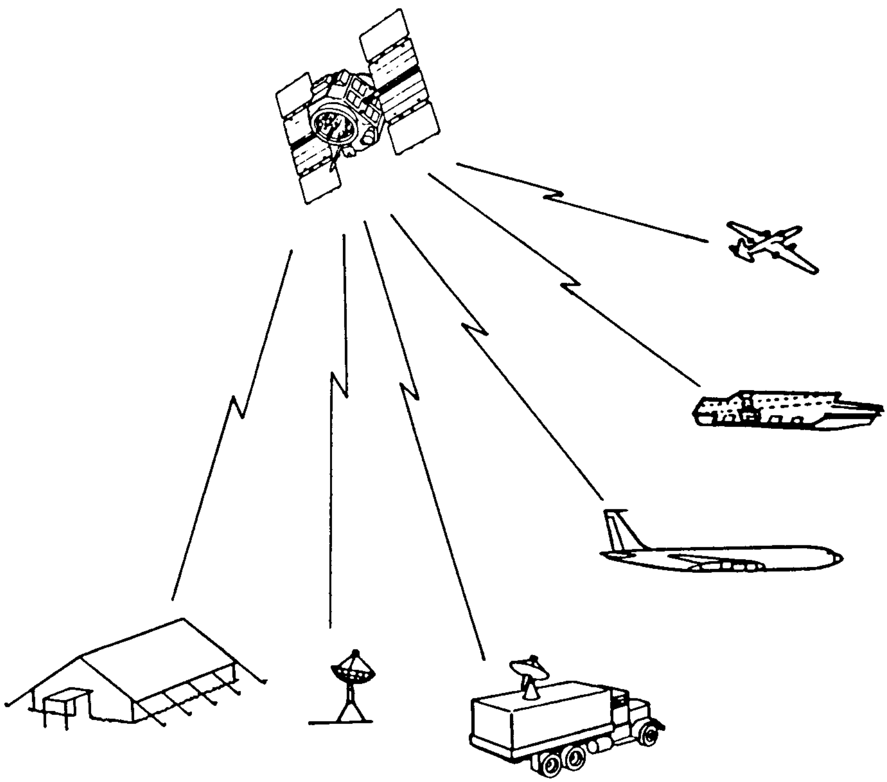




Appendix 4C

Definition of Provisional Units Terms

ALDP	Airlift Division (Provisional)
TAWP	Tactical Airlift Wing (Provisional)
CSGP	Combat Support Group (Provisional)
TASP	Tactical Airlift Squadron (Provisional)
ECS	Electronic Countermeasures Squadron
AREFSP	Air Refueling Squadron (Provisional)
AERO EVAC SQP	Aeromedical Evacuation Squadron (Provisional)
MASP	Military Airlift Support Squadron (Provisional)
AVSP	Audio Visual Squadron (Provisional)
ALCSP	Airlift Control Squadron (Provisional)
WXGP	Weather Group (Provisional)



5

Air Refueling

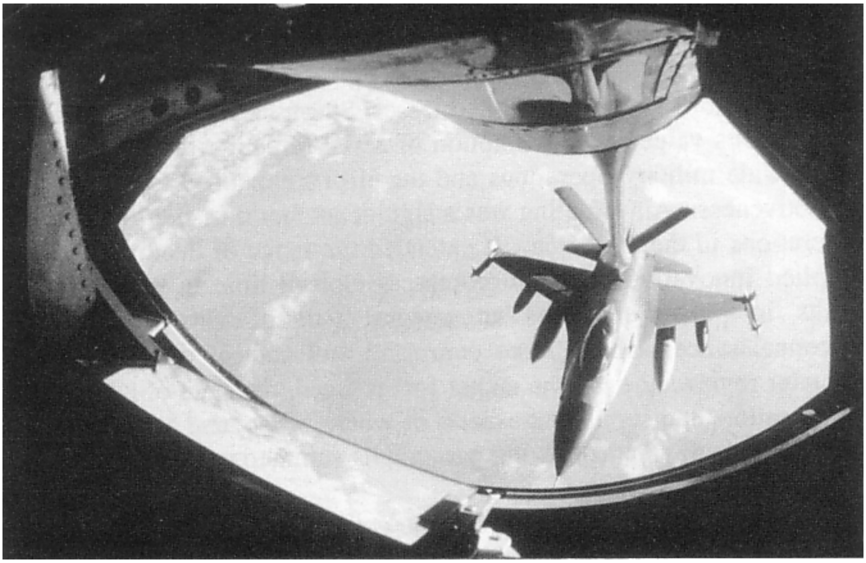
Operations Desert Shield and Desert Storm clearly demonstrated the tremendous value and contribution of aerial refueling to U.S. and allied worldwide military operations and the efforts expended to maximize its effectiveness. Air refueling was a significant factor in every phase of air operations in the Gulf War. It extended the range of deploying aircraft, applied innovative tactics to compress closure time in getting combat units in place, and was an integral part of virtually all strike, reconnaissance, and airborne command and control operations. This chapter reviews the job the tanker forces faced, the state of planning and preparation, and significant aspects of where, when, and how the job was accomplished. The following paragraphs summarize issues addressed.

Planning was incomplete, but the continuous experience of forming and executing tanker task force (TTF) activity enabled quick response to deployment taskings. As the situation demanded, the planning, employment, basing, and daily numbers of committed tanker aircraft changed constantly throughout Desert Shield and Desert Storm.[1]

Air power operations involved every aspect of the tanker force, including airframe and aircrew availability, manpower issues, call up of Air National Guard (ANG) and Air Force Reserve (AFRES) forces, scheduling, deployment, employment, logistics support, and interoperability between U.S. and Allied aircraft. Coalition forces in the Southwest Asian theater assembled air refueling assets (including twelve different refueling aircraft) from five nations. The United States provided the Air Force KC-10 and KC-135A/E/Q/and R tankers, the Marine Corps KC-130, and the Navy carrier-based KA-6. U.S. air component tankers included ANG, AFRES, and active duty assets. The United Kingdom's tankers VC-10 and TriStar

[1](S) Tanker Study, Headquarters Strategic Air Command, Plans and Resources (XP), 1 Mar 1991, p 5-1.

K.Mk 1 and the French version of the KC-135R model were in theater. Canadian and Saudi air forces flew a Boeing 707 tanker derivative.[2]



An F-16 from the 363d TFW refueling during Desert Storm.

Although the primary mission of Air Force tankers was air refueling, they also transported cargo and personnel. Tankers carried 4,817 short tons of cargo and 14,208 passengers during the operations. Strategic Air Command (SAC) released 20 KC-10s to U.S. Transportation Command (TRANSCOM) for use in Military Airlift Command (MAC) channels. Those KC-10s hauled 25,172 tons of cargo and carried 4,185 passengers.[3]

AFRES and ANG air refueling participation in Desert Shield and Desert Storm consisted of 80 deployed tankers and over 5,000 mobilized air reserves and guardsmen. Air Reserve Component (ARC) units included

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[2](S) Desert Shield/Desert Storm Tanker Assessment, Headquarters Strategic Air Command, Plans & Requirements (XP), 23 Sep 1991, p 1-3.

[3]Memo for the Record, SAC/LGL, "Movement of Passengers and Cargo," 8 Jan 91, in History, HQ SAC, Jan-Dec 91, p 493.

thirteen ANG KC-135E units, three AFRES KC-135E units, and three KC-10 associate units. Volunteers added significantly to the active forces. However, volunteerism did have limitations that point out the importance of timing in activating both the Reserve and the Guard.[4]

Approximately 100 tankers operated from 9 countries to form the Atlantic and Pacific Air Refueling Bridges, which moved over 1,000 fighter and bomber aircraft. Desert Shield and Desert Storm involved the largest, most complex tanker operations since the Vietnam War. The increased capability of the reengined KC-135R was the mainstay of air refueling support. Air refuelable tankers, which are presently limited to 59 KC-10s and 8 KC-135Rs, provided the greatest offload capability. Additional air refuelable KC-135Rs would allow a decrease in the number of tankers required for deployment in future conflicts.[5]

SAC KC-10 and KC-135 tankers refueled all United States Air Force aircraft, as well as the aircraft of Italy, Oman, Bahrain, and the United Arab Emirates (UAE). United States Air Force, U.S. Navy, and United Kingdom tankers refueled Navy aircraft. SAC and Marine tankers refueled U.S. Marine Corps aircraft initially, but eventually, Marine aviation completed its own refuelings. The tankers of the United Kingdom and France refueled their respective aircraft. Canadian and Saudi aircraft were refueled by their own and United States Air Force tankers. The Kuwaiti Air Force was not air refueled.[6]

Airspace was the primary limitation for air refueling in Desert Storm. It was also a major factor for Proven Force operations. During heavy flying periods in the AOR, additional tankers, regardless of configuration, could not have been used because of airspace congestion. Air refueling tracks and anchors were used to maximize tanker availability. A relatively small two to three percent of attack packages were composed of both receptacle and probe-equipped receivers, but the packages required either one KC-10 and one KC-135, or multiple KC-135s. Multipoint refueling aircraft could allow planners to decrease the total number of tankers used,

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[4]DS/DS Tanker Assessment, p 3-7.

[5]*Ibid*, p 4-10.

[6]*Ibid*, p 9-2.

but increasing the number of receivers per tanker imposes safety implications related to large-formation refuelings.[7]

Desert Shield and Desert Storm proved that airpower projection is critically dependent on air refueling. U.S. Air Force tankers alone flew over 34,000 sorties or 141,000 flight hours, performed 85,000 refuelings and, offloaded over 1.2 billion pounds (193,543,000 gallons) of fuel. Tables 12 and 13 summarize tanker activity during Desert Shield and Desert Storm.[8]

A total of 262 KC-135s and 46 KC-10s operating out of 21 locations in 10 countries provided round the clock aerial refueling support to U.S. Air Force, U.S. Navy, U.S. Marine Corps, and Coalition forces during Desert Storm. Fully 81 percent of the United States Air Force's KC-10 fleet and 44 percent of the KC-135 fleet were committed to the Gulf crisis during its peak. Table 14 depicts the diversity and magnitude of the tanker deployment.[9]

Table 12
Cumulative Desert Shield Totals

Aircraft Type	Events/ Sorties*	Hours	Total Rcvr ARs	Offloads (pounds of fuel)
KC-10	4,117	23,262	4,523	87,340,800
KC-135A/R/Q	10,128	37,095	23,312	263,379,200
KC-135E	3,040	14,476	5,545	90,297,600
Total	17,285	74,833	33,380	441,017,600

*Sortie numbers include AR, airlift, MAC channel, and KC-10 dual role sorties.

[7] *Ibid*, p 9-3.

[8] *Ibid*, p 2-13.

[9] Briefing, SAC Battle Staff, 27 Feb 1991.

Table 13
Cumulative Desert Storm Totals

Aircraft Type	Events/ Sorties*	Hours	Total Rcvr ARs	Offloads (pounds of fuel)
KC-10	3,278	16,717	10,915	283,616,000
KC-135A/R/Q	9,897	34,635	27,390	353,030,000
KC-135E	3,690	14,886	13,391	164,090,000
TOTAL	16,865	66,238	51,696	800,736,000

Table 14
Tanker Deployment at the Peak of Desert Storm

	KC-10	KC-135A	KC-135Q	KC-135E	KC-135R	Total
Deployed in AOR	29	36	26	66	65	222
Supporting outside the AOR	17	25	3	15	26	86
Total	46	61	29	81	91	308
Percent of type committed	81	34	54	48	45	45

The size and complexity of the Gulf War called for the involvement of aerial refueling assets of the extent shown in the following table. Although the United Kingdom, France, Canada, Saudi Arabia, and the U.S. Navy and Marine Corps all provided refueling aircraft, Air Force tankers conducted the bulk of the aerial refueling during the operation. The assets conducting these operations came from 20 different active duty units, plus thirteen Air National Guard, three Air Force Reserve, and three associate units. Table 15 depicts the number of refueling events and total offloads provided by USAF tankers.[10]

Tanker Planning

Commander-in-Chief, Strategic Air Command Operation Plan (CINCSAC OPLAN) 1002-88 was the baseline planning document for refueling operations in support of the U.S. Central Command (USCENTCOM) and U.S. Air Force Central Command (USCENTAF) OPLANs 1002. The SAC plan called for deployment of B-52s, RC-135s, and U-2s; KC-135s and KC-10s were to provide refueling support for operations. The KC-135s included KC-135Rs to support the B-52s at Cairo East and KC-135Es to support the AOR from Jeddah New. The balance of the tankers would support the fighter deployment and airlift, with KC-135A/Rs operating from the continental United States (CONUS), KC-135A/Rs and KC-10s operating in the Atlantic TTFs, and KC-135As in the Pacific.

Changes in the CENTAF OPLAN in April 1990, added KC-135s to support the AOR from Sharjah, UAE. SAC later argued that the number of tankers in the area of responsibility (AOR) to support more than 500 fighters plus Navy carrier air was insufficient. The changes also added additional KC-135s to Cairo East to support increased numbers of B-52s, more KC-135s to both the Atlantic and Pacific TTFs, and KC-10s for tasking in MAC channels. More KC-10s would serve in a dual role of refueling deploying Tactical Air Command (TAC) fighters and airlifting their supporting personnel and cargo. All of these aircraft allocations were overtaken by the events in Desert Shield.[11]

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[10]DS/DS Tanker Assessments, p 2-3.

[11]History of the Strategic Air Command, 1 Jan - 31 Dec 90, Volume I Narrative, p 335.

Table 15
Total USAF Refueling Events and Receiver Onloads

SAC RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
KC-10	361	16,531,034
KC-135	23	656,032
B-52	2,166	137,225,933
RC-135	739	40,736,096
EC-135	69	3,295,603
FB-111	130	1,673,875
E-4	2	279,097
SAC SUBTOTAL	3,490	200,397,670

TAC RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
F-16	10,066	64,487,654
F-15	10,007	168,208,013
EC-130	206	2,765,913
A-10	2,863	12,344,576
E-3	937	54,912,230
EF-111	1,262	18,078,413
F-4	3,331	36,975,098
RF-4	436	4,635,936
F-117	Not Releasable	1,941,196
F-111	188	3,442,886
TAC SUBTOTAL	29,296	367,791,917

Table 15 (Continued)
Total USAF Refueling Events and Receiver Onloads

MAC RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
C-5	187	13,647,565
C-130	6	56,614
C-141	316	16,942,522
AC-130	12	268,646
EC-130	9	113,491
HC-130	2	20,064
WC-130	2	19,110
MC-130	19	191,872
MAC SUBTOTAL	553	31,259,884

USAFE RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
F-111	2,499	32,881,709
EF-111	142	1,820,768
FB-111	29	169,369
RF-4	112	893,849
F-4	1,730	20,648,531
F-16	4,015	22,421,805
F-15	2,260	30,673,651
WC-135	3	53,203
EC-135	6	107,942
EC-130	10	75,046
HC-130	1	9,555
A-10	852	3,151,776
USAFE SUBTOTAL	11,659	112,907,204

Table 15 (Continued)
Total USAF Refueling Events and Receiver Onloads

AFRES RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
F-16	20	120,736
A-10	55	257,491
C-5	28	2,082,630
C-141	7	316,166
KC-10	2	177,600
AFRES SUBTOTAL	112	2,954,623

SOF RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
AC-130	84	1,195,846
MC-130	39	527,289
SOF SUBTOTAL	123	1,723,135

ANG RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
A-10	5	2,496
C-141	8	371,564
EC-130	37	514,112
C-5	16	1,174,636
RF-4	327	3,410,534
F-16	118	828,057
F-15	14	146,131
ANG SUBTOTAL	525	6,447,530

Table 15 (Continued)
Total USAF Refueling Events and Receiver Onloads

USN RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
F-14	4,085	33,969,581
F/A-18	5,252	8,234,240
A-6	2,026	16,558,048
KA-6	262	3,286,630
EA-6	682	5,598,579
A-4	16	46,214
A-7	896	4,772,236
S-3	97	421,875
KA-3	2	15,475
USN SUBTOTAL	13,328	72,997,060

USMC RECEIVERS	REFUELING EVENTS	TOTAL ONLOAD
F/A-18	681	7,498,060
AV-8	238	2,905,017
EA-6	101	1,301,900
A-6	78	899,724
USMC SUBTOTAL	1,098	12,604,704

DROGUE REFUELINGS	14,426	85,601,761
BOOM REFUELINGS	45,758	723,481,963
GRAND TOTAL	60,184	809,083,724

Initial Response

Air refueling operations began before Desert Shield. On 21 July 1990, transmissions between the U.S. Embassy in Abu Dhabi and the U.S. State Department requested that two SAC KC-135 tankers be assigned to refuel UAE Mirage 2000 fighters beginning the morning of 22 July 1990. The UAE planned to fly combat air patrols and protect UAE oil wells from possible Iraqi aircraft attacks. U.S. tankers were needed to extend sortie durations and were perceived by the UAE as a non-provocative deterrence to attack.[12]

Notification and deployment orders were sent almost simultaneously; within two hours of the initial notice, the Joint Chiefs of Staff (JCS) sent a draft deployment order to SAC placing SAC's tankers under the operational control of U.S. Commander-in-Chief, Central Command (USCINCCENT). While SAC agreed with placing conventional bombers under CINCCENT, it opposed CINCCENT operational control for its tankers. The draft order involved deploying two KC-135R tankers and approximately fifty people from RAF Mildenhall to the airfield at Al Dhafra. Although qualified as a bare base operation, SAC tankers routinely deployed to unimproved bases for short-term operations or exercises. SAC's main concern was the lack of airfield information–a problem for all major commands in Desert Shield. The mode of coordinating with UAE surface-to-air missile units, the legality of refueling foreign government aircraft, and methods of providing early warnings of hostile air attack were also of concern. The final JCS deployment order was received on 23 July 1990 and the operation was called Ivory Justice.

The U.S. Embassy in Abu Dhabi suggested that SAC switch to using KC-10s to refuel the Mirage because the KC-10's long hose and soft basket placed less strain on the Mirage 2000's probe. Time was not available to make the change, which actually proved unnecessary. Three Mirage 2000s refueled successfully on 31 July and 1 August 1990; the exercise was terminated on 2 August when Iraq invaded Kuwait.[13]

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[12]History, p 323.

[13]DS/DS Tanker Assessments, p 4-11.

Deployment Phase

On 2 August 1990, the Secretary of Defense directed deployment of U.S. forces to support military operations in the CENTCOM AOR. JCS immediately directed deployment of two KC-10s to Diego Garcia to join two KC-135s there on an exercise. Unlike the earlier draft order, this order allowed SAC to retain operational control of the tankers. Another order directed CENTAF to conduct execution planning for deploying one RC-135 and three KC-10 aircraft to the CENTCOM AOR. En route refueling support was required for the quick reaction module, which included fighters and Airborne Warning and Control System (AWACS) aircraft. SAC recommended against early JCS basing options at Riyadh and Dhahran because basing tankers there would place them within range of Iraqi missiles and aircraft. Jeddah New was suggested for tanker basing, since it was farther from Iraq.[14] CENTCOM agreed, but CENTAF prevailed, citing Riyadh as its headquarters location and the site of Royal Saudi Air Force (RSAF) tanker and E-3 operations.[15] Brigadier General Caruana was designated as Commander Strategic Forces (STRATFOR) and departed with the initial module of forces to lead the SAC contingent in the CENTCOM AOR.

SAC anticipated massive MAC air refueling requirements as well as fighter movement refuelings. As it turned out, MAC decided to make an enroute stop in Europe and ground refuel rather than air refuel. This action eased the tanker commitment to support TAC fighter deployments, which primarily called for non-stop CONUS-to-Southwest Asia flights requiring multiple refuelings.[16]

By 8 August, force deployments were scheduled through C+40 (first day deployment commenced plus forty days). Initially, eighteen tankers were to be in the AOR, which was far fewer than planned in the latest draft of SAC OPLAN 1002. In reality, OPLAN 1002 was never used, but air refueling planners at the time were concerned that the number of tankers being considered would be inadequate.[17]

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[14] *Ibid*, p 5-2.

[15] History, p 332.

[16] DS/DS Tanker Assessments, p 5-2.

[17] *Ibid*, p 5-2.

On 9 August, JCS designated the deployment as Desert Shield, and the classification of operations was downgraded to Secret. This date marked the beginning of the tanker Atlantic Bridge, which would adjust support levels to match the fluctuating rate of deployment.

Air Bridges

In coordination with USTRANSCOM, air bridges were established on both Atlantic and Pacific routes to support CENTCOM deployment and to provide logistic support for SAC. Initially, approximately one and one-half fighter squadrons a day used the Atlantic Bridge from the CONUS to the AOR. ANG, AFRES, and active duty tanker aircraft provided refueling. Also, some MAC aircraft and straggler fighters on the way to rejoin their units were refueled along the bridge. Maintenance and support personnel, security police, fire fighters, communicators, and other personnel were deployed to support sustained tanker operations. The KC-135A model was used extensively to free the KC-135R model for the Saudi peninsula. The Atlantic Bridge network freed MAC airlift aircraft to move other cargo and units as tanker organic lift capacity was employed to the maximum.[18]

Atlantic Bridge

The Eighth Air Force operated the Atlantic Bridge; its bases in Europe included RAF Mildenhall, England; Lajes AB, Azores; Zaragoza and Moron ABs, Spain; Mont de Marsan, France; Malpensa, Italy; Incirlik AB, Turkey; and Hellenikon and Andravida, Greece. The bridge was the primary deployment route for all U.S. aircraft requiring aerial refueling. The number of tankers in place afforded the flexibility to adjust refueling capability to deployment volume. Bridge tankers at bases along the route launched on short round-robin missions to refuel deploying aircraft. KC-135s or other KC-10s over the Atlantic and Mediterranean would refuel KC-10s acting as the escort refueling tankers for deploying fighter aircraft formations; the refueled KC-10s in turn would refuel fighters in the formation (chicks-in-tow as such formations are called in the air refueling community because of the resemblance to a mother hen and her chicks).[19]

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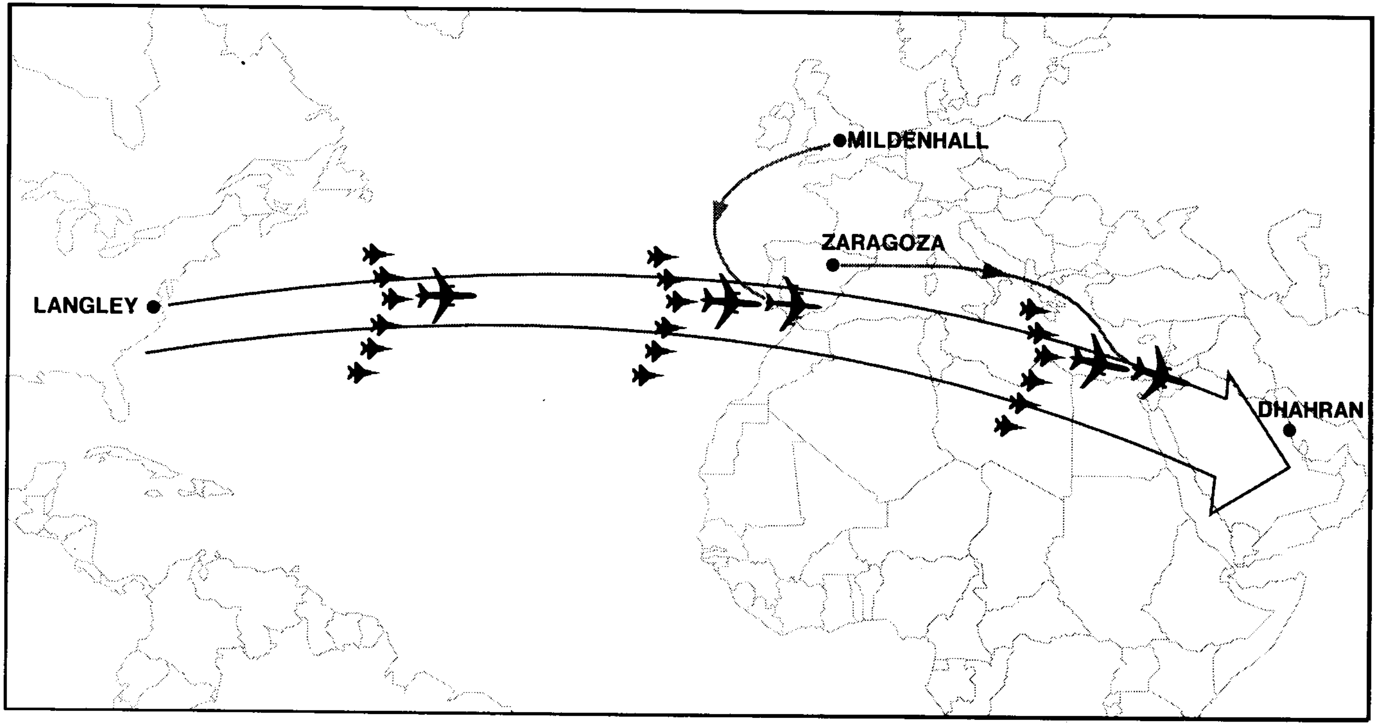
[18] *Ibid*, p 4-3.

[19] History, p 333.

Figure 38
Atlantic Bridge Air Refueling



Basing problems created an exception to the short round-robin missions performed by the KC-135s in the Atlantic Bridge. Because Eastern Mediterranean basing was unavailable, KC-10s out of Moron and Zaragoza were substituted to provide support for fighters transiting the Eastern Mediterranean and the Red Sea. The sortie duration for these missions was from seven and one-half to nine hours; the substitutions continued until a base was established at Cairo West.

Planning for eastbound deployments called for tanker task forces at Lajes, Moron, and Souda ABs and at Cairo East on the eastern end of the bridge. The deployment would allow support of collocated B-52s and naval aircraft operating from carriers in the Red Sea if hostilities erupted. Early changes brought in Mildenhall AB and dropped Souda AB because it had insufficient ramp space. These actions created a gap in the middle of the Mediterranean leg of the Atlantic Bridge and put an additional burden on Spain- and Egypt-based tankers to provide refueling support over the Mediterranean Sea. The use of the dual-role KC-10s increased and MAC's decision to land in Europe and refuel also relieved the pressure on the eastern span of the Atlantic Bridge.[20]

Fluctuating basing rights caused a domino effect in assignments for and numbers of aircraft. Moron, Spain became available in late August 1990, but before Desert Shield, was in drawdown status with minimum U.S. presence. Initially, ANG KC-135E tankers were deployed there, but they were replaced by KC-10s in late September to provide deep Mediterranean air refuelings. When the war began in January 1991, Spain agreed to base B-52s at Moron, and the KC-10s moved to Zaragoza and RAF Mildenhall in early February. When the war was over, the B-52Gs departed Moron on 21 March and KC-10s returned to assist with Atlantic Bridge redeployment operations.[21]

SAC continued to stress the need for tankers in Egypt–if not at Cairo East, then in Cairo West, a remote military airfield. The lack of a Cairo base for tankers forced more of limited KC-10 and KC-135R tanker assets to Atlantic Bridge operations. Also, OPLANs called for KC-10s in the MAC channel, and MAC airlift clearly was extended. Release of KC-10s for airlift duty would be limited by the lack of KC-135 bases in the eastern

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[20]DS/DS Tanker Assessments, p 4-4.

[21]*Ibid*, p 4-5.

Mediterranean. As a consequence, SAC also asked JCS to consider as possible TTF operating locations Akrotiri on Cyprus; Incirlik in Turkey; Hellenikon in Greece; Antalya in Turkey; and Sigonella in Italy.[22]

Constant coordination problems occurred involving multiple commands and levels of the State Department. Tanker Task Force Europe (ETTF) regularly used Hellenikon AB for fuel and weather diversion and for supporting RC-135 operations. Hellenikon AB shares the runway with Athens International Airport in Greece. U.S. operations at Hellenikon were scheduled to be shut down and the airfield turned back to the Greek government by 30 June 1991. As part of the Mutual Defense Cooperation Agreement, U.S. Air Forces Europe's (USAFE's) host operational support would end 1 February 1991. The European Command (EUCOM) plan was to move tankers to Andravida, a Greek air base west of Athens. There was much concern about U.S. operations leaving Hellenikon in the middle of the Gulf War, and Headquarters SAC directed that no changes be made before logistical and operational issues were resolved. The war ended in late February, and the tankers adjusted to Andravida; five KC-135Rs supported redeployment bridge taskings until late April 1991.[23]

Over time, efforts by the Services and the State Department to maximize the tanker basing in Spain were very successful. At first, a Status of Forces Agreement limited permanently based tanker aircraft in Spain although more were allowed for short training periods. Operations were conducted from Zaragoza and Moron ABs, and less frequently from Torrejon and Rota. The number of tankers needed for the Atlantic Bridge, coupled with the number of aircraft stopping en route to the AOR, motivated negotiations for increasing the ceiling. Increases came slowly. An initial increase of KC-135Es at Moron AB was allowed, and their capabilities over those of KC-135As gave basing in the bridge the flexibility to move forward to the AOR, if required, to support combat aircraft. The next increment raised permanent tanker basing in Spain even further. Tankers making en route stops were not included in the count, which gave additional flexibility. Although KC-10s used Rota originally, safety considerations required that tankers not use Rota unless absolutely necessary. [DELETED][24]

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[22]History, p 338.

[23]DS/DS Tanker Assessments, p 4-6.

[24]*Ibid*, p 4-7.

The commercial airport at Malpensa in northern Italy was 340 nautical miles north of the planned B-52 tracks. It became a beddown for as many as twelve KC-10s providing pre- and post-strike air refueling for the B-52s. Operations at Malpensa began on 9 February 1991, and the Italian military provided 150 troops for security. There were many difficulties to overcome. Fuel was limited. Winter operations required de-icing of aircraft, and military aircraft were low priority compared to commercial flights. On at least one occasion, tankers were late because of de-icing delays and missed their assigned air refueling. As a consequence, Malpensa was one of the first bases shut down after the Gulf War. France was also cooperative and was one of the first countries to offer basing rights for tankers. The first U.S. KC-135R arrived in France on 7 February 1991 and was the first U.S. aircraft based there since 1966. Up to ten KC-135s were based at Mont de Marsan, a French Air Force base in southwestern France, but KC-10As could not use Mont de Marsan because of taxiway obstructions. The KC-135Rs based there provided pre- and post-strike air refueling for B-52G sorties. Other support included maintenance equipment, technicians, and translators. On one occasion, an engine tester from another base was flown in via a French KC-135R. Mont de Marsan operations were concluded in mid-March.[25]

In addition to Atlantic Bridge operations, RAF Mildenhall staged tankers deploying from Dyess AFB in Texas to Incirlik in Turkey were held at RAF Mildenhall awaiting diplomatic clearance. While Incirlik was an established USAFE base routinely supporting ETTF operations, ongoing diplomatic actions delayed deployments. When hostilities began, tankers joined the Joint Task Force (JTF) (known as Proven Force). SAC retained operational control of the aircraft and tactical control passed to USAFE. This was the first time SAC tanker's participated in a composite force; JTF Proven Force has been described as an early example of the United States Air Force composite wing concept.[26]

Pacific Bridge

The Pacific Bridge was not established and used as planned, since most deployment operations used the Atlantic Bridge. The Pacific Bridge mainly supported tanker, bomber, and airlift traffic en route to Diego Garcia in the

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[25] *Ibid*, p 4-8.

[26] *Ibid*, p 4-6.

Indian Ocean. Bridge operating locations were Hickam AFB in Hawaii, Andersen AFB in Guam, and Diego Garcia. Planning had also included Singapore, Malaysia, and Clark AB in the Philippines, but these locations were not used except for weather or fuel diversions.[27]

The Marine AV-8s from Iwakuni in Japan were originally (OPLAN 1002-88) to deploy to the AOR using Pacific-based tankers. Also, the Harrier was only certified for refueling with KC-10s. Because of logistical constraints, the Marines requested that they deploy East through the CONUS and over the Atlantic Bridge. The deployment of twenty B-52s to Diego Garcia was the primary aircraft movement over the Pacific Bridge, and subsequent operations were designed for logistical support of the bombers and tankers from Andersen AB.[28] A logistics shuttle called SAC Desert Express (not to be confused with the Airlift operation Desert Express, flown with C-141s from Charleston AFB) was started in mid-August 1990. KC-135As moved cargo and personnel from CONUS bases to Castle AFB in California. The SAC Desert Express then went from Castle AFB through Hickam AFB to Andersen AFB. From there, KC-135R or KC-10 aircraft replaced KC-135As–the distance-limited KC-135As could not fly Hickam to Diego because of the number of miles involved.[29]

The final number of tankers committed to Desert Shield far exceeded the requirements specified in the "on-the-shelf" OPLANs. Twenty-one bases in twelve foreign countries were used as tanker beddown locations for over 300 tankers. To make it even more challenging, six of the bases in the AOR were bare base locations, i.e., essentially a runway, fuel, and water. Basic support such as cooks, security police, medical personnel, and civil engineers were flown in and literally built the base facilities from the ground up. Supply personnel, transporters, and maintainers were then needed to accomplish day-to-day activities supporting flying operations. Places to work, eat, and sleep were built while flight operations continued.

During Phase I in Desert Shield, the requirement for tankers remained fairly constant at 115 KC-135s. As additional forces deployed in Phase II for the air campaign, tanker requirements more than doubled. Then in February when twenty more B-52s deployed to Moron and Fairford, addi-

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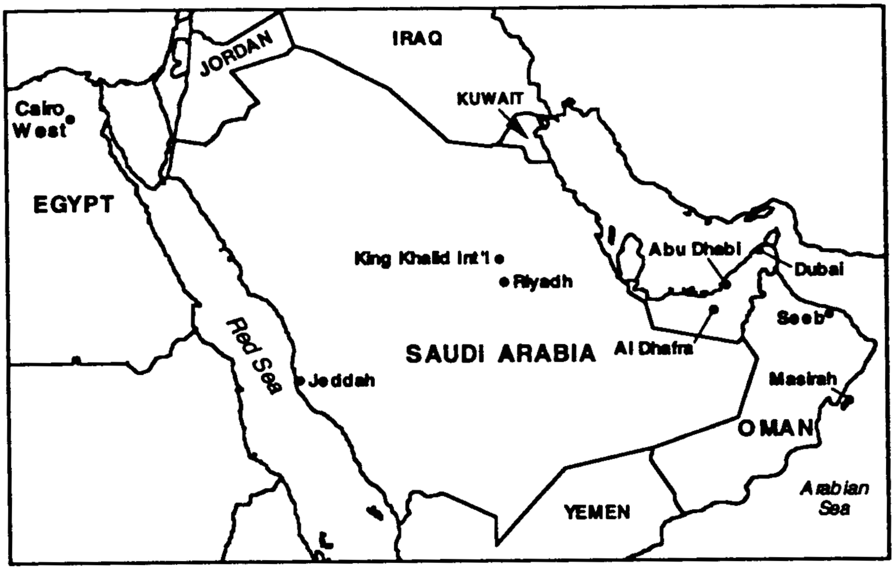
[27] *Ibid*, p 4-8.

[28] History, p 344.

[29] DS/DS Tanker Assessment, p 4-9.

tional tankers were deployed. The map at Figure 39 shows the final bed-down locations of the tanker force in the AOR.

Figure 39
Tanker Beddown in the AOR



Jeddah New supported the largest deployed tanker operation. An ANG Colonel, appointed as commander of the 1701 Provisional Air Refueling Wing, led a mixed SAC, ANG, and AFRES unit–a classic example of integrating the Reserve and ANG with the active force to create a total force package. Centrally located King Khalid International, a large, new commercial airport on the outskirts of Riyadh, was home to the 1703d Air Refuel Wing (AREFW). U.S., French, and British tanker forces shared the facilities. Riyadh was the first base to be used by tankers after JCS deployment began. It was first utilized by four KC-10s and became the 1700th Strategic Wing, home of KC-135Qs and RC-135s. After the war, 15 KC-135Rs remained as the follow-on tanker force.

At the invitation of the UAE, two KC-135Rs were based at Al Dhafra during Exercise Ivory Justice. During Desert Storm, Al Dhafra was shared by CENTAF and Italian forces and accommodated a maximum of seven KC-135Rs. It was home to the 1705th Air Refuel Squadron (AREFS). Cairo West basing rights were secured on 27 September 1990, and, initially, accommodated three KC-135Rs, succeeded by fifteen KC-135Es before hostilities. Flight clearances throughout Egypt were a problem during operations, and the likelihood of terrorist activity against the tanker beddown location there was assessed as very high. Seeb was home to the 1702d AREFW, which supported fifteen KC-135Rs and ten KC-10s. Seeb also supported Navy operations in the Persian Gulf and Gulf of Oman, and most of the offloaded JP-5 fuel came from this location. The politics of war came to the forefront in numerous situations. For example, on two separate occasions the Government of Oman requested that tankers move for short periods (1-4 days) during Omani National Days and Air Force Day.

Masirah was the beddown location for five KC-135Rs, increased to ten. MAC was host at Masirah with C-130 operations. Dubai was the home of the 1713d AREFW, and operations were totally ANG. Since Dubai is a commercial airport, close coordination with local authorities was required. The 1712th AREFW, a composite ANG unit, was established at Abu Dhabi in December 1990. After initially deploying to Jeddah New, the wing moved to their final operating location in January 1991 before start of hostilities.

Diego Garcia was unique in location and mission. It was the only site with a SAC presence and prepositioned materials before 2 August 1990. Tankers at this base were used solely for B-52 support. Communications capability was extremely limited, which contributed to many difficulties.

Follow-on Deployment Phase

As USCENTCOM AOR combatant requirements grew, STRATFOR continuously tailored tanker requirements to support planned offensive operations. The final deployment position was 209 tankers (179 KC-135s and 30 KC-10s) to be in place in the AOR no later than 15 January 1991. The crew ratio in the event of hostilities was also established as 1.50 for the KC-135 and 2.0 for the KC-10.[30]

The final Desert Shield action for the tanker force was bedding down twenty-four KC-10s in the AOR. The organic lift capability of these aircraft was used again to support SAC's final buildup of aircraft and personnel. At the start of Desert Storm, SAC had committed over 300 tankers to the AOR, Turkey, and the bridges.[31]

Desert Storm

When Desert Storm officially began at 0300, 17 January 1990, in the AOR, tankers had already offloaded fuel for strike, reconnaissance, command and control, and other combat support mission aircraft. (Refuelings had been accomplished hours earlier for B-52s en route from outside the AOR to their targets in Iraq.) KC-135s from Jeddah flew at an altitude of 3,000 feet while refueling F-15Es scheduled to strike fixed Scud launching sites in Western Iraq. The low-level refuelings were necessary because the F-15s had to penetrate low and fast to surprise their targets. These were the only low-level refuelings planned for the air campaign. The rest of the schedule was executed with little change, and 296 of the planned 299 refueling sorties were flown. The operation was a success in spite of more than a little concern over air space saturation. The concern remained following a 6 January airspace saturation exercise highlighting the tremendous task of air space management and deconfliction of air space that were natural products of air operations of this magnitude. Airspace saturation will be discussed later in this chapter.[32]

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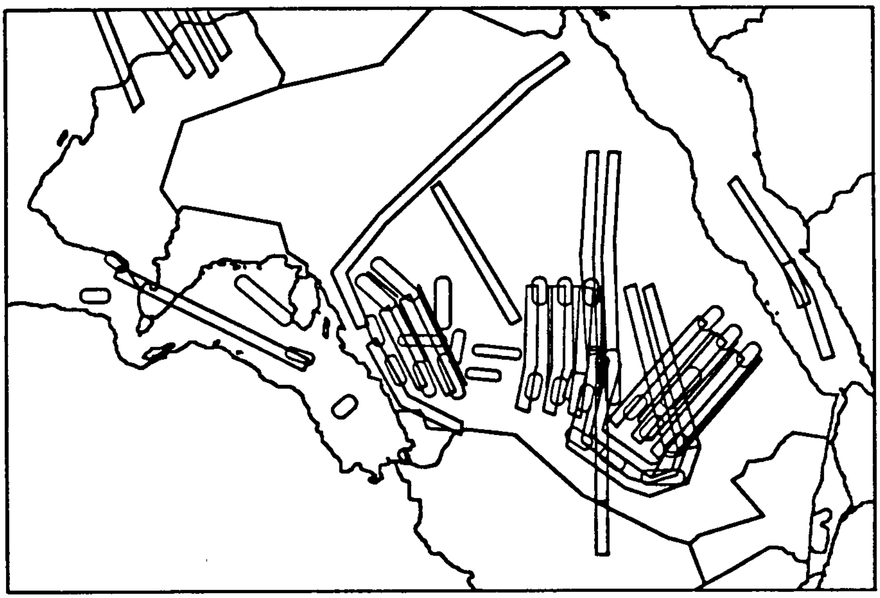
[30] *Ibid*, p 5-8.

[31] *Ibid.*

[32] History, p 365.

The [DELETED]-based B-52s, which flew 795 combat sorties during Desert Storm, were some of the few aircraft not requiring refueling on the way to targets. All of the other aircraft that required air refueling used the air refueling track structure, which was oriented to satisfy several objectives (See Figure 40 below). First, the long parallel tracks beginning in central Saudi Arabia and ending at the Iraqi border were positioned to refuel combat aircraft moving toward the center of Iraq. Second, initial tanker

Figure 40
Air Refueling Tracks and Anchors



orbit areas were positioned south and outside the range of Iraqi early warning/ground controlled intercept (EW/GCI) to preserve tactical surprise. Other objectives included keeping B-52 refueling tracks outside the heavily congested AOR airspace and providing several anchor orbits for supporting F-15 and F-14 air-to-air capabilities and combat air patrols (CAPs).[33]

The demand for air refueling in the AOR changed significantly during the transition from Desert Shield to Desert Storm. Putting the force in place, which took over five and a half months, had been a major undertaking. Once the positioning was accomplished, refueling proceeded at a relatively normal pace, until initiation of the 42 days of Desert Storm signalled a dramatic increase in refueling requirements, as shown in Table 16.

Table 16
Average Daily Air Refueling Statistics[34]

	Desert Shield		Desert Storm	
	KC-10	KC-135	KC-10	KC-135
Sorties flown/day	2	66	35	215
Hours logged	12	182	240	977
Aircraft refueled	13	175	222	839
Fuel Delivered (Million gals)	0.2	1.9	4.5	11.0

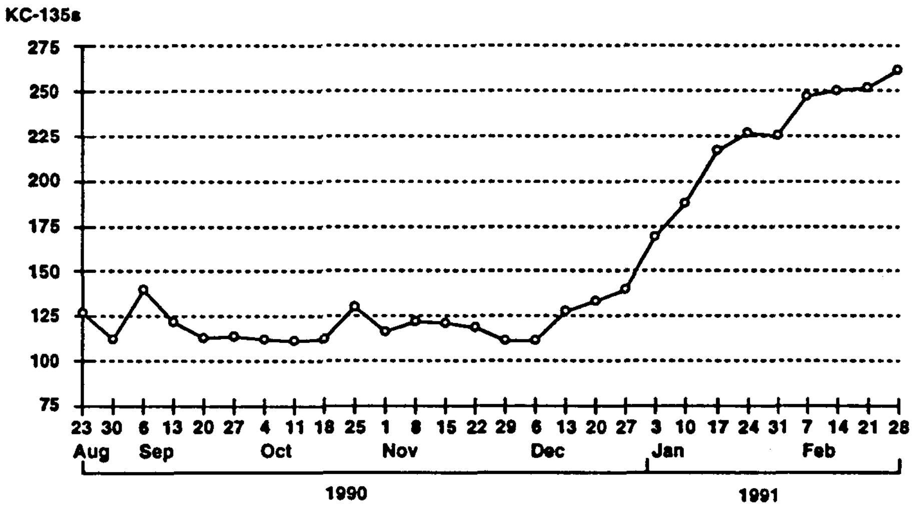
Source: Totals for entire operations from HQ SAC/DOOT.

Another illustration of the change in pattern and intensity of air refueling activity is reflected in the following chart accounting for KC-135 tankers deployed from the CONUS from August 90 to the end of Desert Storm.

[33]*Ibid.*

[34]Headquarters Strategic Air Command/DOOT.

Figure 41
KC-135s Deployed From CONUS[35]



Virtually every type of strike and direct combat support mission required air refueling. The total of all U.S. and foreign combat sorties was 69,399, an average of 1,650 per day. In addition to U.S. tankers, the tankers of the United Kingdom, France, Canada, and Saudi Arabia accomplished air refueling; the British and French tankers refueled their own aircraft. Canada's tankers refueled approximately seventy-five percent of its aircraft; United States Air Force aircraft refueled the remaining twenty-five percent. Saudi Arabia's tankers refueled fifty percent of its aircraft; United States Air Force tankers refueled the other fifty percent. Other foreign aircraft received United States Air Force refuelings.

The total number of Air Force, Navy, Marine, and foreign refueling sorties in Desert Storm was approximately 15,100, or 360 sorties a day. On average, each tanker flown provided 4.5 refuelings to combat aircraft. The

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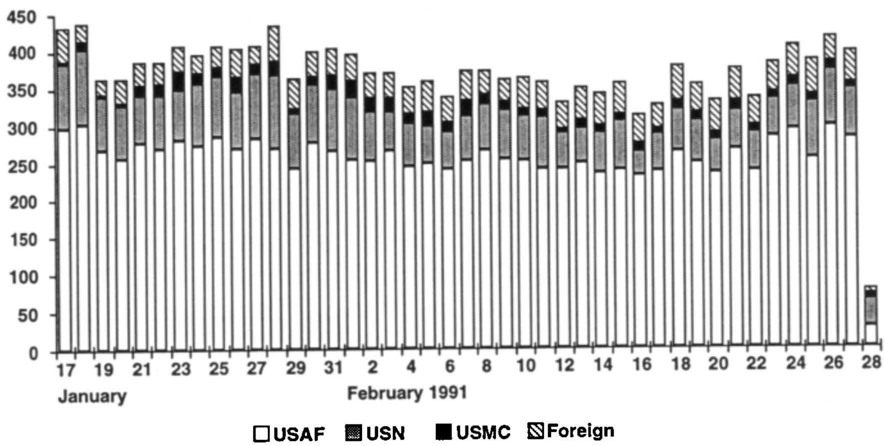
[35]*Ibid.*

following figure reflects the daily activity levels.[36] During Desert Storm, nearly 107 million gallons were delivered by air to more than 43,000 receivers. The air campaign was heavily dependent on air refueling, and the successful integration of air combat missions and related refueling missions was a major achievement.

Figure 42
Air Refueling Sorties Flown.



Redeployment

USCENTAF, USAFE, and U.S. Marine Corps, Central Command fighters used the Atlantic Bridge to return to their home stations quickly and efficiently. Fighter streams flew from tanker to tanker on their legs from Southwest Asia to a remain-over-night location en route to the CONUS. European-based fighters redeploying directly to home stations used the same refueling procedure. The majority of CONUS aircraft were to remain over night in Spain, with the exception of A-10s, which were to spend the night at Sigonella in Italy and Lajes in the Azores. The tanker bridge allowed SAC to support planned flow of one fighter squadron per day from

[36] GWAPS Analysis of ATO Data.

Southwest Asia to Spain and one fighter squadron per day from Spain to the CONUS.

Airlift

SAC was not explicitly tasked to participate in the airlift role except for the dual-role assigned its KC-10s. However, organic air movement provided necessary SAC resources to support B-52, KC-135, KC-10, RC-135, and U-2 aircraft. MAC was heavily tasked to support deployments to Southwest Asia and could not fulfill all airlift requirements. Unable to assign sufficient priority to strategic lift requirements, SAC had to use KC-10s and KC-135s for cargo and passenger transportation. During the first 30 days of Desert Shield, SAC organic airlift carried 4,870 passengers and 2,612 tons of cargo.[37]

SAC planners had to compete with MAC requirements for KC-10s. KC-10s could be placed in the MAC channel and used as airlifters under MAC control. KC-10s were in great demand because of KC-10 dual-role commitments and because a tanker base to anchor the Atlantic bridge was not available in the deep eastern Mediterranean region at the onset of Desert Shield. Five KC-10s were given to MAC on 24 August 1990, and five more were made available on 4 September 1990 for a purely airlift role to help USTRANSCOM overcome its backlogs. Ten KC-10s were given to TRANSCOM in March and April 1991 to assist MAC in redeploying forces from the AOR. During the early phases of Desert Shield, SAC utilization of KC-10s was high, and SAC planners recommended to the Headquarters Strategic Air Command Director of Operations (Hq SAC/DO) that SAC delay making a large number of KC-10s available to MAC for the following reasons:

- MAC did not actively pursue using KC-10s to augment C-5 and C-141 missions until the F-117 deployment on 21 and 22 August 1990.

- SAC had a JCS requirement to maintain sixteen KC-10s at Moron and Zarogoza in Spain to support bridge deployment operations.

[37]DS/DS Tanker Assessment, p 5-5.

- Twelve KC-10s were required to support a movement of twenty-four F-4G aircraft from the CONUS to the AOR.

- KC-10s were used extensively for dual-role and force extension missions (four to five missions per day).

- The 330 fighters and many other larger aircraft deployed to the AOR depended heavily on KC-10A support.

- Operational requirements often resulted in a quick need for drogue-equipped tankers to move Navy and Marine aircraft. Drogue-equipped KC-135s were not always immediately available.

To help overcome USTRANSCOM's backlogs, SAC offered KC-135 support; but USTRANSCOM rejected this proposal, partly because of the incompatibility of MAC's cargo handling equipment with the KC-135. Also, MAC preferred KC-10s because cargo bays in KC-135s do not have room for many of the standard loads packaged on MAC pallets. After USTRANSCOM's rejection of KC-135s for airlift and a need for additional supplies to sustain on-going operations, SAC independently employed tankers to transport equipment and personnel to tanker forward operating locations (FOLs). Mighty Express was formed and utilized ANG KC-135Es to transport cargo and personnel from CONUS to Europe or to the AOR. Mighty Express was an airlift support initiative by Eighth Air Force Logistics and Operations approved by Hq SAC. The Express began operations on 21 January 1991 and was supported by Mather's 940th AREFG KC-135Es. Mighty Express, flying from its Barksdale Aerial Port of Embarkation, in CONUS used two primary routes intersecting at Moron in Spain to facilitate rapid movement of cargo from CONUS to Southwest Asia. The Express moved nearly 700 passengers, 3,000 high priority parts, and almost 200 tons of cargo between January and April 1991, when it was terminated.[38]

An interesting situation arose at Moron. The B-52s began dropping bombs in the AOR at such a substantial rate that Moron was expected to run out of munitions. Fortunately, 3,200 short tons of munitions were available in Bitburg, Germany. To maximize their air refueling support

[38]*Ibid*, p 5-6.

to the B-52s on strike missions, as well as assist in resupply of ordnance, Zaragoza KC-10s launched for an air refueling mission and landed in Germany to pick up weapons. They offloaded the weapons at Moron, took off on a refueling mission, and recovered at Zaragoza.

Aircrew Manning

The aircrew manning level of SAC's KC-135 and KC-10 tanker force had a direct impact on tanker operations. The KC-135 manning level was 1.27 and was based primarily on supporting SAC's SIOP commitment. The KC-10 manning level was 3.5 (2.0 active plus 1.5 reserves) and was dedicated to supporting contingency operations. Initially, the theater commander requested that all tanker forces in the AOR be manned at the 2.0 level. Because SAC could not support a KC-135 crew ratio of 2.0 in the AOR, the 2.0 level was later reduced to 1.5. Despite the change, few tankers were available for training, and crew shortages forced continued back-to-back alert cycles even with the call-up of Reserve forces.

The manning level of the KC-10 was more than sufficient to support the 2.0 AOR requirement. The call-up of one of the three KC-10 Reserve Associate units enabled a 3.0 crew ratio for KC-10 aircraft temporarily dedicated to TRANSCOM. The only significant KC-10 manning problem occurred in the AOR when many crews pushed the flying-hour limitations of 125 hours per 30 consecutive days as specified in AFR 60-1, SAC Supplement 1. In an effort to keep only highly experienced crews in the AOR, the theater's no-rotation policy prevented SAC from rotating crews with high flying times. Therefore, SAC was forced to raise the flying-hour limitation from 125 hours to 150 hours per 30 consecutive days. Had additional crews been sent to the AOR, or if the no-rotation policy had been relaxed, the waiver may not have been necessary. Even with the waiver, crews approached or exceeded the 150-hour limit in isolated incidents. The 330-hour limitation per 90 consecutive days, as required by AFR 60-1, SAC Supplement 1, was not waived.

While KC-10 manning was not as serious a problem, aircraft availability was. Because of limited availability and high demand, KC-10 training came to a virtual standstill. During the period from 30 October 1990 through 15 January 1991, a backlog of over 60 students developed. Hq SAC/DO dedicated three KC-10 aircraft to combat crew training squadron (CCTS) training at March AFB in California. From 15 February 1991 through 21 April 1991, over 130 student sorties were flown, and a total of 44 students received their SACR 60-4 qualification evaluations. This brought the CCTS student load back to normal levels, and with increased KC-10 availability, the special CCTS was terminated and returned to unit level on 26 April 1991.

To provide additional relief to the KC-135 force and to prevent the call-up of additional KC-10 Reserve associate units, SAC implemented STOP LOSS for all tanker specialties. This personnel program prevented voluntary separation of qualified tanker crew members and remained in effect until the first of June 1991.[39]

Operational Issues

Air Tasking Order

The number of SAC tankers allocated to the various strike packages was a USCENTAF decision. The U.S. Navy deemed the initial allocation of tanker support to Naval air unacceptable. This perceived problem was alleviated when the United Kingdom made tankers available to the Navy, four carriers were positioned in the Persian Gulf to reduce flight time and fuel requirements to target areas, and SAC tankers became available to Navy aircraft on a "when available" basis.

The scheduling and assignment of tankers was labor intensive and a major factor in the time required to produce each air tasking order (ATO). Scheduling tankers was virtually the last part of the ATO construction process. The tanker schedulers had to wait until the receivers computed their routes of flight and onload requirements. This constraint allowed for only a short time (2 to 4 hours) to deconflict the airspace, schedule the tankers, and task the various air refueling units. Significant inroads were made toward improving the automation of scheduling as the operation progressed. Further improvement in the actual assignment of air refueling assets to receivers could result in an increase in total offload capability and shorten the ATO processing time for future operations.[40]

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[39]DS/DS Tanker Assessments, p 5-7.

[40]*Ibid*, p 8-2.

Airspace

Air space was the critical limiting factor affecting air refueling during Desert Storm. This problem was not just confined to the theater of operations but was also a factor in the refueling areas on the Turkey/Iraqi border and in the Mediterranean. Within the theater during heavier flying periods, additional tankers, regardless of configuration, could not have been used because airspace was unavailable. This was especially true as the war shifted to the Kuwaiti theater of operations (KTO) and the vast majority of air refuelings were being requested for the northeastern section of Saudi Arabia and the Persian Gulf. Within the theaters, additional tankers could have been scheduled during less intensive flying periods to reduce the overall utilization rate or to increase the overall number of attack sorties during a given twenty-four-hour period.

Airspace was also a limiting factor for the forces stationed in Turkey. As an example, a dedicated air refueling area was used by the RC-135, North Atlantic Treaty Organization AWACS, and the F-15 CAP. The area was also utilized as an orbit area for the AWACS and the RC-135. Later, when aircraft flying combat air patrol were pursuing defecting Iraqi fighters, two smaller orbit areas were set up on the southeast corner of the border between Turkey and Iraq.

Despite reduced civilian air traffic, the airspace above the Mediterranean Sea was extremely congested. The congestion problems were compounded by severe language barriers between aircrews and the foreign air traffic controllers. Multiple ship refueling formations would often be vectored off course because the controllers were unable to communicate that a single aircraft should take a different route.[41]

Air Refueling Airspace Congestion

During Desert Storm, the critical limiting air refueling factor was airspace congestion. Large strike forces were designed to overwhelm the enemy defenses. However, force size was constrained by the number of tankers that could be scheduled into the heavily congested air refueling tracks. This was especially true as the air campaign shifted to the KTO and the majority of air refueling took place over northeastern Saudi

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[41] *Ibid*, p 8-1.

Arabia and the Arabian Gulf. As a result, there were more near mid-air collisions (NMACs).

The USCENTCOM planning staff monitored air refueling airspace congestion carefully. When the staff refined the initial air campaign before the war, it ran computer programs to track the number of tankers and receivers and modified the flow of the strike forces to even out the peaks in airspace congestion. During the war, the tanker scheduler who developed the tanker portion of the daily ATO flew on one of the AWACS. He would literally stand behind the AWACS controller at his console and assist with tanker track coordination. Having someone who knew the planned air refueling flow assist in monitoring the air traffic proved very useful.

Nevertheless, the Air Force Inspection and Safety Center received 37 NMAC reports for Desert Storm. It estimated that reported NMACs equaled only a small fraction of those actually occurring. Table 17 shows selected NMAC details to illustrate the air traffic congestion and aircraft separation problems involving tankers. Of the 37 reports, 26 incidents had been fully investigated and closed out by 1 July. The balance of the reports may never be closed out because the incidents involved host nation air traffic control support.

A disturbing trend is that these NMACs occurred at mid-to-high altitudes. Historically, over half of NMACs occur at low altitude, below 5,000 feet. One of the reasons for the mid-to-high altitude NMACs was the configuration of the minimum risk routes (MRRs). Returning strike aircraft would follow the MRR corridors until inside the Saudi border and then proceed directly to their landing base, often cutting across the air refueling tracks. The practice was particularly dangerous at mid-to-high altitudes because of the higher aircraft speeds involved. During a high-altitude, head-on NMAC, there was simply not enough time for man and machine to react and take evasive action. The "see and avoid" concept worked some of the time; however, the "big sky" theory was operating more often than not.[42] Fortunately, only one mid-air collision actually occurred.

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[42]The "see and avoid" concept requires pilots to scan the sky constantly for other aircraft and to take evasive action if a potential mid-air collision is detected. The primary problem with this concept is that it is very difficult to detect a developing mid-air collision in bad weather, at night, or head-on. The "big sky" theory is that one doesn't need to worry about avoiding a mid-air collision because the sky is big enough to prevent one.

Table 17[43]
Tanker Near Mid-Air Collisions

Aircraft Involved	Flight Level	NMAC Details	Miss Dis (ft)
C-130 KC-135	210	C-130 enroute observed 3 tankers at the same altitude, opposite direction. C-130 flashed lights and the tankers began evasive action.	200
KC-135 KC-135	280	The first KC-135 reported that it had entered an air refueling orbit. The second KC-135, hearing the first KC-135's report, said that it was also in the same air refueling orbit.	Unk
KC-135 KC-10	225	2 KC-135s were in altitude block FL 200-230. Due to traffic they were told to transition to an intrail, co-altitude formation. Shortly thereafter, the second KC-135 experienced a head-on NMAC with a KC-10.	30-50 vertical and 100 horizontal
KC-135 2 F-14	160	The KC-135 crew saw two fighters approaching from the rear and appearing to be rejoining on them. When it became apparent that the fighters did not see the tanker, the tanker crew accelerated in an attempt to gain spacing.	50-100
EC-135 KC-135	240	While enroute the EC-135 saw the KC-135 and took evasive action by banking up to 90 degrees.	200

[43] Air Force Inspection and Safety Center.

Multipoint Refueling

Expedited Air Refueling

A large formation of receivers can mean that the first receiver to refuel will have the least amount of fuel at the end of the refueling track. To expedite air refueling in Desert Storm, quick-flow procedures were institutionalized that allow a large number of receiver aircraft to engage a limited number of refueling booms quickly. This also resulted in higher receiver to tanker ratios. Quick-flow procedures were designed for up to three flights of four receivers per tanker, a 12 to 1 ratio. After the first receiver is in contact with the boom and taking fuel, the next receiver moves from the right observation position to an on-deck position. This can be visualized as a loose fingertip (pilot technique) right wing formation with the receiver on the boom. These procedures also provided assurance that all aircraft in a package were topped off with fuel by the end of the refueling track. Significant reductions in boom cycle time were realized by reducing the "no contact" time between disconnect and contact for multiple receivers. The net result was an increase in capability for more receivers to refuel in a given period of time. The procedure also made it possible for an entire strike package to arrive at the refueling drop-off point with full tanks.[44]

Air refueling can be expedited by placing more offload points on a tanker; i.e., adding wing-mounted air refueling drogues. However, the time allocated for air refueling in Desert Storm was normally sufficient, especially when the above quick-flow air refueling procedures were used. A few strike forces were composed of receptacle and probe aircraft requiring either a DC-10 or multiple KC-135s with boom and drogues. Wing-mounted drogues would have decreased the number of KC-135s needed for composite forces. Wing-mounted drogues on KC-135 and KC-10 aircraft would have facilitated the refueling of Navy attack aircraft.

KC-135 Boom Drogue Assemblies

At the start of Desert Shield, one air refueling drogue was deployed with every three KC-135 aircraft. The supply of drogues was rapidly

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[44](S/NF) Tanker Tactics in Southeast Asia, 17AD(P) Pamphlet 3/1, 10 Nov 1990.

exhausted. Units needing drogues began assigning drogue orders the highest priority available, putting a large demand on the supply system. Additionally, many of the drogues in storage developed leaks when exposed to fuel because of dry unused O-rings and seals. Replacements for drogues in storage were ordered, further increasing the demand on supply; finally, orders could not be filled in a timely manner. The majority of the inoperable drogues in the AOR were unserviceable because of coupling leaks. To provide relief, the drogue coupling leak limit was increased and limited field repair of seals and O-rings within the coupling was authorized. Also, a drogue repair team was established to travel within the AOR repairing drogue assemblies. Management and direction of drogues became impossible from CONUS and were turned over to theater headquarters. As a result, the availability of drogues in the AOR improved and mission shortfalls due to faulty drogues were no longer a problem.[45]

F-117 Air Refueling

The F-117 had been used in previous contingency operations. However, throughout its development and certification, only a limited number of tanker units were involved in refueling these aircraft. The tankers were primarily KC-135Qs from Beale AFB and KC-10s from March AFB. [DELETED] The first squadron of F-117s from Tonopah were refueled en route to Langley AFB by KC-135Qs. KC-10s operating in a dual role carried cargo and refueled the F-117s across the bridge into Saudi Arabia. The second squadron of F-117s were supported solely by KC-10s. Early in the development of the Desert Storm plan, it was determined that ten KC-135Qs at Riyadh would be insufficient to support planned F-117 missions. An intensive training program was then developed to train and qualify KC-135R crews at KKI to provide the additional air refueling capability required to support F-117 missions.[46]

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[45]DS/DS Tanker Assessment, p 8-3.

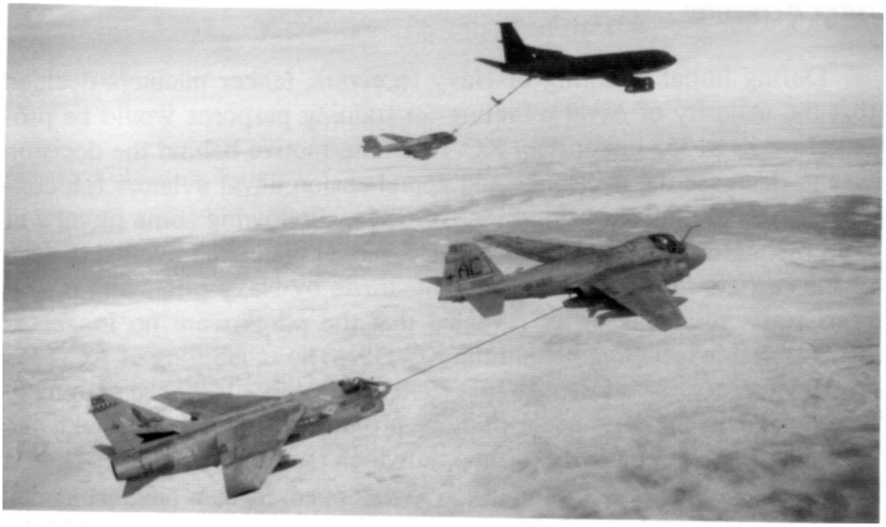
[46]*Ibid*, p 6-5.

The maximum number of F-117s allocated to one tanker was two. The KC-135R had the ability to support the two F-117s in both prestrike and poststrike phases.

Navy Refueling

During initial refueling of Navy receivers, tanker planners decided that the majority of naval refueling for training purposes would be provided by KC-135s rather than KC-10s. The motive behind the decision was to decrease the resistance and apprehension naval aviators felt concerning refueling from behind the KC-135s. Following some months of air refueling training behind the KC-135, tanker planners travelled to each of the carriers in the Gulf. Statements made by Navy pilots and operations staffs on each carrier revealed that the pilots were no longer as uncomfortable refueling behind the KC-135. The scheduling of KC-135s for Navy receivers between August 1990 and October 1990 had extremely beneficial results. The same training program was attempted with the Marines; however, an early mishap, in which the radome of an F-18 was damaged by the basket of a KC-135, stopped further advancements. Following the incident, the Marines refused to refuel behind KC-135s at night and were hesitant to refuel behind them during daylight hours. The Marines specified KC-10s for all nighttime refueling and normally used their own KC-130 if their refueling could not be accommodated by an Air Force KC-10.

Air refueling rendezvous procedures were modified from the standard Air Force procedures to accommodate the Navy. Multiple tanker air refueling cells normally consist of tankers stacked at 500-foot intervals. The Navy senior staff and the 17th Air Division (Provisional) Commander agreed to 1,000-foot intervals between tankers in the same cell. This change was primarily due to the method in which naval receivers rendezvous on KA-6 tankers. Instead of proceeding through an air refueling initial point as Air Force aircraft do, they approach the air refueling cell from any direction. They generally view the tanker cell from a side view and plan to rendezvous with their respective tanker at or just below their refueling altitude. Due to these established procedures, they felt it was inherently unsafe to have the tankers at 500-foot intervals. Upon the insistence of 17th Air Division (Provisional) planners, they agreed to conduct all rendezvous at an altitude 1,000 feet below the lowest tanker in the cell in accordance with Air Force Regulations. Upon attaining visual contact with the tanker cell, the receivers would climb and join their respective tankers.



In the foreground, an A-6E provides fuel from a "buddy store" for an A-7E, while in the distance, an EA-6B receives fuel from an Air Force KC-135E.

Initially, the air refueling tracks consisted of an anchor at each end. These anchors were built with fifty-nautical-mile legs (as per Air Force regulations). During Desert Shield, numerous air refuelings were accomplished with naval receivers in tanker cells. On several occasions, the naval receivers complained that they had trouble finding the tankers orbiting in a twenty-by-fifty-nautical-mile anchor pattern and missed refueling even though the tanker cell was in the assigned orbit. The tracks were later modified to include pre- and postanchors with thirty-nautical-mile legs. Even when the legs were shortened to thirty nautical-miles, naval message traffic included complaints about the size of the anchor pattern and the difficulty of locating the tankers. The final solution was to shorten the anchor leg length to twenty nautical miles. All pre- and postanchors were reduced in size to twenty-by-twenty nautical miles and tested in Imminent Thunder, a joint multinational exercise conducted in December 1990. Positive comments from the Navy carrier groups concerning the new track construction resulted in the modification of all Desert Storm tracks with anchor orbits to the twenty-by-twenty-nautical-mile anchors.[47]

AWACS

The AWACS aircraft plays a critical role in the employment of Allied combat aircraft. Designed to provide early warning of airborne threats, the AWACS also provides controlling instructions to friendly aircraft. While not a complete air traffic control facility, it can provide limited flight-following and avoidance information. During Desert Storm, the AWACS was heavily involved in the detection, acquisition, and downing of enemy aircraft by Allied air-to-air systems. It provided command and control as well as real-time threat advisories to attacking Allied aircraft and assisted in the assembling of strike forces before border crossings.

Air refueling and airspace deconfliction was an integral part of strike force assembly. Because of the heavily congested airspace over the Saudi Arabian peninsula and the criticality of air refueling to the overall air campaign, a joint agreement between the SAC planners in theater (STRATFOR) and the USCENTAF staff placed a tanker representative on the airborne command element (ACE) team aboard the AWACS. The ACE team, commanded by an Air Force colonel, was the USCENTAF Commander's airborne command element charged with carrying out real-time changes to the air war as well as providing overall guidance to airborne Allied aircraft. The tanker representative–an individual familiar with air refueling procedures and the current ATO being executed–on the ACE team could provide AWACS controllers with guidance on the best responses to air battle changes and to requests for emergency air refueling.

ACE tanker representatives provided critical input to the successful execution of the air war. They advised the AWACS controllers on the movement of air refueling sources, provided threat advisories to the tanker crews, repositioned tankers for air refueling returning strike forces low on fuel, supported attacking aircraft missions generated on short notice because of real-time changes in the war, and planned fuel requirements for aircraft involved in the search and rescue of downed Allied aircrew members. They also provided input to the tanker planning pro-

[47] *Ibid*, p 6-6.

cess by reporting on actual utilization of air refueling assets, thereby improving the assignment of tankers in the ATO process.

A source of confusion during Desert Storm centered on the AWACS' capability, or lack thereof, to function as a complete air traffic controller facility. Because the AWACS could view a large part of the air war with its radar, and because procedures were established for the tactical checking of aircraft, many tanker aircrews believed AWACS was functioning like an air route traffic control center in the CONUS. Limitations to the AWACS radar and computational capabilities plus the workload of the onboard personnel do not allow the AWACS to function as an air traffic controller facility. In some instances, tanker crews, mistakenly believing they were under full radar coverage and flight-following protection, had near mid-air collisions with other Allied aircraft. In most of these cases, the other Allied aircraft were not being viewed on the AWACS controller's radar scopes. An intensive educational process began to instruct tanker crews that even though they were being tracked by the AWACS, the system offered only a limited veil of protection.[48]

Radio Communications

Tanker radio configuration posed some communication problems in the theater of operation. The KC-135 deployed with two ultra high-frequency (UHF) and one high-frequency (HF) radios. Once in theater, one of the UHF radios was temporarily replaced with a very high-frequency (VHF) radio. The VHF radio was installed to facilitate communications with air traffic control facilities in the theater and surrounding areas. Following installation of the VHF radio and removal of the second UHF radio, the problem became one of too few radios with too many frequencies to monitor. An example of commonality problems surfaced with the Navy and involved the need for two UHF radios on each KC-135. Navy fighters do not have VHF capability. Without two UHF radios, the tankers could not arrange rendezvous with the Navy fighters. The prime UHF radios of the tankers were dedicated to conducting air refueling operations. No other type of communications could occur on the air refueling frequency for safety reasons. (The second UHF radios were later re-installed, and permanent VHF radios are now being installed on all U.S. KC-135s.)

[48]DS/DS Tanker Assessment, p 6-7.

VHF radios did improve tanker radio reception range. However, AWACS had only two VHF radios from which to broadcast. This made communications with AWACS difficult during time-sensitive periods. SAC bomber aircraft did not possess VHF capability either and were unable to communicate with foreign air traffic controllers; therefore, tankers were used to relay bomber clearances.[49]

KC-10 VS KC-135

The majority of the probe-equipped fuel receiver aircraft community prefers the KC-10. The drogue and basket assembly on the KC-10 features a longer hose and a softer basket as compared with those of the KC-135. During Desert Shield and Desert Storm, a large number of receivers requested KC-10 rather than KC-135 aircraft. The limited number of KC-10s in theater were used for long-station-time and large offload requirements. Therefore, only a limited number of KC-10s remained for allocation to those who *wanted* a KC-10 refueling rather than to those who *needed* a KC-10 refueling. Following the extensive program to train Navy receivers in using the KC-135 tankers for refueling, the "requirement" for KC-10 refuelings dropped dramatically as pilots overcame their preconceived prejudices. Follow-on examination of soft basket and longer hose drogue equipment and the benefits of additional tanker and receiver training may indicate potential solutions to the KC-10 versus KC-135 issue.

Allied Receiver Aircraft

Saudi E-3 (AWACS) and F-15 aircraft were air refueled throughout the entire operation. The U.S.-made aircraft were certified to air refuel with both the KC-135 and KC-10. Additionally, Saudi air crews maintain proficiency in United States Air Force air refueling procedures. Other aircraft requesting air refueling included Egypt's F-4, F-16, and Mirage 2000; UAE's Mirage 2000; Italy's IDS Tornado; Oman's Jaguar; United Kingdom's VC-10; and Canada's CF-18, of these, only the U.S.-made F-4, F-16, and CF-18 aircraft were certified for air refueling with United States Air Force tankers.[50]

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[49] *Ibid*, p 8-3.

[50] *Ibid*, p 8-6.

Receiver Certification

Receiver aircraft are normally certified to air refuel with U.S. Air Force tankers in a test process conducted by Air Force Systems Command. Certification results in validated air refueling procedures published in both SAC tanker and receiver air refueling manuals. Certification consists of a technical assessment of the tanker and receiver fuel systems, including the compatibility of tanker and receiver offload and onload systems, i.e., probe and drogue. The assessment determines if flight testing is required. In some cases, certification is based on flight test data for previously cleared aircraft, and additional flight testing is not required. The certification procedure for foreign receivers is funded by foreign governments through foreign military sales (FMS).

Legal Issues

Two options are available to refuel foreign receivers legally. In both cases, the receiver aircraft must be certified to air refuel with U.S. Air Force tankers. First, SAC can provide air refueling under a current FMS agreement written specifically to include air refueling. Second, SAC can provide air refueling under the 1986 Air Force-approved "Concept of Operations for USAF Air Refueling of Foreign Military Aircraft in Joint Exercises." The concept permits air refueling during combined exercises to ensure compatibility among Air Force tankers and Allied aircraft. It does not address Allied air refueling in an actual contingency or crisis and imposes restrictions on Allied receivers participating in an exercise. In an exercise, Allied receivers must have a valid requirement for U.S. air refueling and must refuel on a noninterference basis. Allied pilots must be current and qualified in U.S. Air Force procedures. No initial or requalification training may be provided. The foreign government must pay for or provide the fuel offloaded.

Neither option satisfied the requirements of Desert Shield. The exercise guidelines were too restrictive to allow timely training and subsequent support of Allied aircraft in Desert Shield. The certification process is both expensive and time consuming when conducted under FMS agreements.

Joint Staff Guidance

On 2 October 1990, Hq SAC/DO requested that Hq USAF/XOO clarify U.S. policy on Allied air refueling with a view towards providing USCINCCENT maximum operational flexibility in supporting Allied air refueling requirements for Desert Shield. On 17 October 1990, SAC requested that USCINCCENT/CCJ3 bring the operational requirement for Allied air refueling to the JCS' attention and request assistance in resolving policy issues preventing or limiting U.S. support to Allied receivers. On 20 October 1990, USCINCCENT requested that the JCS provide guidance to allow both air refueling training and operational support of Allied receiver aircraft. In November, the JCS authorized USCINCCENT to conduct air refueling operations with aircraft of Allied, GCC, and friendly nations in order to meet Desert Shield operational requirements. The following guidance was provided:

1. Potential liabilities must be addressed through a memorandum of understanding or other acceptable agreement.

2. Qualification/currency, briefings, and inflight procedures must be in accordance with Air Force regulations and manuals.

3. Allied forces must pay for U.S.-owned fuel offloaded to Allied aircraft.

After the JCS authorized Allied air refueling, USCENTAF began limited air refueling operations with Allied receivers who had not been previously cleared. The Assistant Secretary of Defense (ASD) issued a limited air refueling clearance for the Omani Jaguar and Egyptian/UAE Mirage 2000 on the basis of technical assessments. These receivers were restricted to eighty percent fuel capacity because of incomplete data on their fuel systems. Additionally, the receivers were restricted to daytime air refueling because of their inadequate aircraft lighting. ASD issued an unrestricted clearance for the Italian IDS Tornado on the basis of previous flight test results provided the identical German IDS Tornado and unrestricted air refueling were involved in the tests. The initial assessment of the British VC-10 required inflight testing. Flight testing was never initiated and VC-10/USAF tanker air refueling was never conducted.[51]

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[51]*Ibid*, p 8-7.

Allied Interoperability

The restrictions and delays involved in certifying Allied receivers and conducting subsequent air refueling operations impaired SAC's ability to provide timely support of joint and combined contingency operations. The FMS process is slow and requires Allied governments to pay all costs associated with the certification effort, even though certification is mutually beneficial. Coalition air warfare would have been better served if certification and training efforts of Allied receivers had been conducted in peacetime. Air refueling support of Coalition forces is vital if Coalition allies are going to play a major role in the next air campaign. The Air Force should pursue certification of Allied receiver aircraft, particularly French and British, to ensure interoperability in a future crisis.

Fuels: JP-5 Versus Jet A-1

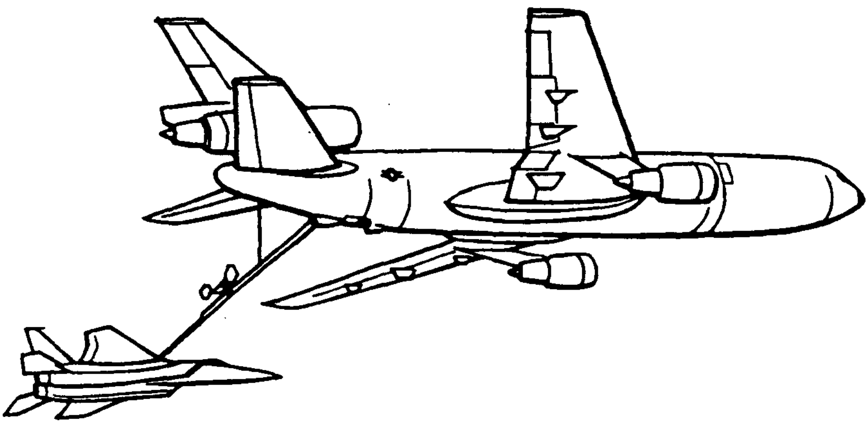
The U.S. Navy uses JP-5 fuel, which has a less volatile flashpoint than Jet A-1, the fuel used predominantly by the U.S. Air Force during Desert Shield and Desert Storm. The less volatile JP-5 meets U.S. Navy carrier operation safety standards whereas Jet A-1 does not.

Concentrated efforts to fulfill requests for JP-5 to Navy aircraft were often negated by operational realities. In several instances, requests for Navy support were received too late to purge tanks and load JP-5. Jet A-1 was available at all locations within the AOR. However, Al Dhafra and Cairo West, which provided significant naval support, did not have a supply of JP-5. Logistically, JP-5 was difficult to provide because it had to be trucked in from Alexandria and offloaded where tankers were located. Stock on hand was supplemented by establishing bladders, but the real limitation was resupply time–which dropped to less than a day at some locations during the height of the air war. A supply of JP-5 was introduced in the theater for the air refueling of carrier-based aircraft. JP-5 was available at Seeb and later at Jeddah. Operationally, Navy receivers onloaded any type of jet fuel available, including Jet A-1; then, if necessary, they corrected the flash point problem once back on the carrier (i.e., they dumped it over the side).

The use of various fuels [Jet A-1 (JP-8), JP-4, JP-5] is a safety issue on the agenda of the Navy-Air Force Board as well as a concern of the Environmental Protection Agency, which prefers Jet A-1 because it evaporates faster. The National Transportation Safety Board is also involved and prefers JP-5 because of its greater safety margin.

Summary

Desert Shield and Desert Storm refocused attention on the tremendous value and contribution of the tanker force to U.S. and Allied worldwide military operations. U.S. tankers refueled both U.S. and Allied receivers using boom/receptacle and probe/drogue configurations. At first, receiver certification and other legal issues limited U.S. tankers in providing international refueling support. Then, flexibility in tanker-receiver scheduling was increased through extensive training efforts during Desert Shield. Differences in fuel requirements posed some problems and specific fuel requests could not always be supported. Tanker placement in theater often made economic transport of some fuels to specific operating locations difficult, particularly on short notice. Multipoint refueling capability could have enhanced scheduling flexibility in a few situations; however, the tanker force, as configured, was able to support the air operations successfully, both in theater and between the CONUS and Southwest Asia. It is imperative that tanker aircrews, as well as their command and planning staffs, continue to receive training that includes worldwide operations.



6

Arming the Force

The Munitions Story in Desert Shield and Desert Storm

At the start of Desert Shield, a few older technology munitions were prepositioned in the area of responsibility (AOR). However, they were not at the location of the arriving operational units, and little airlift was available to move them. Total munitions requirements were unknown at that time because no agreed-to plan existed, and the size and mission of the force was changing rapidly. The movement of additional munitions to the AOR relied on a transportation system already heavily taxed with moving the operational units, and few places were available to store the munitions once they arrived in the AOR. These were the challenges facing men and women involved in arming the force. After the war, General Horner described the situation as:

> Initially our biggest problems from a logistics standpoint were munitions, fuels and bare base . . . but these were caused by the speed with which our fighter units deployed. We began the deployment under the auspices of one plan, . . . within the first day we switched to a second plan . . . and then abandoned all previously developed contingency plans and constructed one as we went along.[1]

Some 5,500 Air Force munitions personnel deployed in the AOR, and nearly 18,000 munitions personnel throughout the Air Force ultimately supported the Gulf War activity.[2] The Air Force alone used over thirty kinds of munitions in Operation Desert Storm. U. S. Naval Air used nine varieties, and U. S. Army aviation units added thirteen to U. S. totals. Coalition air forces additionally employed some twenty-six unique types of their own munitions. Munitions is a collective term that includes:

[1] Lt Gen Charles A. Horner USAF, Commander CENTAF, Article: Desert Shield and Desert Storm: An Overview. Air Power History, Published by Air Force Historical Foundation, Virginia Military Institute, Lexington, VA 24450, Fall 1991, p 6.

[2] Intvw, Col J. A. Cyr, AF/DPXC, 20 Apr 1992.

bombs, "dumb" or conventional unguided bombs, cluster bomb units, "smart" or precision-guided munitions, air-to-air and air-to-ground missiles, and special operations munitions. A great variety of specific nomenclature, such as MK-82 and M117, was involved, and the nomenclature is essential to a description of the complexity of arming the force. Therefore, Table 18 provides a brief description along with common government nomenclature of munitions items that were used against Iraqi targets during Operation Desert Storm.

Table 18
Munitions Nomenclature and Description

General Description	Item Designation	Comments
Air-To-Air Missiles	AIM-7	Radar
	AIM-9	Infrared
Air-To-Surface Missiles	AGM-45	Shrike, antiradiation
	AGM-65	Maverick
	AGM-88	Harm antiradiation
20 mm Gun ammunition	M61A1	Vulcan cannon
30 mm Gun ammunition	GAU-8	Avenger Cannon
General Purpose	MK-82 Low Drag	500-pound
	MK-83 Low Drag	1,000-pound
	MK-84 Low Drag	2,000-pound
General Purpose	MK-82 Air Retard	500-lb high speed, low altitude delivery
	MK-84 Air Retard	2,000-lb high speed, low altitude delivery
	M117 bombs	750-lb Low Drag
	M117 Air Retard	750-lb high speed, low altitude delivery
Cluster Bomb Units (CBUs)	CBU-52	Incendiary/frag bomblets
	CBU-58	Incendiary/frag bomblets
	CBU-71	Incendiary/frag bomblets
	CBU-87	Light armor/anti-personnel
	CBU-89	Antitank/antipersonnel

Table 18 (Continued)
Munitions Nomenclature and Description

General Description	Item Designation	Comments
Combined Effects Munitions (CEMs) Rockeye	MK-20	Anti-armor cluster bomb
Precision-Guided Munitions (PGMs) also called laser-guided bombs (LGBs)	GBU-10	MK-84, 2,000-pound w/laser guidance and control
	GBU-12	MK-82, 500-pound w/laser guidance and control
	GBU-10 (I-2000)	BLU-109 w/improved penetration
	GBU-24	MK-84 low-level laser guidance
	GBU-27	BLU-109 for F-117A
	GBU-28	Hard target penetrating munition
	GBU-15	Modular guided with either electro-optical or infrared capabilities
Conventional Air-Launched Cruise Missile	CALCM	B-52-delivered cruise missile w/conv warhead
UK-1000	UK-1000	Runway cratering bomb built by British

Background

The munitions support story for Desert Shield and Desert Storm begins during the Carter Administration. In 1979, President Carter announced the doctrine of the Rapid Deployment Force (RDF) to be used to meet contingencies anywhere in the world. The announcement signalled the start of policy development and programmatic actions that ultimately led to negotiations with the Omani Government establishing munitions storage depots in that nation and at Diego Garcia, a British-owned island in the Indian Ocean about 3,000 miles from the AOR. The Air Force was tasked to identify munitions stocks for the storage areas.[3] The first U.S. Air Force munitions were positioned and stored in the Persian Gulf in

[3](S) Intvw, Ms. Bev Hooper, AF/LGSP, 25 Mar 1992.

support of Central Command (CENTCOM) missions in October 1983. These were existing munitions, since new funds had not been appropriated for additional munitions stocks for that theater.[4] As a result of State and Defense Department negotiations with the Omani government, three munitions depots were established at Thumrait, Seeb, and the former Royal Air Force post at Masirah.[5] Initial munitions for the new depots came from excess stocks of the primary warfighting commands, U.S. Air Force Europe (USAFE) and U.S. Air Force Pacific (PACAF), and thus did not include "preferred" munitions. Also, the State Department and the Defense Department jointly decided that the latest technology weapons would not be placed in the Persian Gulf region for security and safety reasons.[6]

The Reagan and Bush administrations continued and expanded the RDF doctrine for the Persian Gulf region with the advent of Afloat Prepositioned Ships in Southwest Asia. The ships were to be loaded with both Army and Air Force munitions stocks when the Congress approved funding.

Initial Stages

Taskings, developed in support of the RDF for U.S. Air Forces, led to the deployment of 48,325 short tons of munitions in theater before Desert Shield. Approximately 11,993 short tons were stored at permanent explosives storage locations in Diego Garcia and Oman, and 36,322 short tons of munitions were located on three prepositioned ships [DELETED].[7]

These prepositioned stocks within the U.S. Air Force, Central Command (CENTAF) arena were primarily iron bombs, unguided MK-82 (500-pound) and MK-84 (2,000-pound) bombs, Vietnam-era cluster bomb units (CBU-52/58/71s), and Vietnam-era antitank MK-20 Rockeyes.[8] The initial stocks of munitions available for combat operations did not include the

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[4](S/NF/WN) Rpt, Conduct of the Persian Gulf Conflict, Vol III, p D43-45, Jan 1992.

[5](S) Rpt, Conduct of the Persian Gulf Conflict, Vol III, p D11-15, Jan 1992; and (S) Ltr, Review of TAC History Draft, 12 Jul 1991.

[6](S) Intvw, Ms Bev Hooper, AF/LGSP, 2 Apr 1992.

[7](S) Briefing, Lt Col Brad Christy, Ammunition Control Point (ACP), subj: "USAF Global Asset Prepositioning," undated.

[8](S) HQ TAC History (Munitions Support Annex) Draft, 12 Jul 1991, p 2.

newer precision-guided munitions except for the GBU-27 ordnance the deploying F-117As ferried with them.[9] Tactical forces were deployed to the AOR with air-to-air self-defense missiles (AIM-7s and 9s).

The following table shows the items stored on the ground in Oman and aboard the prepositioned ships before Desert Shield. All numbers are in complete rounds.

Table 19
Munitions at Prepositioned Storage Locations
In CENTAF Prior to Desert Shield[10]

	Location			
Munition	[DELETED]	[DELETED]	[DELETED]	**Afloat**
MK-82 General Purpose	6,372	2,520	6,000	27,000
MK-84 General Purpose	500	360	900	5,302
GBU-12 PaveWay II	630			
GBU-10 PaveWay II	500			
M117				12,090
MK-20 Rockeye	400	800	1,000	1,237
SUU-30 (CBU 52/58/71)	1,299	730	1,200	12,830
MJU-2				24,412
RR-170 Chaff		100K	46K	500K
MJU-7 Flare			4,000	
30 mm CPX		100K	500K	
20 mm HEI		100K	415K	2.5M
Durandal	780			

[9](S) Intvw, CENTAF/LGW, 15 Apr 1992.

[10]CENTAF Master Storage Plan 1-89, CENTAF/LGW; confirmed by MSgt Reed, CENTAF LGW for Oman figures. (S) AF/ACP MSG 110235Z Aug 1990, subj; Saudi Deployment Ammunition Availability on Prepo Ships, source for Afloat numbers.

These munitions and components had been maintained for several years by contractor and Air Force personnel. When Operation Desert Shield was initiated, the munitions were found to be fully serviceable and combat ready, having been inspected and renovated over the years of storage by CENTAF personnel and civilian contractors.

Figure 43 shows the relative positions of munitions storage locations in Oman and aboard the three prepositioned ships prior to Desert Shield.

As the CENTAF forces were bedded down, prepositioned munitions had to be pushed forward to support those forces. Air Force personnel moved to the forefront of early munitions support operations as they began emptying the Omani depots. The first forward shipment took place on 10 August 1990 when 1,000 MK-82 bombs were sent by truck to Al Dhafra. Air Force personnel also assisted with downloading munitions from prepositioned ships at ports throughout Southwest Asia, an effort that began on 24 August 1990. They also participated in the early line-haul distribution of munitions assets to beddown locations for the tactical forces.[11]

Additional initial munitions for the AOR forces were to be provided through the standard air munitions packages (STAMP) and standard tanks, racks, adapters, and pylons packages (STRAPP) airlifted to tactical fighter locations. The STAMPs and STRAPPs were designed and built to move critical munitions components, bomb "bodies," and supporting munitions handling gear rapidly to bare base fighter operational areas to support specific aircraft, such as the F-16 and F-15E.

STAMP and STRAPP had been configured to fit within C-141 wartime cargo weight limits. By 11 August 1990, the Ammunition Control Point had identified 58 C-141 sorties to move the standard packages to the Gulf region.[12] Problems arose when the Military Airlift Command (MAC) Deputy Commander for Operations allowed only peacetime cargo weight limits for Desert Shield operations. Peacetime cargo limits were used

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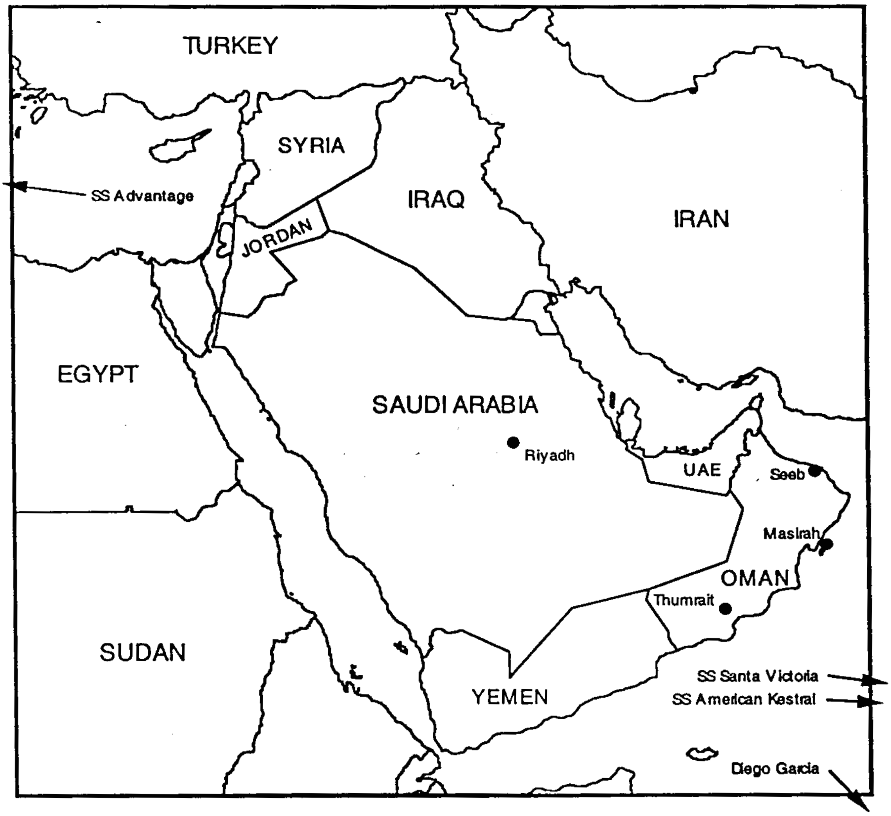
[11](S) Intvw, CENTAF/LGW, 15 Apr 1992.

[12]*Ibid.*

Figure 43
Munitions Storage Locations Prior to Operation Desert Shield



because in-flight air refueling was not available and there was concern with structural problems in the C-141 wing. This necessitated reconfiguration of pre-packed pallets before shipment.[13]

Munitions were also carried to the Gulf on Civilian Reserve Aircraft Fleet aircraft. When this occurred, all STAMP/STRAPP packages had to

[13](S) Rpt, AF/ACP Report to GAO on Munitions Ops, Jan 1992, p 8.

MK-82 500-pounders are off loaded before they are armed (above); 500-, 1,000-, and 2,000-pound bombs are moved to newly constructed earthen berms (below).

be torn down and reconfigured to comply with height and cube dimension requirements for the civilian aircraft.[14]

In addition to the forces going to the Arabian peninsula, Strategic Air Command (SAC) employed twenty B-52Gs to Diego Garcia, British Indian Territory, in early August for interdiction and point target missions.[15] SAC was initially directed to load ten B-52Gs with M117R (retarded-fin configuration) 750-pound bombs and maintain a battlefield air interdiction role in CENTAF.[16] The order created a major task for munitions logistics operations, since the Diego Garcia munitions organization initially reported only 2,870 M117R bombs available as of 15 August 1990.[17] [DELETED] As Desert Shield progressed, the concern at Diego Garcia centered on having initial stocks of 750-pound bombs and CBUs to supply incoming forces. As a result of the conventional ordnance shortage at Diego Garcia, the initially deploying B-52s from Loring AFB, Maine each carried 45 M117R bombs on the 20-hour deployment mission.[18] To further assist in getting more munitions to Diego Garcia, SAC ensured that bombers departing from Andersen AB in Guam were loaded with either CBUs or M117 bombs.[19]

As Desert Shield continued to unfold in late August, SAC asked USCENTAF to institute plans for using cluster bomb units, specifically CBU-58s and CBU-89 Gator mines.[20] CBU-58s were most effective against enemy personnel or light armor concentrations, whereas the CBU-89 could "disrupt, delay, or channel the movement of hostile forces."[21] SAC munitions supervisors advised that the B-52 could carry as many as fifty-one CBU-58s and up to thirty CBU-89s per aircraft. Obvious to both SAC and the Air Force Ammunition Control Point, the numbers of munitions

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[14](S) Intvw, Maj Keller, Cmdr, 2701 Muns Maint and Test Sqdn, Hill AFB, UT, 12 Mar 1992.

[15](S/NF/RD) HQ SAC History, 1 Jan thru 31 Dec 1990, p 182.

[16]*Ibid*, p 200.

[17](S) Msg 4300BW(P), 150330Z Aug 1990, subj: EARFLAP to HQ AF/LRC, SAC/BS, and AF/ACP.

[18]*Ibid*, p 197.

[19](S) Rpt, SAC History for 1990, pp 462-463.

[20]*Ibid*, p 205.

[21]*Ibid*.

capable of being carried on the B-52 had significant impact on getting large numbers of munitions into Southwest Asia. SAC's initiative became a precursor to significant air movement of critically required B-52 ordnance as additional B-52 forces received host nation beddown approval and were deployed from November 1990 through January 1991.

As Desert Shield activities increased, concerns were voiced in Hq U.S. Air Force Battle Staff meetings with the Chief of Staff on the status of critically required munitions within the Gulf region. Table 20 displays those concerns, showing amounts and specific locations of munitions.

The critical munitions, whose status was being monitored early in Operation Desert Shield, were of a defensive nature: they included air-to-air missiles, AGM-65A/B Maverick air-to-ground missiles, CBU-89 Gator antitank mines, and AGM-88 HARM antiradiation missiles. The only prepositioned "critical" munitions, either in fixed storage areas in Oman or aboard prepositioned ships, were the MK-20 Rockeye antitank weapons. The Air Force Ammunition Control Point set priorities for earliest available movement of munitions considered critical by CENTAF. However, the munitions were then placed in the transportation system where priorities were set by USCENTCOM. The munitions did not arrive in theater for up to six weeks after the requirements had been determined. While these initial actions were underway to provide immediate support to the forces, a major effort was underway to identify munitions required by the force so that they could be moved to and stored in the AOR.

Munitions Requirements

Munitions requirements are largely a function of the size of the force and the plan that estimates how that force will be used. As Desert Shield and Desert Storm progressed, force size and use changed and, as a result, munitions requirements changed. When Desert Shield began, an agreed-to plan had not been implemented, and the force structure was fluid and growing. Munitions planning factors were dictated by USCINCCENT OPLAN 1002-90 (Draft). The plan was under final review in August 1990, even as the invasion of Kuwait took place. However, Time-

Table 20
Critical Munitions Status, 10 August 1990[22]

Type	Positioned in Saudi	Oman	Prepo	Saudi FMS	Europe	Pacific	STAMP STRAPP
AGM 65A/B	0	0	0	2,527	10,409	1,496	3,016
AIM 9L/M	180	0	0	1,177	4,527	2,906	0
AIM 7F/M	180	0	0	909	1,666	1,772	0
MK 20	0	1,800	2,961	0	16,019	8,607	360
CBU 89	0	0	0	0	0	0	288
AGM 88	0	0	0	0	2,445	849	0

10 August 90

[22] (S) Brfg Slide, CENTAF Critical Munitions Status, to Chief of Staff, 10 Aug 1990.

Phased Force Deployment Data requirements had not been completed, or made available to the military Services. The lack of a final deployment plan and the need to deploy a large number of fighting units rapidly made developing a full munitions requirement list difficult.[23] The size of the force went from the 700 aircraft originally planned to over 1,200 at the start of Desert Storm. The basic mission of the force went from defense to offense, and aircraft types not planned for were deployed to the theater–e.g., F-15Es and F-117As.

As discussed previously, munitions were prepositioned in the AOR and aboard three ships in the area. They were not the most current. In some cases, the only munitions the operational units had were what they carried with them as they deployed.

The Ammunition Control Point estimated that the prepositioned munitions stocks in Oman and aboard the three prepositioned ships could sustain limited air campaign operations only for less than ten days. This estimate was based on early information on units tasked to deploy to the Persian Gulf and on the concern that few air defense (self-protection) weapons were in theater. Munitions requirements were constantly debated throughout the crisis.

While estimating requirements for the arriving forces was difficult, satisfying the requirements, whatever they were, was also difficult. CENTCOM was, very appropriately, establishing the priorities for moving items in the transportation system, and Air Force munitions were not the number one priority. The full burden of DOD activity in support of Operations Desert Shield and Desert Storm weighed heavily on the available transportation system and its capacity for moving munitions.[24] The "full court press" established at all levels of the DOD demonstrated the complexity in determining priorities for deploying munitions to the Gulf. Competition for transportation was extraordinary, and priority systems exercised in the past were burdensome and ineffectual.[25]

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[23](S) Rpt, Conduct of the Persian Gulf Conflict, Vol III, p D10-11.

[24]Rpt, "Conduct of the Persian Gulf War," Final Report to Congress, Apr 1992, p 43, file NS252.

[25]USAF/ACP report to the GAO.

Only two ports in the CONUS could load ships with munitions; similar situations existed in Europe, the Pacific, and in the AOR. The lack of appropriate loading ports created a bottleneck.[26] The transportation system continued to be overtaxed as more forces were added to the AOR in November 1990.[27]

Once munitions were in the transportation system, there was little visibility on where they were and when they would arrive at the debarkation port. Because the management information system used to track the munitions did not work well,[28] senior munitions managers did not have confidence in the inventory figures from the AOR.

The requirement for munitions continued to escalate throughout Desert Shield and the early stages of Desert Storm, creating turmoil and uncertainty for senior munitions planners and managers in the Air Force Ammunition Control Point, Air Force Logistics Readiness Center (AF/LRC), and CENTAF Rear. Their reaction appears to have been to "push" as many munitions as possible into the Gulf region to ensure continuous support. Priorities were established by USCINCCENT. In August 1990, 48,000 short tons of munitions were prepositioned in the AOR. During Desert Storm, 69,000 short tons of munitions were expended. By the time of the cease fire, 350,000 short tons of munitions were either in the AOR or en route to the AOR in support of the U.S. Air Force. At the cease-fire, forty-eight major sea going vessels were either in the AOR or en route to the AOR with Air Force munitions.

The specific requirements for each munition increased dramatically throughout Desert Shield and Desert Storm. Initially, 48,000 short tons of munitions were stored in Oman and aboard the three ships in the area. On 16 August 1990, CENTAF Rear established a seven-day requirement for the AOR (see column 1, Table 21),[29] which exceeded the prepositioned assets and the assets brought to the theater by deploying fighters (see

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[26]Conduct of the Persian Gulf Conflict Vol III, p 39.

[27](S) Rpt, Conduct of the Persian Gulf Conflict, Vol III, p App F-32.

[28]Intvw, Dakan with LC B. Swezey, CENTAF/LGW, 15 Apr 1992.

[29](S) Msg, CENTAF REAR to AF/ACP, et al, "Seven Day Munitions Requirements," 160105Z Aug 1990. This is also the source of the "on-hand" figures in column 2.

Table 21
Munitions Requirements Growth

Item	Requirement	On Hand	30 Days*	60 Days**	On Hand*	90 Days	120 Days	Amount Expended	On Hand
AIM-7	358	358	2,826	1,536	450	1,980	1,980	67	1,755
AIM-9	348	384	5,326	2,268	748	2,612	2,612	48	2,840
.50 cal						1,538.8K	1,688.8K	21,568 Rounds	3,164K
20mm	400,000	690,000	1.260K	2.575M	~674K	2,875.0K	3,075.0K	61,000 Rounds	4.6M
30mm	1,100,000	0	3.1M	7.71M	~206K	9,250.0K	10,375.0K	982,000 Rounds	1.2M
MK-82 Air	4,710	1,500	25,900	52,924	3,000	28,800	33,800	51,932	19,820
MK-82R				29,700		78,200	88,200	7,952	7,645
MK-84 Air	900	570	5,775	33,650	562	16,940	118,940	7,856	6,176
MK-84R				10,900				2,611	2,857
M117				72,220	6,928	98,380	132,220	43,435	11,973
UK-1000			500			500	500	288	
CBU-52/58/71	1,250	755	2,800	69,275	400	168.58K	224.58K	21,696	47,767
CBU-87	3,630	384	5,950	13,000	47	40,600	42,600	10,035	8,154
CBU-89	3,630	288	5,950	8,410	0	11,010	13,010	1,105	2,746
MK20	2,400	944	3,150	7,550	0	21,150	22,150	5,345	6,003
GBU-10	190	0	340	2,090	108	4,490	4,990	2,002	637

Item	Requirement	On Hand	30 Days*	60 Days**	On Hand*	90 Days	120 Days	Amount Expended	On Hand
GBU-10i						240	340	375	27
GBU-12				24		6,050	6,050	4,086	506
GBU-15						250	300	71	69
GBU-24B (MK 84)				650		1,000	1,300	284	235
GBU-24A/B (I-2000)				800		1,100	1,300	897	
GBU-27	60	192	340	1,450		1,250	1,350	739	172
GBU-28								2	
AGM-65B	1,500	360	1,350	3,500	50	3,750	3,800	1,673	2,857
AGM-65D	1,640	360	1,730	5,100	336	6,870	6,920	3,405	2,724
AGM-65G						1,300	1,400	177	377
AGM 45			1,700	64	64	784	784		64
AGM-88	1,080	1,080	3,500	2,500	381	3,120	3,220	1,067	381
BLU-82								11	
BLU-107	300	0	500	780	0				910
Conv ALCM								35	

column 2). On 21 August 1990, CENTAF Forward established a 30-day requirement for the AOR (see column 3[30]). On 29 December 1990, CENTAF Forward established a 60-day requirement (see column 4[31]). On 24 January 1991, CENTAF Forward provided their estimate of a 90-day and a 120-day requirement for the theater (see columns 5 and 6[32]). Column 7 lists the amount of each munition expended in Desert Storm[33], and column 8 shows the quantity on hand at the cease fire.[34]

Munitions Movement and Control

Compounding the efforts required in determining munitions requirements for Operations Desert Shield and Desert Storm was the need to design a munitions flow or movement program in support of deploying forces. Both AF/LRC and the Ammunition Control Point pointed out the need early in Operation Desert Shield.[35]

Significant efforts were required to determine where the munitions were, locate available transportation support from both sea and air, and cope with "throughput" factors arising because only two explosives-capable ports of debarkation from the United States (Sunny Point in North Carolina and Concord in California) were available. Munitions were transported to the Gulf from limited explosives port facilities in the European Command (EUCOM) and the Pacific Command (PACOM), and the resultant flow from all sources descended on the Gulf's extremely limited and over-burdened ports of debarkation facilities.[36]

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[30](S) Msg, USCENTAF FWD/LG, "projected Munitions Requirements," USCENTAF FWD/LG to AF/ACP, et al, 211356Z Aug 1992.

[31](S) Msg, USCENTAF FWD/LG, USCENTAF Munitions Rqts, USCENTAF/LG to USCENTAF REAR, AF/ACP, et al, 291509Z Dec 1990.

[32](S) Msg, USCENTAF/LG/DO, "Projected 90-day and 120-day Muns, CENTAF/LG/DO to USCENTAF REAR, AF/ACP, et al, 240615Z Jan 1991.

[33]Based on EARFLAP reports completed by AF/LGMW and input from the Ammunition Control Point.

[34]Brfg, AF/LGSP, Munitions Consumption, Operation Desert Storm, 17 Mar 1992.

[35](S) Msg, USAF/ACP 110310Z Aug 1990; and (S) Msg, USAF/LRC 11120Z Aug 1990.

[36](S) Msg, USAF/ACP, response to GAO questions on munitions support to operation Desert Storm.

The problems associated with munitions transit to ports of embarkation complicated munitions movement activities throughout both Desert Shield and Desert Storm.[37] Within U.S. Air Force Europe (USAFE), three major munitions depots were involved in supporting Desert Shield and Desert Storm: Royal Air Force Welford in the United Kingdom, Camp Darby in Italy, and Morbach in the Federal Republic of Germany. Each of these depots reported major problems with moving explosives over local roads and rail lines to ports, as well as problems with local national drivers accepting the responsibilities of handling munitions shipments.[38] A shortage of explosives-capable semitrailer trucks and experienced drivers in the United States also stymied movement of munitions to the two explosives-capable port facilities in the United States: Sunny Point in North Carolina and Concord in California.[39]

Getting munitions to the Persian Gulf area to support CENTAF was a prime consideration of the logistics community throughout Operations Desert Shield and Desert Storm. Figure 44 shows locations within the United States from which Air Force munitions were shipped to ports of embarkation on both U.S. coasts.

Figure 45 depicts the movement of munitions throughout Operations Desert Shield and Desert Storm.[40]

Original planning factors for a CENTAF air campaign included approximately a forty-five-day "trip" to the Gulf.[41] That length of time as Desert Shield unfolded proved to be far too optimistic. The munitions community found that the movement of munitions from U.S. storage locations to the Gulf required from fifty-five to seventy-two days under optimum conditions; in many cases, it took that long to get munitions to the Gulf explosives port, not the intended destination in theater.[42]

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[37](S) Msg, HQ USAFE, 161800z Sep 1990.

[38]*Ibid.*

[39](S) Rpt, USAF/ACP to GAO, Jan 1992.

[40]Chrt, Movement of muns in DS/DS, AF/ACP, 2 May 1991.

[41](S) USCINCCENT OPLAN 1002-90 (Draft).

[42]Rpt, USAF/ACP to GAO, "Munitions Activity in SWA," Jan 1992.

Figure 44
United States Munitions Storage and Port Locations

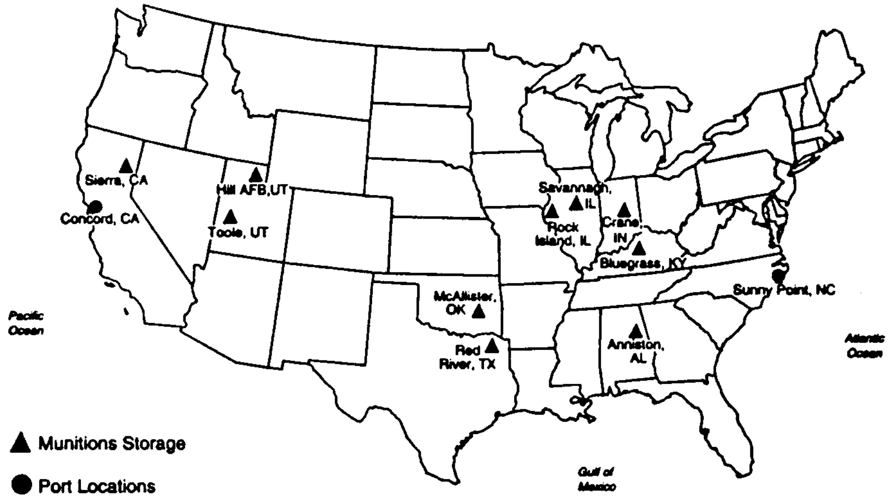
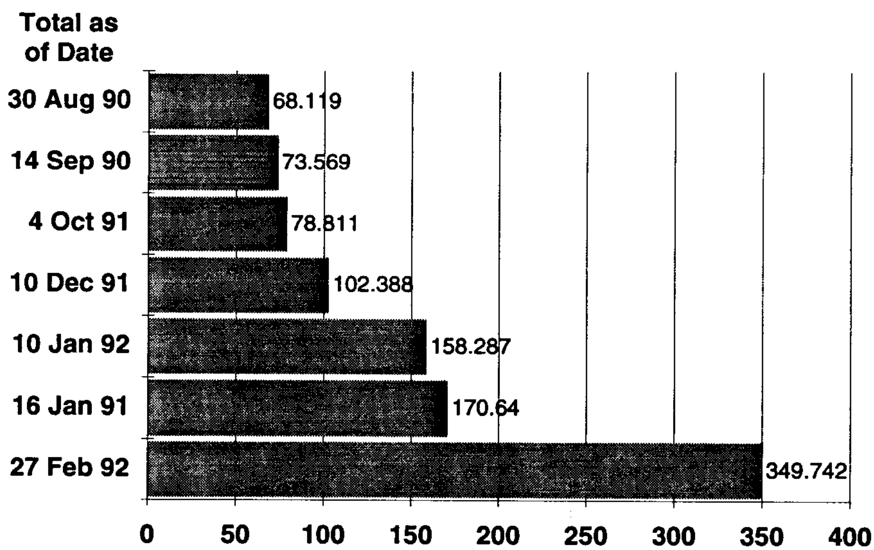


Figure 45
Total Munitions Tons Deployed



Munitions movement within the Gulf was also difficult and required exceptional management actions. Dealing with host nation drivers and vehicles was complicated, involving centuries-old distrust and national security concerns among the countries of Oman, United Arab Emirates, and Saudi Arabia. To solve the problem, the CENTAF Director of Logistics was afforded C-130 intratheater airlift to move critically short munitions and component stocks to Gulf locations.[43] During the Gulf War effort, 32,000 short tons were shipped by tactical air and 49,000 short tons were line-hauled to points of intended use.[44]

An accurate accounting of munitions components was the key to understanding what munitions were on hand at operational locations. Unfortunately, the accounting had to be done manually by arriving personnel, since an accurate, automated munitions counting system was not available to the in-place forces in Desert Shield.[45]

The Combat Ammunition System (CAS), an automated management information system being developed by the Standard Systems Center at Gunter AFB in Alabama, had not been developed sufficiently to be of value to the munitions community during the Gulf War. As a result, manual accounting procedures were instituted in the Gulf region as well as locally developed data base systems on personal computers brought into the theater. Although CAS had been implemented at Tactical Air Command (TAC), USAFE, and PACAF, the data provided were not accurate and did not assist in tracking the worldwide munitions inventory. As a result, inventory tracking of munitions components throughout Desert Shield and Desert Storm was done manually, resulting in inaccuracies in reported inventories, poor tracking of munitions in transportation channels, and lack of credible munitions information for senior Air Force managers.[46]

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[43](S) CENTAF/LGW Lessons Learned, May 1991.

[44](S) USAF/ACP Report to GAO, Jan 1992.

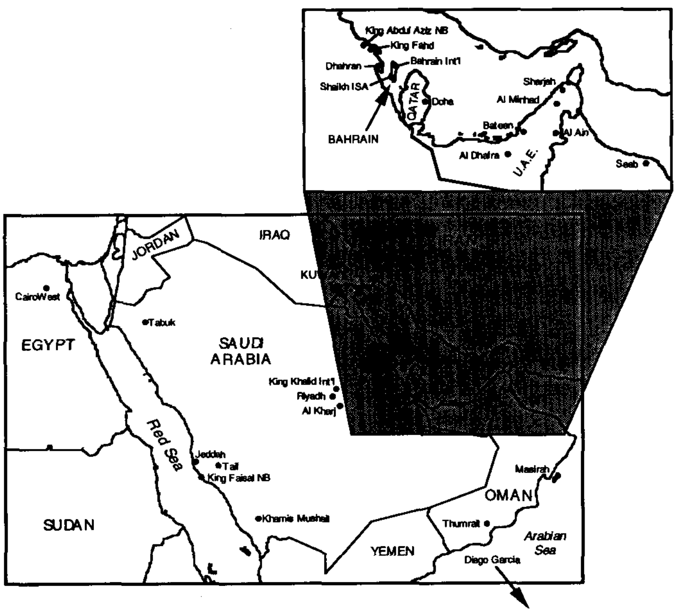
[45]*Ibid.*

[46](S) Intvw, Lt Col Brad Christy, AF/ACP, Munitions activities in the Gulf War, 13 Mar 1992; (S) Intvw, Maj Bob Lerner, CENTAF/LGW, 15 Apr 1992; (S) Intvw, Lt Col Bill Swezey, ASD/ALZ, 15 Apr 1992; (Lt Col Swezey was the senior munitions manager in CENTAF FWD during Operation Desert Shield and Desert Storm); Hq USAFE/LGW Lessons Learned, the Gulf War, undated.

Munitions Storage and Safety Conditions

Once the munitions reached the theater, there were problems in storing them correctly. Supporting the munitions operations and delivering munitions to the point of intended use within the Gulf was to be a major undertaking. Command and control issues were immediately apparent in view of initial deployment size.[47] From the original four permanent munitions storage locations in Southwest Asia (SWA) established at the initiation of operation Desert Shield to the twenty-four explosives storage locations established by the end of the air campaign, ensuring intratheater support was a major task for all involved.[48] Figure 46 shows the munitions locations in support of Operation Desert Shield and Desert Storm. Constructing and organizing new bomb dumps in the desert was a major challenge; however, Persian Gulf nations were very cooperative in providing locations for munitions facilities.

Figure 46
Munitions Storage Locations, 16 January 1991



[47]CENTAF/LGW Lessons Learned briefing, May 1991.

[48](S) Msg, CENTAF/LGW 221016Z Feb 1991.

To compensate for inadequate munitions storage capacity, a depot facility was established in the central region of Saudi Arabia in September 1990.[49] This location, known as Al Kharj, provided USCENTAF with an explosives overflow capacity of 14 million pounds of class 1.1 (mass detonating) explosives. The location, coupled with construction of munitions storage areas at Jeddah, Al Minhad, Al Dhafra, Taif, and Doha, increased Gulf munitions storage capacity to 47.8 million pounds of net explosives weight.[50]

Explosives safety became a major concern throughout the build-up in the Gulf region. Detailed explosives storage planning factors, active explosives safety training programs, and strict emphasis on technical order discipline were key factors in maintaining a low explosives mishap rate throughout Desert Shield and Desert Storm.[51] Only three reportable minor explosives incidents occurred during logistics operations. However, several munitions reliability issues came to the forefront during the air campaign. The early burst problem of the FMU-139 bomb nose fuze was the most significant in the reliability arena and is discussed later.

Explosives storage capability at most Gulf beddown locations was either nonexistent or insufficient to permit on-base storage of the required munitions stockpile. Deploying forces were faced with organizing munitions storage and accountability activities, developing flow plans and flight-line delivery functions, and organizing explosives safety programs.

Because of the nature of combat preparation, none of the new bare-base beddown locations had the required explosives storage licensing arrangements completed by the Air Force Inspection and Safety Center before accepting explosives.[52] However, CENTAF weapons safety and munitions personnel assessed proposed explosives locations, designed those locations to meet established explosives quantity distance criteria, established warehousing procedures, and wrote storage planning and training directives that included explosives quantity distance and basic weapons safety considerations. Where available, and with host nation

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[49](S) USCOMCENTAF SITREP 181800 Sep 1990.

[50](S) Msg, USAF/ACP AMMO 1 Net 282000Z Nov 1990.

[51](S) Msg, AFISC/SEW 221640Z Mar 1991.

[52]AFISC/SEW, Lessons Learned in Desert Shield/Desert Storm, Jun 1991.

approval, explosives storage locations were placed away from populated activities on base, thus decreasing explosives risks to base populations.[53]

Desert Storm

The "Air Bridge"

From the outset of Desert Shield, SAC underscored the need to have forward basing to employ conventional ordnance with maximum effectiveness. As a result, Moron in Spain, and RAF Fairford in England were ultimately chosen for additional bomber bases beyond that already established in Diego Garcia.[54] The nearly threefold increase in B-52 aircraft sent munitions requirements "off the map" in January 1991, creating special concern for sustaining Moron forces.[55]

With the heavy M117, MK-82, and CBU loads that the B-52 force was able to carry, the Air Force Logistics Readiness Center, Ammunition Control Point, USAFE Director of Logistics, PACAF Director of Logistics, CENTAF Director of Logistics, TAC Director of Logistics, and SAC Director of Logistics began a concentrated effort to provide SAC with the necessary munitions. Major sealift actions continued, and an "air bridge" was developed. C-5, C-141, and Civil Reserve Air Fleet (CRAF), aircraft transported critically required munitions to the B-52 operational units in Diego Garcia, Spain, and the United Kingdom[56] The air bridge required the concerted actions of personnel involved in processing munitions from storage areas, line hauling them to aerial ports of debarkation, and accomplishing their aerial port transfers at both points of debarkation and embarkation.[57] There were 693 sorties flown in support of the air bridge, which began on 15 January 1991 and terminated 27 February.[58]

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[53](S) Intvw, CENTAF/LGW, 15 Apr 1992.

[54](S) Rpt, AF/ACP, "Answers to GAO Questions on Desert Shield, Desert Storm," p 16.

[55](S) Intvw, CENTAF/LGW, 15 Apr 1992.

[56]Rpt, AF/ACP Answers to GAO, Jan 1992, p 16.

[57](S) Intvw, Lt Col E. B. Christy, AF/ACP, 25 Apr 1992.

[58](S) Msg, AF/ACP to CENTAF/LG and CENTAF REAR, subj: Proposed Munitions Support CENTAF, 121557Z Jan 1991.

The munitions were taken from Guam and RAF Welford because of their proximity to the CENTAF area of responsibility and the fact that U. S. port facilities were saturated. Airlift to the Gulf was necessary because: (1) the supply needs of the force applied far outstripped the supplies prepositioned and (2) the politically sensitive climate surrounding the operational bases prevented overt identification of ammunition required or shipment destination.[59]

Tempo and Training

Munitions activity was on a continuous "high." Forward operating locations were established, and redistributing munitions between depots, units, and between countries occurred on a daily basis to meet urgent operational tasking. Munitions personnel worked in 120-degree heat to meet critical mission takeoff times and to build up and deliver munitions to the flight line in support of Coalition air operations. They succeeded in the face of some of the most difficult conditions ever encountered by Air Force members, although they didn't come under fire, for the most part, and were not subjected to actual chemical or biological warfare conditions.

Training of munitions personnel involved in Desert Shield and Desert Storm paid huge benefits to the Air Force. The five and one-half months of Desert Shield afforded senior leadership a rare opportunity to hone combat skills of the heterogeneous forces ordered to Southwest Asia. Interviews with many deputy commanders for maintenance revealed that personnel from as many as forty bases would be represented in the maintenance force at one Gulf base. Thus, training that newly formed force became essential. One statistic reveals most about quality munitions training: the zero significant explosives accidents involving Air Force personnel. That safety record is directly attributed to strong supervision, demand for following appropriate technical data, and emphasis placed on quality training and quality safety practices.

A "force multiplier" in training the munitions personnel was offered by the Air Force Combat Ammunition Center (AFCOMAC) located at Sierra Army Depot in California. The Center was designed and developed as a combat-oriented, munitions production course offered to select-

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[59]*Ibid*, p 17.

ed midgrade NCOs and junior officers directly supervising munitions production operations. In the early 1980s, Lt. Gen. Leo Marquez, Air Force Deputy Chief of Staff for Logistics and Engineering, recognized that the Vietnam-experienced midlevel technicians and junior officers were leaving the Service. When nearly every Air Force base experienced problems in using live ordnance for mass munitions production, General Marquez ordered the establishment of a course designed to teach munitions combat production techniques. That course was developed, and facilities at Sierra Army Depot were offered as a location for instruction. The first class graduated in the spring of 1985, and by the time Operation Desert Shield began, nearly 3,000 students had completed the course.

GBU-28 (Hard Target Penetration Munition)

The GBU-28 Hard Target Penetration Munitions was specifically developed for Desert Storm. A need was established for a weapon with significantly more penetration power than that of the BLU-109 2,000-pound precision-guided munition. Demand increased for such a weapon and in January 1991, the Assistant Secretary of the Air Force for Acquisition surveyed organizations countrywide for ideas that could result in a quickly developed weapon for penetrating deep hardened targets. Aeronautical Systems Division worked closely with the Armament Division at Eglin AFB in Florida, the Tactical Air Warfare Center (TAWC) at Eglin, with competing contractor representatives from Lockeed, and Rockwell, and with several subsystem contractors including Texas Instruments. Around the clock operations began in both contractor and military facilities to produce the required weapon, test components, develop the explosives filler, and flight-test a weapon twice as heavy and nearly twice the length of any precision-guided munition in the Air Force inventory.

On 2 February 1991, the Secretary of the Air Force directed Quick Look operational test of the newly developed GBU-28/B.[60] The schedule was so tight that on 20 February, 1991, the bomb being used in the first

[60]Article, "War Planner: Civilians Didn't Change Target List," *Air Force Times*, 8 Jul 1992, (SD 4-16); (S/DECLASS: OADR) Msg, HQ TAC/DR to USAFTFWC/CC, et al, subj: Seek Eagle Request (SER 41-91) Delivery Info for CBU-87/89 and MK 84/82/20 with wing tanks on the F-15E Desert Storm, 232321Z Jan 1991, (SD 4-17); (S/DECLASS: OADR) Msg, TAC/CV to SAF QA, et al, subj: Desert Storm Deep Hardened Target Penetration Test, 191803Z Feb 1991, (SD 4-18); (S/DECLASS: OADR) Msg, USAFTAWC/CC to HQ TAC/DO, et al, End-of-Test Report, GBU-28/B Quick Look, 272000Z Mar 1991, (SD 4-19).

captive test was still warm from the explosive filling process. Weapon testing was accomplished at the Tonopah Test Range and at Holloman AFB in New Mexico. On 26 February 1991, the 6585th Test Group conducted a sled run to test thick concrete penetration. Earlier that same day, two "production" GBU-28s were picked up from Eglin for delivery to the 48th Tactical Fighter Wing (Provisional) in Taif, Saudi Arabia. The 431st TES F-111s Weapons Officer, a weapons loader from TAWC, and contractors from Lockheed and Texas Instruments accompanied the bomb delivery. The 431st TES aircrew member carried a VCR tape of the Tonopah test and immediately began briefing F-111 aircrews. The targets included two command and control bunkers at and near Iraq's Al Taji air base, north of Baghdad. Within five hours of delivery, on 27 February 1991, the weapons were flown into combat. The first GBU-28 hit an underground bunker it was aimed at, but only clipped its corner due to crew error in designating the wrong aim point. The second GBU-28 made the successful "hit," destroying a command and control complex containing senior staff members of the Iraqi military.[61]

The success of the GBU-28 weapon system development program resulted from rapid response, concurrent analysis and testing, a strong interaction between government and contractor agencies, and knowledgeable personnel in all aspects of the development and implementing groups. Further operational discussions of the GBU-28 are covered in the *Operations and Effects* volume of this survey.[62]

Development of the PGM

The unquestioned value of the precision-guided munition spurred the rapid development and successful employment of the GBU-28. Penetration capability had long been a desired feature of air-delivered munitions.

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[61](FOUO) Videotape, GBU-28 Hard Target Penetrator Munition, various dates (Sup Video 2); Art, "GBU-28 Desert Storm Rapid Response," *TAC Attack*, Jan 1992, p 4-7, (SD 4-20); Intvw, Donna Clark, Historian, with Maj Phillip J. Siebert, 422 TES PRO F-111, 9 Feb 1992; Art, "Pilot's Last War Mission the First for New Bomb," *Air Force Times*, 23 Sep 1991, (SD 4-21); (C/DECLASS: OADR) Msg, Det 3 ESAA/CC to DIA, et al, subj: IIR 1218 0104 90/Description of Underground Bunker Iraqi President Saddam Hussein, 231615Z Aug 1990, (SD 4-22); Art, "Powerful GBU-28 Bomb used in Iraq Made of Old Gun Barrels," Air Force Times, 3 Jun 1991 (SD 4-23).

[62](S) Intvw, Maj Wright, ASD program Manager, Kathy Douglass, ASD deputy program manager, and Art Spencer, Wright Lab (HERD), 28 Jun 1991.

Beginning in World War II, the United States gained experience in trying to destroy hardened submarine bunkers and command posts. However, the armament developers of that period had trouble developing a hardened fuze that would survive the penetration requirements and still function. The problem remained through development of the Vietnam-era precision-guided munitions.

The post-Vietnam years saw two separate developmental tracks: developing much more sophisticated delivery platforms including the F-16, the F-15E and the F-117A, and continued research on precision-guided munitions technology. The delivery platforms received commensurate congressional appropriations; for the most part, precision-guided munitions technology remained in the laboratory testing stage. Procurement monies for precision-guided weapons did not keep pace with the new delivery platforms being brought into the Air Force inventory.[63] The problem was somewhat rectified when specific procurement monies were made available for weapons deployed on the F-117A in the late 1970s and early 1980s. Additionally, congressional appropriations allowed for procurement of the improved 2,000-pound MK-84 weapon variant and associated guidance, fuzing, and control equipment in the mid-1980s.[64] Concerted efforts in procuring new munitions centered on the combined effects munitions (CEM) and the sensor fuzed weapon (SFW) in the late 1980s. The CEM became the "weapon of choice" in many Desert Storm operations; however, the SFW was still battling development problems as Operation Desert Shield unfolded.[65]

BLU-82 (15,000-pound "Daisy Cutter")

On 29 January 1991, the CENTAF Director of Logistics received a requirement from the Commander of CENTCOM Special Operations Command (COMSOCCENT), for ten BLU-82 weapons.[66] The BLU-82 is a 15,000-pound gelled-slurry-fill bomb used in Vietnam to clear helicopter pads.

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[63](S) Intvw, AF/LGSP and AF/XOOTM, 20 Aug 1992.

[64](S) Intvw, AF/LGSP, 21 Aug 1992.

[65](S) Intvw, AF/LGMW, 20 Aug 1992.

[66](S) Msg, 291530Z, Munitions Requirement, Operation Desert Storm, COMSOCCENT//SOCC//, Jan 1991.

[DELETED] The bomb is rigged with nylon webbing to a pallet and delivered by a C-130 using the parachute extraction aerial delivery system.[67]

The worldwide inventory of BLU-82 bomb cases on 29 January 1991 was forty-eight. Cases are stored empty and require premix filling before they can be used. The first two bombs were filled and airlifted on 1 February 1991. The remaining eight, to satisfy the COMSOCCENT requirement, were filled by priority contract and transported to Hill AFB on 3 February. Starting 5 February, two bombs per day were airlifted to the Gulf until eight had departed by 8 February.

Anticipating future demand for more bombs, the Ammunition Control Point began making preparations to fill and ship the remaining thirty-eight empty BLU-82 cases. On 10 February 1991, COMSOCCENT directed the Ammunition Control Point to immediately ship the five available bombs (above the ten already shipped) and take actions necessary to prepare and ship the balance of thirty-three.[68] The five bombs were shipped on 16 February. On 13 February, USCINCCENT/J3 requested that the Ammunition Control Point ship another eleven BLU-82s. The first three were ready on 22 February, and the remaining seven were ready on 25 February for airlift to the Gulf.

A total of eleven BLU-82s were expended during the war. After the war's end, seven filled BLU-82s remained in the Gulf and eight were at Hill AFB. All the remaining BLU-82s were destroyed after the war because of concern about the stability of the explosive filler.[69]

FMU-139 Fuzes

The FMU-139A/B fuze provides nose and tail fuzing for precision-guided bombs and M117 and MK-84 General Purpose bombs in high-

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[67](S) Point Paper, on BLU-82, Maj Young, AF/LEYX, 14 Feb 1991.

[68](S) Msg, COMSOCCENT/SOCJ4, Number 51, 10021/10 Feb 1991, subj: Munitions Requirements, BLU-82.

[69]Intvw, CMSgt John Delaney, 2721 Munitions Maintenance and Test Squadron, Hill AFB, 1 Apr 1992.

and low-drag releases. During Desert Storm, at least fifty-one reports of early bursts were attributed to the FMU-139 fuze. [DELETED][70]

The FMU-139A/B fuze's early burst problem was not new. Similar problems had been documented in 1988 and 1989. An attempted fix involved several human factors related to properly made cable connections and a contractor rework of the FZU-48/B power cable. The contract was awarded in December 1990. Reworked cables were to be fielded in August 1991.

The reworked cables and engineering change proposals to incorporate the human factors had not yet been fielded when the war began. As a result of the early bursts in Desert Storm, the CENTAF Chief of Munitions restricted the operational employment of FMU-139A/B-fuzed munitions and recommended the substitution of other, less desirable fuzing options.[71] CENTAF also requested that all new production fuzes and modified cables be released to it as soon as possible in order to build sufficient stock levels. Motorola began surge production of the modified cables with funds provided by Aeronautical Systems Division from Eglin AFB. The Ammunition Control Point initiated follow-on support contracts with monies provided by Air Force Headquarters. The first 5,000 cables arrived in the Gulf in only forty-eight hours. However, they were never used, since hostilities ended shortly thereafter.

Explosives Ordnance Disposal (EOD)[72]

Nearly one-third of the active-duty Explosive Ordinance Disposal (EOD) force, 320 personnel, were assigned to the Central Command AOR. EOD managers successfully integrated EOD personnel from many commands, sister Services, and host nations. The unit at Dhahran, for example, comprised disposal technicians from five Air Force Major Com-

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[70](S) Msg, 091300Z Feb 1991, Premature Detonation of FMU-139A/B Fuzes, 1708BWP/CC.

[71](S) Msg, 573, FMU-139 A/B Fuze/Cable Replacement, 1 Feb 1991, USCENTAF/LGW.

[72]Maj D. Murray, USAF HQ/USAF/CEOR Memo, 16 Apr 1992. Additional details and confirmation provided by (S) interviews with CMSgt JJ Glover, HQ USAF EOD Manager during the war, 24 Apr 1992, and Cmdr M Mathews, NAVSCOLEOD, Indian Head NAS MD, 24 Apr 1992.

mands, Britain, and Saudi Arabia. Host nation EOD personnel required extensive war-related training.

To expand ordnance clearance operations, Central Command introduced two special types of vehicles for use at high-threat bases. The first type was a munitions clearance vehicle. Twenty M60A3 main battle tanks with M9 combat engineer blades were procured from U.S. Army European depots to clear submunitions from runways and taxi surfaces. The second type was a base recovery vehicle. Thirty-seven M113A2 armored personnel carriers, topped with .50-caliber rifles, filled that role. They served as reconnaissance vehicles and a platform from which to fire at unexploded ordnance to destroy it from a safe distance.

In response to the terrorist threat in the Gulf, additional MK32 X-ray units, protective bomb suits, shields, and bomb blankets were shipped to EOD units. Production of the Andros robot for removal and safing of improvised explosive devices was also accelerated–the first four units going directly to Southwest Asia. [DELETED]

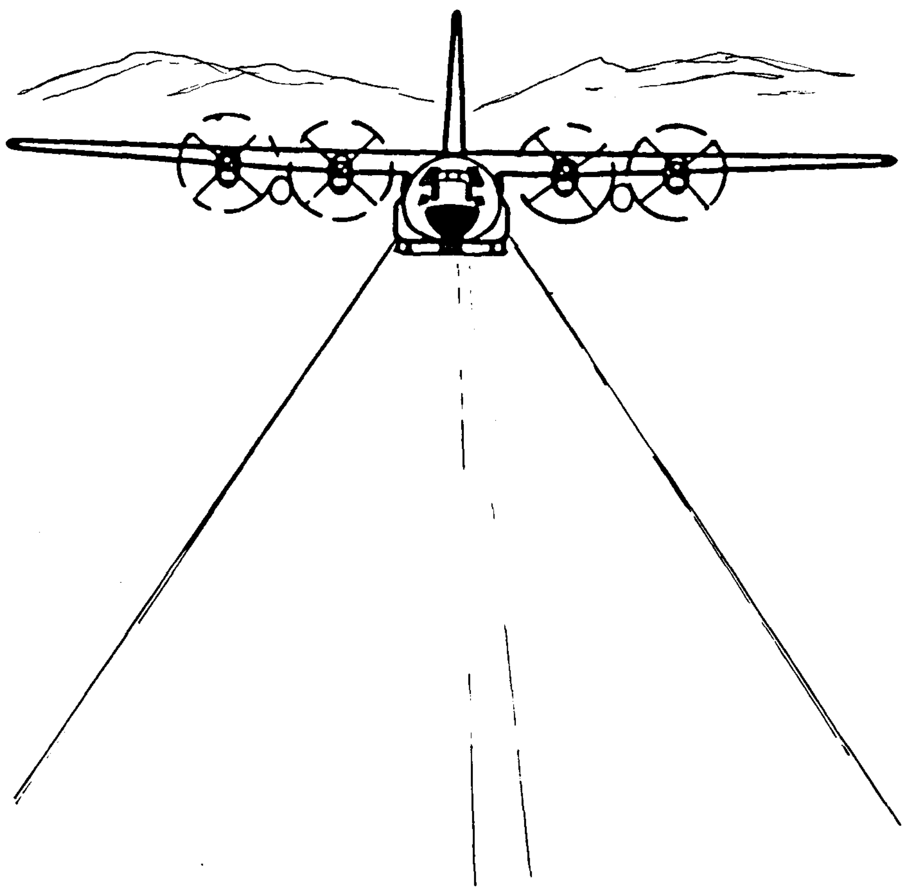
One EOD unit cleared an Air Force munitions storage area hit by an errant Army Hellfire missile. While thousands of pounds of ordnance were destroyed in the accident and the resultant cleanup activity, there were no injuries. The local Air Force EOD unit, teamed with a nearby U.S. Army unit, had the storage area cleared of hazardous ordnance items and ready for reuse in just four days.

During Desert Storm, EOD personnel responded frequently to weapon system emergencies involving combat aircraft, and, on other occasions, disposed of ordnance jettisoned from Coalition aircraft. At the request of Saudi Arabia, EOD units investigated Scud missile impact sites, recovering debris and sections of intact missiles. EOD technicians shipped several of these to U.S. intelligence agencies.

During the liberation of Kuwait City, Air Force EOD teams provided direct support to Central Command Special Operations Forces by clearing hazardous ordnance from Kuwait International Airport. The teams also cleared booby traps and hazardous ordnance from key government and civilian buildings in Kuwait City and were the first to enter the U.S. Embassy compound.

Two special EOD teams were organized on short notice to deploy with Red Horse personnel and deny the enemy use of two air bases in southern Iraq. After hazardous ordnance was cleared from runways to provide a minimum operating strip for C-130 aircraft, heavy equipment and demolition explosives were airlifted directly to the sites. Captured Iraqi ordnance, technical publications, and even the contents of the Iraq EOD school were eventually returned to the United States.

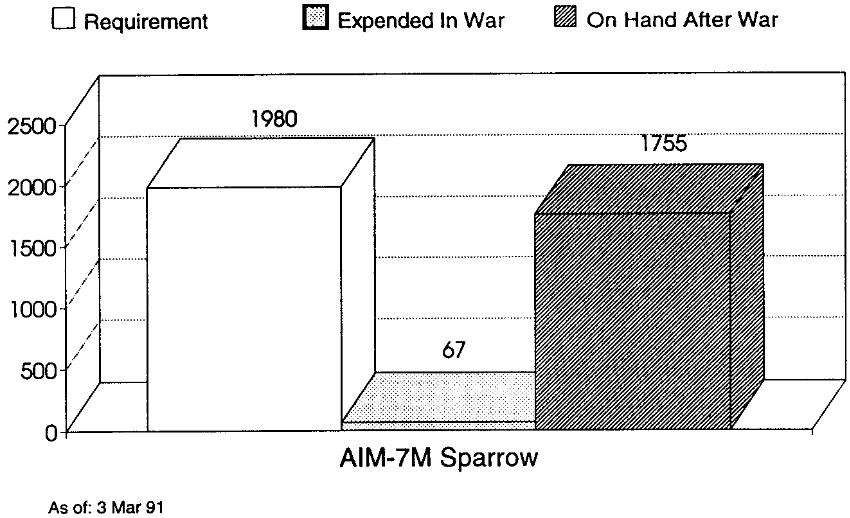
Despite the drawdown of U.S. forces in Southwest Asia, the EOD mission continued unabated for many months. Over a million items of U.S. and foreign ordnance were disposed of safely during the year after the close of Operation Desert Storm. Another posthostility mission was the inspection of Iraqi chemical and ballistic missile sites by United Nations personnel, with EOD technicians playing a key support role.



Munition Expenditures

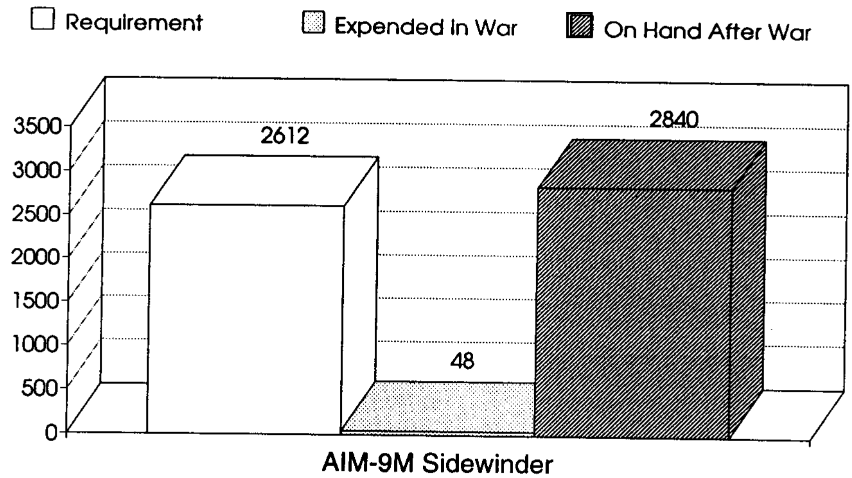
The following figures display the numbers of specific munitions consumed during Operation Desert Storm. Emphasis from the highest levels of the Air Force centered on availability and consumption of those munitions. The figures show the requirement level for munitions items before the war, consumption during Operation Desert Storm, and the Gulf on-hand inventory after the war.[73]

Figure 47
AIM-7M Sparrow Missile



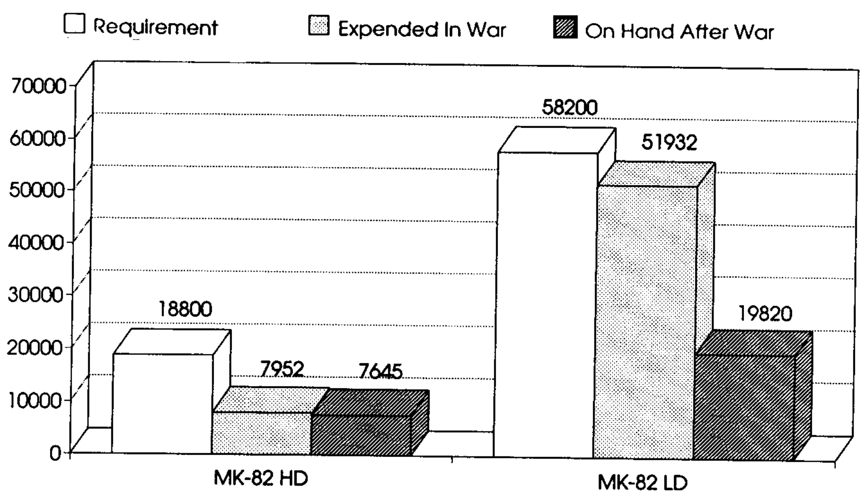
[73]AF/LGMW Briefing, Operation Desert Storm Munitions Expenditure report, As of 2 Mar 1991. Based on EARFLAP reports.

Figure 48
AIM-9M Sidewinder Missile



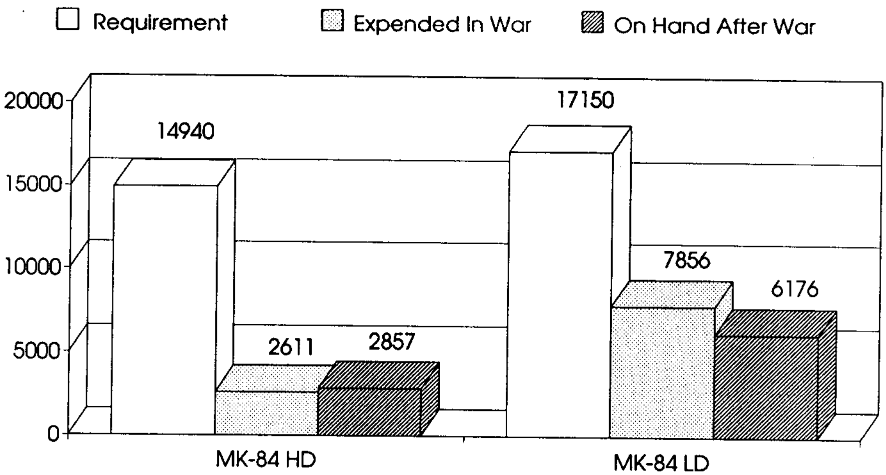
As of: 3 Mar 91

Figure 49
MK-82 Low and High Drag 500-Pound Bomb



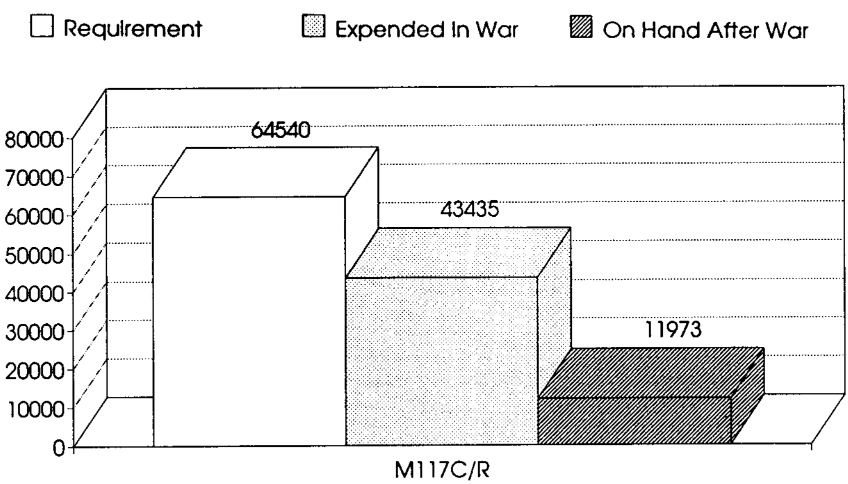
As of: 3 Mar 91

Figure 50
M117 (750-Pound Bomb)



As of: 3 Mar 91

Figure 51
MK-84 (2,000-Pound Low and High Drag Bomb)



As of: 3 Mar 91

Figure 52
AGM-65 Series Maverick Missile

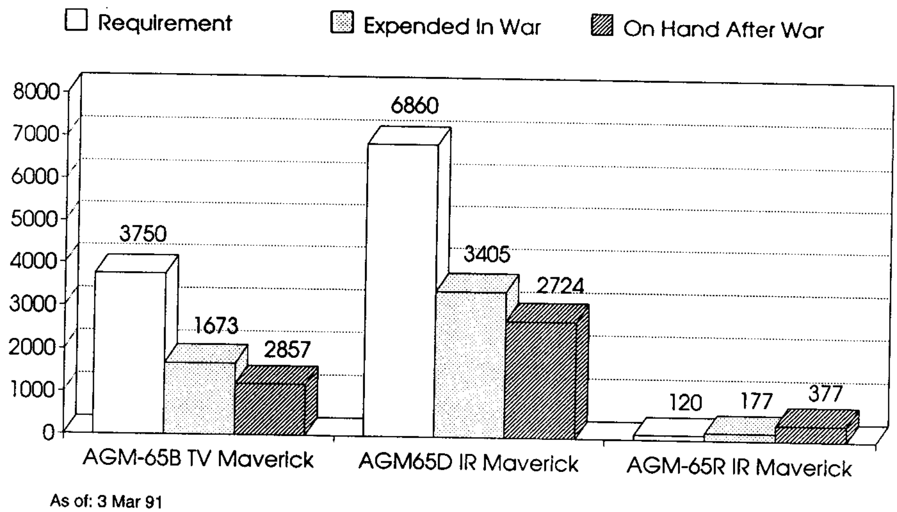


Figure 53
GBU-10 (Improved 2,000-Pound Bomb)

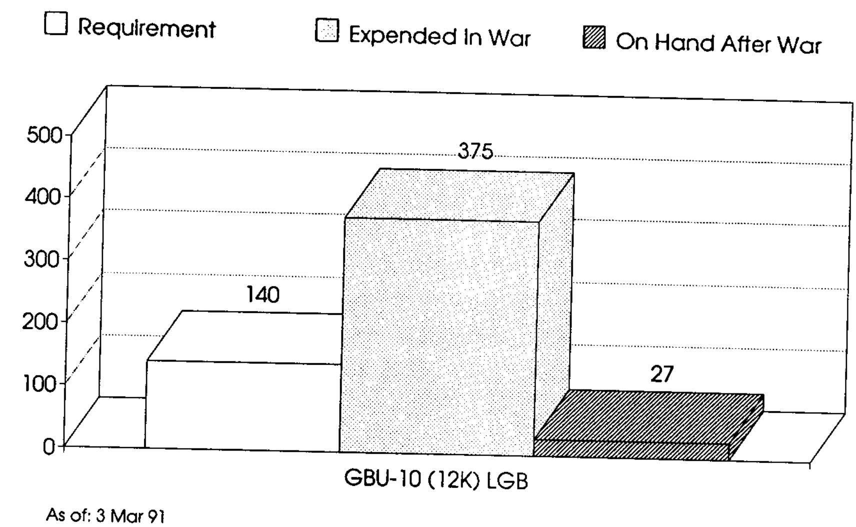
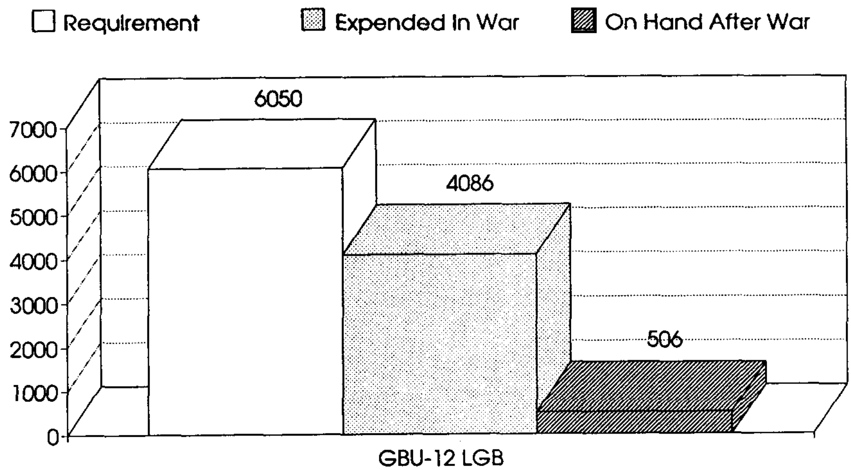
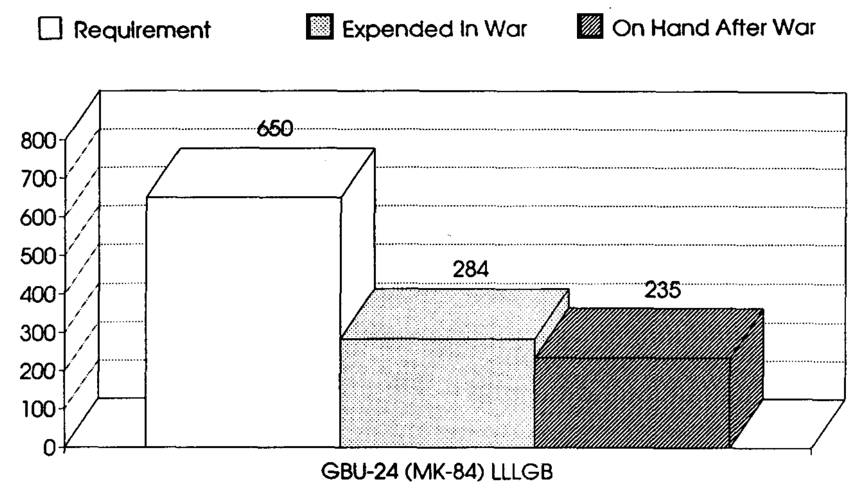


Figure 54
GBU-12 (500-Pound PGM)



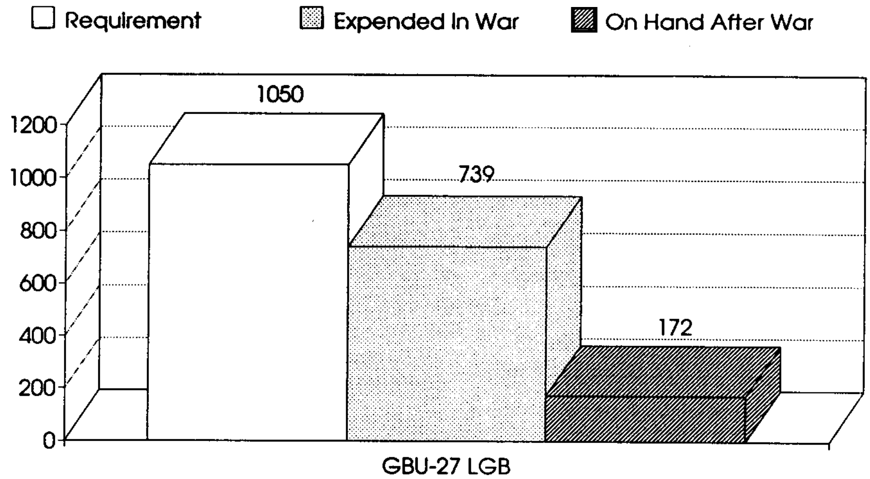
As of: 3 Mar 91

Figure 55
GBU-24 (Improved 2,000-Pound Bomb)



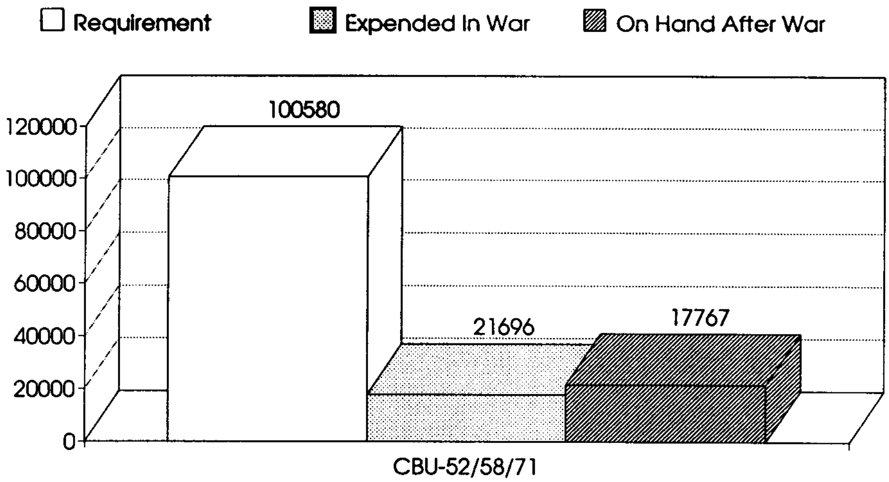
As of: 28 Feb 91

Figure 56
GBU-27 (2,000-Pound PGM for F-117A)



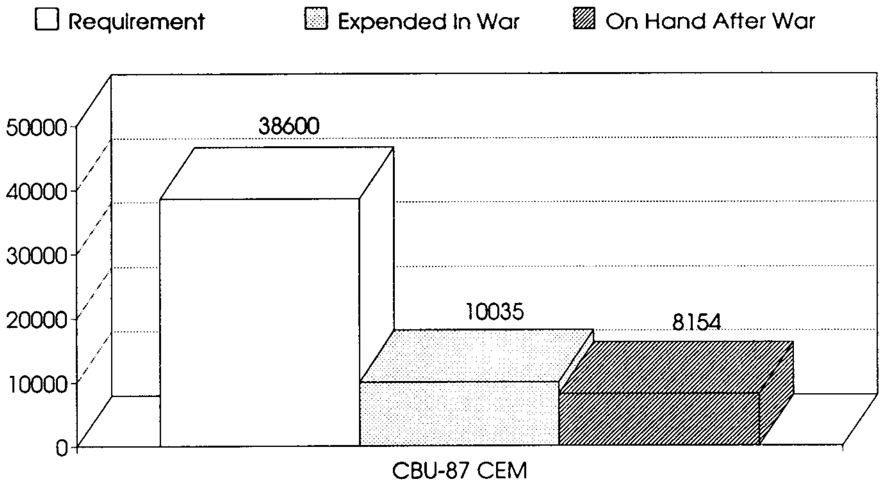
As of: 28 Feb 91

Figure 57
CBU-52/58/71 (Cluster Bomb Units)



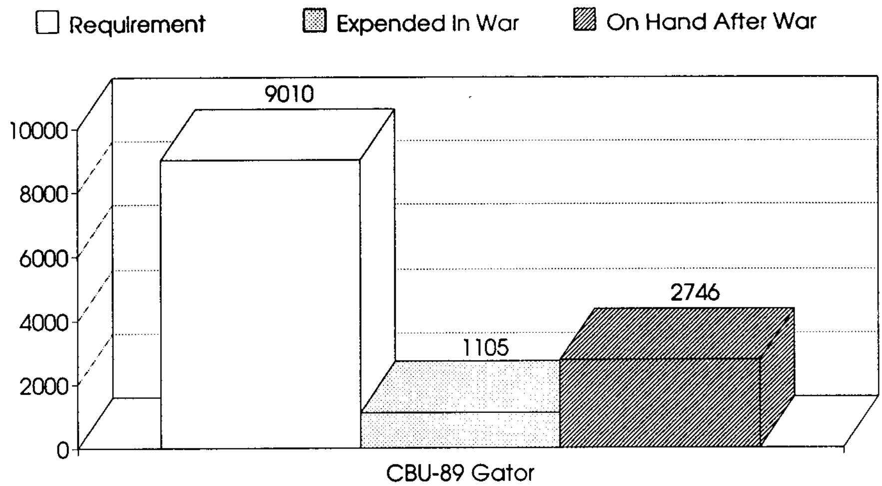
As of: 3 Mar 91

Figure 58
CBU-87 (Combined Effects Munition)



As of: 4 Mar 91

Figure 59
CBU-89 (Gator Antitank Munition)



As of: 3 Mar 91

Observations

During the initial stages of Desert Shield, a good deal of confusion existed concerning arming the force. Munitions in Oman and aboard ships in the immediate area, provided initial support. However, they were not the latest munitions and were not appropriate for air defense, the immediate concern. The deploying units flew in armed with AIM 7s and 9s. Confusion in the early stages of an operation are normal; however, it continued to cause problems in the munitions area.

Requirements for munitions were not clear and escalated sharply as the mission and size of the force grew. There was difficulty in knowing what munitions were where, since the management information system being built to answer these questions did not perform well. The transportation system was overwhelmed because of the volume being shipped and lack of information on what assets were where. These factors contributed to the continuing confusion in arming the force.

Numerous storage depots had to be and were built. The preconflict training of the munitions people on storing and building up bombs paid dividends.

There were 48,000 short tons of munitions prepositioned for the AOR before the war; 69,000 short tons were dropped during Desert Storm. Three hundred and fifty thousand short tons available for the AOR were either in the AOR or en route to the AOR at the end of the war. The quick response to the requirements for special weapons is noteworthy. The GBU-28 was fielded very quickly for attacking bunkers, and the BLU-82 Daisy Cutters were built up and shipped on very short notice and used for clearing minefields.

In summary: there were no known instances of missions cancelled because munitions were unavailable. This record was accomplished with zero significant safety accidents involving Air Force personnel.

7

Supplying the Force

This Chapter addresses supplying the force with spare parts and fuels. The first part of the Chapter focuses on spares activities related to aircraft mission support. The second half of the Chapter addresses petroleum product support, exclusive of air refueling, which was covered in Chapter 5.

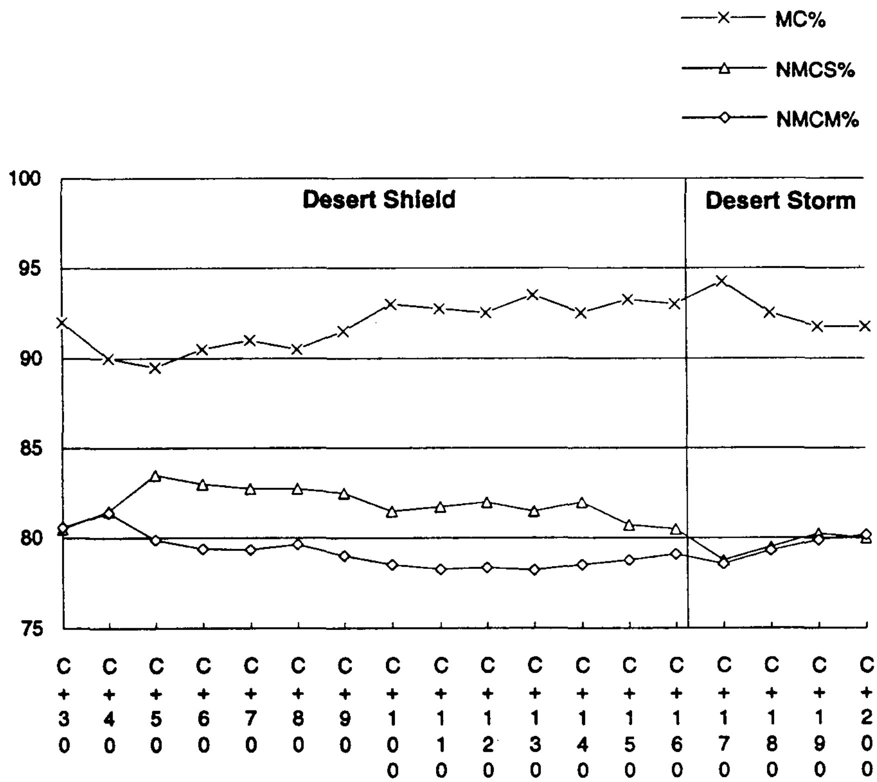
Supplying Spare Parts

The overall effectiveness of spares support during Desert Shield and Desert Storm is reflected in the aggregate aircraft status statistics recorded during those operations (Figure 60). Supply support exceeded both peacetime standards and wartime projections. This section describes how that was accomplished.

To ensure uninterrupted maintenance, operating bases, maintenance depots, and storage depots maintain stocks of consumable and reparable spares. During steady-state operation, out-of-stock conditions that can ground aircraft or cause maintenance work stoppage are held to levels established on the basis of mission and economic considerations. The basic flow is from industry to the wholesale warehouse, to the user-level supply ctivity, and finally to the maintenance technician who uses the items to fix aircraft or aircraft components. Items that can be repaired come back into the system for reuse.

When aircraft units were tasked to support Desert Shield and Desert Storm, multiple events disrupted the steady-state balance of the supply pipelines. First, the tasked aircraft moved to new operating bases; most were thousands of miles from their home base. Second, spares usage patterns changed because of changes in flying activity and location. Third, the supply and maintenance resources initially moved to the new operating location constituted only a small portion of the home base resource. And fourth, supply pipelines were interrupted or constrained. The story of supplying the force during Desert Shield and Desert Storm is, in large part, the story of how the Air Force dealt with these four events.

Figure 60
Desert Shield and Desert Storm Aircraft Status[1,2]



[1]Background Paper, "CENTAF Logistics Story," CENTAF/LG, Apr 1991.

[2]Mission Capable (MC) is the term used to describe an aircraft or other type of equipment that is in a condition that would allow it to perform all of its assigned missions without restriction. The numerical values shown in the figure represent the average frequency over time of the aircraft conditions expressed as a percentage of the number of aircraft in the AOR. The Not Mission Capable Supply (NMCS) and Not Mission Capable Maintenance (NMCM) rates represent, respectively, the percentage of time that aircraft were not MC awaiting parts or maintenance actions to be completed.

Supply Concept of Operation

The basic supply concept of operations in support of air power calls for preplanned requirements determination driven by specific threat assumptions. It also calls for the use of various spares segments and packages to allocate and position available supply resources. The types and levels of support provided to particular units are tailored to their planned mission. That general concept of operations was the basis for supply preparations before the Gulf War and resulted in a spares-rich environment. As was demonstrated during Desert Shield and Desert Storm, however, some of the systems and procedures needed to manage those spares effectively according to the concept of operations were either not in place, were not well documented, or did not work.

From a supply perspective, spares were authorized, procured, and allocated to the forces sent to the Gulf on the basis of their wartime tasking and priority. Units designated for mobility tasking in the war plans would have to be moved from their home base to support a wartime operation, and were by policy authorized mobile spares packages.[3,4] Units with documented wartime tasking to operate in place, such as most units stationed in Europe, did not have mobility spares packages. Rather, the spares required to support their day-to-day operations were augmented with additional assets to support the initial wartime period, when resupply is expected to be interrupted.[5,6] Since these units were not designated for deployment tasking, they did not have mobility bins to transport their spares. Their spares and equipment sizing were based upon operate-in-

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[3]Most of the mobility spares packages that moved forward with the initial aircraft deployments were called war readiness spares kits (WRSK). WRSKs are predetermined and prepackaged spares designed to support deployed units operating at planned wartime activity rates until reliable resupply lines can be established. WRSKs are authorized to units that are designated for mobility tasking in the War and Mobilization Plan, Volume 3 (WMP-3). Other types of spares packages include mission support kits (MSK) which are generally tailored packages of spares designed to support activities not documented in the WMP.

[4]AF Regulation 400-24, *Logistics War Reserve Materiel (WRM) Policy*, Department of the Air Force, 31 Jul 1990, p 35.

[5]These additive spares are called base level self-sufficiency spares (BLSS).

[6]AFR 400-24, p 36.

place assumptions that included the continuation of a full base repair capability, and their supply people did not practice deployed operations.

At the time of the Gulf War, the Air Force objective was to provide wartime-tasked units with sufficient prepositioned spares to support wartime operations for the first sixty days until wartime resupply channels could be established and operated on a routine basis.[7] In practice, however, only thirty-day prepositioned stocks of most reparable spares were authorized.[8] For units operating out of fixed bases after deployment, as within the area of responsibility (AOR), the basic supply concept of operations called for a second spares package built and deployed around day 30 of the conflict.[9] Those spares would augment the initial spares package and support continued operations, which normally included expanded maintenance capabilities, until establishment of normal, dependable resupply support from the continental United States.

Taking Supply to War

The Gulf War was not business as usual for supply. Few things happened "by the book," or in accordance with the basic supply concept of operations. For example:

- Units that were supposed to fight in place were deployed without mobility spares.

- The mobile supply computer systems did not work well, temporarily "blinding" Air Force, Central Command, the wholesale supply system, and the major commands. As a consequence, alternative computer support capabilities were developed. Target support levels were not accepted as good enough.

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[7]Report LS861050, *Supply Wartime Planning and Execution Guide*, AFLMC, Sep 1987, p 11.

[8]AF Regulation 400-24, *Logistics War Reserve Materiel (WRM) Policy*, Department of the Air Force, 31 Jul 1990, p 34.

[9]These packages are called follow-on spares kits (FOSK). The FOSK concept is to move a second increment of spares forward as a single package rather than processing the thousands of individual requisitions that would otherwise be required to move those spares. Although this support concept had been on the books for several years, the programs and procedures for executing it were not in place.

- Resupply of war readiness spares kits and other spares packages commenced almost immediately and continued even after sustainment spares had been put in place and routine resupply was certain.

- Several new spares support concepts were conceived and implemented. While some adjustments to plans and planning concepts are always needed, adjustments and deviations during Desert Shield and Desert Storm were not the exception; they were the rule.

Upon deployment notification during Desert Shield, units attempted to fill shortages in existing spares packages or began assembling other types of packages.[10] Base level actions included issuing available serviceable spares from stock, moving assets among the assigned spares packages, expediting local repair, contacting the supporting wholesale sources of supply, and selectively cannibalizing aircraft not needed to support the deployment. These initiatives were generally effective, and most kit fills were over ninety percent full at the time of deployment. Although not well documented, it appears that many units unilaterally increased authorized quantities of known problem items for their spares packages, built new packages to take items they thought they would need but that were not in existing packages, or simply overfilled their packages on selected items.[11]

For some units, preparing for deployment to the AOR was even more challenging. Several were tasked to deploy aircraft but were not authorized mobility spares, or at least not sufficient spares to support the number of aircraft deployed. These units had only minimum time to compute their requirements and build new spares packages to be deployed with them.[12,13] As noted earlier, the operating convention has always been that only units authorized mobility spares were "available for mobility tasking." The

[10]The other types of spares packages built were typically some variation of a mission support kit (MSK). MSKs are built to support specific tasking that does not justify the authorization of additive war reserve materiel (WRM). Many of the MSKs built to support movements to the AOR were designated high-priority MSKs (HPMSK) to give them the same replenishment priority as WRSK.

[11]Report, *Desert Shield/Storm Logistics - Observations by U.S. Military Personnel*, GAO/NSIAD-92-26, Nov 1991, p 24.

[12]*Ibid.*

[13]John H. Gunselman Jr., Col, USAF, *Documentary on Desert Shield/Storm Supply Support*, Air Force Journal of Logistics, Fall 1991.

deployment of units stationed in Europe, to the AOR, and to Turkey for the Proven Force operation demonstrated that these types of units can deploy and operate effectively, albeit with some difficulty, if they can be afforded time to prepare and be assured of continuous resupply.[14]

At the wholesale supply activities (which included Air Force air logistics centers and other Service and Defense Logistics Agency inventory control points), battle staffs, and twenty-four-hour customer support activities were set up to expedite resupply requirements and solve the ever-present problems. Similar operations were set up at the Service and Defense Agency headquarters to facilitate coordination of activities and handle unique requirements. Also, depot surge programs were initiated to accelerate repair of existing and potential problem items, and where appropriate, expedite procurement actions. Problem items were identified through supported command and Commander-in-Chief inputs, ongoing critical item management programs, and the use of capability assessment models. Additional repair resources and expedited procurement actions were taken as required to respond to mission needs.

The specific items to be surged by the air logistics centers were identified by multiple sources. The sources included various logistics information systems and recommendations from system program managers and the commands using the aircraft. Data available in the automated systems were typically current at a point in time; as such, their value was time perishable. The data from automated systems were augmented with data from several other sources, including records of recent shortages of spare parts needed to repair aircraft or aircraft components and of known shortages in spares packages that are deployed with aircraft units. Over eighty-five percent of the items identified by the using commands as needing surge were already in the Air Force Critical Item Program and being worked.[15] Air Force Logistics Command surged over 75,000 items

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[14]Additional implications could not be addressed here because of lack of data. One might infer that the capability of these units to deploy was at least in part due to the mobility experience of personnel previously assigned to mobility tasked units, e.g., prior TAC experience. Further, the impact on the capability of the residual USAFE forces to meet a concurrent theater contingency remains an unknown.

[15]Briefing, AFLC Desert Shield/Storm Lessons Learned, 12-13 Jul 91 Hot Wash Conference, AFLC Briefing Book.

through early March 1991 to fill spares packages and other priority spares requirements.[16]

Under the unit move concept, spares normally move forward with the aircraft. During the Desert Shield deployments, however, several decisions disrupted this integrated flow. The first reported disruptions were related to the accelerated deployment into the AOR of direct combat forces.[17] To accomplish the acceleration, units tailored down their support packages. Later, priorities were realigned to give priority to personnel comfort items. As a result, the Air Force, Central Command Rear Director of Supply reported that at one point, over 100 pallets of spares were sitting on the ramps at Tactical Air Command bases waiting for airlift after the supported aircraft were already in the AOR.[18,19] Had intense combat activity started before the spares arrived, a significant number of aircraft could have been grounded awaiting parts.

Receiving and Storing Spares at Deployed Locations

Spares were received and stored in a variety of ways in the AOR. In addition to location and facilities requirements, the types of spares being received and their methods of shipment made the process difficult or easy. Without question, the method of shipment easiest to deal with from a receiving and storing perspective was kitted spares packages shipped directly from the home base to the AOR beddown base as a part of a unit move. In such cases, the supported unit knew what they had and, even under the most austere conditions, could protect spares reasonably well because most items were in mobility bins. On the opposite end of the spectrum were individual spares "pushed" to the theater without unit designation, followed closely by loose resupply items and non-kitted spares packages.

Serious difficulties in materiel movement were experienced early on in the AOR. The problems were most critical early on when beddown

[16]*Ibid.*

[17](S) Msg, O 140600Z Aug 1990, subj: Oper/Desert Shield, USCINCCENT CCJ3.

[18]Intvw, author with Col Van McCrea, CENTAF Rear/LGS, 4-5 Aug 1992.

[19]For TAC, this was significant because 100 pallets of WRSK could represent 5 to 10 18/24 PAA fighter squadron's worth of spares. By comparison, however, a single 14 PAA WRSK for SAC B-52s might take as many as 60 pallets.

locations were classified and materiels were being shipped to the AOR with no specific address or indication of the unit the materiel was intended for. One of the best descriptions of the situation at that time was provided in a staff paper provided by Hq Military Airlift Command:

> In the early portions of Desert Shield, destination codes were not provided to the field and the field didn't ask . . . everything was just shipped to Dhahran. As a result, hundreds of pallets were sitting in the Aerial Port facility at Dhahran with no one knowing where they were to go, to whom, or the relative priority. Deployed tactical airlift units would fly the first sortie of the day to Dhahran and leave several people [from units deployed to the various operating locations] there to roam about the yard looking for their shipments and return on the last sortie of the day with whatever they had found.[20]

While the above problems were worked out over time and, from a spares perspective, caused no documented impact on combat capability, they might have been critical had the deployed aircraft immediately engaged, had spares been in short supply, or had Dhahran come under attack before the cargo backlog was sorted out.

As was discussed in the transportation chapters, the general flow of materiels into the AOR was not always smooth. This was especially true for materiels that were not part of a unit move. In the continental United States, backlogs occurred at major departure airports such as Dover, where at times over 3,000 tons of materiel, including spares, awaited airlift. The staff of Air Force, Central Command Rear perceived the problem to be so bad that anytime it became aware that a spare destined for the AOR had been routed into Dover, it rerequisitioned the item and requested specific routing to alternate airports such as Tinker AFB in Oklahoma, and, later Charleston AFB in South Carolina.[21]

The inability of the supply and transportation systems to provide intransit visibility exacerbated the problems. While both systems have reasonably good tracking capabilities, visibility is often lost as an item moves from the supply system into the transportation system. Within the supply

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[20]MAC/LERX staff paper, undated, provided during Intvw, author with Mr. Orson Gover, HQ MAC/LGSW, 11-12 Aug 1992.

[21]Intvw, author with Col Van McCrea, CENTAF Rear/LGS, and SMSgt Karl Lubinger, CSSA Superintendent, 4-5 Aug 1992.

system, items are tracked by requisition number, but within the transportation system, item movement is tracked by transportation control numbers. For shipping efficiency, many supply requisitions are consolidated into a single transportation movement unit, which in turn is further consolidated for shipment. When such shipments were broken down at intermediate transportation hubs, detailed traceability was often lost. Therefore, when items needed to support immediate mission requirements became delayed or lost within the system, it was difficult, and often impossible, to track down and expedite movement to the point of need. New tracking system capabilities were developed to help work around the problem.

Establishing physical control over deployed spares was not always easy in the AOR. Storage facilities given to the deployed units ranged from standard warehouse facilities to no shelter at all. While the wheeled bins used to store and ship most of the preestablished spares packages afforded reasonable protection for their contents, most of the new packages were deployed without bins. Storing these loose spares was a problem requiring local innovation. Had the deployed units needed to move from a location quickly after initial beddown, gathering and moving in-theater spares would have been extremely difficult.

Deployed Supply Operations

Of all the major planned Desert Shield and Desert Storm supply support concepts, only the Forward Supply System operated by Military Airlift Command (MAC) in support of strategic airlift operations stayed intact. Equally important, this supply support concept MAC used to support the war effort was essentially the same concept it used day-to-day in support of peacetime operations; MAC simply raised the tempo and did more of the same.

The Forward Supply System is tailored to the C-5 and C-141 aircraft supporting MAC's strategic airlift mission through a predetermined route structure linking a series of worldwide en route and turnaround stations with the east and west coast hubs of the continental United States. Centrally managed spares with quantities computed to support peak wartime tasking are dynamically allocated to the various locations within the route structure on the basis of planned operating tempos and prepositioned maintenance capabilities. To make the transition from peacetime to wartime operating tempos, MAC shifted spares and support personnel from the Pacific area of operation to the European area linking to a preestablished route base at Dhahran. Stock levels at Rhein Main, Torrejon, and Ramstein were increased by approximately thirty percent, while Pacific levels were reduced about the same amount. C-141 war readiness spares kits (WRSKs) were deployed to all three of the European bases, and C-5 WRSKs were deployed to Rhein Main and Torrejon.

While the primary spares support for aircraft in the AOR was initially from the spares packages deployed with the units, other support concepts evolved. One of the earliest and biggest was the establishment by Strategic Air Command (SAC) of supply centers at Moron AB in Spain, Andersen AFB on Guam, and, later, RAF Fairford in the United Kingdom.[22] The centers at Moron and Andersen were activated during the first thirty days of Desert Shield and provided automated supply inventory management and resupply for SAC aircraft at those locations and elsewhere within the AOR. In addition to providing equipment and repair part support to the maintenance centers collocated at those locations, the supply centers furnished resupply support for all SAC aircraft deployed in the AOR and European theaters.

While the supply center at RAF Fairford remained relatively small (it never exceeded 2,000 line items), the supply operations at Moron AB and Andersen AFB were large. At its peak, the Moron account stocked over 24,000 line items valued at over $120 million[23]–an especially noteworthy situation given that Moron was in a caretaker status at the beginning of Desert Shield. Although somewhat larger, the operation at Andersen was built upon an established supply account.

Another major spares support innovation was the development and deployment of follow-on spares kits. These kits, which only Tactical Air Command built, were put together on the fly at the Command's Headquarters. Requirements were centrally computed, and the required assets were requisitioned directly from the wholesale sources of supply using high-priority requisitions. Air Force, Central Command Rear Director of Supply made the decision to bypass base stocks from continental U.S.

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[22]Point Paper, Desert Shield/Desert Storm Supply Spares Support, HQ SAC/LGSM, 12 Feb 1991; Intvw, author with Col John Clark, HQ SAC/LGS and Mr. Timothy Doolin, HQ SAC/LGSM, 13-14 Aug 1992, plus multiple SAC data sources.

[23]Intvw, author with Mr. Timothy Doolin, HQ SAC/LGSM, 13-14 Aug 1992, plus multiple SAC data sources.

bases building the follow-on spares kits for deployment because those bases were still supporting homestation flying activities.[24] (According to Air Force Logistics Command sources, the procedure for requisitioning the kits had not been coordinated with them.) The impact of the innovation on wholesale stocks was significant; over $400 million worth of follow-on spares kits were issued and put into transportation pipelines to the various Tactical Air Command bases, where they were aggregated and forwarded to that Command's units in the AOR.

Strategic Air Command also developed and deployed additional packages of spares to augment the spares initially deployed to operating bases and the supply centers. The spares packages were similar in concept to the Tactical Air Command's follow-on spares kits, but were developed using Strategic Air Command's unique automated retrieval and compare programs operating on failure and demand data from Strategic Air Command's continental U.S. bases. Individual packages were developed to support the various types and numbers of aircraft at each beddown. They were centrally assembled at a continental U.S. location and were shipped as assembled spares packages to the supply centers and operating locations.[25]

In addition to being in a very favorable spares position as Desert Shield began, units tasked to support the effort were afforded the highest priority for the allocation of those spares. Under the basic Department of Defense system, available spares are allocated to fill field requirements on the basis of the unit's relative priority and the date of the unit's request for the spares. Requirements for the Gulf War were assigned the highest priority for issue and movement. Standard requisitioning procedures were interrupted, and the priority system became overloaded at the top.

A problem noted early on was the inconsistent treatment of consumable[26] spares in the mobile spares packages.[27] Although the policy is that

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[24]Intvw, author with Col Van McCrea, CENTAF Rear/LGS, 4-5 Aug 1992.

[25]Intvw, author with Mr. Timothy Doolin, HQ SAC/LGSM, 13-14 Aug 1992, plus multiple SAC data sources.

[26]Consumable spares are often referred to as economic order quantity (EOQ) spares. This reference comes from the way requirements for such items are generally computed by using derivations of the classic Wilson EOQ formula.

units should build and deploy consumable spares along with spares that can be repaired, not all units had done so. In at least one case, consumable spares requirements had been established for the spares package, but consumable spares had not been put into the packages because funding for that type of spare was restricted.[28] Another type of consumable spares problem was identified in the B-52 spares package. Although the requirements had been identified and filled in those packages, the requirements had not been reviewed and updated for several years, and the assets in the packages had not been inspected for serviceability. As a result, Strategic Air Command had to totally rebuild the B-52 consumable spares segments and ship them to the AOR and other forward operating bases.[29]

station for support and ending with establishment and use of a full Standard Base Supply System "main frame" environment within the AOR. A subsequent CENTAF message in mid-August 1990 provided details of how this was to be done.[31] The plan at that time was to use a three-phase approach. Phase I, covering the period C to C+60, envisioned use of the Combat Supply System, with each unit linked to its homestation for support. During Phase II, C+61 to C+180, the deployed units were to transition to satellite accounts[32] hosted off the core supply unit's home

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[27]EOQ in WRSK has been a recurring problem for over 20 years and has been the subject of numerous Inspector General (IG) and General Accounting Office (GAO) reports.

[28]Intvw, author with MSgt Glover, 1 TFW/LGS, 5 Aug 1992.

[29]Intvw, author with Mr. Timothy Doolin, HQ SAC/LGSM, 13-14 Aug 1992.

[30](S) Msg, O 132000Z Aug 1990, subj: Admin/Log, USCINCCENT//CCCS//.

[31](S) Msg, R 182309Z Aug 1990, subj: Long Term Supply Support: Operation Desert Shield, USCENTAF/BSD.

[32]A satellite account is a separate supply activity hosted on a base level mainframe computer that supports at least one primary (01) account. While satellite accounts could be located on the same installation, as used here, a satellite is typically configured as one or more computer terminal devices located at a remote site but connected to the host computer via some form of telecommunications link.

station account; Phase III, C+181 on, involved a transition to a main operating base concept in the AOR with on-site Tactical Shelter Systems.[33] The message from CENTAF intended to fill a planning void while other alternatives were being considered.[34]

As adjustments proceeded, the above supply support concept was abandoned. In addition to Combat Supply System problems, which are addressed in the next section, major concerns were raised with respect to the Tactical Shelter Systems. The concerns centered on the computer system's configuration, the numbers of systems that were available, and the ability of the Tactical Shelter System to withstand a move to the desert. Before the end of August 1990, the idea of establishing mainframe support within the AOR was scrubbed and replaced with a new plan that envisioned a single continental U.S. mainframe supporting all supply accounts in the AOR. CENTAF Rear Director of Supply selected the single continental U.S. mainframe option over other options, which included establishing individual satellite accounts hosted off existing home base computers and other Major Command-proposed variations addressed later.[35]

The revised plan, which was the genesis of the CENTAF Supply Support Activity, called for establishing traditional satellite supply accounts at the AOR beddown locations and linking them back to the continental United States through a large communications processor to be located at Thumrait, Oman.[36] Unit rotation plans considered at the time were a main factor in the centralization decision. Also, Hq TAC/LGS, as the CENTAF Rear supply activity, had access to the needed technical and personnel resources and felt it could best execute its responsibilities from a centralized continental U.S. facility.[37]

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[33]Tactical Shelter Systems are deployable Sperry 1100/60 mainframe computers that were designed to provide mission critical systems support to multiple functional areas including supply, maintenance, military personnel, air crew operations, and surgeon general.

[34]Intvw, author with Col Mike Christensen, AFSSC/LGS, 18-20 Nov 1992. (Col Christensen was one of the main architects and operating chief of the CSSA at Langley, AFB, VA, during Desert Shield and Desert Storm).

[35]Intvw, author with Col Van McCrea, CENTAF Rear/LGS, 4-5 Aug 1992.

[36]Intvw, author with Mr. Frank Spruce, AFSSC/LG, 22 Oct 1992.

[37]Intvw, author with Col Mike Christensen, AFSSC/LGS, 18-20 Nov 1992.

The above approach to supply support was not immediately accepted by the other participating Major Commands. In particular, U.S. Air Force Europe (USAFE) took strong exception to the plan and made a counter proposal to support the AOR using Air Force in-place resources in Europe.[38] USAFE recommended making all AOR accounts satellites off USAFE bases, stating that the bases had both the resources and the capability to do the job at that time, which was early September 1990. Concurrently, MAC implemented support concepts that it felt were working and saw no need for the continental U.S. consolidation. Strategic Air Command (SAC) also implemented support concepts that were working. However, the concepts were dependent on scarce voice communications lines for support within the AOR. After initially resisting the CENTAF Supply Support Activity concept, MAC and SAC accepted the CENTAF Supply Support Activity for their AOR-based units, with some variations that will be addressed later.[39]

The primary approach to accounting for assets upon initial deployment to the AOR was to use the Combat Supply System, a small computer system designed to deploy with the early elements of aircraft units.[40] The main uses of the Combat Supply System were to (1) account for assets in the deployed spares packages, (2) prepare usage and requirements transactions to be sent back to a homestation computer to update inventory records, and (3) allow the homestation to act as the deployed unit's first source of supply.

Although described in the supply manual as "a stand alone supply computer processing system which can perform essential supply inventory management processes independently,"[41] the Combat Supply System actually has very limited capability. Most of the Combat Supply System's functional limitations are documented in the Supply Wartime

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[38](S) Msgs, P 061630Z Sep 1990, and P 252131Z Sep 1990, subj: Long Term Supply Support: Operation Desert Shield, P 252131Z Sep 1990, USAFE/LGS.

[39]Intvws, author with Col Robert (Dean) Rich, HQ MAC/LGS, and Mr. Orson Gover, HQ MAC/LGSW, 11-12 Aug 1992, and Col John Clark, HQ SAC/LGS, and Mr. Tim Doolin, HQ SAC/LGSM.

[40]Rpt, *Supply Wartime Planning and Execution Guide*, AFLMC Report LS861050, Maj Charles S. Johnson and Capt Robert E. Burleson, Sep 1987.

[41]AFM 67-1, Volume II, Part Five, Chap 1, para 3.c.

Planning and Execution Guide.[42] Perhaps its most serious limitation is that its designed telecommunication capability never worked properly.

The known Combat Supply System limitations were compounded during Desert Shield by equipment failures due primarily to heat, difficulty in getting deployed transactions back to the Standard Base Supply System, a general lack of user training, and the fact that not all units brought Combat Supply Systems.[43] These problems were never fully resolved, and the resulting loss of asset visibility at the individual home-station accounts carried over to the wholesale supply system, which was effectively blinded. Also, the ineffectiveness of the Combat Supply System contributed to the loss of much of the spares consumption and field data for the August 1990 through January 1991 period, especially for Tactical Air Command units.[44]

The deficiencies of the Combat Supply System were not a serious problem for local management of spares at the AOR bases, since alternate manual accounting methods could be used even if the computer failed. In the past, manual stock record cards or computer listings were used as the primary way to manage spares during deployments and contingencies. Fortunately that capability remained, and in fact, some of the deployed units used manual procedures as their basic asset accounting method. The high mission-capable rates in the AOR achieved, despite Combat Supply System problems, attest to the success of these manual and various innovative "work-around" procedures.

The fact that the deployed units were able to survive and prosper with the noted deficiencies of the Combat Supply System does not imply that deployed computer support is not needed. Quite the contrary; an ability to continue automated processing of supply requirements would have greatly improved the overall efficiency of the operation and avoided most of the brute force heroics needed to keep the system running. For example, supply operations using preestablished or normal Standard Base

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[42]Rpt, *Supply Wartime Planning and Execution Guide*, AFLMC Report LS861050, Maj Charles S. Johnson and Capt Robert E. Burleson, Sep 1987, p 15.

[43]Rpt, *Desert Shield/Desert Storm Supply Lessons Learned*, Capt Raymond T. Daly, Jr., AFLMC Report LS912085, Mar 1992, Appendix B, interview with Col Seagrave.

[44]Intvw, author with CENTAF Supply Support Activity staff at Langley AFB, VA, 4-5 Aug 1992.

Supply System satellite account procedures (such as those used by the MAC Forward Supply System and Proven Force units) did not experience the above problems. Likewise, the CENTAF Supply Support Activity ultimately established for the AOR used a more standard, although much larger, satellite account structure that did not experience the noted Combat Supply System problems.

Establishing of the CENTAF Supply Support Activity

During the beddown of the Air Force units in the AOR, it became apparent that the residual supply staff at Ninth Air Force, CENTAF Rear did not have sufficient manning to handle the large volume of policy and support requirements issues being generated. The bulk of the supply staff had been sent forward to establish the CENTAF Forward supply operation. To fill this void, the Tactical Air Command Director of Supply was designated CENTAF Rear/LGS. Under that arrangement, the entire Tactical Air Command supply staff was brought to bear on AOR support issues. In response to the deficiencies noted earlier, CENTAF Rear/LGS decided to build a central supply support facility. That staff was subsequently augmented by supply personnel from the other commands and Defense organizations.[45]

After an extensive growth period, the CENTAF Supply Support Activity was directly supporting twenty-one supply accounts in the AOR. Units supported by CENTAF Supply Support Activity satellite accounts had visibility of assets within the AOR at bases having the same type of aircraft. Also, the CENTAF Supply Support Activity personnel at Langley had visibility of all assets in the AOR that had been loaded into the central system. Figure 61 shows the general configuration of the CENTAF Supply Support Activity.

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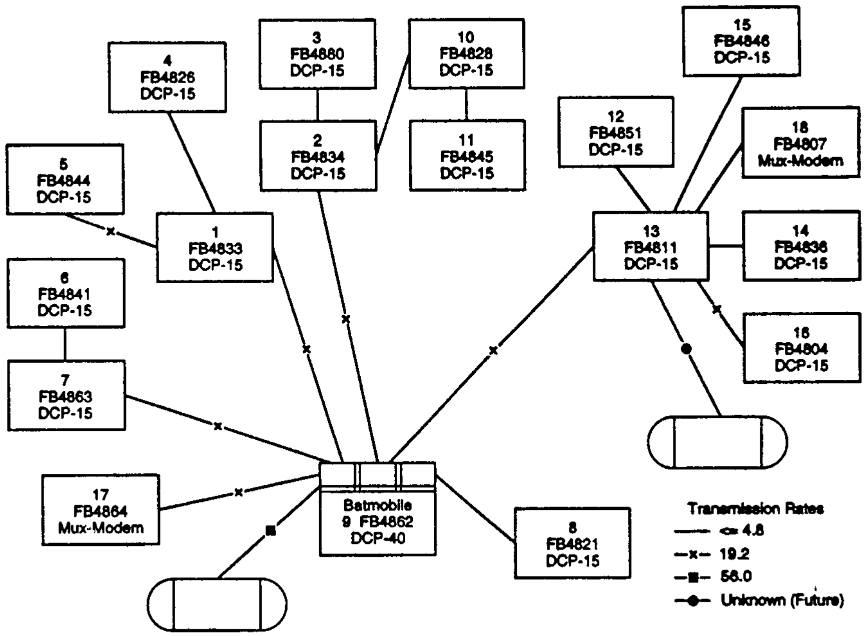
[45]Intvw, author with Col Van McCrea, CENTAF Rear/LGS, multiple CENTAF Supply Support Activity staff personnel, and MSgt Greg Glover, 1 TFW/LGS, plus multiple other sources.

Figure 61
CENTAF Supply Support Activity Configuration



From October 1990 through January 1991, most supply support for the major bases in the AOR transitioned to the CENTAF Supply Support Activity. Direct computer connectivity was provided to twenty-one sites established as Standard Base Supply System satellite accounts. The satellite accounts were organized from a systems perspective into three host supply accounts composed of groups called gangs (See Table 22).

Table 22
CENTAF Supply Support Activity Sites

GANG 1	GANG 2	GANG 3
RIYADH	THUMRAIT	KING FAHD
BATEEN	DHAHRAN	SHAIK ISA
JEDDAH	DOHA	SHARJAH
KING KHALID	AL DHAFRA	KKMC
TAIF	AL MINHAD	
SEEB	AL KHARJ	
CAIRO WEST	TABUK	
AL AIN	KHAMIS	
MASIRAH		

By design, the gangs were arranged to cover like types of aircraft. Because of the mix of aircraft at some bases, however, there were some exceptions. For example, while most large aircraft were supported within Gang 1, nearly half the C-130s were supported through Gang 2 or 3 bases. Likewise, the "fighter gang," Gang 2, supported all F-15s, all F-117s, and most F-16s, but the F-4Gs, RF-4Cs, and all of the A-10s were supported through Gang 3 along with multiple other low-density aircraft. The terminals at each site in the AOR had direct visibility of assets at the other sites on the gang. The CENTAF Supply Support Activity, in turn, had total visibility of all sites within the AOR. The individual sites were activated over a two-month period starting in mid-November 1990.

Each CENTAF Supply Support Activity support site was equipped with remote job entry terminals and a communications processor[46] that linked it, either directly or through another site, to another, but larger communications processor (called the Batmobile) located at Thumrait, Oman. Connectivity to the continental U.S. was via military satellite to Ft. Detrick, Maryland, and on to Langley AFB, Virginia, over a dedicated

[46]The satellite accounts at each site were equipped with 15-20 UTS-40 or PC terminals tied to a DCP-15 communication processor which was linked through tactical communications back to a DCP-40 switch (called the Batmobile) located at Thumrait. The communications processors and transmission paths were shared with maintenance CAMS terminals. However, rather than processing CAMS at Langley, each maintenance activity in the AOR was routed through Langley to their home station computer.

commercial lease line. CENTAF Supply Support Activity operations at Langley were hosted on the Tactical Air Command (TAC) MAJCOM Development Center UNYSIS 2200/400 series computer, which was upgraded to provide the needed processing and storage capacity. By the end of Desert Storm, the CENTAF Supply Support Activity was the largest Air Force retail supply account ever assembled, with 288,290 item records and an asset value in excess of $1.5 billion.[47]

Given the absolute priority of aircraft support, the CENTAF Supply Support Activity concentrated first on providing spares for out-of-commission aircraft and getting aircraft spares packages loaded on the computer. With the exception of some SAC and MAC aircraft addressed later, the CENTAF Supply Support Activity supported most aircraft spares requirements in the AOR. An automated system recently installed at TAC proved to be very effective in finding spares to support requirements in the AOR.[48] That system provided worldwide visibility of assets, allowing the CENTAF Supply Support Activity spares controllers to locate and request shipment of available assets quickly. Lateral support actions requested through the CENTAF Supply Support Activity satisfied approximately forty-five percent of spares requirements for aircraft out-of-commission in the AOR.[49]

Concurrent with providing spares support for out-of-commission aircraft, the process of transferring the spares packages in the AOR to the CENTAF Supply Support Activity computer at Langley was started. Loading the spares records using home station data was a long and arduous process and highlighted serious quantity variations between the computer records and actual spares balances in the AOR. At the direction of CENTAF Rear LGS, existing balance discrepancies were corrected by adjusting kit quantities to the actual on-hand quantities determined by physical inventory.[50] While these adjustments were essential to effective

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[47]CENTAF Supply Support Activity briefing slides, undated, provided by CENTAF Supply Support Activity during 4-5 Aug interviews. [Documents from CENTAF Supply Support Activity].

[48]That system was called the MICAP Asset Sourcing System (MASS).

[49]John H. Gunselman Jr., Col, USAF, *Documentary on Desert Shield/Storm Supply Support*, Air Force Journal of Logistics, Fall 1991, pp 13-14.

[50]Intvw, author with SMSgt Karl S. Lubinger and with MSgt George Herman of the CENTAF Supply Support Activity staff at Langley AFB, VA, 4-5 Aug 1992.

current operations, consumption data were lost in the process, along with the audit trail for spares losses and gains.

By the end of the war, 2,400 segments of deployed spares packages comprising over 220,000 records were loaded. The records covered most of the aircraft packages but only fifty to sixty percent of nonaircraft packages such as combat communications. In addition, accountability for only about ten percent of the equipment items deployed into the AOR had been picked up on CENTAF Supply Support Activity records.[51] The major task of establishing and maintaining operating stock levels for the full range of base support items never occurred. Other major functions performed included all financial and fuels accounting for the deployed units.

At its peak, the CENTAF Supply Support Activity was staffed with over 130 people drawn from several organizations, including the TAC Staff, First Air Force, TAC wings, SAC, MAC, Air Force Logistics Command, Air National Guard, and Defense Logistics Agency. Estimates indicated that operating the CENTAF Supply Support Activity as a central facility versus deploying mainframe computers to the AOR reduced supply and communication personnel requirements in the AOR by 400 to 600.[52]

In the operation of the CENTAF Supply Support Activity, exceptions were made in supply transaction routing for SAC and MAC aircraft operating in the AOR. Requisitions for SAC B-52 and KC-135 aircraft located in the AOR were electronically passed to Moron AB for processing. Mission-capable (MICAP) parts requirements for those aircraft were called into the CENTAF Supply Support Activity, which in turn forwarded the requirements to Moron AB. Mission-capable-parts requirements for B-52s that could not be supported at Moron were passed to the Eighth Air Force at Barksdale AFB for processing. KC-135 mission-capable-parts requirements that could not be satisfied were sent back to the CENTAF Supply Support Activity.[53] Requisitions supporting MAC's C-130 aircraft in the AOR were electronically passed to Rhein Main AB for processing. C-130 mission-capable-parts

[51]Intvw, author with SMSgt Karl S. Lubinger and MSgt George Herman of the CENTAF Supply Support Activity staff at Langley AFB, VA, 4-5 Aug 1992.

[52]*Ibid.*

[53]Intvw, author with Mr. Timothy Doolin, HQ SAC/LGSM, 13-14 Aug 1992.

requirements were called directly into Rhein Main by the airlift control element teams located at the AOR operating bases.[54]

Supply Support Targets Versus Actual Performance

During Desert Storm, less than four percent of aircraft in the AOR were not operational because of a lack of spares.[55] By contrast, the *de facto* standard for peacetime supply performance has been to maintain that percentage below five percent, and the standard for war allows up to twenty-five percent of committed aircraft to be out of commission at the end of thirty days of wartime activity for lack of spares.[56]

While the performance statistics far exceed the wartime planning targets, they reflect that support came from a resource base designed to support a much more demanding "war and a half" scenario. The resource base was intended to support intense wartime activities with resupply interruptions. While those planned activity levels were in many cases matched or exceeded during Desert Storm, especially in terms of flying hours, resupply was continuous; most requirements, nearly all of which were designated as high priority, were satisfied initially within two weeks, and after November 1990, within three or four days.

The impact of having dedicated air transportation available to move high priority assets as implemented with Desert Express, and later with European Express, was significant. Desert Express began operating between Charleston AFB and the AOR on 30 October 1990. European Express began operating between Rhein Main AB and the AOR on 7 December 1990. With these priority airlift capabilities, combined with aggressive spares sourcing and a nominal 72-hour delivery time to the AOR, " . . . grounding MICAPs decreased from over 500 for 750 aircraft on 1 October 1990, to 219 for 1229 aircraft on 17 January 1991, the day Operation Desert Storm began, and a Not Mission Capable Supply Rate of four percent. This was an unprecedented achievement."[57]

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[54]Intvw, author with Mr. Orson Gover, HQ MAC/LGSW, 11-12 Aug 1992.

[55]Background Paper, "CENTAF Logistics Story," CENTAF/LG, Apr 1991.

[56]These not-mission-capable supplies (NMCS) target percentages for wartime are derived from factors called Direct Support Objectives (DSO), which are used in computing the spares requirements for units having wartime tasking.

[57]Background Paper, "CENTAF Logistics Story," CENTAF/LG, Apr 1991.

The impact of Desert Express and European Express was impressive in terms of the above reduction in numbers of spares on order, a corresponding reduction of two percent in the number of aircraft down for spares, and a similar increase in mission-capable rates. It should be noted, however, that at the time the Expresses were initiated, aggregate out-of-commission-for-spares rates were stable at around six percent, and mission-capable rates exceeded ninety percent. A second large increment of spares had been moved to the AOR in support of the Tactical Air Command units, and high-priority replenishment of deployed spares packages was continuing. In effect, a spares-rich environment had been created; all resupply requirements for the AOR were being intensively managed and were being afforded the highest possible priorities.

During Desert Shield and Desert Storm, Joint Chiefs of Staff (JCS) Project Code 9AU was used to identify spares needed to fix out-of-commission aircraft authorized transit by Desert Express and European Express; the spares were needed to repair out-of-commission aircraft. JCS Project Code 9BU was used for all other requirements supporting the AOR. The use of the project codes served to establish absolute priority over any other worldwide requirements, including for example, a grounded F-15 in Korea.

Summary of Planned Versus Actual Supply Activities

With the notable exception of strategic airlift, supply operations during Desert Shield and Desert Storm were not conducted as planned. Further, multiple supply support concepts evolved, largely along major command lines. By the end of the conflict, CENTAF has put some standardized procedures into place, but full base support capabilities were never put into place and standard requisitioning and resupply procedures and priority rules were never used.

Common themes could be discerned from retrospective analysis of the various supply support concepts that evolved just before and during the conflict. Some of the themes emerged repeatedly during various interviews; others emerged during analysis of the volumes of data assembled and reviewed. The themes were:

Deployment and employment supply activities were largely ad hoc. Established plans were not followed, and new ways of doing business were established on the fly. The most significant of these new concepts was the CENTAF Supply Support Activity.

From all accounts, spares in the system were sufficient to support all mission requirements. This was universally attributed to the full funding in the 1980s of requirements based on a "war and a half" threat. However, the fact that many of the spares needed, were in depots awaiting repair raises repair funding and prioritization issues.

Despite high levels of spares availability, the extraordinary supply support provided to mission forces was due in large part to individual aggressiveness and ingenuity.

The early lack of adequate communications was a problem for all.

Dedicated air resupply for "show stoppers" (items keeping combat essential equipment out of commission) was perceived as a primary contributor to the high mission-capable rates experienced, but the documented mission-capable rates over time suggest that deployed normal air resupply of spares packages was in fact working very well even before Desert Express was started. The more significant reduction was in the numbers of open MICAP incidents.[58]

The combat supply system computer and tactical support shelter systems did not meet the needs of the supply system. Some of the problems were technical, others were management related.

A lack of adequate procedures, compounded by a lack of attention to detail, resulted in inadequate consumable spares in the various spares packages.

A lack of adequate policies, procedures, and automated support tools resulted in inefficient implementation of the follow-on spares kit concept.

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[58]An open MICAP incident is a single requirement for a single part. Since many NMCS aircraft are out of service for more than one part (sometimes resulting from consolidation of "holes" through cannibalization), a reduction in these open incidents typically reduces both the number of NMCS aircraft and the average number of parts needed per remaining NMCS aircraft.

With few exceptions, inadequate or conflicting guidance regarding the retrograde of reparables resulted in delays in getting reparable spares to the appropriate repair facilities.

Central visibility of spares deployed to the AOR was initially lost when deployment began and was not regained until the CENTAF Supply Support Activity approached full operation five months later. Once established, the central visibility of AOR on hand spares and requirements was extremely valuable in managing supply support for such a large force operating out of over twenty locations.

Table 23 summarizes planned versus actual supply activities during Desert Shield and Desert Storm. The items presented are grouped by subject area. The list is not intended to be all inclusive, but focuses instead on the subset of supply activities most closely associated with supporting aircraft units in a deployed operating environment. With a view toward the future need to establish and maintain a capability for deploying robust expeditionary forces into areas not having a U.S. presence or accessible logistics infrastructure, the Desert Shield and Desert Storm experience can be used as a benchmark for making necessary adjustments to supply support concepts. The next time, we may not have a willing enemy and six months to sort things out.

Petroleum Products Support

Providing fuels to U.S. and Coalition aircraft during Desert Shield and Desert Storm was an enormous undertaking; 1.88 billion gallons of petroleum products were consumed during those operations.[59] At the

[59]Defense Fuel Supply Center After Action Data Call, 4 Jun 1991.

Table 23
Planned Versus Actual Supply Activities

Support Area	CONOPS/Plan*	Actual
Resupply	No routine resupply before D+60 (some plans start re-supply at less than D+60).	Continuous resupply.
Resupply	Send requisitions for needed items directly to Inventory Control Point (ICP).	Augment ICP support with CSSA sourcing (lateral) if ICP status bad or delayed.
Resupply	13-14 days for system to provide highest priority items (after resupply begins).	3-4 days via Desert Express / European Express, etc.
Supported A/C beddowns	MDS at multiple bases in 1-2 squadron configurations.	All of some MDS at same location - other MDS collocated with like MDS of Coalition (Saudi F-15, E-3A).
A/C Availability	Significant numbers of A/C down for parts expected and tolerated - specifically defined by DSOs (e.g., 75%).	Any A/C down required immediate resolution.
A/C Availability	Operations Priority Matrix establishes relative balance of target support at MDS and unit levels worldwide.	All A/C in AOR same highest priority.
Spares Management	Initially retain spares accountability at home station.	Same.
Spares Management	Transition to in-theater Standard Base Supply System (SBSS) computer support and transfer war readiness spares kits (WRSK) (and other spares and equipment) to CINC.	TAC established CSSA at Langley; SAC linked support to SBSS through Moron/ Torrejon, and Anderson, and later partially to CSSA; MAC used embedded FSS for strategic airlift and linked to SBSS at Rhein Main for tactical airlift, and later to CSSA; USAFE used inplace computer assets.

Table 23 (Continued)
Planned Versus Actual Supply Activities

Support Area	CONOPS/Plan*	Actual
Spares Management	No resupply of WRSK.	Continuous resupply of WRSK.
Spares Management	Units not authorized WRSK cannot deploy.	Deployed units not authorized WRSK; spares packages built on the fly.
Spares Management	Adjust home station demand levels down after A/C leave.	Retained home station demand levels.
Spares Management	Economic Order Quantity (EOQ) items in WRSK.	Some units did not have EOQ items in WRSK; others failed to rotate age-controlled items.
Spares Management	Status on requisitions within 48 hours by policy/ system design.	CENTAF required status within 8 hours.
Spares Management	Use Combat Supply System (CSS) for deployed asset management until access to "host" SBSSs established.	CSS did not work well. SAC, MAC, TAC "adjusted" differently. CSS finally evolved to CSSA as a common thread for AOR-based units with exceptions, e.g., strategic airlift and USAFE.
Spares Management	Convert WRSK to operating stock except if tasked for possible redeployment.	Kept all WRSK built-up.

* Derived from multiple sources including AFR 400-24, AFM 67-1, WMP-1 (ANNEX E), draft Supply Concept of Operations (AF/LGSS), Supply Wartime Planning and Execution Guide, and OPLAN 90-1002.

height of the war, the Air Force was issuing approximately 15 million gallons of jet fuel per day, including over 11 million gallons per day issued in the AOR and 4 million gallons per day issued to aircraft operating out of Europe. In all, over 111,000 U.S. and allied combat sorties were supported. Storing and issuing this much fuel required over 120 R-14 air-transportable hydrant refueling systems, 220 R-9 refueling vehicles, 679 50,000-gallon fuel bladders, and over 926 fuels personnel.[60]

Fuels personnel coordinated several interoperability fuels issues with the Saudi hosts and Central Command. The issues ranged from loaning R-14s to the Saudis, arranging offshore tanker deliveries, ensuring quality control, and installing and training personnel in the use of fuels mobility support equipment (FMSE). Fuels personnel also managed and coordinated use of the Aerial Bulk Fuel Delivery System to move over 600,000 gallons of fuel to sites as far north as Kuwait in support of allied forces. They also used that delivery system to move Jet Petroleum Thermally Stable (JPTS), which the U2/TR-1 uses, from bases in Europe to the AOR.

Host nation support was a major contributor to the success of the fuels operation. All ground fuels and most of the jet fuel except for JP-5 (for Navy Aircraft) and JPTS were provided from within the theater. Saudi Arabia, United Arab Emirates, and Oman contributed 1.76 billion gallons of fuel for land, sea, and air operations.[61] (Saudi Arabia and the United Arab Emirates donated the fuel.) Without the contributions of those nations, the fuel would have required extensive sealift, which would have exposed the inadequacy of the U.S. tanker fleet.[62] The dollar amount of this contribution (calculated in U.S. dollars at $1.20 per gallon) is approximately $2 billion. Additionally, commercial airport contractors provided into-plane refueling support, host military provided aircraft refueling at military bases, and host nation trucks and drivers accomplished most of the inland distribution of fuel from refineries and depots to the bases. Host nation help with inland fuel distribution removed a major burden from Army Central Command (ARCENT), which was responsible for bulk fuel inland distribution and had committed most of its truck companies to moving fuel for ground forces.

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[60] *Ibid.*

[61] *Ibid.*

[62] Andrew E. Gibson and Commander Jacob L. Shuford USN, Desert Shield and Strategic Sealift, Naval War College Review, Spring 1991, p 17.

By the time the war started, Air Force fuels mobility equipment (air transportable hydrants, air transportable bladders, and air transportable pumps and transfer systems), refueling vehicles, and personnel combined with host nation personnel and fuels facilities were available at each deployed location (except at Al Kharj and the forward operating locations) to provide refueling support to sustain operations. Additionally, fuel distribution and storage equipment from the Army Southwest Asia Petroleum Distribution Operational Project was deployed from the continental United States to the AOR. The project consists of pipeline, tactical petroleum terminals, and pump stations for distributing large quantities of fuel across great distances. During Desert Shield and Desert Storm, more than 127 miles of tactical pipeline were laid to respond rapidly to urgent operational support requirements and to enable movement and storage of greater quantities of fuel forward to support Army requirements.

The Fuel Situation

This section will cover all the major aspects of fuels during Desert Shield and Desert Storm. It describes the fuels situation before Desert Shield and during Desert Shield, build-up, Desert Storm, and redeployment. It ends by discussing the implications of successes and failures during those times.

Before Desert Shield

A supply of jet fuel (for planned arriving forces) was prepositioned in or near the AOR before Desert Shield. [DELETED][63] The fuels included product owned by the U.S. Air Force in Oman and product owned by the Defense Fuel Supply Center (DFSC) at storage sites in the theater, Somalia, Diego Garcia, Singapore, and Italy. DFSC also owned POL in three Afloat Prepositioning Ships which were stationed at Diego Garcia. As Table 24 depicts, approximately 8.5 million barrels of fuels were available before Desert Shield. However, as depicted in Figure 62, about 4.1 million barrels of the storage was malpositioned outside the AOR. Even the fuel in the AOR was somewhat malpositioned, since very little of it was located at the places where the users needed it. Also, most of the jet fuel prepositioned in the AOR was JP-5. While JP-5 was not the

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[63](S) Tel Intvw author with, Cdr Bill Blount CENTCOM/Joint Petroleum Officer, MacDill AFB, 4 Feb 1992.

fuel with the greatest demand, it was the CENTCOM choice of fuel for prepositioning for two reasons. First, JP-5 was more difficult to source in the AOR than JET A-1; second, JP-5 provides more flexibility in that it can be used by both ground- and sea-based aircraft as well as by ground combat support equipment.[64]

Table 24
CENTCOM Fuel Storage
(Millions of Barrels)[65]

ASHORE	JP-5	JET A-1	DFM[66]
Bahrain	1,536		
UAE	954		470
Oman	117	382	248
Djibouti	181		316
Somalia	129	22	
Singapore	350	1,000	
Italy		2,028	
AFLOAT			
Bahrain (one ship)	13		
Diego Garcia (three ships)	760		
TOTAL	4,040	3,432	1,034

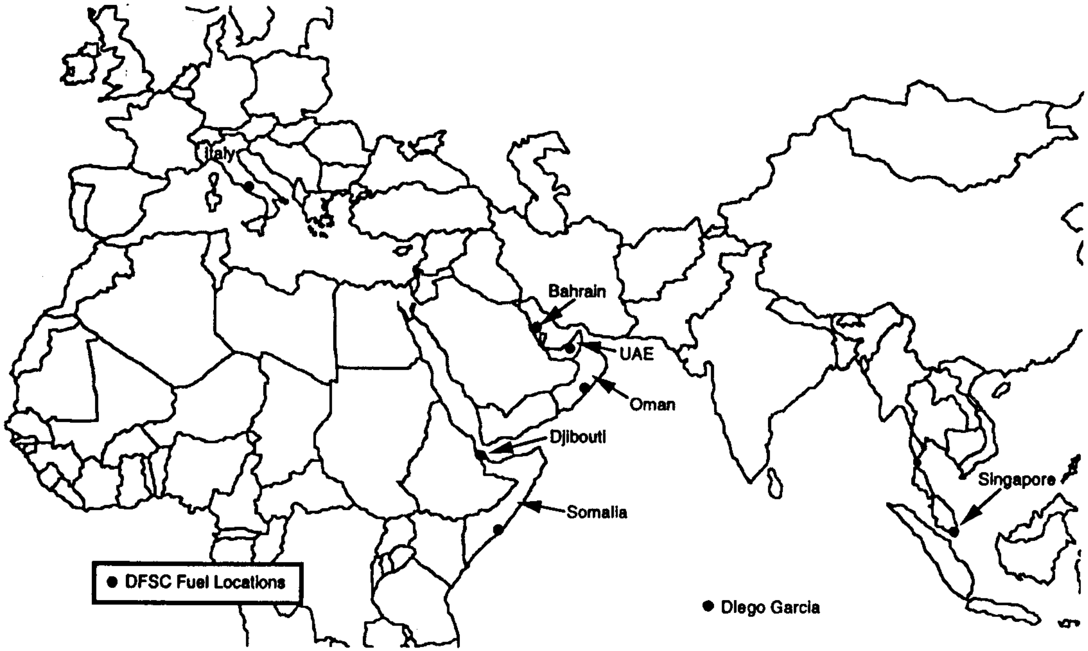
(source: USCENTCOM/JPO)

[64]Briefing USCENTCOM, "Desert Shield/Desert Storm Fuels Support," CENTCOM Joint Petroleum Office, Cdr Bill Blount, Sep 1991.

[65]A barrel equals 42 gallons.

[66]Diesel Fuel Marine.

Figure 62
DFSC Fuel Locations



Although this fuel was prepositioned, its malpositioning would necessitate significant inland distribution. Therefore, plans called for a significant amount of reliance on host nations for adequate refueling support. However, in the absence of any signed agreements, much of this support was based on hand shakes and assumptions.[67] The United States had been negotiating unsuccessfully for years with the Saudi Government for fuel storage in Saudi Arabia.[68] Additionally, very little was known about the fuels capability at in-country airports and bases. Airport data from the Worldwide Automated Airfield Intelligence File Database published by the Defense Mapping Agency did not contain key information such as storage capacity, receipt modes and capacity, and distribution modes and capacity on most of the Southwest Asia airports.[69] Because they lacked that information, fuel planners had difficulty in determining what each base would need to provide refueling support.[70]

In addition to prepositioning fuel, the Air Force also prepositioned some of its FMSE in the AOR. Knowing that deploying aircraft would beddown at host nation airports and military bases where additional fuels support would likely be required, the CENTAF fuels planners prepositioned 59 R-9 refuelers, 42 R-14 portable hydrant systems, 139 50,000 gallon fuel bladders, 29 R-22 storage distribution pumps, and a 5-ton liquid oxygen generating plant in the Air Force prepositioning sites in Oman, Bahrain and aboard the three prepositioned ships in the Indian Ocean.[71] Additional refueling units and FMSE were prepositioned in war reserve materiel status at Seymour Johnson and Myrtle Beach Air Force Bases.[72] These assets were maintained in a constant state of readiness and could be brought out of storage and set up at any bare base to provide quick and safe refueling support. A more detailed discussion of the prepositioned equipment will follow in this chapter.

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[67] *Ibid.*

[68] Tel Intvw, author with Mr Bill Robinson, Deputy Director of Operations, Defense Fuel Supply Center, Cameron Station, VA, 20 Feb 1992.

[69] Intvw, author with Lt Col Thomas Ashman HQ USAF/LGSF, Pentagon, 10 Jan 1992.

[70] Tel Intvw, author with MSgt Richard Willis CENTAF/LGSF, Shaw AFB, 3 Feb 1992.

[71] Intvw, author with Capt James Grant CENTAF/LGSF, Shaw AFB, 27 Apr 1992.

[72] *Ibid.*

The combination of prepositioned fuel and equipment in or near the AOR was not adequate to support forces eventually deployed during Desert Shield and Desert Storm. However, it did provide some initial fuels capability and provided an excellent supplement to the host nation support.

Desert Shield Build Up

As forces began to deploy, an initial cadre of three fuels personnel arrived at Riyadh to guide force beddown and establish movement priorities.[73] In a short time, six more fuels specialists arrived to ensure twenty-four-hour coverage, effect liaison with Army forces, and conduct field assistance visits to determine which and how much fuels equipment and manpower should be deployed.[74] Unit fuels personnel and some fuels mobility equipment deployed with aircraft aviation and combat support unit type codes. However, it soon became apparent that additional equipment beyond that prepositioned in theater would be needed. Due to space limiting factors in the AOR, an additional ninety-two R-9s, thirty-six R-14s, twenty-five R-22s and various other FMSE owned by the Tactical Air Command and earmarked for deployment to Southwest Asia were in war reserve material status at Myrtle Beach and Seymour Johnson AFBs.[75] As forces deployed, and beddown locations were made known, the equipment from Myrtle Beach and Seymour Johnson was airlifted to the AOR.

The major refueling concerns during the early days of deployment were at Dhahran and Riyadh, which were the major Aerial Ports of Debarkation. Host nation refueling capability at these locations could not sustain the flow of aircraft, and some delays in takeoffs of MAC aircraft occurred. The situation existed for about two weeks until CENTAF established a forward operating location at Al Jubayl Naval Airport for intermediate refueling.[76] The situation was completely overcome when adequate FMSE and refueling units were in place.

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[73] *Ibid.*

[74] *Ibid.*

[75] Tel Intvw, author with Maj Leon Spackman HQ TAC/LGSF, Langley AFB, 5 Feb 1992.

[76] Intvw, Capt Grant.

As force levels were increased over and above what had been previously planned, in-theater petroleum, oil, and lubricants (POL) require-ments increased proportionately. Fuels planners were not only responsible for determining how much manpower and equipment would be required at each location, but were also required to establish fuel requirements to support combat operations. The requirements were to be passed forward to Central Command's Joint Petroleum Office, which in turn consolidated each Service's requirements and passed them to the Defense Fuel Region/ Middle East (DFR/ME), a subordinate element of the Defense Fuel Supply Center. Tables 25 and 26 depict the pre-Desert Storm daily requirements provided to Central Command by the Services.

DFR/ME identified sources of supply and, in coordination with the Military Sealift Command, scheduled the tanker ships to carry the bulk petroleum to the AOR. However, as previously stated, most of the requirements (ninety-three percent) were satisfied from within the AOR. In Saudi Arabia, the Saudi Arabian Marketing and Refining Company (SAMAREC) was tasked by the Ministry of Defense and Aviation (MODA) to provide fuel to all Coalition forces operating in country. A written agreement in November 1990 formalized the procedures and scope of fuel support the Saudis would provide. A written pre-Desert Shield agreement with the Omani Air Force made fuel support available to U.S. aircraft operating in Oman. All other agreements were either verbal or based on some other type of contractual agreement. In December 1990, MODA established a National Petroleum Management Council composed of representatives from MODA, SAMAREC, Petrolube, the Ministry of Petroleum, and the Arabian American Oil Company, which dealt primarily with crude production. A similar agency existed in the UAE. The councils coordinated Coalition fuel requirements and resolved problem areas.

The CENTCOM stockage objective was to maintain a minimum of a thirty day POL supply despite that more aircraft were arriving than had been planned for in OPLAN 1002-88.

Table 25
Daily Requirements by Component (Millions of Gallons)

	Theater	Saudi
Air Force	10.8	7.6
Navy	5.5	5.3
Army	6.3	6.3
Marines	2.4	1.5
Total	25.0	20.7

Table 26
Daily Requirements by Product (Millions of Gallons)

	Theater	Saudi
Commercial Jet Fuel (Jet A-1)	15.0	10.9
Army Preferred Diesel (DF2)	4.2	4.2
Navy Preferred Jet Fuel (JP-5)	1.9	1.7
Diesel Fuel Marine (DFM)	3.5	3.5
Motor Gasoline (MG)	0.4	0.4
Total:	25.0	20.7

Determining the POL requirements was a difficult task for the Services; Air Force requirements were the most sensitive. Not only was the Air Force the largest user, aircraft beddown locations as well as the number and type of aircraft being deployed were changing constantly. Requirements were estimated by multiplying the number of aircraft deployed by the War Mobilization Plan (Volume V, Daily Sortie Rates) times the average hourly aircraft fuel burn rates established in AFR 144-4.[77] More exact requirements could not be derived, as the estimators did not know how long the sorties would be or how many would be flown each day. This information could not be provided by any of the air campaign planners.[78] Thus, the requirements provided to CENTCOM were only rough estimates at best.

Service requirements (when consolidated) were forwarded to SAMAREC officials who continually assured Defense Fuel Region and Central Command representatives that they could provide the fuel. SAMAREC officials also provided assurance that they could transport the fuel from their depots and refineries to the locations where it was needed. Inland distribution was a continuing concern by the entire fuels community and will be discussed later. As a side note, fuel requirements from the Military Airlift Command were passed forward to the Defense Fuel Supply Center (DFSC) as well. Fuel requirements at continental U.S. aerial ports of embarkation and intransit locations in Europe went up significantly when the deployment began. DFSC had to ensure that the supplier at these locations could meet the increased requirements. Problems encountered in Europe will be discussed later in this section as well.

Fuel Additives

Since JET A-1 (commercial grade jet fuel) was the primary jet fuel being provided by in-theater suppliers, Air Force fuels personnel were responsible for injecting the fuel with the proper additives before it was consumed by Air Force high-performance jet aircraft. Prescribed amounts of fuel system icing inhibitor, anticorrosion additive, and antistatic additive had to be injected into the fuel to avoid engine damage resulting from prolonged use of commercial grade fuel. With additives injected, JET A-1 is identical to JP-8, the standard used in Europe/NATO.

According to USCENTAF OPLAN 1021-88, each deploying unit was to take a ten-day supply of additives with them when they deployed. However, many of the units did not take the additives, and additional stocks were required to resupply what additives had been taken. DFSC, the agency responsible for providing the resupply, needed to take some special con-

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[77]Tel intvw, author with MSgt Richard Willis CENTAF/LGSF, Shaw AFB, 5 Feb 1992.

[78]*Ibid.*

tracting initiatives to correct the situation. At the onset of Desert Shield, it was apparent that an inadequate inventory of additives was on hand in Saudi Arabia, especially if the conflict situation was prolonged. The quickest method to relieve the insufficiency was to purchase the additives through an existing contract in the Middle East. Therefore, DFSC arranged for the purchase of 9,361 drums of Fuel System Icing Inhibitor, 271 drums of Anti Corrosion Inhibitor, and 88 drums of Anti Static Inhibitor from Caltex Oil Products Company.[79]

With resupply made available from DFSC, Air Force fuels personnel were responsible for injecting the additives into the fuel at all locations. This proved to be very difficult. The fuel additive injectors, as currently designed, slowed down fuel flow because the diameters of the piping within the injectors were smaller than those of the equipment used to offload tank trucks.[80] This situation was exacerbated by numerous injector diaphragm failures and the lack of qualified repair technicians. Thus, the rapid initial lay-in and continued preservation and maintenance of fuel inventories was more important to fuels managers than actually injecting the additives. It cannot be determined if fuel additives were injected at all locations. However, fuel additives or the lack thereof were not "show stoppers"; aircraft flew with and without them, depending on location, with no apparent ill effects.

Deployment Location Capability

As fuel requirements were determined and passed forward, the CENTAF fuels planners turned their attention to aircraft refueling capacity at each location. Ensuring the proper mix between Air Force organic refueling capability (equipment and personnel) and host nation support refueling capability was a very sensitive area. Effort had to be made to ensure round-the-clock sortie-generation capability; yet the United States did not want to offend the host by bringing in massive numbers of fuel trucks, hydrant systems, bladders, and personnel.[81]

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[79]Tel intvw, author with Maj John McCormick DFSC/OS, Cameron Station, VA, 6 Feb 1992.

[80]Intvw, MSgt Willis, 5 Feb 1992.

[81]Intvw, author with Lt Col John Anna, DFSC/NE McGuire AFB (formerly HQ TAC/LGSF, Langley AFB, during Desert Shield).

Since little was known about deployment locations, the senior fuels technicians on the ground were basically responsible for determining their equipment and personnel requirements. Many of these technicians were junior grade non-commissioned officers (NCOs) with little experience in setting up mobility equipment to support combat operations.[82] The situation was caused by the combining of small unit type codes rather than the use of one large unit type code. The lack of senior supervision led to favoritism toward certain host base personnel, discontentment among personnel of the same rank, and a split of refueling responsibilities (i.e., "you refuel your aircraft and we'll refuel ours").[83] The lack of familiarity with fuels mobility support equipment also led to unnecessary delays in equipment operation. The vast majority of fuels supervisory personnel had little if any idea of how to actually set up and locate a bare base FMSE system.[84] For example, at one location with over one-hundred fuels personnel, the R-14s were out-of-service because no one knew to flip the reset switch.[85] Over ten years had elapsed since many individuals had any contact (i.e., training) at all with the equipment. To overcome this lack of experience and knowledge Air Force, Central Command established a special team to set up FMSE at most of the beddown locations.[86]

Once the requirements for refueling equipment and personnel were established at each of the beddown locations, CENTAF, with the assistance of the Tactical Air Command (TAC) Fuels Staff, was responsible for sourcing the assets to meet the requirements. Once sourced, the two organizations were responsible for ensuring that the requirements were provided to CENTCOM for inclusion in the Time Phased Force Deployment Listing. Initial sourcing of equipment came from the fuels equipment prepositioned in the AOR. Follow-on requirements were sourced from additional TAC prepositioned assets at MacDill and Seymour Johnson. When the stocks at MacDill and Seymour were exhausted, equipment from both USAFE and PACAF were sourced. In all, ninety-two percent of

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[82]Intvw, author with Col Randy Harrington HQ USAF/LGSF, Pentagon, 25 Jan 1992.

[83]Point Paper on Operations Desert Shield/Desert Storm After Action Report, TSgt French, Hq USAFE, LGSF, 12 Feb 1992.

[84]Intvw, author with Mr. Jack Lavin HQ USAF/LGSF, Pentagon, 25 Jan 1992.

[85]Background Paper on Increasing Proficiency on Fuels Mobility Support Equipment (FMSE), SMSgt Henderson, HQ USCENTAF, LGSF, 23 Jan 1992.

[86]Intvw, Lavin, 25 Jan 1992.

the worldwide inventory of FMSE was deployed. This deployment left the other combatant commands with limited ability to establish any kind of bare base refueling capability, had it been necessary.

JPTS Stocks

The absence of an inventory of jet propellant thermally stable (JPTS) fuel in Saudi Arabia for U-2 and TR-1 aircraft generated one of the most time-consuming fuels problems to overcome by the fuels community in the first weeks of SWA operations.[87] Because POL managers at Taif were denied use of a storage facility on the base, CENTAF secured and received approval from the Saudi government to install several 50,000-gallon storage bladders. The closest sources of JPTS to fill the bladders were at Torrejon Air Base in Spain and Royal Air Force (RAF) Base Akrotiri on Cyprus. The JPTS at Torrejon consisted of 3,000 55-gallon drums, which were airlifted to Taif by SAC KC-10s and MAC C-141s. The JPTS at RAF Akrotiri consisted of approximately 700,000 gallons stored in bulk fuel tanks. C-141s equipped with area bulk fuel delivery systems airlifted approximately 100,000 gallons from Akrotiri to Taif. Trucks moved additional fuels in drums from the refinery in Texas to Barksdale AFB, Louisiana, where it was then airlifted to the AOR. Once a 60-day stock supply level was established in theater, resupply was established by sealift and line-haul tank trucks.

Inland Distribution

U.S. Army Forces, Central Command was responsible for inland distribution of bulk petroleum to supported Service components in the AOR.[88] The 475th Quartermaster Group (Reserve) was responsible for providing the necessary support. On 7 January 1991, the 475th, through the Commander-in-Chief, Central Command, published an Inland Distribution Plan.

The publishing of the Inland Distribution Plan was delayed by the late arrival of the 475th QM Group, which did not arrive until the last part of

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[87] Intvw, author with Lt Col Patrick Chesterman HQ SAC/LGSF, Offutt AFB, 15 Mar 1992.

[88] USCINCCENT Operation Desert Shield Joint Operations Center, Petroleum Distribution Plan, Cdr Blount, 7 Jan 91.

October 1990.[89] The arrival of this Reserve Group was delayed mainly because of the decision to give deployment of combat forces priority.[90] According to the plan, the primary resupply of all storage facilities in theater was to be by commercial (host nation) and U.S. Army line haul. Support from theater bulk storage facilities forward to the Army Marine Corps, and CENTAF was accomplished primarily by a combination of host nation tank trucks and U.S. Army tankers. Distribution to each base was accomplished through use of in-place contracts, fixed airfield storage facilities, and host nation truck line haul in combination with U.S. assets received by airlift and sealift during the mobilization period.

The expansion of U.S. support to the Eastern, Central, and Western Provinces of Saudi Arabia utilized the 127 miles of tactical pipeline laid to help meet operational requirements. The pipelines were laid by the Army Southwest Asia Petroleum Distribution Operational Project, which was a coordinated effort of military and contract personnel using prepositioned assets in the AOR. The effort augmented the host nation petroleum distribution system.

Distribution to Saudi Arabia's Central Province

According to the inland distribution plan, the 226th Area Support Group, utilizing its organic petroleum assets, was to establish general support (GS) bases for units in and passing through its area of support. These bases were to be established at King Khalid Military City and Logbase Alpha to provide direct support and retail support to Echelon Above Corps units at each location and direct support to divisional and non-divisional units passing through their areas of operation. Additionally, the 226th Area Support Group was to provide gasoline and diesel support to CENTAF at King Khalid Military City.

The 2d Area Support Base was to provide limited general support, direct support, and retail support for MOGAS and diesel in the Riyadh area of operations to Echelon Above Corps units, CENTAF, and units passing through the Riyadh support base area. In addition, Army-projected distribution planning for the Central Province included extending the six-inch tactical petroleum pipeline from the Eastern Province at Bastognein in a

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[89] *Ibid*, telephone interview with Cdr Blount.

[90] *Ibid*.

northwestern direction toward King Khalid Military City. CENTAF's 55th Surveillance and Reconnaissance Wing at Riyadh and the 340th Air Rescue Wing at King Khalid International were to be resupplied by host nation tank trucks. CENTAF storage facilities were used at the respective airbases. These plans were not fully implemented before Desert Storm.

Distribution to Saudi Arabia's Western Province

According to plan, the 475th Quartermaster Group was to provide class III bulk support to CENTAF locations through employing Liaison teams in the Western Province of the Kingdom of Saudi Arabia. Liaison teams were to be responsible for ensuring orderly resupply of fuel at all beddown locations by host nation contracts, planning future support requirements, and providing an operational link with the 475th Quartermaster Group as operators of the inland petroleum distribution system. CENTAF beddown locations included the 190th Air Rescue Service at Jeddah New, the Tactical Fighter Wing at Khamis Mushait, the 33d Tactical Fighter Wing at Tabuk, and the 48th Tactical Fighter Wing at Taif. As was the case in the Central Province, these plans could not be fully implemented before Desert Storm.

Distribution Outside Saudi Arabia

In addition to the Kingdom of Saudi Arabia, ARCENT through the 475th POL Group was responsible for distributing Class III bulk to Service components located in Oman, UAE, Bahrain, Qatar and Egypt, which encompass the rest of the CENTCOM Theater of Operations. The major customer in these locations was CENTAF. Distribution to the locations was accomplished by plane, truck and bladder contracts initiated by the respective Service component through DFR-ME/DFSC.

Host nation support was a major contributing factor to the distribution of petroleum within the theater. According to interviews with Air Force Lt. Col. David Herrick and Army Lt. Col. Bob Ross from the JCS/J4 staff, the Army could not have provided the required support if it were not for the assistance of the host nation. All but four of the twenty-eight Army line haul units were in the reserve, and they did not arrive in-theater until after the Presidential call-up, causing significant concern on the part of CENTAF and Air Staff Logistics staffs.

The CENTAF logistics staff felt that host nation support for line haul would collapse once the shooting began.[91] Knowing that the Army was stretched to its limit already, CENTAF took the initiative to establish its own line haul transportation organization. Dubbed the "Blueball Express," its primary mission was to transport munitions and aviation fuel to sustain the air campaign and subsequent ground offensive.[92] Consisting of over 200 drivers and 118 commercially leased tractor trailers, the Blueball Express moved over 20 million pounds of USCENTAF cargo and munitions.

JP-5 for the Navy

The U.S. Navy required JP-5 for carrier based aircraft. Since the Air Force was providing the majority of the aerial refueling for Navy aircraft, JP-5 storage sites were established in Seeb, Oman, and Jiddah in Saudi Arabia, to provide the required product. Approximately 400,000 gallons of JP-5 were available at Jiddah to support aircraft operating out of the Red Sea; 200,000 gallons were available in Seeb to support aircraft operating out of the Persian Gulf. All storage was in 50,000-gallon collapsible bladders. DFSC established resupply from stocks in Oman and afloat in the Red Sea. Air Force tankers operated from both Seeb and Jiddah to provide JP-5 aerial refueling for the Navy, in addition to the other locations throughout the AOR where the tankers operated with the standard host nation provided JET A-1. Although JP-5 was the aviation fuel the Navy preferred, dedicating part of the tanker force to JP-5 only to support the Navy was not practical. The Navy requested exclusive JP-5 support because of safety concerns once the aircraft landed on the carriers. JP-5, a more stable fuel, has a flash point of 140 degrees F.[93] The flash point of JET A-1 is 100 degrees F, which makes it less stable to handle. JP-4, the common fuel used in the continental United States, has a flash point of -20 degrees F. It was available at four (non-tanker) bases in the AOR and at Incirlik, Turkey. According to USCENTAF/DO, the Air Force would provide JP-5 to the Navy whenever possible, and would inform the pilots when something other than JP-5 was issued.[94] A review of fuel issue

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[91]Intvw, Capt Grant; Intvw, MSgt Willis.

[92]Maj Milton T. Siler, "Blueball Express," Journal of Logistics, Fall 1991.

[93]The Flash point of fuel is defined as the temperature the fuel will ignite given and ignition source. Thus, the higher the flash point, the more stable the fuel.

[94]Msg, USCENTAF, 002259Z, Dec 1990.

records maintained in the Contingency Supply Support Agency computer data base at Langley AFB indicates that 20,386,486 gallons of jet fuel were issued by the Air Force to the Navy during Desert Shield and Desert Storm. Eighty-five percent of the fuel provided to the Navy was JET A-1, 5 percent was JP-5, 7 percent was JP-4 and 3 percent was JP-8.

Intransit Fuels Support (Europe)

The fuel support to transiting aircraft as well as equipment and manpower provided by USAFE were major contributing factors to the success of Desert Shield, Desert Storm, and Proven Force. For example, USAFE fuels staff personnel sourced Command assets and worked airlift requirements for critical fuels issues in minimal time. The fuels division tasked 356 USAFE fuels personnel for Desert Shield and Desert Storm, thereby placing over 35 percent of all fuels specialists at the forward operating locations.[95] Over 300 fuels mobility support assets and approximately 100 refueling vehicles were deployed. With almost 80 percent of the MAC airlift transiting USAFE bases and a large number of SAC tankers and B-52s bedding down at USAFE bases in England and Spain, the USAFE experienced a command-wide 200 percent increase in fuels consumption, equating to an unprecedented 600 million gallons of aviation fuel consumption during August 1990-February 1991.

The only significant problem arose in Spain where fuel consumption increased by 300 percent. Torrejon and Zaragoza Air Bases were saturated. While no sorties were lost, some diversions were made because fuel inventories at the terminals supplying the bases were reduced to critical levels. The resupply capability from the terminals to the bases was a key concern to those determining fuel supportability of scheduled MAC missions. Moron had little difficulty supporting fuel requirements, but the fuel system there was not tasked as heavily. The primary resupply to terminals supporting U.S. bases in Spain is through the Spanish Pipeline System operated by CAMPSA, the Spanish governmental petroleum transportation agency. CAMPSA must balance U.S. military requirements against those of the Spanish Military and the Civil Sector. USAFE instituted unprecedented measures to resupply the terminals. Normally, only the U.S.-built Rota-Zaragoza pipeline supplies terminals feeding all three U.S. bases. However, fuel demands in southern Spain at Moron and Torrejon

[95]Headquarters United States Europe Logistics History, Aug 1991.

restricted the availability of fuel to northern Spain, which resupplies Zaragoza. In October 1990, negotiations resulted in an agreement to utilize a CAMPSA northern pipeline route, thus enabling the United States to receive fuel directly from Zaragoza.

In mid-November 1990, it was evident that the northern pipeline route would not be able to maintain fuel stocks at Zaragoza. The around-the-clock pipeline receipts from the south were not sufficient to build fuel inventory levels at Torrejon. Fuel levels continued to drop at terminals resupplying Torrejon and Zaragoza. Since the rail system in Spain could not augment fuel deliveries, tank truck deliveries began in January 1991. At one time, as many as sixty trucks were delivering jet fuel from hundreds of miles away. When USAFE asked for additional tank truck deliveries, they were told by Spanish officials that the United States had saturated the CAMPSA fleet. However, base fuel levels continued to drop to as low as one day of supply. By late January 1991, the fuel situation in Spain, which was a priority issue in USAFE's efforts to support the Gulf Crisis, received General Officer attention. In February 1991, the issue was elevated to the U.S. Ambassador, who requested more pipeline time from Spanish officials. At the expense of civil requirements, the United States was able to receive more pipeline time for fuel deliveries, allowing for full mission accomplishment without any loss of sorties. During August 1990-February 1991, over 300 million gallons of jet fuel was issued at USAFE bases in Spain–six times the normal amount. Torrejon alone issued sixty percent of this total, or seven times their normal peacetime workload.

Single Fuel on the Battlefield

During Desert Shield, CENTCOM designated JET A-1 as the single fuel on the battlefield. However, throughout Desert Shield the Army experienced a growing concern about the suitability of JET A-1 as a replacement for diesel in tanks. The biggest operational problem cited was the lack of smoke-generating capability with JET A-1 in tanks. Because diesel smokes more than JET A-1, diesel fuel would give them more cover. There was also a concern that during the conversion of diesel burners to JET A-1, excessive filter clogging would occur because of the cleaning nature of JET A-1.[96] Operators also speculated that JET A-1 lubricity was not as great as diesel fuel and would cause equipment failures. Finally, some equipment fires were attributed to the use of JET A-1 instead of diesel. As a result of these concerns, ARCENT proposed giving their commanders a choice of using either JET A-1 or diesel fuel. CENTCOM concurred with this decision because the operational concerns outweighed the logistical advantages of using a single fuel. The decision optimized the Saudi's capability to provide fuel to the forward Army Logbases. Specifically, the use of diesel by the Army allowed the Saudis to draw from some diesel storage sites located nearer to Logbases, thus reducing the transportation time. It also maximized the use of Saudi transportation because it allowed for the use of Saudi trucks and pipelines in diesel service that may not have easily converted to JET A-1. Finally, the decision maximized the Saudi refining capacity, which was at the maximum for JET A-1 but had excess capability for diesel.

Desert Storm: Sustaining the Flow

During Desert Shield, CENTCOM established a goal to achieve a thirty-day fuel stockage objective. The fifty-day supply prepositioned ahead of time was no longer adequate, since requirements planned for in CENTCOM OPLAN 1002-88 more than doubled. The OPLAN stock level represented only about fifteen days of supply before the start of the war. To meet the thirty-day stockage objective, the remaining stocks were stored as follows:

- Five-day supply at base level (bladders storage plus host nation tankage)
- Ten-day supply at depots and refineries in the host countries.

The CENTCOM/JPO coordinated with fuel representatives from each country, asking them to maintain fuel stocks equal to a ten-day supply. Saudi Arabia and UAE agreed, but other countries were either unable or unwilling to make the commitment. As a result, the Saudis agreed to supply fifteen days of fuel for Coalition forces based in Saudi Arabia. Using imported and fuel they produced themselves, the Saudis positioned 250 million

[96]Briefing, USCENTCOM, "Desert Shield/Desert Storm Fuel Support," USCENTCOM Joint Petroleum Office, CDR Bill Blount, Sep 1991.

gallons in tankers off the coast of UAE. Before Desert Storm began, CENTCOM's fuel supply had reached a level of twenty-six days theaterwide.

Table 27 indicates that when Desert Storm began, both Air Force-owned fuel and equipment and host-nation-owned fuel and equipment were stored at each of the deployed locations. The combination of these assets allowed for the issue of 906 million gallons of jet fuel to support 111,000 Allied sorties without any delays or incidents. The months of preparation had provided the fuels community with ample time to build stocks and establish the infrastructure for sustaining combat operations. However, three significant concerns arose related to Desert Storm: (1) host nation drivers would walk off the job when the war began; (2) in-theater refineries and port facilities would be destroyed, thereby requiring stocks to be brought in from outside sources; and (3) keeping bases resupplied with fuel could be a problem in view of increased consumption rates.

Some host nations drivers did walk off the job during the first few days of the war. However, Air Force drivers provided by the Blueball Express were able to take their places without any degradation in support. As the war went on, some of the host nation drivers came back to work.

With the majority of the fuel being provided from sources within theater, the concern over the loss of in-theater refining capability was well founded. This concern prompted a study by DFSC in early November hypothesizing the loss of differing percentages of in-country refining capability. According to DFSC, only a degradation of one-hundred percent of the in-country refining capacity would result in fuel nonsupport. The concern that port facilities might be damaged or destroyed prompted the deployment of two Navy Offshore Petroleum Discharge Systems (OPDS) and the Army's inland petroleum distribution system (IPDS). The systems provided the capability to establish over-the-shore fuel support in ports that had been damaged or in undeveloped coastal areas that required support. Personnel from the Navy Amphibious Construction Battalion deployed to the AOR to operate the Navy's system, but the system was never employed.[97] The magnitude of the host nation refining support, with the length of the mobilization period, created the ability to sustain fuel supplies so robust that it was never challenged.

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[97] *Ibid.*

Table 27
Desert Storm Fuel Status

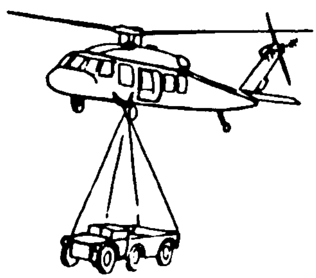
Location	Storage USAF/HN (MIL GL)	Equipment R-9	R-14
Cairo	.95/1.09	0	4
Tabuk	1.5/2.45	9	5
King Khalid Int'l	.035/10.5	6	2
King Fahd Int'l	2.8/10.7	25	17
Jeddah	1.75/3.1	11	12
Taif	2.5/.3	9	14
Dhahran	1.76/3.9	13	5
Al Kharj	4.17/0	24	15
Al Dhafra	4.75/2.16	15	6
Thumrait	5.6/0	9	6
Khamis Mushait	.34/2.5	8	3
Shaik Isa	2.9/.056	20	8
Bateen	.97/.32	4	3
Doha	.24/.245	8	2
Sharjah	.215/.5	3	1
Al Jubayl	.62/0	0	2
Al Ain	.53/.19	6	2
Seeb	1.1/5.2	7	5
Masirah	7.8/2.1	9	2
Al Minhad	1.2/.25	10	5
Riyadh	.635/5.0	21	5
Al Jouf	1.8/0	2	2
Ships	114.2/130.5		
TOTAL	153.9/191.1	219	126

(Source: AF/LRC)

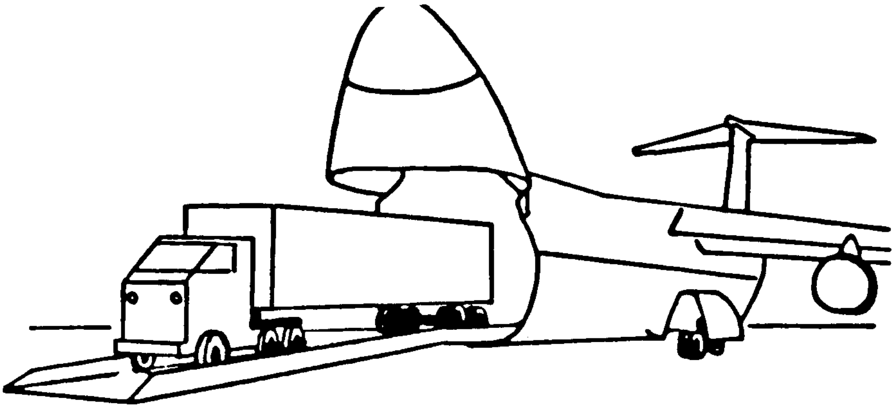
Concern over the ability of resupply to keep up with fuel usage was equally well founded. At locations such as Jeddah New and King Khalid (major tanker beddown locations), where large amounts of fuel were expected to be consumed, only one to three days supply of stock were on hand at each base. Resupply would be vital to avoid runouts. CENTAF and CENTCOM staffs monitored closely daily inventories to see if resupply would keep up. Fortunately, resupply never became a problem at these or any other of the beddown locations.

Redeployment

At the conclusion of the Desert Storm Campaign, approximately 35 million gallons of fuel were in Army and Marine Logbases and 38 million gallons in Air Force bladders.[98] The stocks were used to support redeploying forces and to refuel MAC aircraft. As the stocks were drawn down, some were replenished to support continuing redeployments; others stocks became unavailable as the fuels mobility support equipment was taken down.



[98] *Ibid.*



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Maintaining the Force

Chapter 2 described the state of overall logistics preparation for a Southwest Asia contingency on the eve of the Gulf War. This chapter will relate the maintenance situations as it actually unfolded throughout Desert Shield and Desert Storm. Areas to be covered include:

- Reestablishment of maintenance capability during deployment to the AOR
- Maintenance activity in the AOR during Desert Shield and Desert Storm
- Maintenance support from outside the area of responsibility
- Maintenance indicators such as mission capability rates, break rates, and fix rates, and
- Maintenance footprint–how the requirements for maintenance personnel in the AOR were determined, how the number of personnel in AOR was tracked, and how the number in the theater compared with prior expectations.

Generally, the discussion that follows will be aligned in terms of design and mission, highlighting where appropriate the influence of policy and external factors. Conflicts among data from different sources will be examined. Our review of how the maintenance concept of operation was actually practiced, produced both positive and cautionary lessons to be learned from the Gulf War. Major findings of the chapter are as follows:

- The tooth-before-tail nature of the deployment had a differential effect on mission-capable rates that varied with maintenance concept.[1] During the first month of deployment, F-15 forces suffered a drop in combat-ready aircraft of between nine and fifteen percent as compared to peacetime rates. The F-16 and A-10 forces, for which intermediate maintenance is less of a concern, did not experience this drop.

- Maintenance during Desert Shield and Desert Storm was, in general, without critical, mission-limiting problems. With some exceptions, mission-capable rates during both Desert Shield and Desert Storm were roughly the same as in peacetime or slightly lower, although the rates varied from month to month and from one type of aircraft to another.[2] Other Services had similar experience with their flying units.

- Both the industrial-level and base-level maintenance capacities exceeded the demands generated by the Gulf conflict.

- When the maintenance concepts used during Desert Shield and Desert Storm sharply differed from anticipated methods (e.g., establishing intermediate maintenance support in Europe rather than in theater), imbalances between maintenance and other logistics factors appeared quickly. The most prominent imbalance was with transportation.

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[1]Each of the services organizes its logistics somewhat differently. For support of aircraft, the Air Force has historically organized around three echelons. These echelons (which parallel the operational, support, and industrial paradigm described in chapter 2) involve the resources to provide on-aircraft maintenance, off-aircraft "intermediate" repair of removed aircraft components, and depot maintenance of both the aircraft and its components. The intermediate level of support has most commonly been located on the same base as the aircraft. It can be located elsewhere, as happened in certain cases in the Gulf War, and may be totally absent if reliability is sufficiently high. The case where intermediate maintenance is absent is referred to as two-level maintenance and has important combat advantages because it reduces the amount of materiel that must be moved forward.

[2]We are aware of the apparently widely held impression that mission-capable rates during Desert Shield and Desert Storm were better than in peacetime. This impression is in error. The subject is discussed more fully under the heading Quantitative Logistics Indicators.

- Even when problems arose, they were ameliorated by a relatively healthy supply stock and innovative procedures.

- The desert environment appears to have had little persistent effect on reliability. The major exceptions to sustained high reliability involved T-64 and T-700 helicopter engines (used on the CH/MH-53 and MH-60 helicopters, respectively), which, as a result of sand erosion problems, achieved reliability levels approximately 1/10th that of peacetime levels. The T-64 unreliability was compounded by a two-level maintenance concept predicated on the normal reliability level.

- The 17,000 maintenance men and women in the area of responsibility (AOR) accounted for approximately thirty-eight percent of the Air Force population in the AOR and in terms of numbers constituted the single largest manpower element.[3] The actual tail-to-tooth ratio was larger, since Desert Shield and Desert Storm maintenance was also supported from the USAFE theater, from Guam, and from the continental United States. Additionally, the evidence suggests that there were approximately one-third fewer maintenance people in the theater than would have been expected on the bases of normal wartime planning factors.

- Automated maintenance management support was not available until late in the game–approximately Dec 1990.[4] Absence of aircraft-status information hampered the various headquarters in their attempts to ascertain the health of the fleet (although this was worked around via phone calls and messages). Absence of

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[3](S) Briefing, AFMEA/MEMS, Desert Shield vs Europe Force Projection/Support, ca January 1991; (S) USAF Wartime Manpower and Personnel Readiness Team (AFWMPRT) Desert Shield/Desert Storm Electronic Database; United States Air Force Statistical Digest (Abridged): Fiscal Year 1991 Estimate, pp D-38 and D-48. Specialty codes included within maintenance are officer: 4024, 4054, 4016, 4096; enlisted: 391XX, 392XX, 411XX, 452XX, 454XX, 455XX, 456XX, 457XX, 458XX. Using the Statistics Digest as a point of reference and the AFWPRT data for AOR counts, approximately 16% of all Air Force maintenance personnel were in the AOR during the peak months of Feb and Mar 1991.

[4]The Core Automated Maintenance System (CAMS) was the Air Force's standard automated system for managing maintenance. On most bases in peacetime, it and the Standard Base Supply System (SBSS) shared the same mainframe computer system.

configuration data, especially on engines, compromised ability to do maintenance itself, although again other factors such as healthy spares stocks prevented critical shortfalls.

Maintenance of Aircraft in the AOR

[DELETED][5] The actual beddown split the intermediate maintenance capability between the AOR and U.S. Air Forces in Europe (USAFE) and was a compromise between the need to limit population in the AOR and the desire for self-sufficiency. The desire for self-sufficiency was more than a "we always do it that way" reaction and reflected concern over potential interruptability of the lines of communication if intermediate maintenance were to be located outside the AOR.[6] A chronology of the tactical forces beddown illustrates how a balance was struck between a desire for self-sufficiency and the limited number of personnel the theater could support.

- 24 Aug 1990: USAFE Deputy Chief of Staff for Logistics, citing the extended logistics pipelines between SWA and the continental United States (CONUS), places intermediate-level repair capability at the disposal of U.S. Air Forces, Central Command (USCENTAF).

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[5][DELETED]

[6](S) Msg, Hq USAFE/LGS to USCENTAF [Rear]/BS, 241600Z Aug 1990, subj: Intermediate-Level Maintenance Support for Operation Desert Shield; (S) Msg, USCENTAF [Rear]/BSD to USAFE/LG 281653Z Aug 1990, Intermediate Level Maintenance (ILM) Support for Operation Desert Shield; (S) Msg, USCENTAF [Rear]/BS to USCENTAF FWD/LG 061037Z Sep 1990, Intermediate Level Maintenance (ILM) Concept of Operations; (S) Msg, USCENTAF [Rear] to 1, 363, 4, 35, 37, 48, 386, 354, 23 TFWs deployed, 552 AWACW deployed, and 33 TFS deployed 091621Z Sep 1990 (draft), subj: Intermediate Level Maintenance Concept of Operations; (S) USCENTAF [Rear] facsimile 10 Sept 1990 to USAF Logistics Readiness Center, subj: Intermediate Level Maintenance; (S) CENTAF Intermediate Maintenance Game Plan as of TAC Msg 172359Z Sept 1990; (S) CENTAF Intermediate Maintenance Game Plan as of 051800Z Oct 1990. Unless otherwise indicated this set of correspondence is the source for the tactical aircraft (F-15, F-16, A-10, F-117) intermediate beddown description.

- 28 Aug 1990: USCENTAF Rear acknowledges USAFE offer and plans to use USAFE avionics capability when deployed avionics intermediate shops are down and until shops are up and running in the AOR. Emphasis remains on "developing all the forward capability we can."

- 6 Sep 1990: USCENTAF provides first consolidated game plan for intermediate-level maintenance (ILM) beddown. Avionics is essentially the same as shown in the 9 Sep 1990 column in table 8-1a and has all avionics ILM earmarked for the AOR.

- 9 Sep 1990: USCENTAF Forward notes that "Base populations continue to increase and every effort must be made to limit deploying populations."

- 17 Sep 1990: Only in-theater avionics intermediate maintenance capability is at Dhahran, Tabuk, and Thumrait, as it has been all along, but the 401st Tactical Fighter Wing will now be supported from Ramstein, Hahn, & Torrejon.

- 5 Oct 1990: In addition to in-theater F-15C support, A-10 intermediate support is still planned for King Fahd; all other support will come from the USAFE theater.

The evolution of the beddown is traced in Tables 28 and 29.

(Re)establishing Maintenance Capability Once in the AOR

If one activity characterized maintenance after arrival in theater, it was foraging for support. Because the tooth (combat forces) was deployed before the tail (support forces), organic capability to support operations beyond refueling and simple removal and replace actions was

Table 28
ILM (Avionics) Beddown

Aircraft Type	Unit	Aircraft Movement Date	Number of Aircraft	Aircraft Location	9 Sep AIS Plan	9 Sep AIS Actual	17 Sep AIS Plan	17 Sep AIS Actual	5 Oct AIS Plan	5 Oct AIS Actual
A-10A	23TFW	4 Sep	48	King Fahd	King Fahd 4 Oct	Bentwaters	King Fahd 4 Oct	England	King Fahd 6-7 Oct	Bentwaters
A-10A	354TFW	17 Aug	24	King Fahd	King Fahd 16 Sep	Bentwaters	King Fahd 16 Sep	England	King Fahd 6-7 Oct	Bentwaters
A-10A	354TFW	20 Aug	24	King Fahd	King Fahd 19 Sep	Bentwaters	King Fahd 19 Sep	England	King Fahd 6-7 Oct	Bentwaters
F-4G	35TFW	17 Aug	36	Shikh Isa	Shikh Isa 16 Sep	Spangdahlem	Shaikh Isa 16 Sep	George		Shaikh Isa
F-15C	1TFW	7/8 Aug	48	Dhahran		Dhahran		Dhahran-in place		Dhahran
F-15C	33TFW	4 Sep	24	Tabuk		Tabuk		Tabuk-in place		Tabuk
F-15E	4TFW	10 Aug	24	Thumrait		Thumrait		Thumrait-in place		Thumrait
F-16C	363TFW	12 Aug	48	Al Dhafra	Al Dhafra 11 Sep	Ramstein & Hahn	Al Dhafra 11 Sep			Al Dhafra
F-16C	388TFW	4 Sep	48	Al Minhad	Al Minhad 4 Oct	Hahn and Hill	Al Minhad 4 Oct			Al Minhad
F-16C	401TFW	4 Sep	24	Doha	Doha 4 Oct	Ramstein, Hahn, & Torrejon	will not deploy	(no data)		Torrejon
F-117A	37TFW	21 Aug	18	Khamis Mushait	Khamis Mushait 20 Sep	Tonopah	Khamis Mushait 24 Sep	Tonopah		Khamis Mushait
F-111F	48TFW	25 Aug	32	Taif	Taif 24 Sep	Lakenheath	Taif 24 Sep	Lakenheath		Lakenheath
EF111	366CFW	24 Aug	13	Taif	Taif 23 Sep	Upper Heyford	Taif 23 Sep	Upper Heyford		Upper Heyford
RF-4C	117TRW	24 Aug	6	Al Dhafra	Al Dhafra N/A	Zweibucken	Al Dhafra N/A	Zweibrucken		Zweibrucken
E-3A	552AWACW		6	Riyadh	Riyadh N/A	Tinker	Riyadh N/A	Tinker		Tinker
EC-130E	7ACCS	24 Aug	6	Sharjah	Sharjah N/A	Keesler	Keesler	Keesler		Partial at Riyadh
EC-130E	41ECS	23-31 Aug	5	Bateen	Bateen N/A	Davis-Monthan	Batten	Davis Monthan		Partial at Riyadh

Table 29
ILM (Engine) Beddown

Aircraft Type	Unit	Aircraft Movement Date	Number of Aircraft	Aircraft Location	9 Sep JEIM Plan	9 Sep JEIM Actual	17 Sep JEIM Plan	17 Sep JEIM Actual	5 Oct JEIM Plan	5 Oct JEIM Actual
A-10A	23TFW	4-Sep	48	King Fahd	Dhahran	Bentwaters	Bentwaters	England	Bentwaters	England
A-10A	354TFW	17-Aug	24	King Fahd	Dhahran	Bentwaters	Bentwaters	England	Bentwaters	England
A-10A	354TFW	20-Aug	24	King Fahd	Dhahran	Bentwaters	Bentwaters	England	Bentwaters	England
F-4G	35TFW	17-Aug	36	Shikh Isa	Shaikh Isa	Spangdahlem	Shaikh Isa	George		Shaikh Isa
F-15C	1TFW	7/8 Aug	48	Dhahran	Dhahran	Bitburg	Dhahran	Dhahran		Dhahran
F-15C	33TFW	4-Sep	24	Tabuk	Dhahran	not stated	Bitburg	Eglin		Bitburg
F-15E	4TFW	10-Aug	24	Thumrait	Dhahran	not stated	Bitburg	Eglin		Bitburg
F-16C	363TFW	12-Aug	48	Al Dhafra	Dhahran	Hahn	Hahn	Hahn		Hahn
F-16C	388TFW	4-Sep	48	Al Minhad	Al Minhad	Ramstein	Ramstein	Ramstein		Ramstein
F-16C	401TFW	4-Sep	24	Doha	Al Minhad	Ramstein	Torrejon	Torrejon		Torrejon
F-117A	37TFW	21-Aug	18	Khamis Mushait	not stated	Tonopah	Tonopah	Tonopah		Tonopah
F-111F	48TFW	25-Aug	32	Taif	Taif	Upper Heyford	Lakenheath	Lakenheath		Lakenheath
EF111	366CFW	24-Aug	13	Taif	Taif	Upper Heyford	Upper Heyford	Upper Heyford		Upper Heyford
RF-4C	117TRW	24-Aug	6	Al Dhafra	not stated	Zweibrucken	Shaikh Isa	George		sharing w F-4G
E-3A	552AWACW		6	Riyadh	not stated	Tinker	Tinker	Tinker		Tinker
EC-130E	7ACCS	24-Aug	6	Sharjah	not stated	Keesler	Little Rock	Little Rock		Little Rock
EC-130E	41ECS	23-31 Aug	5	Bateen	not stated	Davis-Monthan	(MAC)	(MAC)	(MAC)	(MAC)

almost nonexistent.[7] The foraging ranged from vehicles to forklifts to liquid oxygen to basic shop-level repair capability.[8] The effort was successful because of the presence of host nation support (in some cases leading to collocation) and contract-operated aircraft repair capability. It was this preexisting capability that carried the day until lines of communication were established and started forwarding the "gotta-have" and "ought-to-have" parts and equipment from home units. The units were in a position to overcome these sorts of initial problems as a result of getting ahead on scheduled inspections, goldplating war reserve spares kits, and robbing parts from nondeploying aircraft in the days or weeks from initial warning until they actually deployed.[9] Additionally, after arrival they employed what is sometimes called "shade-tree" repair to work around limitations in test equipment and repair parts.[10]

Although collocation with the host nations may have been a significant factor in other areas, it played a minor role in maintenance. Maintenance collocation in the sense of shared maintenance capability was limited to (1) those few instances when U.S. and Allied forces maintained the same type of aircraft (e.g., F-4Gs and F-15s) and (2) sharing of common shop equipment such as simple machine tools, battery chargers, parachute rigging, tubing benders, and the like.[11]

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[7]AFLLS Remedial Action Project report 40550-21733 (00064), 4 May 1991; Intvw, Lt Col Dave Honderick, Lt Col Hank Taylor, Maj Dave Sanders, 1702 Air Refueling Wing, Seeb, Oman, 1 Jan 1991 (IRIS 00885904); Intvw, Lt Col Miles O'Brien, Assistant Dep Commander for Maintenance, 317 TAW, Thumrait AB, Oman, 27 Aug 1990 (IRIS 00882906); Intvw, Lt Col Jeff Rimell, Deputy Commander for Maintenance, 1703 AREFW, King Kahlid AB, Saudia Arabia, 19 Mar 1991 (IRIS 00885926); Intvw, Maj Dell Rose, 1909 AREFW(P), 1 Jan 1991 (IRIS 00885933).

[8]*Ibid*; Ltr, Lt Col Thomas M. Beres, Commander 8 Special Operations Squadron, to Commander 1 Special Operations Wing, subj: Desert Storm/Shield JULLS Inputs; AFLLS Remedial Action Project Report 92539-29721 (00016), 25 Sep 1990.

[9]A representative account is in Intvw, Maj Draper with Lt Col Vaden R. Gilloth, Deputy Commander for Maintenance 388th TFW Deployed, 12 Mar 1992, GWAPS NA-422.

[10]Ltr, Mr. Edward H. Merry, Hq TAC Director of Performance Analysis, to Hq USAF/LE, 13 Nov 1990, subj: Trip Report to Operation Desert Shield, atch 6. "Shade tree repair" is repair ordinarily not authorized. An example is field repair to the internal components of an avionics component that would normally be done at depot.

[11]William M. Rider, After Action Report, ca Mar 1991, p 5.

Off-aircraft (Intermediate) Maintenance

Off-aircraft intermediate maintenance of avionics, as described earlier, was split between locations in the AOR and the USAFE as part of a move to hold down the number of personnel in the theater. The desert environment had no appreciable adverse effects on the avionics intermediate shop test stations, whether they were housed in shelters or tents. Because initial demand on F-16 test stations was light and they were holding up well, one avionics intermediate shop per base was deployed rather than the expected one per squadron.[12] The F-15E mobile electronic test set was a clear avionics success story.[13] This set of suitcase-sized automated test equipment was functionally similar to the room-sized equipment procured with earlier model F-15 aircraft. But at one-eighth the volume and one-seventh the weight, it deployed on a single pallet.[14] During the Desert Shield deployment, it was set up within ninety minutes of arrival, and in the first three months of desert operation, experienced one failure, a TACAN test package adapter. One of the few documented instances of lost sorties due to avionics maintenance occurred in late January 1991 when Al Kharj reported a backlog of twenty-six electronic countermeasures pods in maintenance.[15]

The final ILM configuration had two jet engine intermediate maintenance (JEIM) facilities set up in the AOR; USAFE Queen Bee sites or other external sources (see Table 32) provided all other JEIM maintenance.[16] One in-theater site at Dhahran AB in Saudi Arabia repaired F-100PW-100 engines from the 1st Tactical Fighter Wing (Provisional) F-15C aircraft. The second, at Shaikh Isa AB in Bahrain, repaired 79-GE-17 engines

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[12]Rider, After Action Report, p 4. An AIS is a set of automatic test equipment consoles for testing various different types of electronic components (e.g., digital, analog, radio frequency) used on an aircraft. It takes a C-5 aircraft to move an AIS. Intvw, Col Mark Dracon, Commander 1702 Air Refueling Wing and staff, Seeb, Oman, 21 Mar 1991.

[13]Ltr, Edward H. Merry, TAC/LGP, "Operation Desert Shield TAC/LGP Trip Report & Lessons Learned," 14 Nov 1990.

[14]AFP 800-7, *USAF R&M 2000 Process*, 1 Jan 1989, p 5.

[15]Msg, COMUSCENTAF to AIG 9671, 230900Z Jan 1991, OPER/Desert Shield.

[16]The term "Queen Bee" means what it sounds like–one centralized site provides shop-level repair for a number of other locations.

from F-4G Wild Weasel aircraft.[17] In addition, a C-130 propeller repair capability was set up at Al-Ain because of the difficulty of moving assembled propellers by airlift; C-130 engines themselves were repaired at Rhein Main.[18]

It would be inaccurate, however, to describe Air Force engine maintenance as a completely smooth operation. Tactical Air Command (TAC) reported, as an example, that most of their units deployed without engine records or otherwise lost track of engine status during the conflict.[19] Further, no engine management system was deployed.[20] The result was that many serviceable engines sat in limbo until the records were forwarded from the United States or were otherwise reconstructed.[21] Paperwork was not the only thing lost: engines themselves were lost in the transportation system. The result of lost engine histories and lost serviceable and repairable engines was, of course, extended pipeline times, although the extent of the lost engine availability has not been quantified.[22]

The Army provided intermediate- and depot-level support for the T-700 helicopter engine; the Navy provided similar support for T-64-7A/100 engines. Cross-Service support was poor.[23] However, at least for the Army, the support it received was not worse than it was able to provide for its own aviation units. The Army Aviation Center After Action Report states flatly that the Army aviation logistics system broke down, and at one time, over 1,700 SeaLand vans of aviation repair parts sat idle

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[17]Hq TAC, *Tactical Air Command History-1991*, Chapter VI: Desert Shield/Desert Storm Special Topics, pp 345-346.

[18]Capt Dennis M. Crimiel, *Desert Shield Analysis (C-5/C-141)* (Gunter AFB, AL: Air Force Logistics Management Center, Sep 1991), p 48.

[19]TAC Command History, p 345.

[20]J. A. Forbes, Memorandum: "Summary of Desert Shield/Desert Storm Discussions with AFLMC Personnel," 4 Sep 1992.

[21]This problem persisted at least until mid-Feb. See Col Ralph J. Templin's daily log from 10 Feb 1991 (Ltr, 363 TFW (Provisional)/MA to AF/LEY/LEYM, subj: The War from an F-16 Maintenance Perspective, nd). Col Templin was the Deputy Commander for Maintenance for the 363 TFW (F-16Cs) at al Dhafra.

[22]TAC History, p 347. The flow of parts to and from an installation was usually called a pipeline–analogous to fuel pipelines, water pipelines, etc.

[23]Air Force Logistics Lessons System (AFLLS) Remedial Action Report (RAP) 15840-21700, "Dependency on Other Services for Helicopter Spare Engine Support," 9 May 1991.

at sea ports in Saudi Arabia.[24] Additionally, Corpus Christi Army Depot (CCAD), the depot-level repair center for both Army and Air Force T-700 engines, had just undergone a manpower cut (in FY 1990). To respond to both the much-higher-than-expected failure rate and the loss of manpower, CCAD went to two seventy-hour-per-week work shifts, which reduced depot flow days from seventy to fifty.[25] The T-700 engine illustrates the dependency between repair concepts and reliability. It was commonly understood that a two-level maintenance concept required high reliability to work,[26] and the T-700 confirms the point. The T-700 was under a two-level maintenance concept predicated on the normal peacetime reliability. To offset the support shortfall caused by unexpectedly high failures and the long pipeline from Texas to the AOR, CCAD, in addition to surging, implemented a limited in-theater repair capability–essentially two and one-half levels of maintenance.[27]

Counterintuitively, the desert environment appears to have had a limited persistent effect on engine reliability, with the exception of T-64 and T-700 helicopter engines.[28] The helicopter engines experienced significant degradation, averaging 100 to 150 hours of operation between removals for cause during Desert Shield and Desert Storm; peacetime periods between removal were 700 hours for the T-64 and 1200-1500 hours for the T-700. Major problems were severe erosion of compressors and clogging of turbine cooling ports. These helicopter engine reliability problems were, of course, shared by the Army and Marine Corps units flying the same engines. However, sand-induced engine reliability problems were not shared by Air Force engines. The General Accounting Office credits an unnamed "Air Force Logistics Command Official" with the observation that in the Air Force " . . . continuous actions had been

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[24]Hq Department of the Army, Concepts, Doctrine, and Force Policy Division, *U.S. Army Aviation Center Operation Desert Shield/Storm After Action Report* (Coordinating Draft), (Washington, DC: Hq U.S. Army, 22 Nov 1991), p 92.

[25]Briefing Book, AFLC Desert Shield/Storm Lessons Learned, section IV, tab 6.

[26]AFP 800-7, *USAF R&M 2000 Process*, 1 Jan 1989, pp 4-6, 32-33.

[27]*Ibid.*

[28]TAC history, p 347; Steven Prazak, "Maintenance Operations in Desert Storm: an Interview with Col Davies," *Industrial Engineering*, Oct 1991, pp 38-41.

taken to monitor, prevent, and/or eliminate problems [with fixed-wing aircraft engines]."[29]

The theater was served by a transportable "FAST CAL" precision measurement equipment laboratory (PMEL) established at Riyadh AB, although RAF Kemble, Moron AB, and the Royal Saudi Air Force provided some limited support.[30] The Riyadh location had the advantage of being at the hub of the intratheater airlift system. The CENTAF Deputy Chief of Staff for Logistics considered the laboratory highly successful in supporting Air Force, Army, and Marine requirements.[31] However, other evidence suggests that the Deputy Chief's view was overly positive. One Strategic Air Command (SAC) unit, for example, reported that after the first sixty days, almost all of its equipment was overdue because it had no PMEL support.[32] Additional reports indicated that, although the laboratory's calibration standards were available, the laboratory personnel lacked technical data and spare parts.[33]

Battle Damage Repair

Air Force Logistics Command deployed forty-two aircraft battle damage repair (ABDR) teams, a total of 621 personnel, to the AOR in the first war-time test of the ABDR concept.[34] The split between active duty

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[29]U.S. General Accounting Office, *Report to the Chairman, Committee on Armed Services, House of Representatives: Operation Desert Storm, The Service's Efforts to Provide Logistics Support for Selected Weapon Systems* (Washington, DC: General Accounting Office, Sep 1991), p 44.

[30]Briefing, Tactical Air Command to the Maintenance Officer Association, subj: Desert Shield/Desert Storm: A Logistics Perspective, 27 Apr 1991, GWAPS NA 425. Precision measurement equipment (PME) is test equipment used to test and calibrate other test equipment. It, in turn, is calibrated to physical, electrical, and other measurement standards traceable to the National Institute of Standards and Technology. A PME installation is usually thought of as a laboratory rather than a shop because of the near clean room environment and accuracy of the standards.

[31]Rider After Action Report, p 5.

[32]AFLLS Remedial Action Project Report No 40605-54247, 4 Jun 1991.

[33]AFLLS Remedial Action Report No. 40765-81244, 7 Apr 1991; AFLLS Remedial Action Report No. 40766-46951.

[34]Brfg, AFLC Desert Shield/Storm Lessons Learned; History, *Sacramento Air Logistics Center in Desert Shield/Desert Storm, Volume III, Aircraft, C3, and Space Systems Support*, Sep 1992.

and reserve was as shown in Table 30. Individual teams ranged in size from five to thirty-four personnel; each team comprised an aeronautical engineer and specialists in engines, structures, egress systems, electrical systems, guidance and control systems, and other fields.[35] The first team, from Warner Robins AFB and trained in F-15 repairs, deployed simultaneously with the first F-15 squadron. Additional ABDR teams and/or individual personnel deployed as CENTAF saw the need. For instance, Logistics Command offered to send additional teams in late September 1990, but CENTAF declined with a request that they remain on-call in the United States.[36] The deployment experience of the 2951st Combat Logistics Support Squadron from Sacramento Air Logistics Center is probably indicative of the overall deployment of ABDR personnel and is illustrated on Table 31.

Table 30
Aircraft Battle Damage Repair Team Deployment

Source	Active	Reserve
Number of Teams	39	3
Number of Personnel	54	972

[35]White paper, Michael M. Self, "Air Force Logistics Command Operations in Desert Storm" (AFMC/XPOX: Wright Patterson AFB, OH, Jul 1991).

[36](S) Msg, USCENTAF/LG to Hq AFLC, 280100Z Sep 1990, subj: Aircraft Battle Damage Repair (ABDR) Augmentation.

Table 31[37]
2951 Combat Logistics Support Squadron (CLSS)
Deployment to Desert Shield/Desert Storm

Departure Date	Return Date	Number of Personnel	Comments
11 Aug 1990	12 Oct 1990	4	Augment F-15 team
25 Sep 1990	19 Mar 1991	48	2 F-111 teams
9 Oct 1990	18 Mar 1991	3	Augment 406 CLSS F-111 team
29 Dec 1990	11 Mar 1991	23	A-10 team
7 Jan 1991	14 Mar 1991	23	A-10 team
16 Jan 1991	11 Mar 1991	23	A-10 team
20 Jan 1991	11 Mar 1991	23	A-10 team
1 Jan 1991	12 Mar 1991	4	Augment 2955 CLSS F-15 team

Note that two of the A-10 teams arrived in the AOR as the war was starting.

By various counts, approximately thirty aircraft sustained battle damage.[38] A listing of the Air Force battle damage and repair activity, obtained from the Survivability and Vulnerability Information Analysis Center (SURVIAC), is in Appendix 8-A to this chapter, and shows overall trends.[39] Figure 63 shows the number of ABDR events by aircraft type.[40]

[37]Memorandum for the Record, Capt Hawley, 2951 CLSS Maintenance Involvement in Operation Desert Shield and Desert Storm, ca Mar 1991.

[38]The Self white paper indicates that ABDR teams returned 30 aircraft to service, exclusive of non-ABDR maintenance. A review of the individual ABDR record folders at the Survivability Vulnerability Information Analysis Center (SURVIAC) revealed 28 folders on aircraft with damage.

[39]Unless otherwise indicated, data summarized below were obtained on 16 Sep 1992 from individual record folders maintained by the Survivability Vulnerability Information Analysis Center (SURVIAC) at Wright Patterson AFB, OH.

[40]From briefing titled "Desert Storm Aircraft Battle Damage Repair," part of Briefing Book for United States Air Force Scientific Advisory Board Logistics Cross Matrix Panel, 24-26 Apr 1991.

Figure 63
ABDR Events by Aircraft Type

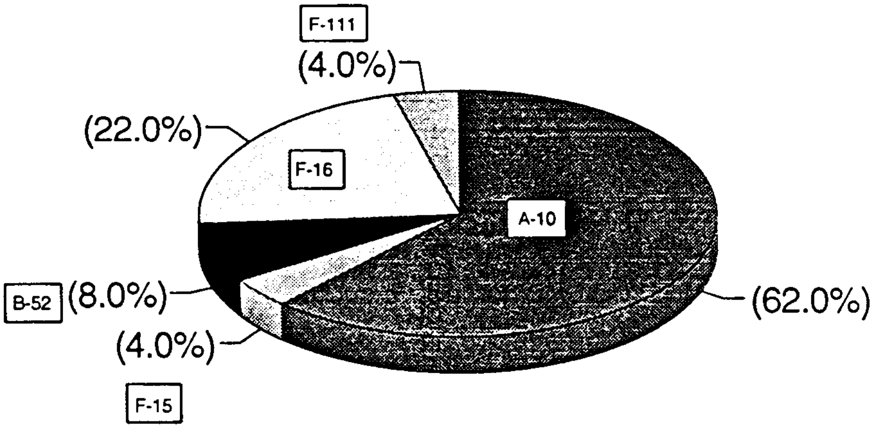
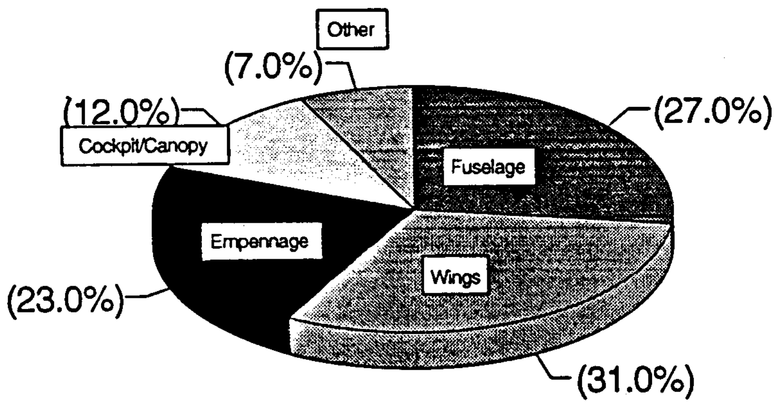


Figure 64 summarizes damage frequency by aircraft area.[41]

Figure 64
Damage Areas



[41]Scientific Advisory Board briefing.

The histogram in Figure 65 characterizes the time required to repair the battle damage.[42] Because of the limited number of aircraft sustaining battle damage, it is probably unwise to use the battle damage repair data as conclusive evidence of any particular trend. It is instructive, however, to compare the early expectations of the ABDR concept with the experience of Desert Storm. In 1976, the Institute for Defense Analysis published a report titled *The Impact of Battle Damage on A-10 Availability and Sortie Rate*.[43] The report, citing the success of Vietnam-era rapid area maintenance teams, recommended the creation of teams specially trained to perform temporary, field-expedient battle damage repair on A-10 aircraft and is *the* report that led to the ABDR concept.[44] Based on a fairly extensive simulation analysis, the study concluded that "A dramatic saving of time is possible by following the temporary repair doctrine. . . ."[45] Figure 66 compares the repair times presented in the 1976 IDA report with those of the fifteen A-10 Desert Storm battle damage incidents on which we were able to obtain repair data. It should be evident that the Desert Storm A-10 ABDR experience is consistent with 1976 expectations in the sense that over fifty percent of the aircraft were returned to service within four hours.[46] Because of the limited amount of battle damage to other than A-10 aircraft, the comparison was not extended to other aircraft types.

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[42]Data are from appendix 1 to this chapter. The repair times recorded in the individual SURVIAC records jackets were usually in man-hours, in some cases in clock- hours, and in a few instances in terms like "approximately two days." In almost all cases, the estimated repair time was recorded rather than the actual repair time. Core Automated Maintenance System data on ABDR are not available (according to SURVIAC personnel CAMS was not available in Desert Storm for ABDR repair recording). For this analysis, we took estimated hours to be equal to actual and also assumed that man-hours and clock-hours are equal. The effects of the two assumptions are partly offsetting in that estimates of repair tend to be optimistic and (at least for repairs with higher man-hour estimates) clock-hours will be a smaller number than man-hours.

[43]S.E. Johnson and Col E.D. Smith, *The Impact of Battle Damage on A-10 Availability and Sortie Rate* (Institute for Defense Analysis, Arlington, VA, May 1976).

[44]Tel intvw, J.A. Forbes, GWAPS staff, with Mr. J. Grier (SM-ALC/TIED), 5 Nov 1992. Mr. Grier was the Deputy Program Manager for the ABDR program. Mr. Grier also reviewed the data presented here for accuracy.

[45]Johnson and Smith, p 48.

[46]This is in spite of the fact that the IDA study considered only antiaircraft (AAA) fire (up to 23mm). The Desert Storm data presented include damage from all causes.

Figure 65
Aircraft Battle Damage Repair Time
(Data are man hours or clock hours)

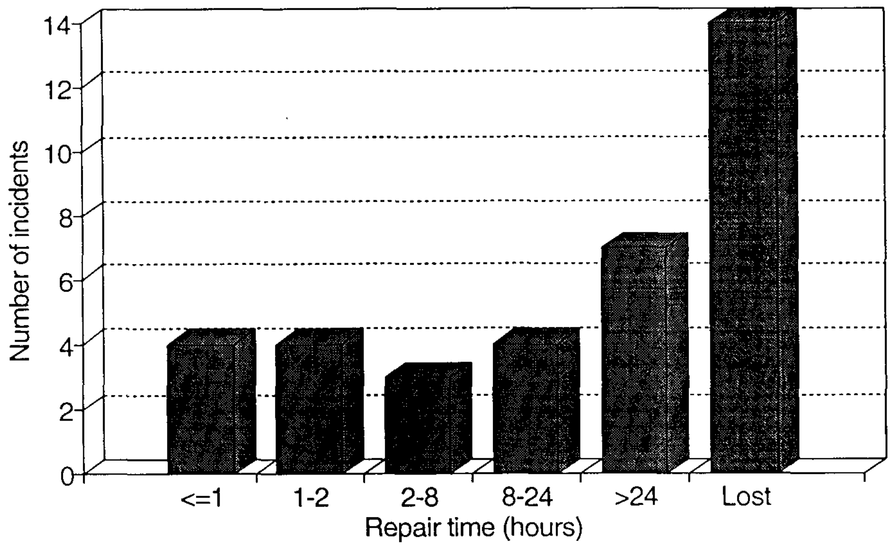
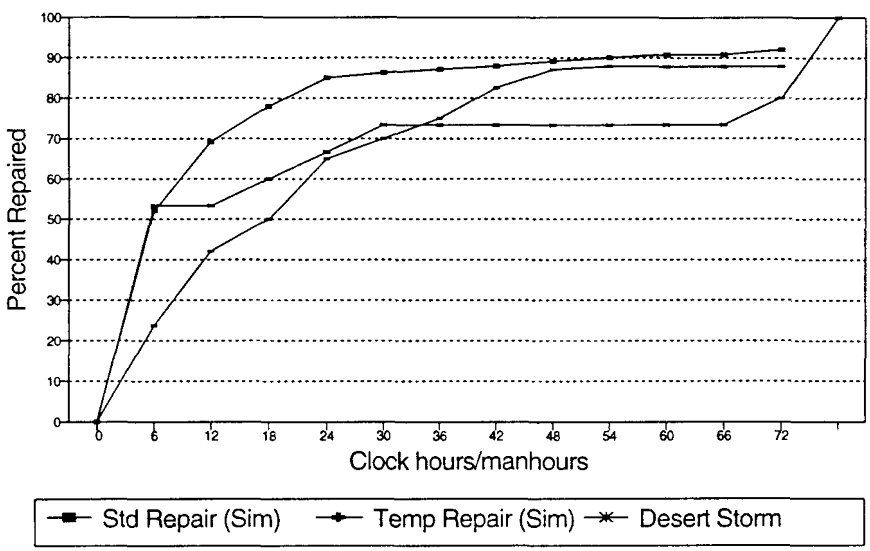


Figure 66
A-10 Aircraft Battle Damage Repair



A result of the limited need for battle damage repair was that ABDR teams and technicians functioned in their traditional combat logistics support squadron (CLSS) roles (i.e., performing heavy maintenance) or were simply integrated into the maintenance organizations where they were stationed. The ABDR personnel at Taif are an illustration. Sourced from the 2951st CLSS, 406th CLSS, and 2953d CLSS, the 81st Taif ABDR technicians were integrated so thoroughly into the Taif maintenance organization that they held the supervisory positions in the Fabrication Shop, Structural Maintenance Shop, one of the Aircraft Maintenance Units, and the Electric Shop.[47]

Environmental Effects on People and Equipment

Other than sand-induced unreliability of helicopter engines, the desert environment did not cause the rash of major problems that had perhaps been feared. Minor problems either completely or at least partly solved during the Gulf conflict included sand frosting and scratching of aircraft canopies and higher than normal usage rates of propellers, tires, and brakes.[48] Preventative maintenance such as washes reduced the effects of these problems. By October of 1990, deployed units were reporting imagery degradation due to sandblasting of Low Altitude Navigation Targeting Infrared Night (LANTIRN) seeker windows.[49] The design of the system, however, was such that the degradation was detected by the LANTIRN Intermediate Automatic Test Equipment before it was noticeable to pilots and it was that degradation being reported. The interim solution was to ship more spare windows and clear up confusion over the approved replacement procedures.[50] The long-term solution, not completed before the end of Desert Storm, was development of a harder coating for the windows.

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[47]Memo, Capt Jim Suzel, SM-ALC/LAC, Combat Logistics Support Squadrons, Mar 1991.

[48]Michael M. Self, "Air Force Logistics Command Desert Storm Logistics Comparative Staff Study," Aug 1991.

[49]Msg, Hq TAC/LGM to Hq USAF/LRC, subj: LANTIRN Lessons Learned, 231000Z, Oct 1990.

[50](S) Background paper, Hq TAC/IN, subj: DR/LG/IN Inputs to Saudi Arabia Trip, ca Oct 1990.

The one significant environmental problem from a "people" aspect appears to have been heat tolerance while wearing chemical protective gear.[51] As it happened, the problem had been anticipated, and the Air Force Human Systems Division at Brooks AFB in Texas had started developing a multiman intermittent cooling system before Desert Shield. On 13 August, Hq TAC elevated the cooling system to an urgent requirement and the system was rushed into production. When the production contract was completed in December 1990, 373 air distribution units and 24,800 cooling vests had been produced for the theater.

Embedded Software

Issues associated with embedded software during Desert Shield and Desert Storm seem to have been limited to Electronic Warfare equipment.[52] This equipment requires reprogramming (actually only loading of changed data rather than new computer code) to respond to changed threats. During Desert Shield and Desert Storm, five different Air Force electronic warfare systems required a total of eight mission data changes. Additionally, four foreign military sales systems required a total of twelve mission data changes. The time to prepare the changes averaged 103 hours (range of 30 to 480). Warner Robins Air Logistics Center created the data and then transmitted them through communications centers to the unit in the theater for upload into aircraft. The average time required to generate Air Force-organic changes was 37 hours (range of 16 to 60) versus the wartime programming goal of 72 hours. On the receipt end, most units used 1960s-technology AN/ASM-660 punch-tape-based memory loader verifiers. The verifiers required approximately two hours to upload data into an aircraft. Newer program loader verifiers using current technology were entering initial operational test and evaluation and were not available during Desert Shield and Desert Storm.

If there was a particular problem other than obsolete technology in the electronic warfare reprogramming area, it appears to be a lack of memory loader verifiers at the deployed locations in some instances. When EF-111As from Upper Heyford England arrived in the theater, for example, two of the aircraft had malfunctions in the ALQ-99 jamming

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[51]Talking paper, Hq AFLC/XRCO, subj: Multi-Man Intermittent Cooling System (MICS), 5 Jul 1991.

[52]Briefing Book for 12-13 July HOT WASH Conference, np, 15 Jul 1991, GWAPS NA-487.

subsystems. In both cases, the needed fix was a data reload requiring a memory loader verifier, which the deployed unit did not have initially and did not receive until later.[53] A similar problem occurred with the QRC-01 Pod carried on the AC-130H; the 1st Special Operations Wing deployed without a capability to reprogram the Pod.[54] The problem with the QRC-01 pod was expected to disappear with introduction, after the Desert Storm timeframe, of the newer ALQ-184 system, which was designed to be flightline reprogrammable.[55]

Collection and Use of Maintenance Data

Before Desert Shield began, the need for a deployable Aircraft Maintenance Information system was recognized. The Air Force Logistics Management Center had created a project to determine requirements in the areas of status and inventory, configuration control, engine tracking, aircrew debriefing, work order generation, and aircraft scheduling.[56] The perception of need appears to have been well founded, since the mainframe-based Core Automated Maintenance System (CAMS) planned for wartime support was not available until approximately the one-hundredth day after deployment began and was never available to all units.[57] Because, in the absence of automated support, the choices were to either revert to manual procedures or do without data, Desert Shield and Desert Storm provided a "window" into the importance of maintenance data to maintenance and, hence, to combat capability. To quote from one of the interviewees contacted by the logistics management center: "Work-

[53]AFLMC, JULLS Maintenance Inputs (Gunter AFB AL: AFLMC, 4 Sep 1992), AFLLS No: 92153-95479 (00015). A memory loader verifier was a device to upload digital data into memory onboard an aircraft, pod, or other system and then verify that the load was correct.

[54]QRC stands for quick reaction capability, i.e., it was designed and fielded faster than would be expected from normal procurement cycles. An EW pod is a self-contained electronic countermeasures (ECM) unit that is temporarily hung on an aircraft for a specific mission.

[55]AFLMC, JULLS Maintenance Inputs, AFLLS No: 15856-12900 (00047).

[56]Capt James T. Silva, *Desert Shield Maintenance Automation Needs* (Gunter AFB, AL: Air Force Logistics Management Center, Jun 1992), p 1.

[57]*Ibid*, p 11. CAMS capability was provided at approximately the 100th day by remotely linking deployed units to mainframe computers at their home units in the United States. It appears that some units never did get capability. 1st Special Operations Wing, Desert Storm JULLS Inputs, 1SOW/CC Letter 18 Apr 1991 with attached JULLS inputs.

arounds [were] used for virtually everything. . . nothing came to a total grinding halt."[58] Thus, failure was gentle, and immediate impact on combat capability appeared to be absent. The lack of automation does seem to have increased the difficulty of determining aircraft mission capability at both the flightline and higher headquarters level. It severely compromised knowledge of the remaining usable life of components such as engines and removed the ability to use failure history as an aid to troubleshooting.[59] All of these effects increased the labor-intensity of maintenance by either making it more difficult or making maintenance unnecessarily frequent. Quotations from interviews with Air Force Logistics Management Center personnel illustrate this point:

> We assigned about five guys for two days to get serial numbers accounted for.[60]
>
> Scheduling was a real headache because of the ops to maintenance interface problems. It was also very confusing because of the lack of knowledge of the complete status of the aircraft and the availability of parts (time frames to bring the aircraft back up to MC status).[61]
>
> When an engine was pulled and sent to Rhein Main for repair/overhaul, it is critical that the history accompanies the motor . . . . Thousands of hours of serviceability could be and were lost in the repair process.[62]

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[58]*Ibid*, p 25. The workarounds included manually filling out standard forms and using "green" notebooks to keep status information; manually inventorying (and reinventorying aircraft); ad hoc programs on lap-top computers (usually in word-processing programs); and using mail, situation reports (SITREPS), and facsimile to exchange data with home units. *Ibid*, pp 12, 20, 37.

[59]*Ibid*, pp 20, 23, 26, 28, 38, 47; 1st Special Operations Wing, Desert Storm JULLS Inputs, 1 SOW/CC Letter 18 Apr 1991 with attached JULLS inputs; AFLLS Remedial Action Project No 15839-53600, Engine Management During Wartime Conditions, 9 May 1991; Tactical Air Command, *Desert Shield Desert Storm Logistics Data* (Langley AFB, VA: TAC/LGP, Sep 1991), pp ii, iii. Additionally, as discussed under the topic of Logistics Indicators and Aircraft Battle Damage Repair, missing data have made it difficult for all to analyze the lessons of Desert Shield and Desert Storm.

[60]*Ibid*, p 20.

[61]*Ibid*, p 23.

[62]*Ibid*, p 26.

Maintenance Outside the Area of Responsibility

Maintenance forces outside the AOR provided ILM to AOR units, maintained the USAFE Proven Force, SAC, and MAC aircraft, and also provided industrial-level support.

Intermediate-Level Centralized Support to the AOR

After the phase I deployment settled down, most Tactical Air Command (TAC) and TAC-gained Air National Guard and Air Force Reserve Units in the AOR received engine intermediate support from "Queen Bee" locations in Air Force Europe[63] because, as the TAC 1991 History states, the units lacked adequate in-AOR facilities and equipment. While this is certainly the case, more specific and compelling reasons include reducing the influx of people and equipment into a theater with an already-strained bare-base support structure (as indicated earlier) and recognition that better efficiency was likely to be achieved by an established facility.[64] The Air Forces, Central Command Deputy Chief of Staff for Logistics also cited reduced airlift as a reason. Probably a more accurate statement would have been reduced front-end airlift because, at four engines per C-141, the number of engines moving back and forth between USAFE and the AOR required over 150 equivalent sorties.[65] Table 32 summarizes the Queen Bee support picture. Only three out of the seventeen installations listed earlier in Table 29 received engine support from within the AOR.

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[63]Discussion of engine maintenance is based primarily on Hq TAC, *Tactical Air Command History-1991*, Chapter VI: Desert Shield/Desert Storm Special Topics, pp 343-347. The term Queen Bee refers to a base that provides centralized engine maintenance for a group of bases operating the same engine type. Queen Bee engine support was a quasi 2-level concept in that the supported units did not have collocated intermediate capability. Like any 2-level concept, it was dependent on high reliability (or excellent supply pipelines) for success.

[64]Rider, After Action Report, p 4.

[65]The figure of 4 engines per aircraft is from the TAC Command History although TAC calculates 172 aircraft loads from their higher total number of engines.

Table 32
Queen Bee Engine Support[66]

Type Acft/ Engine	Deployed Units	AOR Location	Supported from	From AOR	To AOR
F111A/ TF30-P-109	Mountain Home	Taif	48 TFW, Lakenheath, England	13	11
A-10A &OA-10A/ TF34-GE-100	2d TFW, England AFB, LA; 354 TFW, Myrtle Beach AFB, SC; 706 TFG, Naval Air Station New Orleans, LA	King Fahd	81 TFW, RAF Bentwaters, England	73	60

[66] In-theater locations are from Col Rider's After Action Report. TAC's totals in the same report from which these data are extracted were 358 engines repaired out of 330 received from the AOR. Col Rider's after action report cites 437 engines repaired. It is probably impossible to reconcile the numbers because of the problems during the conflict with engine status reporting.

Table 32 (Continued)
Queen Bee Engine Support

Type Acft Engine	Deployed Units	AOR Location	Supported from	From AOR	To AOR
F-16/ F110-GE-100	347 TFW, Moody AFB, GA & 388 TFW, Hill AFB, UT		86 TFW, Ramstein Germany	41	42
F-16/ F100-PW-200	366 TFW, Shaw AFB, SC; 169 TFG, McEntire ANGB, SC; 174 TFW, Hancock Field, NY		50 TFW, Hahn Germany	144	136
F-15C & F-15E/ F100-PW-200	33 TFW, Eglin AFB, FL (F-15C); 4TFW, Seymour Johnson AFB, NC (F-15E)	Tabuk, Al Kharj	36 TFW, Bitburg AB, Germany	41	38
TOTAL	312	287			

Although Table 32 indicated that Queen Bee sites returned ninety-two percent of engines to serviceable condition, the engines were not readily available to aircraft in the AOR. The experiences of the Ramstein operation are indicative.[67] As indicated in Table 32, the 86th Tactical Fighter Wing (TFW) at Ramstein supported the 347th TFW(Provisional), and the 388th TFW(P), flying F100-100 engines on F-16 aircraft.[68] Monthly engine production at Ramstein was about 400 percent higher than during peacetime and was achieved through compression of individual maintenance tasks. As an example, at the start of Desert Shield, F-100-110 engines were in the middle of a high pressure turbine/low pressure turbine time compliance technical order that typically took about two weeks per engine. During Desert Shield and Desert Storm, the more typical time was four days. But the Ramstein shop was in fact underutilized because, during almost all of the Desert Shield timeframe, moving retrograde (i.e., unserviceable) engines from the theater to Ramstein was a problem. The officer in charge of the 86th engine operation sent a message to the 347th TFW and the 388th TFW on this subject in December 1990. Instead of more repairable engines, however, the only immediate result of his message was a staff assistance visit from Hq U.S. Air Force Europe, also at Ramstein. Retrograde engines did not begin showing up until January 1991, and after that, in ones and twos. Repair parts were also a limiting factor. The parts situation was caused largely by the condition of retrograde engines, which had been fairly well stripped during in-theater cannibalization. As an additional note, when the 86th moved serviceable engines to the Ramstein loading dock, the engines would sit there for one to four days–tending to confirm other indications of poor visibility and control over components in transit.

Proven Force

The 7440th Composite Wing (P) comprised RF-4C, F-4G, F-16, F-15C, F-11E, EF-111A, MC/HC/EC-130, KC-135, E-3, and MH-53 air-

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[67] J. A. Forbes, Memorandum, "Summary of Desert Shield/Desert Storm Discussions with AFLMC Personnel," 4 Sep 1992.

[68] Both of the wings in theater had 18 authorized spare engines. This is three times the normal peacetime authorization; the additional spares were pulled from stateside units (see Memorandum with AFLMC personnel).

craft.[69] The wing established seven aircraft maintenance units (one for each flying squadron), a combined component maintenance/equipment maintenance section, and an ammunition branch out of the 39th Consolidated Aircraft Maintenance Squadron and deployed U.S. Air Forces in Europe units.[70] The component repair and equipment repair functional areas provided fuel system, hydraulic, nondestructive inspection, electronics countermeasures, armament, precision measurement equipment, sheet metal, machine, electrical, environmental, and wheel and tire shops. Since the majority of intermediate-level repair (i.e., engine repair and all avionics except electronic countermeasures) was sourced out of European home stations, the wing, along with almost all units in the AOR, operated on a de facto two-level maintenance concept with Military Airlift Command channel and special airlift providing the lines of communication.[71] Although the official history of Proven Force states that monitoring of parts flow was "highly effective,"[72] it was also evidently cumbersome and manpower intensive, requiring manual tracing of as many as 500 pieces of cargo *per day*.[73] As discussed previously, however, if mission-capable rates were the measure, then the net result was effective because Proven Force mission-capable rates were approximately the same as those for peacetime and for similar models of aircraft in other units.

SAC Aircraft

The Strategic Air Command had deployed 234 air refueling aircraft, 38 bombers, and 10 reconnaissance aircraft into the AOR by the time Desert Storm terminated.[74] Additional aircraft had been deployed outside the AOR, mostly to Spain and Diego Garcia. (Other reports in this series discuss the politically charged process of deciding where to bed down the aircraft and the uncertainties that resulted.)

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[69](S) Hq United States Air Forces in Europe Contingency Historical Reports, Desert Storm, Week 1 (15-23 Jan 1991), Volume I of III, 14 Feb 1991, (S) briefing titled: "Desert Storm Saturday 19 Jan 1991 D+03"; (S) History of Joint Task Force Proven Force, 13 Dec 1991, p 77.

[70](S) Hist, United States Air Forces in Europe, Calendar Year 1990, p 307.

[71](S) *Ibid.*

[72](S) *Ibid*, p 80.

[73](S) *Ibid*, p 82.

[74]Rpt, *Logistics After Action, 17th Air Division, Riyadh, Saudi Arabia*, ca Mar 1991.

In July 1990, Strategic Air Command had two KC-135R aircraft in Southwest Asia (in the United Arab Emirates). By 12 August, 99 KC-135 aircraft were supporting Desert Shield operations; a month later, the number grew to 150.[75] To provide maintenance for the tankers, the Command created intermediate-level maintenance centers at Moron AB and RAF Mildenhall. By 7 September, the RAF Mildenhall facility was able to perform KC-135 phase inspections, fuel cell repair, and wheel and tire build-up. Moron in Spain by then had a much more complete capability for avionics maintenance, corrosion control, as well as some limited support for RC-135s. Other than the uncertainty caused by limited communications and limitations imposed by the War Readiness Spares Kits issues (see Chapter 7 of this report), creating an overseas maintenance capability for KC-135 aircraft was essentially unremarkable.

When the KC-10 was procured, Strategic Air Command chose not to establish a KC-10 intermediate-level maintenance capability because of the aircraft's high reliability and the ready availability of Douglas Aircraft commercial support.[76] So it should come as no surprise that KC-10 support was unproblematic. To ensure support, however, Oklahoma City Air Logistics Center dispatched a Douglas logistics survey team to Europe to establish contingency distribution centers to expedite movement of spare parts.[77] The fifty-seven KC-10 aircraft deployed were for all intents and purposes problem-free during Desert Shield and Desert Storm.[78]

After 8 August 1990 and until B-52 deployments to Moron and RAF Fairford began during Desert Storm, B-52s were stationed at Diego Garcia as part of the 4300th Provisional Bomb Wing.[79] Intermediate-level maintenance and heavy maintenance such as engine changes, corro-

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[75]Theodore Jamison, *SAC Logistics Support of Operations Desert Shield and Desert Storm After the First 30 Days*: Sep 1990-27 Feb 1991 (Draft), nd, p 6. The rest of the KC-135 data are drawn from this source.

[76]Intvw, Dr. Theodore Jamison with Maj Gen Charles J. Searock, SAC Deputy Chief of Staff for Logistics, 4 Mar 1991; Dr. Theodore Jamison, Notes from briefing: Hq SAC/LGL (Col Linville) to JCS/J4 (Col Remplo), 1 Oct 1994. The KC-10 is an "off the shelf" commercial DC-10 with modifications for air refueling.

[77]Hist, Oklahoma City Air Logistics Center, Fiscal Year 1991, p 137.

[78]Searock interview.

[79](S-DRAFT) Rpt, SAC Logistics Support of Operations Desert Shield and Desert Storm After the First 30 Days: Sep 1990-27 Feb 1991, ca Jun 1991, p 7.

sion washes, and phase inspections were not available at Diego Garcia and were instead provided from Andersen AFB, Guam.[80] The capability at Andersen was fortuitous. Although the base had been closed the previous year, Maj. Gen. Searock, Strategic Air Command Deputy Chief of Staff for Logistics, had made and won a case for leaving the intermediate-level maintenance capability in place as a sort of insurance policy for the Pacific Theater.[81] Although proposals to create an intermediate-level maintenance capability at Diego Garcia were discussed after Desert Shield began, nothing concrete transpired before Desert Storm ended.[82]

In-theater B-52 intermediate-level maintenance was never seriously considered because of lack of facilities and ramp space. The problem was where else to put it once B-52s bedded down in theater.[83] RAF Fairford had an inactive intermediate-level maintenance capability that, somewhat like the one at Andersen, had resulted from a fortuitous previous decision. In this case, the maintenance assets had previously been put in place (using assets from Mather AFB when the 420th Bomber Wing was inactivated) in what amounted to prepositioning for a war in Europe.[84] The perspective of the Strategic Air Command Deputy Chief of Staff for Logistics is revealing:

> We knew that if we had a war in Europe or in the Pacific where we would go; we did not know–we had not thought through yet what we would do if we had a war in Southwest Asia.[85]

RAF Fairford, however, was too distant from the AOR to provide intermediate-level maintenance support.[86] Because Moron AB in Spain was already on the tanker air bridge, it was the logical choice. Moron had the advantage of being a reasonable distance from RAF Fairford and

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[80]SAC Logistics Support after first 30 days, p 10.

[81]*History of the Strategic Air Command 1 Jan - 31 Dec 1990*, Volume I, Narrative, p 13; Intvw, Dr. Theodore Jamison with Maj Gen Charles J. Searock, SAC Deputy Chief of Staff for Logistics, 4 Mar 1991.

[82]SAC Logistics Support After first 30 days, p 10.

[83]Searock interview.

[84]*History of the Strategic Air Command 1 Jan - 31 Dec 1990*, p 12; Searock interview.

[85]Searock interview.

[86]SAC Logistics Support After the First 30 Days, p 10.

became the second site for intermediate-level maintenance.[87] Table 33 shows the combined KC-135 and B-52 intermediate-level and heavy-maintenance production at Andersen and Moron for the period August 1990 through March 1991.

Table 33
Intermediate-Level and Heavy-Maintenance Production
August 1990 - March 1991[88]

Product	Andersen	Moron
B-52 Phase Inspections	28	19
KC-135 Phase Inspections	0	59
B-52G Engine Changes	122	20
KC-135 Engine Changes	0	11
B-52 Wash and Corrosion Control	60	19
KC-135 Wash and Corrosion Control	0	90
Repaired line and shop replaceable units	4,076	2,935

[87]Searock interview.

[88]The very large difference between Andersen and Moron engine changes is only partly due to the longer period of time Andersen was in business. Another reason was engine over-temperature during the long, heavy-weight flights both to and from Diego Garcia by aircrews who were not used to the weights involved (Searock interview).

Strategic Airlift Maintenance

The Military Airlift Command maintenance concept was fundamentally different from that of either Tactical Air Command or Strategic Air Command and also changed little between peacetime and wartime. Intermediate and heavy maintenance of C-5 and C-141 aircraft was centralized at home stations on the east and west coast of the United States. The Military Airlift Command's C-5 and C-141 maintenance cycle for repairable components during Desert Shield and Desert Storm is illustrated on Figure 67. As was true in peacetime, forward operating locations did not have intermediate repair capability; that capability was provided by Dover AFB for the C-5 and McGuire AFB for the C-141. Overall reparable asset flow times were comparable to those of peacetime and are summarized in Table 34 for the C-5 and Table 35 for the C-141. The main purpose of presenting the data is that they provide one measure of the routine resupply and other logistics cycle times achievable when operational aircraft and their intermediate maintenance are in different theaters. Note that the resupply times achieved by Desert Express (seventy-two hours) are significantly better than those of either the C-5 or C-141.

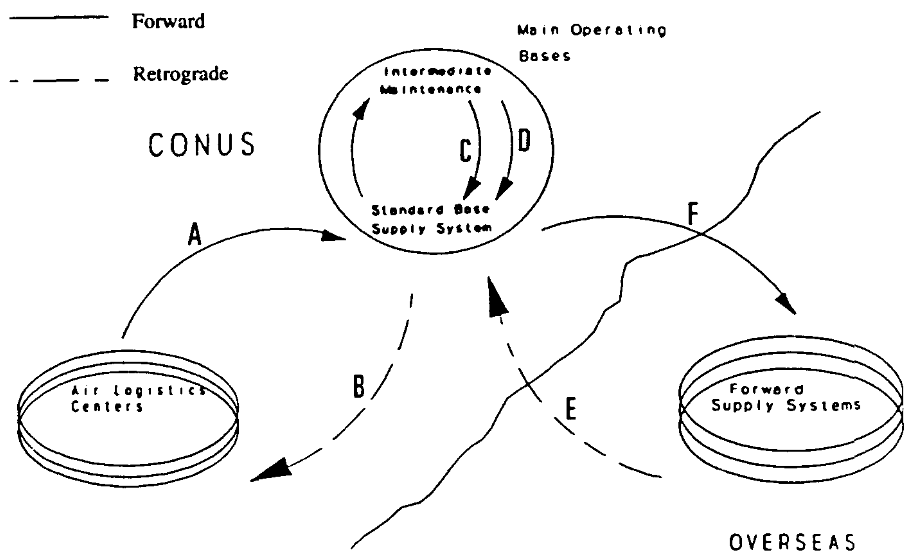
Of equal importance with cycle times are failures experienced versus failures planned for. If "planned for" is taken to be the supply items in the War Readiness Spares Kits plus base-level self-sufficiency spares, there was only a partial match. For the C-5, for example, thirty-six to thirty-nine percent of the items in kits were not in demand at any time during Desert Shield or Desert Storm.

Military Airlift's C-141 and C-5 aircraft operated under an isochronally (i.e., equally spaced time intervals) scheduled maintenance concept, with home station checks every 50 days and alternating major and minor inspections every 200 days.[89] To increase available airlift, the Command froze the calendar on scheduled maintenance at the beginning of Desert Shield and then reinstated the inspections in late September.[90] The

[89]Talking Paper, Hq USAF/LEYM, subj: MAC Strategic Aircraft Scheduled Maintenance, 17 Sep 1990.

[90](S) Msg, CINCMAC/CC to CSAF, 172359Z Sep 90, subj: Desert Shield Reserve Logistics Augmentation (U).

Figure 67
MAC Maintenance Cycles



result of deferring maintenance, of course, was a bow-wave of delayed repair work (from an average of 37 open discrepancies to an average of 46 per C-141 aircraft in the space of a month and a half).[91] To catch up on maintenance, the Command requested recall of 890 reservists.[92] It asked for only portions of the C-5/C-141 maintenance cadres assigned to the Air Force Reserve and Air National Guard, since mobilizing all the maintenance personnel would have produced more manpower than needed.[93] The C-5/C-141 maintenance personnel called up helped augment increased airlift operations at Charleston, McGuire, Dover, and Westover

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[91] *Ibid.*

[92] LEYM Talking paper, CINCMAC Msg.

[93] *MAC History*, Chapter III, Desert Storm, Section titled: "Role of MAC's Air Force Reserve Component Forces," electronic version available in GWAPS archives as MACSHLD.42.

Air Force Bases. During the second airlift surge in December and January, scheduled maintenance was deferred again.

Table 34
C-5 Repairable Asset Flow Times[94]

Figure 67 reference	Description	Average time (days)	Comment
E	Retrograde forward site to SBSS	8.6	
C	Intermediate turn time (repaired)	5.3 (Dover)	65% of units were repaired
D	Intermediate turn time (NRTS)	5.0	45% of units were NRTS
B'	Retrograde from main base to ALC	21.1	
	ALC turn time	no data	
A	Order and ship time from ALC to main operating base	19.1	
F	Order and ship time from main operating base to forward base	18.4	

[94]Air Logistic Center (ALC) turnaround time in this table may not be a meaningful measure. The ALCs "surged" the most needed parts as identified by the operating commands rather than attempting to fix everything. See the discussion on industrial maintenance in this chapter.

Table 35
C-141 Repairable Asset Flow Times

Figure 67 reference	Description	Average time (days)	Comment
E	Retrograde forward site to SBSS	12.6	
C	Intermediate turn time (repaired)	6.9	42% of units were repaired
D	Intermediate turn time (not repairable)	4.7	58% of units were NRTS
B	Retrograde from main base to ALC	15.3	
	ALC turn time	no data	see footnote on C-5 table
A	Order and ship time from ALC to main operating base	21.1	
F	Order and ship time from main operating base to forward base	22.2	

Before the Gulf War, increased demands on the C-141 fleet (primarily low-level flying and increased heavy-weight refueling) accelerated structural damage to the aircraft, with a corresponding reduction in service life.[95] The severity of the problem led the Military Airlift Command Council to conclude in May of 1990 that maintaining a viable fleet would not be possible beyond the turn of the century.[96] Naturally, the increased flying tempo during the Gulf War held the possibility of exacerbating the problem. To minimize impact, Hq MAC and 21st Air Division both put zero fuel weight and gross takeoff weight limitations on the aircraft.[97] The impact of these decisions (although the precise trail of logic is not recoverable) was to restrict C-141 loads to twenty short tons.[98] The Command later estimated that this restriction reduced C-141 airlift capability by six to ten percent.[99] Although the Gulf War resulted in about three years worth of flying hours during a one-year period, the effect on the C-141 fleet was to shorten fatigue life by about one year. The reason for the moderate impact was reduced exposure during the Gulf War to stressful flight profiles such as air refueling, air drop, and low-level flying.[100]

Industrial Maintenance

Air Force Logistics Command and its contractors participated in the Gulf War primarily by (1) increasing production of repair parts, (2) accelerating the output of aircraft from program depot maintenance lines, and (3) fielding combat logistics support squadrons. The first of these is called repairable surging.

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[95]Msg, CINCMAC to CSAF, 170015Z Jan 1990, subj: C-141 Airlift Capability; Talking Paper , Hq MAC/LGMM, Force Structure Options, 4 Dec 1989.

[96]MAC Council Memorandum for CINCMAC, 23 May 1990, subj: C-141 Service Life/Retirement.

[97]Ltr, Col Anthony E. Naddeo, MAC/LGX, to MAC/XPY, Staff Comments on "Strategic Airlift Draft Report," 18 Jun 1992; Ltr, Col Alvin C. Scheitzer II, MAC/XPX, to MAC/XPY, subj: Staff Comments on "Strategic Airlift Draft Report," 26 Jun 1992.

[98]Schweitzer ltr.

[99]Naddeo ltr.

[100]John Lund and Ruth Berg, *Strategic Airlift in Operation Desert Shield and Desert Storm: An Assessment of Operational Effectiveness* (Working Draft) (WD-5956-AF, Santa Monica, May 1992), pp 66-68. This working draft is taken as credible in this matter because the MAC staff reviewed it and did not take issue with the assertions.

The normal peacetime production rate of repairable (sometimes called "exchangeable") items is 60,000 per month.[101] "Repairable surging" is increasing the rate at which Air Force Logistics Command "turns around" repairable items such as avionics line replaceable units and aircraft engines. An item was considered surged if it was either already undergoing repair and turned out faster than normal or entered earlier than normal into the repair process (and then repaired). Overall Logistics Command surge performance is depicted in Figure 68. As can be seen from the figure, the surge production (i.e., production over and above normal) rate was approximately 6,700 per month from late August through mid-January and then climbed to 18,000 per month after mid-January.[102] Note that production was linear in the two periods before and after mid-January and fairly independent of the requirement. Throughout the January, February, and March periods, production trailed demand by about 10,000 components. It is not certain why this was so, but a reasonable conjecture based on after-action reporting is lack of carcasses to repair–the same problem the Air Force Queen Bee engine shops in Europe experienced.[103] Overtime rates varied widely, with some units reporting rates as low as seven percent and others as high as eighty percent.[104]

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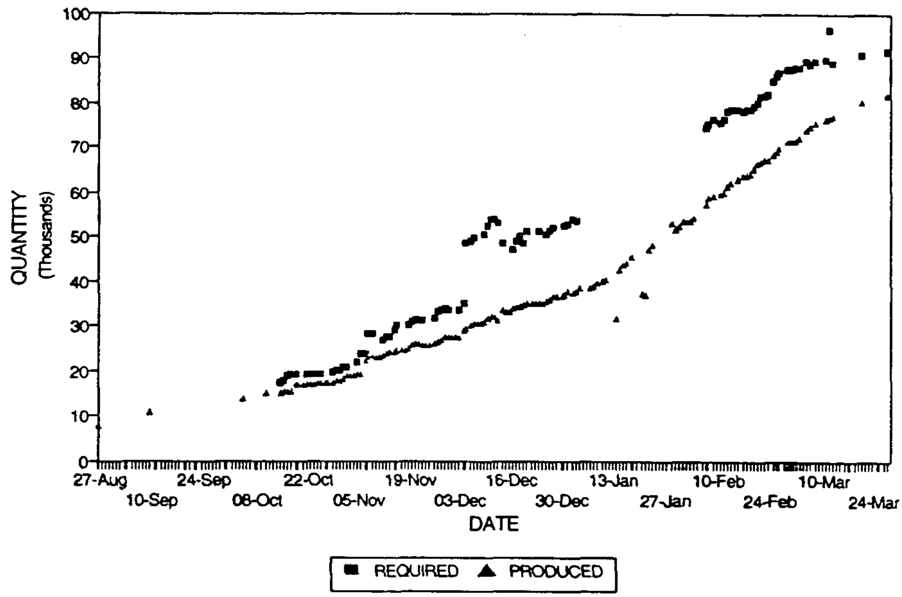
[101]White Paper, Michael M. Self, AFMC/XPOX, "Air Force Logistics Command Operations in Desert Storm," Jul 1991.

[102]This figure is a synthesis of data from two sources. One source was 102 daily AFLC situation reports (SITREPs) from 27 Aug 1990 through 28 Mar 1991. The second source was a set of handwritten production tables maintained by Mr. Michael Self, a member of the staff of the Deputy Chief of Staff for Plans, Hq AFLC (AFLC/XPOX, "SOR Surge Item Production" (Hq AFMC/XPOX: Wright Patterson AFB, OH, 4 Jan 1991). All of these data should be treated with some caution. First, there are obvious reporting errors such as the three data points in mid- and late Jan 1991. Second, data are missing. Third, AFLC indicated that total surge production was over 90,000 components, and this accounting indicates the total was approximately 81,000 through the end of Mar 1991. See the Self White Paper for the 90,000 figure.

[103]Ltr, Eva C. Ugarhovich, SM-ALC Directorate for Financial Management, to AFLC/XPOX, subj: Desert Shield/Storm After Action Reporting, 12 Apr 1991, atch 1, p 12 and p 40; SM-ALC History, Vol III, pp 3-5.

[104]Seven percent figure is from SM-ALC Ugarkovich Ltr, atch 1, p 37; 80 percent (72 hour work week) figure is from ltr, Charles R. Wallace, Director of Financial Management, Warner Robins Air Logistics Center, to Hq AFLC/XP, subj: Inputs for the Desert Storm White Paper, Logistics Accomplishments, 29 May 1991, atch 1, p 1.

Figure 68
Surge Requirements and Production (Cumulative)



Quantity produced is one consideration; a second is: were the right things being produced? To quote from two after action reports from the same Air Logistics Center (ALC):

> This [Command and Control Information] system was used to electronically transmit surge requirements to the Avionics Surge Center. The electronic data interface greatly speeded the surge notification process.[105]

> Each ALC has their own rules on how to compute surge candidates. MAJCOMs and ALCs need to agree on how to identify surge candidates and how requirements will be computed. The local CCIS was completely ineffective in identifying quantities and tracking.[106]

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[105]Ltr, Maj Gen Richard F. Gillis, Commander, Warner Robins Air Logistics Center, to AFLC/XP, subj: Desert Shield/Storm After Action Reporting, 29 Apr 1991, atch 1, p 3.

[106]Ltr, Maj Gen Gillis, p 10 of atch 1.

The implication is that although requirements identification was fast, it was not necessarily accurate. The view that surge requirement identification and tracking was problematic is corroborated in other after-action reporting.[107] However, it is also apparent that by the phase II deployment (mid-September 1990), much of the initial confusion had died down as customers (e.g., Air Force Special Operations Command, Tactical Air Command, Strategic Air Command, and Military Airlift Command scrubbed the initial lists generated by the Weapon System Management Information System and switched to using reports of actual War Readiness Spares Kit shortages and mission capability limiting items.[108]

Finally, confusion existed over how surge was to be implemented and the purpose of *Air Force Logistics Command's Surge Contingency Plan 70*. The plan, as viewed by Logistics Command Headquarters and as stated in the introduction to the plan, was not intended to be implemented but was a guide for writing air logistics center-level plans.[109] This intent was consistent with a concept of decentralized decision making on when and what to surge. But at the level of the air logistics centers, the expectation evidently was that Headquarters would make the decision to surge and that "Plan 70 should be implemented early to ensure consistent implementation across the command."[110] One result of the confusion over who was supposed to decide to surge was an initial delay (of some weeks duration) as each weapon-system program manager "convinced" other ALCs and peer directorates within the same ALC to respond to surge requirements.[111]

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[107]SM-ALC indicated that correlation between its previously prepared lists and requirements established by the commands during Desert Shield was as low as 15%. Ugarkovich ltr, atch 1, p 12.

[108]Ltr, Maj Gen Gillis, atch 1, p 16; Ugarkovich ltr, atch 1, p 44.

[109]Intvw, James A. Forbes with Mr. Tom Jenkins, Hq AFMC/LGSI, 23 Sep 1992; AFLC Surge Contingency Plan 70, p iii.

[110]Ltr, Maj Gen Richard F. Gillis, atch 1, p 3 and p 8. This same view is reflected in SM-ALC after action reporting (Ugarkovich ltr) and by RAND in their assessment of Desert Shield [Project Air Force Desert Shield Assessment Team, *Project Air Force Assessment of Operation Desert Shield: Volume II, The Buildup of Combat Power–Technical Appendices* (RAND N-3427-AF, Santa Monica, Jun 1992)].

[111]Ltr, Maj Gen Gillis, p 8.

The Air Force referred to production of an aircraft undergoing program depot maintenance earlier than originally planned as "acceleration." AFLC accelerated approximately seventy aircraft during Desert Shield and Desert Storm–sixty-four within AFLC industrial facilities and another six that were undergoing program depot maintenance at contractor facilities.[112] Of the seventy aircraft, four were C-5 aircraft and thirty-five were C-141s.[113] The acceleration provided for almost 1,000 additional flying days. However, the additional flying days were not fully used.[114] For example, Military Airlift Command used approximately one-third of the 174 additional flying days made available on C-141 aircraft–the rest of the additional C-141 flying days were unused. Chapter 3 shows that, except at peak periods, more C-141 mission-capable aircraft were available than required; this should not be a surprise, but it does reinforce the point that industrial maintenance capability exceeded the demands placed on it.

Quantitative Logistics Indicators

One of the impressions apparently created during the Gulf conflict and then perpetuated afterwards is that Air Force aircraft had mission-capable rates "equal to or better than" peacetime rates. Often, the emphasis was on "better than."[115,116] The mission-capable rates were generally

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[112]Self white paper, p 7.

[113]There is ambiguity on the number of C-5 and C-141 aircraft accelerated. The Self white paper indicates 12 C-5 aircraft and 41 C-141 aircraft. A Warner Robins summary of C-5 and C-141 acceleration shows only 4 C-5s; tail numbers 90019, 90005, 80226, and 90020; and 35 C-141s. Since the Warner Robins summary provides specific aircraft tail numbers, it is the preferred source. Summary of C-141 Aircraft Maintenance Repair (AMREP) data on C-5 and C-141 Aircraft, Warner Robins Air Logistics Center, ca 15 Mar 1991, GWAPS NA-506.

[114]Summary of C-141 Aircraft Maintenance Repair (AMREP) data on C-5 and C-141 Aircraft.

[115]James P. Coyne, *Airpower in the Gulf* (Arlington, VA: Aerospace Education Foundation,1992), p 128; Dr. William Suit, "The Logistics of Air Power Projection," *Air Power History*, Fall 1991, p17.

[116]The various mission capability definitions are:

a) Fully mission capable (FMC)–an aircraft ready to perform all of its assigned missions, and good, but they were not *that* good. With the exception of a few aircraft such as C-141s–with rates slightly higher in Desert Shield and Desert Storm than in peacetime–the mission-capable rates of all other aircraft appear to have stayed about the same or decreased when compared to peacetime rates.[117] The text below assesses mission-capable rates, break rates, and fix rates. Mission-capable rate is a composite of many factors and thus inherently integrates the effects of design, policy, spares levels, manning levels, and other influences. The break rate is the number of returning sorties that need repair and is driven mostly by the basic reliability of the aircraft. Repair rate is the number of returning aircraft ready to go in a given amount of time (e.g., eight hours) after landing. Although repair rate is a function of inherent maintainability, it also reflects maintenance capability and spares availability. By considering all three rates (fully mission-capable, break, and fix) it is possible to get a feel for the influence of more immediate factors as well as those of longer duration. Air Force mission-capable rates can be compared with those of other Services, since the definition of the term is generally consistent across Services.

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b) Partially mission capable (PMC)–an aircraft that is ready to perform one or more of its assigned missions, but not all assigned missions.

c) Non-mission capable (NMC)–an aircraft not able to perform at least one of its assigned missions. It may be non-mission capable for maintenance (NMCM), non-mission capable for supply (NMCS), or non-mission capable for both (NMCB).

d) FMC rate = FMC/(FMC + PMC + NMC), the proportions of all aircraft that are fully mission capable.

[117]There is evidence that the increase in apparent mission capability for MAC C-5 and C-141 aircraft was due at least in part to "hip-pocketing" discrepancies such as popped circuit breakers, bubbled windshields, and inoperative oil pressure gauges that would be cause for non-mission-capable-maintenance in peacetime. AFLLS remedial action project report 20553-31617 (00002), 5 Dec 1990. For C-130 aircraft, the difference is probably due to a difference in what was being measured. In the AOR, C-130 aircraft were flying a relatively simple mission that did not need special avionics, radar, or the various C-130 drop modes. By comparison, these systems are included in normal peacetime readiness ratings. Intvw, Lt Col Miles O'Brien, Assistant Deputy Commander for Maintenance, 317 TAW, Thumrait, Oman, 27 Aug 1990.

Mission-Capable Rates

Because the Core Automated Maintenance System (CAMS) was never fully fielded, reliable mission-capable rates were difficult to obtain during or after the conflict.[118] As a workaround, the CENTAF (Rear) battle staff at Langley AFB telephonically obtained once-per-day snapshots as of midnight in Riyadh.[119] The snapshot flying data inflated the mission-capable rates by about five percent to seven percent compared to rates that would have been obtained with the automated system. This inflation may be a source of the impression that the mission-capable rates were better than in peacetime.[120] Military Airlift Command collected data manually for a different reason. The combination of CAMS and the Reliability and Maintainability Information System (REMIS) assumed that a Military Airlift Command aircraft remained mission-capable from the time it left home station until it returned–this practice also produced inflated fully mission-capable rates.[121] For the C-5, the inflation was as much as ten percent during the Gulf War. Another factor influencing the validity of the comparisons between wartime and peacetime rates is that a month-to-month variability (of say five percentage points or more) occurs normally without obvious cause. Hence, a value of five percent difference in either direction should be viewed skeptically.

The pattern of the F-16's mission-capable rate is typical of Tactical Air Command aircraft. In Figure 69, the upper line is the reported rate and the lower line is the reported rate less six percent (i.e., the average inflation due to snapshot data collection). July was the last month before deployment. From the figure, the reader can decide that deployment

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[118]Tactical Air Command, *Desert Shield Desert Storm Logistics Data* (Langley AFB, VA: TAC/LGP, Sep 1991), p iii. To quote:

> Data from August and September was sketchy at best. We were still working a classification issue for maintenance data, later it became FOR OFFICIAL USE ONLY. The result was an ad-hoc mix of lap-tops, local programs, manual records, facsimiles of daily logs, and attempts to use modems to interact with CAMS mainframes at home. None were entirely successful.

[119]*Ibid*; J.A. Forbes, telephone interview with Mr. Ed Merry, Air Combat Command, 9 Aug 1992.

[120]TAC Logistics Data, p iii.

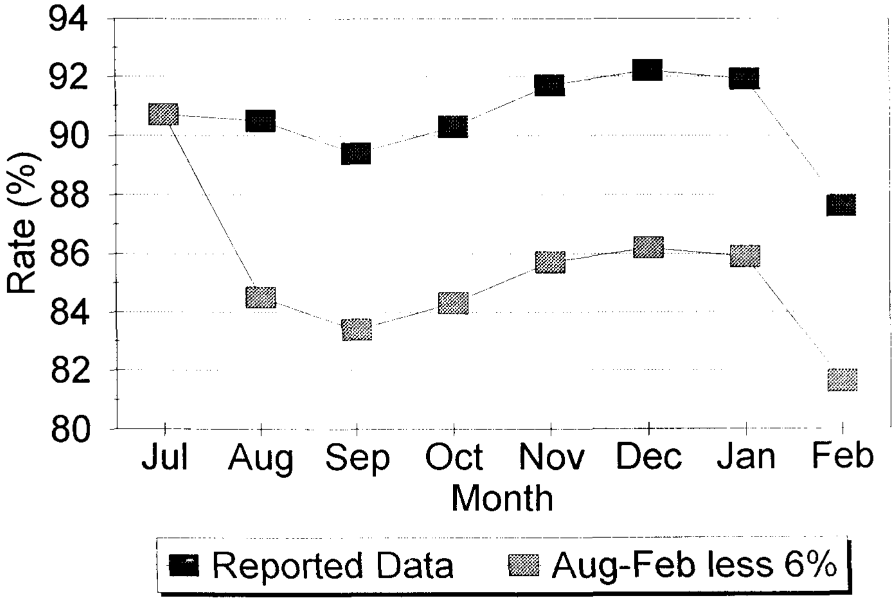
[121]REMIS was an AFLC system that aggregated data from individual base-level CAMS installations.

initially degraded mission capability. However, most of the bugs were worked out of the system in roughly four months. Table 36 contrasts the average fully-mission-capable rates before deployment, during Desert Shield, and during Desert Storm for major U.S. Air Force aircraft.

Break Rates and Fix Rates

Why did the mission-capable rates go down in general after deployment? The answer can be seen in break and fix rates.[122] Tactical Air Command aircraft all followed a more-or-less common pattern that

Figure 69
F-16 FMC Rate



[122]The problems with CAMS during Desert Shield/Desert Storm preclude analysis of more universal measures. An attempt was made to analyze mean-time-between-maintenance trends using data from the Air Force's Maintenance and Operational Data Access System for the period Sep 1990 through Aug 1992 but was not successful. It was apparent from wild month-to-month variations during the period of Desert Shield and Desert Storm that the data were corrupted. Discussions with personnel of the Air Force Logistics Management Center confirmed that many of the CAMS data tapes for this period were lost. Memorandum, J. A. Forbes, "Summary of Desert Shield/Desert Storm Discussions with AFLMC Personnel," 4 Sep 1992.

Table 36
Fully Mission-Capable Rates Compared[123]

Sourcing Command	Aircraft	FMC Rate Before Deployment	Desert Shield Avg (adj)	Desert Storm Avg (adj)
TAC	F-15	84.6	73.2	78.8
TAC	F-15E	79.4	84.6	79.9
TAC	F-16	90.7	87.7	80.8
TAC	OA-10	87.5	88.4	87.5
TAC	A-10	88.9	85.0	81.0
TAC	F-4G	83.3	77.7	72.5
TAC	EF-111	75.8	59.5	47.2
TAC	F-117	82.4	79.5	72.5
TAC	RF-4C	79.7	73.7	61.3
TAC	E-3	81.4	79.6	82.2
USAFE	A-10	88.9	n/a	75.6

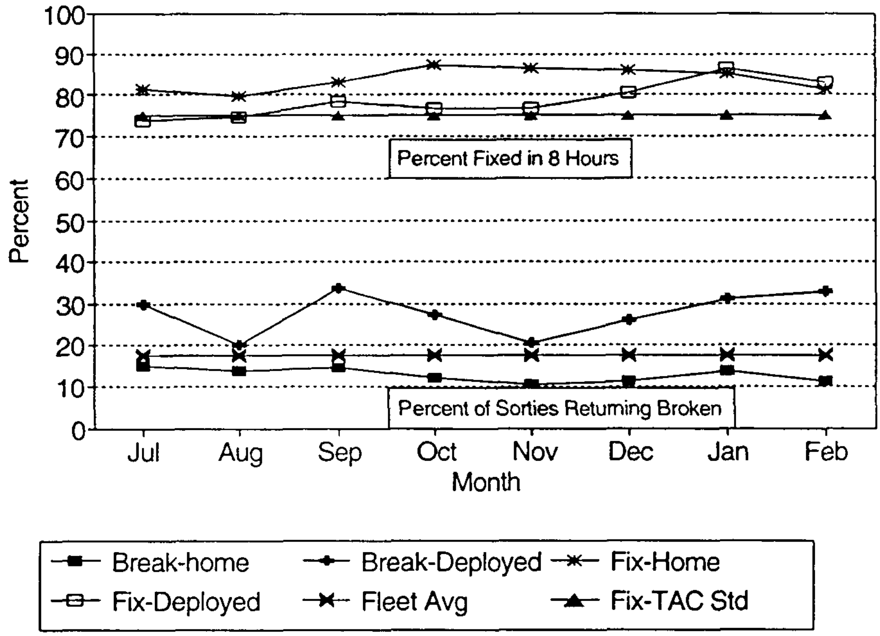
[123]Data compiled from multiple sources. TAC aircraft: Desert Shield/Desert Storm Logistics Data; USAFE Aircraft: USAFE Command Management Review; SAC Aircraft: Reconstructed from CENTAF mission capability data; MAC Aircraft: Reliability and Maintainability Information System (REMIS) 18 Mar 1992; SOF Aircraft: Reconstructed from CENTAF mission capability data. TAC, USAFE, SOF, MAC (C-130) and SAC Desert Shield and Desert Storm aircraft status was reported using snapshot data and the reported data have been adjusted by 6% accordingly. USAFE figures are for Desert Storm only and exclude Proven Force. F-111 aircraft are not included in the USAFE figures because the data are evidently corrupted (starting Desert Storm in Nov 1990). The "before" column is Jul 1990 data in the case of TAC, the average of the three months before to deployment in the case of USAFE, and Jul 1990 REMIS data for C-5s and C-141s. For C-5 and C-141 aircraft, Desert Shield is the average of August through Dec 1990, and Desert Storm is the average of Jan and Feb 1991. For C-5 and C-141 aircraft, data are always for the entire fleets and are as provided by Air Mobility Command/LG facsimile 15 Dec 1992. [The C-141 and C-5 data were manually collected by AMC (then MAC) during Desert Shield and Desert Storm because REMIS did not collect data on overseas locations.] For all other aircraft, Desert Shield and Desert Storm data are only for aircraft that deployed. The C-130 peacetime rate is after the conflict (Apr 1991 - Aug 1991) rather than before.

Table 36 (Continued)
Fully Mission-Capable Rates Compared

Sourcing Command	Aircraft	FMC Rate Before Deployment	Desert Shield Avg (adj)	Desert Storm Avg (adj)
USAFE	RF-4C	78.8	n/a	77.2
USAFE	F-4G	78.9	n/a	63.6
USAFE	F-16	86.8	n/a	79.1
USAFE	F-15	84.4	n/a	74.6
SAC	B-52G (Diego Garcia)	not available	0.87	0.83
SAC	B-52G (Moron)	not available		
SAC	KC-135	not available		
SAC	KC-10	not available		
MAC	C-141	79.7	83.3	84.4
MAC	C-5	69.8	68.7	67.8
MAC	C-130	81.5	-----	90.1

can be visualized by examining F-15 data (Figure 70). F-15 aircraft deployed to the AOR broke more often than did aircraft at home. It is not hard to understand why. Over and above being in a harsh environment, aircraft in the AOR were flying longer sorties than peacetime training missions. In addition, the rate at which broken aircraft in the AOR were fixed was worse than the rate at home station (although the AOR rate improved over time as the supply system, intermediate maintenance, and other capabilities came fully on line). For the C-5, maintenance ability to repair aircraft rapidly enough between missions appears to have been the limiting factor. As is discussed in chapter 3, Military Airlift Command flew all C-5 aircraft that were mission capable.

Figure 70
F-15 Break and Fix Rates



Why Were Capability Rates Better Than Expected?

Although capability rates were not as good as appeared from the initial data, they were still better than ones forecast as late as April 1990. In that month, the AFLC Logistics Operations Center assessed Logistics Command's ability to support OPLAN 1002-90. The Center concluded that Logistics Command could fully support only two of thirteen aircraft types tasked in the OPLAN; the B-52 and C-141 were actually rated as unsupported.[124] Because of the disparity between prediction and outcome, the

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[124]The assessment was largely done mechanically by the Weapon System Management Information System Supportability Assessment Module (WSMIS-SAM). WSMIS-SAM is a mathematical model that forecasts aircraft mission-capable rates (essentially availability percentage) based on availability of spare parts, pipeline times, repair rates, and similar data. Source of information for the following discussion is Michael M. Self, "Air Force Logistics Command Desert Storm Logistics Comparative Staff Study," Aug 1991.

Command performed an after-the-fact assessment during the summer of 1991 to uncover the reasons for the differences. Results are summarized in Table 37.[125]

Three common threads run through Table 37. First, aircraft such as the F-4G and the F-16 simply "got well" between the initial assessment and the Desert Shield and Desert Storm deployment. Second, nondeploying aircraft and their WRSKs kits were extensively cannibalized.[126] Third, only small proportions of the respective fleets usually deployed, making extensive cannibalizing practical. Those that remained home became a ready source of supply for those that did deploy. The April assessment assumed there would be no cannibalization from nondeployed aircraft or their WRSKs.

Comparison with Other Services

Navy experience was essentially the same as Air Force experience. Eight carriers participated in Desert Shield and Desert Storm. The Center for Naval Analyses (CNA) analyzed the mission capability data and concluded that the Navy mission-capable rates were as high as those normally experienced in peacetime,[127] although CNA did not provide the equivalent peacetime rates. CNA's summary data for Desert Shield and Desert Storm are presented in Table 38. Reasons given for the sustained mission-capable rates were (1) flying-hour usage rates were near planned wartime numbers, (2) carriers shared intermediate maintenance facilities, (3) and a healthy supply stock was available.[128] A quantifiable measure of supply health is the range and depth fill rates of the Navy's Aviation

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[125]Aircraft such as the F-111F and F-117 that were not tasked in OPLAN 1002 are necessarily absent from this comparison.

[126]Col Raymond Davies, Deputy Commander for Maintenance of the 4 TFW (P) probably portrays a typical approach to deployment when he describes cannibalizing approximately 300 parts from aircraft remaining behind. Steven Prazak, "Maintenance Operations in Desert Storm: an Interview with Col Davies," *Industrial Engineering*, Oct 1991, pp 38-41

[127]Ronald Nickel, et al, *Desert Storm Reconstruction Report, Volume IX: Logistics*, (Alexandria, VA: Center for Naval Analysis, Oct 1991), p 7-1.

[128]*Ibid*, p 7-15.

Coordinated Allowance List and rotable pools.[129] Fill rates are given in Table 39.

Table 37
Rationale for Differences Between April 1990 OPLAN 1002-90 Assessment and Desert Shield/Desert Storm Results[130]

Aircraft Type	April 1990 Assessment	Rationale for Difference and/ or Comments
A-10	Fully supported.	Six squadrons deployed with six WRSKs but kits deployed were meant for a larger number of aircraft. Parts plentiful from the beginning and WRSKs kept filled by resupply. A-10 level of activity could have been sustained for considerably longer than combat phase of Desert Storm.
E-3	Marginally supported for two problem parts.	Peacetime and wartime missions are the same, extensive desert operational experience, effective parts chaser operation at Tinker AFB (possible because of small number of E-3s), Desert Express, and weekly EC-135 rotation aircraft transporting parts, preemptive cannibalization of problem parts from depot aircraft.
F-4G	Unsupported because of 13 problem parts. Also anticipated windscreen problems.	Of 13 problem parts, 10 had get-well dates before first F-4 deployment. Windscreen problems did not materialize.
RF-4	Supported.	No issues.

[129] *Ibid*, p 7-15 to 7-16. Range is the number of different types of parts. Depth is the total count of parts. The rotable pool (i.e., rotatable) comprises the most important repairable items.

[130] In this table, WRSK stands for war readiness spares kit, a "kit" of parts kept ready to deploy. BLSS stands for base-level self-sufficiency, parts that are not intended for deployment.

Table 37 (Continued)
Rationale for Differences Between April 1990 OPLAN 1002-90 Assessment and Desert Shield/Desert Storm Results

Aircraft Type	April 1990 Assessment	Rationale for Difference and/or Comments
F-15A/B/C/D	Rated marginally supported by WSMIS-SAM, manually upgraded to substantially supported because of small proportion of F-15 fleet tasked for 1002.	Small proportion of fleet tasked.
F-15E	Not assessed because aircraft was new and was in "grace" period.	Inadequate WRSK–first squadron strengthened by cannibalizing from 2d Squadron, which had less than 50% fill rate to begin with, then 2d Squadron deployed. Problem solved by cannibalizing from nondeploying squadrons and production line. Mobile electronics test sets for F-15E permitted on-site repair of electronics versus transport to Europe for repair.
F-16	Marginally supported because of one F-16A-unique problem part.	Problem part resolved before to deployment. Each group of squadrons deploying to a single base were from same or compatible block numbers and had common engines, avionics, etc.
F-111D	Substantially supported.	Not deployed.
EF-111	Fully supported.	WRSKs had high fill rates. Intermediate-level maintenance facility established at Taif.

Table 37 (Continued)
Rationale for Differences Between April 1990 OPLAN 1002-90 Assessment and Desert Shield/Desert Storm Results

Aircraft Type	April 1990 Assessment	Rationale for Difference and/or Comments
B-52	Unsupported for numerous parts.	Small number of aircraft participating in Desert Storm, cannibalization from nontasked aircraft and nondeploying WRSKs (proscribed in peacetime).
KC-135	Substantially supported.	Cannibalized nontasked aircraft and commingled WRSKs of collocated units.
C-5	Marginally supported due to low WRSK/BLSS fill rate.	Parts assessed as problems did turn out to be so but were resolved by surging overhaul.
C-130	All versions rated fully or substantially supported.	Cannibalized parts from obsolete aircraft in storage, borrowed spares from Navy, Coast Guard, and allies, expedited contract repair.
C-141	Unsupported due to low WRSK/BLSS fill rate–in turn caused by a lack of funds to repair on-hand carcasses.	Once Desert Shield was underway, funds became available.

Table 38
Summary Naval Aircraft Readiness Data

Time Period	10/1/90 - 11/31/90	12/1/90 - 1/16/91	1/17/91 - 2/28/91
MC Rate	85	87	88
FMC Rate	83	85	85
Sorties/Day	158	191	457
Flight Hours/Day	385	455	1,376
Average sortie length (hours)	2.4	3.7	3.0

Table 39
Percentage of Spare Parts on Hand During Desert Shield/Desert Storm

	AVCAL Range/Depth	Rotable Range/Depth
GOALS	95/93	100/96
Saratoga	96/93	100/98
Kennedy	96/93	100/99.8
Midway	92/87	100/96
Ranger	92/88	100/96
America	96/93	100/98
Roosevelt	96/93	100/96

Army rates were similar to those experienced by the Air Force and Navy, although the Army considered the results of the conflict to have validated its equipment more than its support concepts. As noted earlier, the Army Aviation Center stated that its aviation logistics system itself broke down.[131] The primary problems were lost parts and a relatively immobile aviation intermediate maintenance (AVIM) that was unable to keep up with the forward movement of aviation units. Summary data for the Army are in Table 40.

Table 40
Army Aviation Summary Mission Capability Data

Aircraft Type	Desert Shield FMC Rate	Desert Storm FMC Rate
AH-64	85	91
OH-58D and armed OH-58D	89	86
UH-60	84	85
OH-58 A/C	90	92

How Large was the Maintenance Footprint and was it too Large?

A perception has apparently formed that too many support personnel were in the theater.[132] The narrative record is ambiguous: some interviews created the impression that the deploying forces deliberately minimized the number of personnel sent to the AOR.[133] This would make

[131]Hq Department of the Army, Concepts, Doctrine, and Force Policy Division, *U.S. Army Aviation Center Operation Desert Shield/Storm After Action Report* (Coordinating Draft) (Washington, DC: Hq U.S. Army, 22 Nov 1991), pp 63-74, 92-93.

[132]Intvw, Mr. Richard Gunkle with Lt Gen Trevor Hammond, Hq USAF Deputy Chief of Staff for Logistics, 7 Oct 1992.

[133]As an example, the following is quoted from an interview with Maj Dell Rose, Deputy Chief of Maintenance, 1709 Air Refueling Wing (P): "We had 359 people here supposedly what it take (sic) just to manage and maintain 10 airplanes. We were tasked with sending over a group of 22 aircraft and they told us that we couldn't even have 359 folks. . . . Now something doesn't make sense. If you are authorized 359 folks to manage 10 airplanes, and all of the sudden you have a force of 22 and they won't even let you take 359 and then they make you split that workforce between the air guard and

sense considering the Commander-in-Chief Central Command's cap on the number of personnel permitted in the theater. Contrary indications are that ABDR personnel worked as ordinary shop mechanics and in some cases maintenance personnel worked outside of their specialty codes. Out-of-specialty utilization can be an indication of either imbalance or "extra" personnel. A definitive count of maintenance personnel in the AOR or attached to forces directly supporting the AOR will probably never be available. Chapter 3 of this report described the deployment difficulties arising from lack of Time Phase Force Deployment Data (TPFDD); those same TPFDD that would normally be the basis for personnel accounting.[134] However, data are not totally lacking.[135] The Air Force Wartime Manpower and Personnel Readiness Team at Site "R", Ft. Ritchie, Maryland, maintained data on deployed personnel through deployment manning documents during Desert Shield and Desert Storm.[136] As shown on Figure 71, a peak of approximately 17,000 maintenance personnel were in the AOR (in March 1991), or 21,000 if one includes

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ARFs, something doesn't make sense."

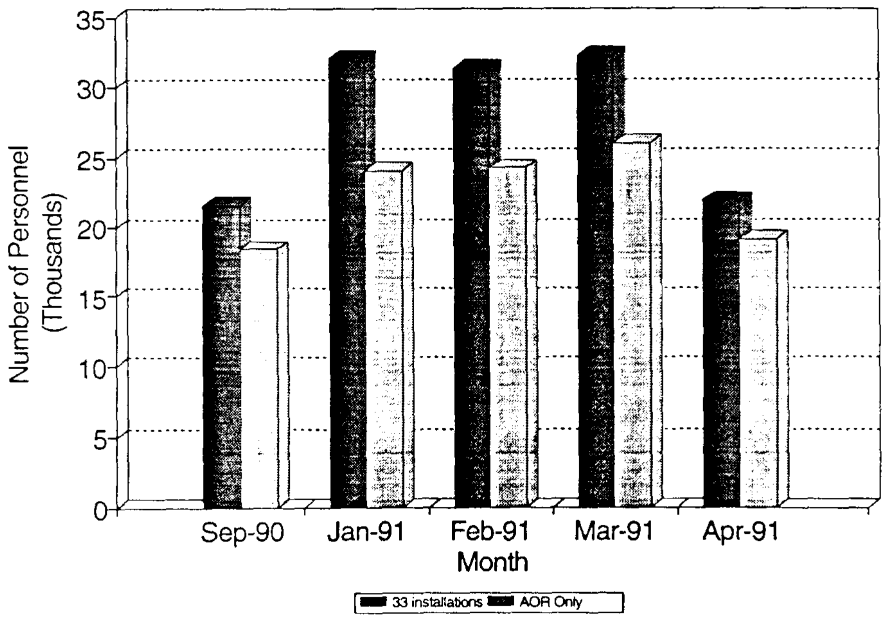
[134]The basis for this discussion is an interview with personnel of the Air Force Wartime Manpower and Personnel Readiness Team. Jim Forbes and Ted Beck, Memo for the Record: "Visit to Air Force Wartime Manpower and Personnel Readiness Team," Ft Ritchie, MD, 2 Oct 1992, GWAPS NA-482.

[135]Although, ironically, the Air Force Military Personnel Center maintained that this was so. Ltr, Kenneth S. Rogers, Maj, USAF, Chief, Readiness Systems Branch, Hq Air Force Military Personnel Center to SAF/OSG, subj: Data Request (SAF/OSG), 28 Feb 1992; Memorandum by Mr Murray R. Berkowitz, Lt Col, USAF, Chief Research Services, Gulf War Air Power Survey for Personnel Readiness Center and AFMPC/DPMDF, subj: Data Request–Action Memorandum, 29 Jan 1992.

[136]The deployment manning documents (DMDs) are actually requirements documents, but the AFWMPRT used them as a source of deployment data because the requirements were essentially "reverse engineered" by counting the personnel who were actually on-hand at each Desert Shield/Desert Storm deployed location. AFWMPRT personnel were "comfortable" with the data and felt that they were about 95% accurate for the months shown here (Sep 1990 and Jan through Apr 1991). Aug 1990 and Oct through Dec 1990 were considered by the AFWPRT to be inaccurate and are not presented here. Also, for some unknown reason, data on Al Ain are not in the database. Inclusion of Al Ain maintenance personnel would raise the totals by about 360 persons according to data in the 1630(P) Contingency History Report, 6-12 Jan 1991, "Desktop Locator for All Assigned Personnel," dated 11 Jan 1991.

Andersen AFB, Diego Garcia, Incirlik, Lajes, and Moron.[137] Figure 72 shows distribution of personnel by location.[138]

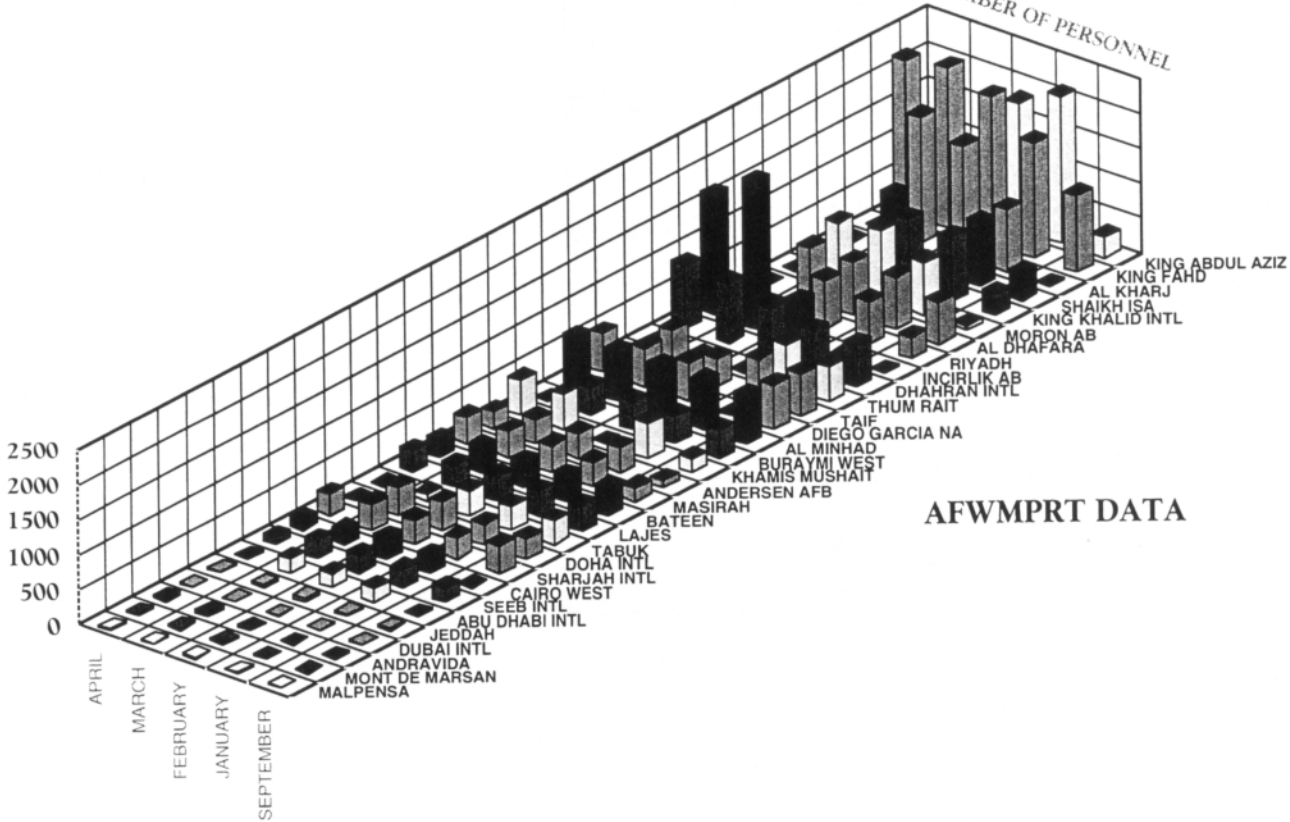
Figure 71
Maintenance Population by Month



[137]This is an incomplete accounting because it does not include Proven Force personnel at other than Incirlik, nor does it include the maintenance personnel providing intermediate-level maintenance (ILM) from USAFE. The CENTAF Deputy Chief of Staff, Logistics has stated that a couple hundred augmentees were deployed from CONUS bases to USAFE locations. Rider, After Action Report, p 4.

[138]This figure also reveals some obvious inaccuracies in the data. There are 30 maintenance personnel shown at Jedda New in Feb 1991 supporting 95 SAC aircraft–an impossibility. See the *Chronology and Statistics* Volume for the aircraft count.

Figure 72
Maintenance Personnel By Base and Month



How the Number of Personnel Deployed was Decided

A SAC Lieutenant Colonel assigned to the 1703d Air Refueling Wing at King Khalid captured the spirit of the deployment in a March 1991 interview. In his words:

> When Plattsburg was tasked to be the lead unit to come over and set up the A-models, our folks at Plattsburg had indeed built a TPFDD flow to get the right organizations and right people for a given size, the right support people packages for the given size, PAA that was supposed to be here, and so-on-and-so-forth. It was approved through 8AF and SAC, and it was the guideline that our unit was using to send folks over. Unfortunately, it never got to CENTAF forward or rear; thus it was never approved from their perspective, and they were not going by the same document at all. In fact, their document was largely an ad hoc document, built as it went along. . . . [139]

Although confusion is obvious, it would be stretching the facts to suggest arbitrary sizing of the deployed forces. The evidence indicates that, in the absence of solid guidelines, the various headquarters and deploying units held down the number of maintenance personnel deploying–sometimes deploying a considerably leaner force than they would have used for the same number of aircraft in the United States.[140] This point was discussed earlier in this chapter. The question is, did they?

Actual Number Deployed versus Number Computed from Unit Type Codes for Selected Bases and Units

To answer the question, the survey team undertook a ministudy to compare the number of maintenance personnel at eight selected bases in the AOR with the number that would be expected if the deliberate planning

[139]Intvw, Lt Col Jeff Rimell, Deputy Commander for Maintenance, 380th Bomb Wing, Plattsburg AFB, NY, 19 Mar 1991. This picture was corroborated in an interview with Col Tom Howard, Chief of Logistics Plans Division, Hq USAF. Frank Cartwright, Memorandum "Notes from Meeting with Col Tom Howard," ca 2 Oct 1992, GWAPS NA-481.

[140]Other corroborating evidence is found in: Rider, After Action Report, p 4; AFLLS No 15858-67900 (00048), 9 Apr 1992, AFLLS No. 32953-51176 (00033), 29 Mar 1991, AFLLS No. 42029-47873 (00062), 23 May 1991, AFLLS No. 40550-21733 (00064), 5 Apr 1991.

process was used.[141] Appendix 8-B presents the detailed analysis; Figure 73 summarizes the results. The top left pie in the figure shows the number of maintenance personnel expected on the basis of the deliberate planning process–a total of 7,021 for the eight bases. The deliberate planning process, however, following OPLAN 1002-90, would have placed all intermediate-level maintenance in the AOR. A significant portion of that maintenance actually went to Europe; the lower left pie adjusts for this fact-of-life change. For these eight bases, centralized intermediate-level maintenance support from Air Force Europe reduced the expected AOR population by almost 900 people or thirteen percent. The top right pie captures the actual Air Force Wartime Manpower and Personnel Readiness Team (AFWMPRT) AOR population for the eight bases (4,002 persons) and an imputed number of persons providing intermediate-level maintenance from Europe.[142] The telling comparison is between the two bottom pies. The number of persons that should have been expected in the AOR, given the actual maintenance beddown, is 6,135. The number in the AOR, according to the AFWMPRT data, was 4,002, a difference of over 2,100 or almost thirty-five percent.[143] Two answers are possible. Either the AFWMPRT data are grossly wrong, implying that the Air Force had no idea how many people were in the AOR–*a damning indictment of its personnel systems*–or the Air Force went to war on the eight bases with one-third fewer maintenance specialists than it thought it needed. If the latter possibility is accepted, the perception that more people were in the AOR than needed is contradicted by the results of this study.

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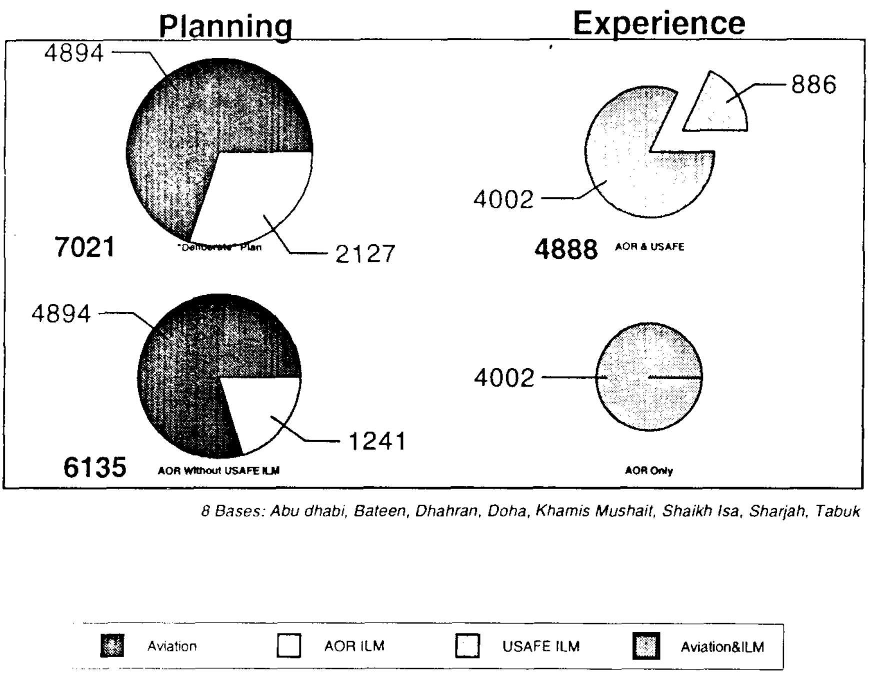
[141]Definition of maintenance personnel is the same as given earlier. The eight bases resulted from selecting installations (1) that had data in the AFWMPRT data base, (2) for which there were no obvious, gross errors, (3) had a single type of aircraft (e.g., F-15). The third restriction reduced the potential for error when estimating the number of personnel who be expected to deploy. Personnel data are as of 15 Jan 1991.

[142]Imputed because the actual number is unknown. This number was estimated using Unit Type Codes appropriate to the support provided. Details are in appendix 2.

[143]General Schwarzkopf's ceiling of 530,000 personnel in the theater is not a factor, since that occurred on 19 Feb, a month later than the as-of date of the data presented here. (S/WNINTEL/NOFORN) Capt Steven B. Michael, *The Persian Gulf War: An Air Staff Chronology of Desert Shield/Desert Storm* 1992, p xiii.

Figure 73
Maintenance Personnel: *Planned vs Actual*



Summary

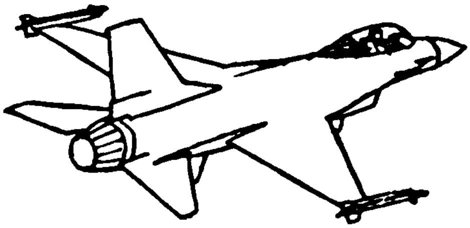
The tooth-before-tail deployment's effect on mission-capable rates varied differentially with maintenance concept. During the first month of deployment, the F-15 complement suffered a drop in combat-ready aircraft of between nine percent and fifteen percent compared to peacetime rates. The F-16 and A-10 complements, for which intermediate maintenance is less of a concern, did not experience the drop. Throughout the conflict, maintenance was generally without critical, mission-limiting problems, and the industrial-level and base-level maintenance capacity exceeded the demands generated by the Gulf conflict. With some exceptions, mission-capable rates during both Desert Shield and Desert Storm were roughly the same as or slightly lower than peacetime rates, although rates varied from month to month and from one type of aircraft to another. Other Services had similar experiences.

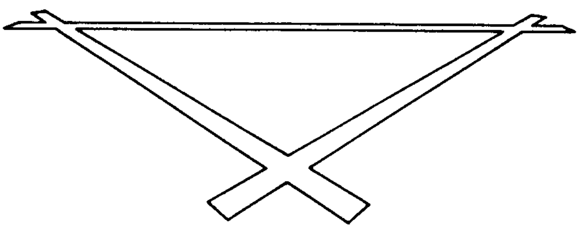
Where the maintenance concepts used during Desert Shield and Desert Storm differed sharply from anticipated methods (e.g., establishing intermediate maintenance support in Europe rather than in theater) imbalances between maintenance and other logistics factors appeared quickly. The most prominent imbalance was with transportation. Even when problems arose, however, they were ameliorated by a relatively healthy supply stock and innovative procedures.

The desert environment seems to have had little persistent effect on reliability. The major exceptions to sustained high reliability were T-64 and T-700 helicopter engines (used on the CH/MH-53 and MH-60 helicopters, respectively), which, as a result of sand erosion, achieved reliability levels approximately one-tenth that of peacetime levels. The T-64 unreliability was compounded by a two-level maintenance concept predicated on a normal reliability level.

Maintenance men and women accounted for approximately thirty-eight percent of all Air Force personnel deployed to the AOR and, in terms of numbers, were the single largest manpower element (although an accurate count will probably never be available). The actual tail-to-tooth ratio was larger than that visible in the AOR, since Desert Shield and Desert Storm maintenance was also supported from the Europe theater, from Guam, and from the continental United States. There is no evidence that too many maintenance personnel were in the AOR; in fact, the evidence (for eight bases) is that the Air Force went to war with one-third fewer personnel than it would have planned.

Automated maintenance management support was not available until late in the game–approximately December 1990. Absence of aircraft status information hampered the various headquarters in their attempts to ascertain the health of the fleet (although this was worked around via phone calls and messages). Absence of configuration data, especially on engines, compromised ability to perform maintenance, although, again, other factors such as healthy spares stocks prevented critical shortfalls.





Appendix 8-A

Summary of Gulf Conflict U.S. Air Force Battle Damage and Repair

Aircraft	Tail Number	Date of Incident	Unit	Severity	Description of Damage	Repair Time	Event Number	Footnote
A-10	81-0964	17 Jan 91	10TFW	Damaged	Hole left wing leading edge, also in mid spar web.	5 m/h est	E-5	
A-10	82-0664	17 Jan 91	354TFW	Damaged	Small calibre holes, 2 severed hydraulic lines, front spar web damage.	Pilot interview indicates overnight fix, 2 m/h est on AFTO 97	E-4	4
A-10	79-0182	23 Jan 91	23TFW	Damaged	Left leading edge wing, 5-6 dime size punctures.	0.25 m/h (est) on AFTO 97 using speed tape	E-12	
A-10	82-0664	28 Jan 91	354TFW	Damaged	Holes in honeycomb, left elevator, and left horizontal stab.	0.5 m/h	F-25	

Summary of Gulf Conflict U.S. Air Force Battle Damage and Repair (Continued)

Aircraft	Tail Number	Date of Incident	Unit	Severity	Description of Damage	Repair Time	Event Number	Footnote
A-10	78-0715	29 Jan 91	354TFW	Damaged	#5 Pylon broke off, couple of small holes in engine and stab.	0.30 m/h (est)	E-16	
A-10	76-0547	31 Jan 91	23 TASS	Damaged	Flack damage on left windscreen.	30 m/h est	E-19	
A-10	78-0686	31 Jan 91	354TFW	Damaged	8" gouge in vert stab.	2 m/h (est)	F-31	
A-10	76-0450	31 Jan 91	926TFG	Damaged	Vert tail, horz tail, aft fuselage, both wings, left engine cowling.	2 weeks to recover to MOB and then cannibalized	E-18	
A-10	77-0268	31 Jan 91	926TFW	Damaged	Shrapnel damage in left cockpit area, rt engine, 37MM AAA.	about 79 m/h (est), no data on when completed	F-32	5

Aircraft	Tail Number	Date of Incident	Unit	Severity	Description of Damage	Repair Time	Event Number	Footnote
A-10	80-0186	1 Feb 91	23TFW	Damaged	Front windscreen below HUD.	R&R front windscreen, 24-hour cure	E-20	
A-10	78-0715	1 Feb 91	354TFW	Damaged	Minor flak damage left engine inlet wing.	Speed tape--flying next morning, 1.0 hour to repair	F-33	
A-10	79-0248	2 Feb 91	23TFW	Lost			F-34	
A-10	78-0675	2 Feb 91	354TFW	Damaged	Wing fence and pylon damage.	Speedtape, 1.8 m/h est	F-35	
A-10	77-0255	5 Feb 91	354TFW	Damaged	Large holes left wing, left engine, right tail.	4-5 days, 174.5 m/h est	F-36	
A-10	82-0664	6 Feb 91	354TFW	Damaged	Struck between Station 9 and right gear pod, hydraulics lost.	no data	F-24	
A-10	79-0206	11 Feb 91	23TFW	Damaged	Rt engine F.O.D. shrapnel.	13.5 m/h, system 23 only	F-28	
A-10	80-0186	15 Feb 91	23TFW	Damaged	Hits both rudders, right elevator gone.	11 days-2 weeks, 139 m/h	F-23	

Summary of Gulf Conflict U.S. Air Force Battle Damage and Repair (Continued)

Aircraft	Tail Number	Date of Incident	Unit	Severity	Descrition of Damage	Repair Time	Event Number	Footnote
A-10	78-0722	15 Feb 91	354TFW	Lost			F-37	
A-10	79-0130	15 Feb 91	354TFW	Lost			F-38	
A-10	79-0181	22 Feb 91	23TFW	Lost			F-29	
AC-130	69-6572	no data	1SOW	Damaged	Popped rivits and cracked ribs.	No data except drawing of damage	E-13	
AC-130H	69-6567	31 Jan 91	1SOW	Lost			E-17	
AH-64	85-25362	25 Feb 91		Lost			F-40	
B-52G	58-0248	18 Jan 91	42BW	Damaged	6' of tail, aft of 1853 bulkhead.	Repair for 1 time flight to Guam; Repair est: about 12 hrs	E-7	2

Aircraft	Tail Number	Date of Incident	Unit	Severity	Description of Damage	Repair Time	Event Number	Footnote
B-52G	58-0194	26 Jan 91	1708BW	Damaged	No data.	No data	E-14	
B-52G		26 Jan 91		Damaged	No data.	No data	E-15	
B-52G	58-0253	27 Feb 91	42BW	Damaged	SAM, multiple holes below left wing, left aft fuselage, under tail.	570 m/h	F-9	
EF-111A	66-0023	14 Feb 91	20TFW	Lost			F-5	
F-111F	70-0442	17 Jan 91	48TFW	Damaged	1.5" X .75" hole right side wing glove.	Unknown	E-3	
F-111F	70-0392	17 Jan 91	48TFW	Damaged	Shrapnel underneath #2 engine burner section.	3 hours	E-1	
F-111F	70-2401	17 Jan 91	48TFW	Damaged	Groove in windscreen, 1" hole in tail.	About 2 hours	E-2	
F-15C	83-0226	22 Jan 91	1TFW	Damaged	No data.		F-14	
F-15E	88-1689	18 Jan 91	4TFW	Lost			E-6	

Summary of Gulf Conflict U.S. Air Force Battle Damage and Repair (Continued)

Aircraft	Tail Number	Date of Incident	Unit	Severity	Description of Damage	Repair Time	Event Number	Footnote
F-15E	88-1692	19 Jan 91	4TFW	Lost			E-10	
F-16A	79-0391	26 Feb 91	174TFW	Damaged	Fuselage dents and cracks, numerous holes right side of aircraft.	175 m/h est	F-19	
F-16C	88-0257	19 Jan 91	401TFW	Lost			E-9	
F-16C	87-0228	19 Jan 91	401TFW	Lost			E-8	
F-16C	88-0488	21 Jan 91	388TFW	Damaged	14 hits, engine fodded, left wing damaged, etc.	AFTO 97 indicated still down a/o 22 Jan approx 125 m/h (est). Completed 9 Feb	E-11	2
F-16C	88-0450	26 Feb 91	388TFW	Damaged	Small piece of transparency shaved off.	R&R canopy, no data on m/h	F-17	

Aircraft	Tail Number	Date of Incident	Unit	Severity	Description of Damage	Repair Time	Event Number	Footnote
F-16C	88-0495	27 Feb 91	388TFW	Damaged	Missile hit left wing leading edge, 1/2 external tank, more.	Evacuated to Hill AFB OO-ALC (Beyond Repair in Theater)	F-21	
F-16C	84-1390	27 Feb 91	50TFW	Lost			F-13	
OA-10	76-0543	19 Feb 91	23TASS	Lost			F-39	
OA-10	77-0197	27 Feb 91	23TASS	Lost			Unknown	

FOOTNOTES

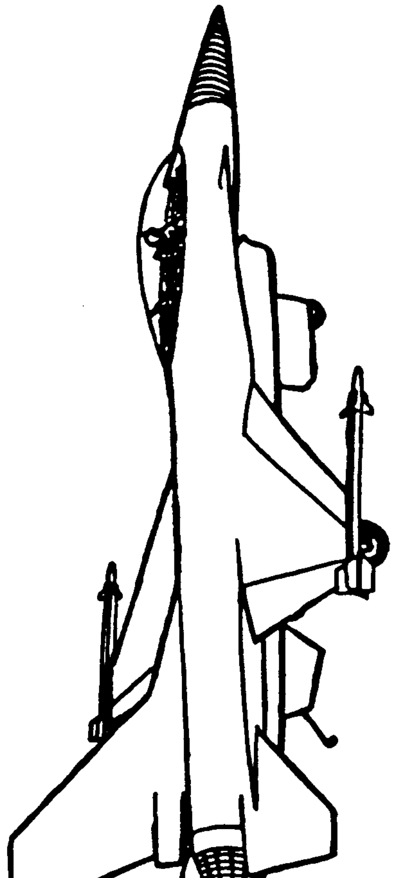
1. Data in this table were obtained from individual record folders maintained by the Survivability Vulnerability Information Analysis Center (SURVIAC) at Wright Patterson AFB, OH, by J. A. Forbes on 16 Sep 1992. Some of the folders were marked with an event number (e.g., E-8, E-6). Where this is true, the table shows the event numbers. In all other cases, the table shows the folder numbers marked on each folder in pencil. The data can be demonstrated to be incomplete. As an example, no folder was available for a KC-135 aircraft, although a KC-135 was damaged during air refueling on 19 Jan 1991 and subsequently returned to service by an ABDR team from the 2953d CLSS (Oklahoma City Air Logistics Center) (ref: *History of the Oklahoma Air Logistics Center, Fiscal Year 1991*, p 130).

2. Cover sheet and free-form commentary only.

3. This folder includes a briefing titled 2951CLSS Support to 23/254 TFW ABDR DS/DS.

4. Interview on USAFTAWC/TXMS Tactical Air Warfare Interview Questionnaire, all other interviews on this same form.

5. No interview form.



Appendix 8-B

AOR Maintenance Population Analysis

This appendix describes the process used to compare the actual number of Air Force maintenance personnel in the Central Command AOR with the number that should have been expected.

Figure 74 illustrates the overall process. Four separate sources of data were merged. They are:

1. Bases and aircraft. Data are from the Air Order of Battle, Table 10 in the *Statistical Compendium.*

2. Maintenance Beddown. Data are as presented in Table 41 of this chapter.

3. Actual personnel. Data were obtained from the Air Force Wartime Manpower and Personnel Team (AFWMPRT) Desert Shield/Desert Storm Electronic Database (S). Specialty codes included within maintenance are officer: 4024, 4054, 4016, 4096; enlisted: 391XX, 392XX, 411XX, 452XX, 454XX, 455XX, 456XX, 457XX, 458XX.

4. Planned personnel. Data were built up by essentially the same process a unit following normal procedures would have used; i.e., the numbers result from determining how many aircraft were to be supported and if intermediate-level maintenance were to be collocated. On the basis of this information, the proper unit type codes were then selected. Sources of information were the USAF War and Mobilization Plan, Volume 3, Part 1, Combat Forces (WMP-3), 1 July 1987; MEFPAK Summary Report: UTC Movement Characteristics, 30 Sep 1992; and the AF/MOX AF MANFOR Detail Listing, 2 Jan 1992.

Table 41 shows the detailed analysis. The left columns are the base names, type of aircraft, and Air Order of Battle on 1 Oct 90, 1 Nov 90, 1 Jan 91, and 1 Feb 91.

The next three columns to the right are the actual personnel counts on 15 Sep 90, 15 Jan 91, and 15 Feb 91. As explained in the main body of this chapter, the data come from Deployment Manning Documents (DMDs) which are normally requirement documents, not personnel accounting documents. In this case, they are taken as accounting documents, since AFWMPRT indicated that the requirements were established from the actual counts of personnel in the theater.

The next columns to the right indicate whether avionics and maintenance were collocated with the aircraft. The next eight columns show how the "expected" number of personnel was derived. As indicated at the bottom of the table, the number of aircraft on station as of 1 February 91 is the basis for this build-up. There are two sets of determinations; the first set is the aviation packages and the second set the intermediate-level maintenance packages. Aviation packages are intended to deploy immediately with the aircraft.

The right-most columns show the calculations of persons per aircraft (as of 15 Jan 91) and spaces per aircraft (as of 1 Feb 1991). Persons means actual count. Spaces means expected number of personnel.

Figure 74
Maintenance Footprint Analysis

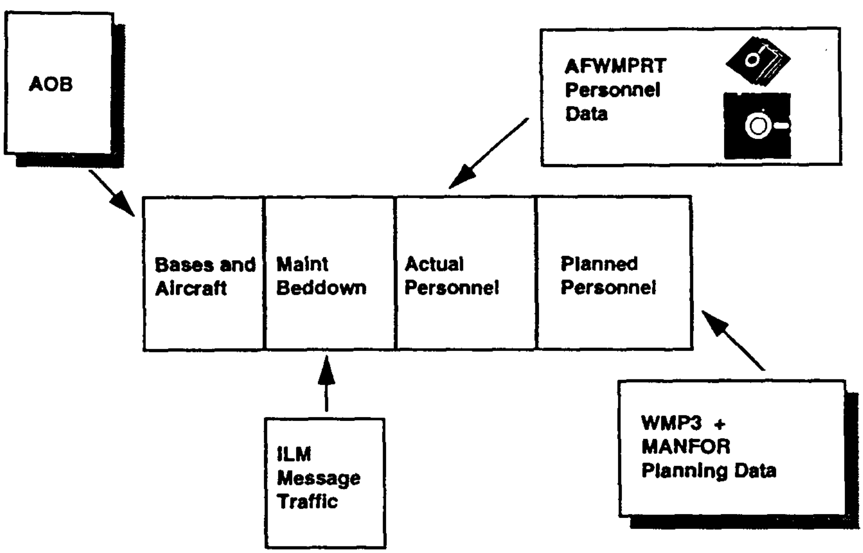


Table 41
Calculation of Expected Number of Maintenance Personnel

Base	Aircraft	Air Order of Battle 1 Oct	1 Nov	1 Jan	1 Feb
Abu Dhabi	KC-135				10
Abu Dhabi Total					**10**
Bateen	C-130	16	16	16	16
	C-29		1		
	EC-130H	5	5	5	8
Bateen Total		**21**	**22**	**21**	**24**
Dhahran	F-15C	48	48	48	48
Dhahran Total		**48**	**48**	**48**	**48**
Doha	F-16C	24	24	24	25
Doha Total		**24**	**24**	**24**	**25**
Shaikh Isa	RF-4G	36	36	48	49
	RF-4C			6	18
Shaikh Isa Total		**36**	**36**	**54**	**67**
Khamis Mushait	F-117A	18	18	36	42
Khamis Mushait Total		**18**	**18**	**36**	**42**
Sharjah	C-130	16	16	16	16
	EC-130E	6			
Sharjah Total		**22**	**16**	**16**	**16**
Tabuk	F-15C	24	24	24	24
Tabuk Total		**24**	**24**	**24**	**24**
All Bases in Sample		**193**	**188**	**223**	**256**

Table 41 (Continued)
Calculation of Expected Number of Maintenance Personnel

Base	Aircraft	Actual Maintenance Personnel 15 Sep	15 Jan	15 Feb
Abu Dhabi	KC-135			
Abu Dhabi Total		**5**	**226**	**226**
Bateen	C-130 C-29 EC-130H			
Bateen Total		**509**	**367**	**378**
Dhahran	F-15C			
Dhahran Total		**911**	**836**	**840**
Doha	F-16C	317	334	344
Doha Total		**317**	**334**	**344**
Shaikh Isa	RF-4G RF-4C			
Shaikh Isa Total		**622**	**1106**	**679**
Khamis Mushait	F-117A			
Khamis Mushait Total		**222**	**463**	**258**
Sharjah	C-130 EC-130E			
Sharjah Total		**523**	**310**	**373**
Tabuk	F-15C	408	360	370
Tabuk Total		**408**	**360**	**370**
All Bases in Sample		**3517**	**4002**	**3468**

Table 41 (Continued)
Calculation of Expected Number of Maintenance Personnel

Base	Aircraft	Collocated Maintenance ILM Avionics	Engine	Allies
Abu Dhabi	KC-135	no	no	
Abu Dhabi Total				
Bateen	C-130 C-29 EC-130H	no	no	
Bateen Total				
Dhahran	F-15C	yes	yes	F-15C/D, A-4, Toronado
Dhahran Total				
Doha	F-16C	no	no	CF-18
Doha Total				
Shaikh Isa	RF-4G RF-4C	yes	yes	F-15C, F-5E/F
Shaikh Isa Total				
Khamis Mushait	F-117A	yes	no	
Khamis Mushait Total				
Sharjah	C-130 EC-130E			
Sharjah Total		no	no	
Tabuk	F-15C	yes	no	
Tabuk Total				
All Bases in Sample				

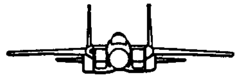
Table 41 (Continued)
Calculation of Expected Number of Maintenance Personnel

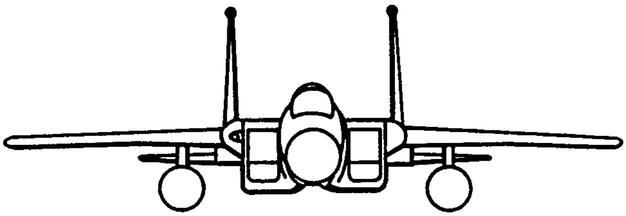
Maintenance Spaces Calculated from UTCs			UTCs					
Base	**Aircraft**	**UE Base**	**Aviation Pkg**	**Spaces**	**Unit**	**ILM Pkg**	**Spaces**	**Total Spaces**
Abu Dhabi	KC-135	10	3YCAE	359				359
Abu Dhabi Total		**10**						**359**
Bateen	C-130E	16	3NCCA	253	50TAS			253
	EC-130H(CC)	4	3DCAK	128	41ECS			128
	EC-130H(CC)	4	3DCAK	128	41ECS			128
Bateen Total		**24**		**509**				**509**
Dhahran	F-15C	24	3FQDC	474	71TFS	HFAZB	524	998
	F-15C	24	3FQDC	474	71TFS	HFAZB	566	1040
Dhahran Total		**48**		**948**			**1090**	**2038**
Doha	F-16C	24	3FKL1	354				354
		1	Pro-rata	15				15
Doha Total		**25**		**369**				**369**
Shaikh Isa	RF-4G	24	3FSG1	314	51TFS	HFAZ1	74	388
	Follow-on		3FSG2	154	51TFS			154
			3RTEN (18	302				
	RF-4G	6	ue)		152TRG	HFASB	45	347
	RF-4G	12	In 3RTEN		67TRW			IN 3RTEN
	F-4C	6	3FSGT	163	52TFW			163
	F-4C	6	3FSGT	163	52TFW			163
	F-4C	6	3FGST	163	52TFW			163
	F-4C	6	3FSGT	163	52TFW			163
Shaikh Isa Total		**66**		**1422**			**119**	**1541**
Khamis Mushait	F-117	18	3FATA	266	415TFS	HFAJA	16	282
	F-117	18	3FATA	266	415TFS	HFAJA	16	282
		6	Pro-rata	94				94
Khamis Mushait Total		42		626			32	658
Sharjah	C-130E	8	3NCCJ	154	63TAS			154
	C-130E	8	3NCCJ	154	Niagra Falls			154
Sharjah Total		**16**		**308**			**0**	**308**
Tabuk	F-15C	10	3FQDH	161	58TFS			188
	F-15C	12	3FQDH	161	58TFS			188
	F-15C	2	Pro-rata	31				31
Tabuk Total		**24**		**353**			**0**	**407**
All Bases in Sample		255		4894			1241	6189

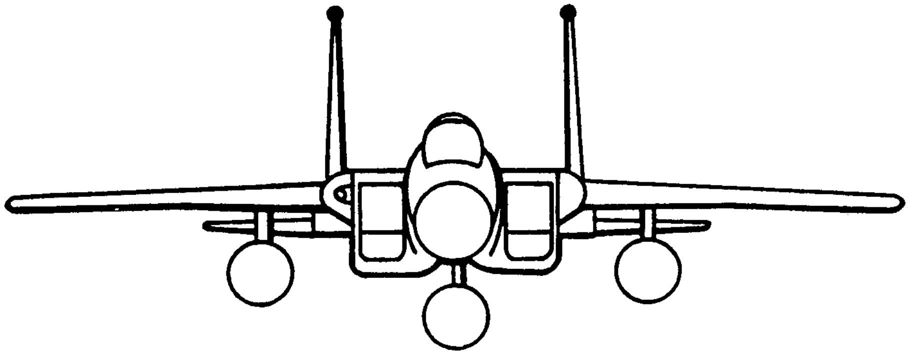
Table 41 (Continued)
Calculation of Expected Number of Maintenance Personnel

RATIOS		Out of AOR ILM	
Persons/ Aircraft*	Spaces Aircraft	UTC	Spaces
		HFKBB	65
		HFKBC	18
		HFKAB	112
		HFKAC	39
22.6	**35.90**		**234**
	15.81	HEDAL	244
	32.00	HEDDB	39
	32.00	HEDDB	39
15.29	21.21		322
17.42	**42.46**		
	14.75	HFAHJ	92
	15.00		
13.36	**14.76**		**92**
	16.17		
	57.83		
	27.17		
	27.17		
	27.17		
	27.17		
16.51	**23.35**		
	15.67		
	15.67		
	15.67		
11.02	**15.67**		
	19.25	HFAHJ	92
	19.25	HFAHJ	92
19.38	**19.25**		**184**
	18.80	HFAZK	27
	15.67	HFAZK	27
	15.50		
15.00	**16.96**		**54**
15.63	**24.27**		**886**

* Number of personnel as of 15 Jan 1991, number of aircraft as of 1 Feb 1991.







9

Logistics Performance

Basic airpower combat effectiveness in the Gulf War is addressed in the GWAPS *Effects and Effectiveness* report; this chapter discusses an essential component of overall effectiveness–logistics performance. Some of the most obvious performance measures, such as mission-capable rates, are at best intermediate and partial indicators. What does it mean, for example, if maintenance and supply create a mission-capable aircraft but munitions is unable to provide the correct ordnance? Beyond this obvious sort of consideration, operations requirements are, as noted in chapter 2 of this report, partly determined by expectations of what logistics is expected to be able to do–hence the visible requirement may not be the "real" requirement. In addition, a number of measures, including mission capability, inevitably involve a "who gets the blame" component–which can foster a natural tendency toward "gaming" reported results. And finally, as documented in earlier chapters of this report, the available data are fragmented and of sometimes questionable accuracy.

No final resolution exists for these kinds of concerns; ambiguity is inevitable, even when hard numbers are available. However, a provisional picture can be drawn by establishing an evaluation framework and then, within the framework, attempting to shed some light on achieved performance. The 4-levels-of-war schema described in the *Effects and Effectiveness* report provides a useful framework (Table 42).[1] The following pages address logistics performance in the context of the operational and strategic levels of war as presented in the figure. They first discuss the operational level of logistics, review the strategic level, and then integrate performance indicators with cross-functional trends to create an under-

[1]This schema is also consistent with proposed joint logistics doctrine. Joint Test Pub 4-0, Doctrine for Logistics Support of Joint Operations, June 1990, p I-1. The "test" publication promulgates the proposed doctrine.

standing of logistics performance during Desert Shield and Desert Storm. The chapter ends with a broader look at the role of logistics.[2]

Table 42
Levels of War

Political: Decisions and Actions that set war objectives and overall conflict parameters.
Strategic: Decisions, actions, and efforts bearing directly on the achievement of war aims.
Operational: Decisions, actions, and efforts focused on the orchestration of campaigns and operations, i.e., the CINC's view.
Tactical: Decisions, actions, and efforts concerning how to plan or execute particular sorties, flights, missions, and mission packages.

Operational Logistics Performance

To what extent did logistics satisfy the operational requirements of the Gulf conflict and when did it not? To answer those questions this section examines the performances of intertheater airlift, air refueling, intratheater airlift, munitions, supply, and air maintenance components.

Intertheater Airlift

With regard to intertheater airlift, the basic questions are: What did the Commander-in-Chief Central Command (CINCCENT) ask for? And did the combination of airlift and sealift get it there when it was supposed to be there? CINCCENT initially directed deployment of a force package consisting of an Army Corps, a Marine Division, three carrier battle groups, the 1st Tactical Air Command (TAC) Fighter Wing, and twelve follow-on fighter squadrons. The 1st Tactical Fighter Wing (TFW) was first priority; all others were unprioritized, and desired closure dates were

[2]In general, this chapter relies on evidence already cited in earlier chapters. For this reason, redundant footnotes are avoided, and citations are limited to corroborating evidence, summary data from other sources, and other information not previously provided.

not established. The emphasis, however, was get it there, and get it there now. This cumulative movement requirement represented an airlift demand six to seven times normal capability. The requirement was quickly recalculated, but continued to change rapidly as the perceived threat situation changed.[3] Thus, a realistic view is that requirements matched capability rather than capability matched requirements. However, the issue is more complicated, since the provided airlift was constrained by a combination of self-imposed limits (i.e., the timing and extent of Reserve call-up and Civil Reserve Air Fleet activation), limited number of off-load locations in the area-of-responsibility (AOR), and nearly useless automated information systems.

Air Refueling

Air refueling was provided on demand and was available with few exceptions when and as needed. Operationally, there were two primary efforts: refueling during deployment and combat sortie refueling in the AOR. An increased tempo of Tanker Task Force activity on a grand scale characterized the deployment; however, a furious level of coordination was required to marry tankers and receivers while simultaneously acquiring beddown and overflight rights for the deployment route structure. Also, a constant tug of war took place between Strategic Air Command (SAC) and Military Airlift Command (MAC) for control of the refueling and cargo-capable KC-10.

Within the AOR, the availability of air space was the single greatest limiting factor affecting air refueling. During the heaviest flying period in Desert Storm, virtually no airspace was available for additional refueling tracks. Generally, setting the available number of tanker sorties at 300 per day satisfied a demand for fuel centered on 270-380 sorties per day throughout Desert Storm. Even so, there were more than four receivers for every boom or drogue in the air at any time. Early in the air campaign, after a series of weather days, planning requests for refueling actually exceeded that number. The imbalance between tankers and receivers was resolved by modifying the size and number of strike packages. Then, as the Tactical Air Control Center gained more experience, planning, coordinating, and controlling air refueling became routine.

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[3]Clayton H. Snedeker, *Operation Desert Shield–Desert Storm: The Vernon J. Kondra Notes, 24 August - 31 May 1991*, April 1992, p 2.

Intratheater Airlift

In phase I of Desert Shield, CINCCENT requested and received 6 squadrons of C-130s as intratheater airlift. A seventh squadron was considered but not ordered up because a beddown site was unavailable. In phase II, 3 more squadrons plus 6 aircraft from the Republic of Korea deployed for a total of 149 aircraft. All of the aircraft requested were provided. C-130 performance is usually measured in utilization (UTE) rate–the number of sorties per day. Utilization was overall less than expected for wartime (3.71 sorties per day in Desert Shield and 3.42 during Desert Storm versus the wartime planning factor of 4.0). The difference is easily understood. First, the Southwest Asia (SWA) theater was quite large; flying time from Riyadh to Tabuk, for example, was over 5 hours. Additionally, 35 of the assigned C-130s were withheld for potential air evacuation of casualties during Desert Storm, and those 35 aircraft are included when calculating overall UTE rate. The most intense test of intratheater lift occurred during the "Hail Mary" movement of XVIII Airborne Corps before the ground war. In that 14-day period, C-130s flew over 8 sorties per day–twice the wartime planning factor.

With regard to munitions, the evidence indicates that all missions requiring armament received it when they needed it. Not all missions received the munitions they preferred however. In particular, CBU 87/89s, Paveway II, and GBU 27 munitions were in short supply and rationed. Management of munitions was not much different from that of previous wars–it was done manually.

After a year's worth of fairly scrupulous research into the available historical record, the authors found very limited evidence of sorties lost due to supply. The very low total for non-mission-capable supply (TNMCS) rates tends to corroborate exceptional supply performance. In the process of achieving this performance, however, supply revamped its planned use of the Combat Supply System and Standard Base Supply System, substituting the Air Force, Central Command (CENTAF) Supply Support Agency in their place. Problem items, including chemical gear, Halon, and personal weapons, could have had a serious impact had the war taken a different turn. Further, the excellent supply performance did not always extend to support of communications equipment, Harvest sets, and other airbase functions. But the bottom line is that supply produced sorties.

In general, and with the exception of C-5 aircraft, the evidence indicates that maintenance also produced the sorties requested. The detailed narratives indicate that when sorties were lost, it was because of ground and air aborts rather than non-mission-capable aircraft.[4] At that, abort rates, during Desert Shield, were about the same as in peacetime and only slightly higher in Desert Storm.[5] Additionally, mission-capability rates were generally excellent, even if they were about the same as in peacetime, rather than better. Although battle damage rates were very low, overall battle damage repair rates were consistent with expectations of the Aircraft Battle Damage Repair (ABDR) program.

With the possible exception of intertheater airlift performance, then, logistics performance required was provided, and provided when it was needed. As for intertheater airlift, a firm set of requirements against which performance can be measured did not exist.

Strategic Logistics Performance

How "stretched" was logistics? Where were the long and short poles in the logistics tent? Where was their margin and how much? And how much reserve capability remained to fight an extended war or even another war?

Viewed from a more strategic perspective, a conclusion that intertheater airlift did not produce would make even less sense because its full capability was not exercised. First, Civil Reserve Air Fleet Stage III was never activated, and Civil Reserve Air Fleet Stage II was only partly utilized (an overage of only fifteen commercial aircraft were needed and tasked per day[6]). Reserves were not called up until 22 August (and even then, only partial maintenance skills were included). An average of sixty C-141 and fifteen C-5 aircraft were withheld each day for support of missions other than the Gulf War. Thus, despite the fact that the Gulf War airlift dwarfed the Vietnam and Berlin airlifts in numbers, it did it with reserve capacity.

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[4]As an example: Ltr, Col Ralph J. Templin, 363 TFW(P)/DCM to AF/LEY/LEYM, subj: The war from an F-16 maintenance perspective, nd.

[5]Tactical Air Command, *Desert Shield Desert Storm Logistics Data* (Langley AFB, VA: TAC/LGP, Sep 1991), pp A-9 and A-10.

[6]MAC History, Appendix 7.

As was true for intertheater airlift, only part of the then-existing refueling capability was committed to the Gulf War; sixty-six percent of the KC-135 and nineteen percent of KC-10 tankers were withheld to support the Single Integrated Operations Plan (SIOP) and other normal mission requirements. Further, both KC-135 and KC-10 aircraft were used for intertheater lift. Beyond that, it is not at all clear whether committing more tankers to Desert Storm would have been productive. A small but persistent pattern of tankers dumping fuel in order to land can be detected, an indication that more fuel was available in the sky over the AOR than could be used. The question is: Was this an indication of an absolute excess of capacity? Or was it an indication of inability to match tankers and receivers? The answer appears to be a combination of both.

The maximum number of C-130s deployed to the theater occurred during Desert Storm when the 149 aircraft mentioned earlier were in the AOR. As much airlift capability as this represents (154,000 short tons and 184,000 passengers during Desert Storm), 149 C-130s made up only one-third of the Air Force C-130 fleet–two thirds of the fleet were either uncommitted or reserved for other missions.[7] It must be concluded that a robust capability was available to expand intratheater airlift and to handle more logistics activities on the ground if needed.

Munitions

During Desert Storm, 69,000 short tons of ammunition were dropped on the enemy. A much larger total of 349,000 short tons were shipped by sea and air by the time hostilities ended, although most of the difference represented munitions still in the sealift pipeline. It must be concluded that there was a robust capability to have extended the war beyond 28 February if the need had arisen–although the amount of additional armament varied by type. Figure 75 shows the amount of munitions in the AOR in August 1990, at the time Desert Storm began, and at the end of Desert Storm. It also shows the percentages of stocks that would have been consumed had the conflict continued for an additional 60 or 120 days with the same rates of consumption.

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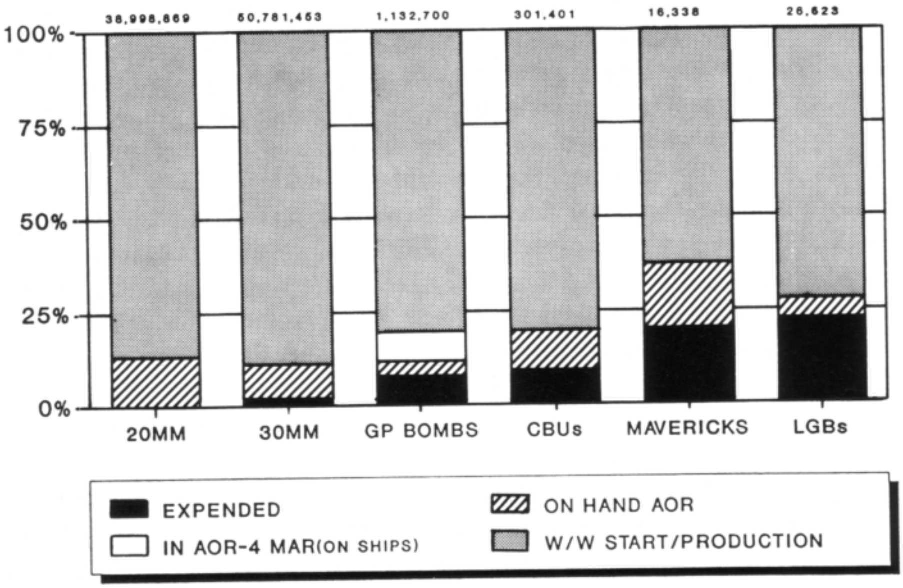
[7]All but one squadron of the active C-130 force was in the AOR. The other two-thirds of the fleet were in the Reserves.

Figure 75
Munitions Posture



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Earlier, this chapter noted that scant evidence was found of sorties having been lost because supplies were unavailable. The reasons for this level of success also indicate supply's capability to have supported the conflict at higher levels or under different circumstances. First, the War Readiness Spares Kits deployed to the theater had been originally sized on the assumption that there would be no resupply and very limited intermediate maintenance for the first thirty days; however, resupply began almost immediately and intermediate maintenance was available. Hence, an interruption in supply would actually have been as planned, rather than a serious problem. Second, worldwide resources were available to the war effort, and the combination of supply information systems with Desert Express demonstrated a reliable capability to satisfy mission-critical-parts requirements by moving the resources to the user in three or four days. Since most valuable supplies (and also the components most likely to ground an aircraft) were repairable rather than consumable, the question then concerns supply's capability to provide parts for repair and maintenance's ability to accomplish that repair.

What was maintenance's reserve capability? The evidence (except that involving the C-5) is reasonably convincing that the operational tempo required less than maintenance's full capability at all three levels: organizational, intermediate, and depot/industrial. Although the evidence at the organizational level is fragmentary as indicated earlier, it is fairly conclusive for intermediate maintenance and depot levels. For the intermediate level in the AOR, for example, one avionics shop per wing was deployed to the AOR as compared to the planned one per squadron.[8] Although direct evidence of the intermediate workload at U.S. Air Force Europe avionics shops has not been uncovered, there is a basis for concluding that engine shops were underutilized. Depot-level capability was clearly in excess of that demanded. The depot was able to accelerate program depot maintenance beyond operation's requirements and needed to implement only selective surging of repairables.

What Does this all Mean?

The final values for the measures of merit applied to each logistics functional area are without question positive (and would hardly be credible otherwise–we won the war). Was all an unalloyed success? Hardly. At levels of detail below the macro measures described above, a combination of successes and serious problems appear in at least five areas: precrisis preparation, precrisis planning, precrisis training (especially to create a combat-experienced nucleus), logistics command and control, and improvisation. Each is summarized below:

Precrisis preparation was one of the most important factors underlying the success achieved in the Gulf War. Prepositioning, for example, saved the equivalent of over 3,400 strategic airlift sorties for Air Force-related equipment alone and more than 10,000 sorties overall. The importance of this prepositioning can be grasped by noting that the total number of intertheater airlift missions during the phase I deployment was only one half the later number. Prepositioned munitions tonnage equalled approximately one-half of the amount dropped on targets. Supply preparation, focused as it was on a central European war, was a robust source of repairables and consumables for the Gulf conflict. In fact, U.S. air

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[8]In addition, however, the peak maintenance manpower requirements in the AOR never exceeded 16 percent of total active duty Air Force Maintenance manning, and a full call-up of reserve maintenance personnel was not exercised.

power, motivated as it was in general by a central European conflict, entailed an across-the-board level of preparation that was much more than adequate to satisfy the demands of the Gulf War. The allied contribution of fuels, subsistence, vehicles, and construction equipment further enhanced the already favorable predeployment supply situation.

Chapters 2 and 3 made the points that deliberate, detailed TPFDD-level planning for a war in SWA did not yet exist in August 1990, that JOPES was immature, and that there was not enough time to set up, load, and schedule missions using the flow generation (FLOGEN) model. These circumstances are fact, but to then conclude that all would have been well with a complete TPFDD, a mature JOPES, and time to run FLOGEN is a mistake because the hidden assumption is that an adversary, allies, and even weather would follow the planned script. In how many wars does that occur? As it happens, unrealistic assumptions extended well beyond JOPES and FLOGEN. Unrealistic assumptions, planned capabilities that did not materialize, and providential capabilities already in place led to a series of improvisations during the conflict. Some have been touted with good reason as successful innovations; they can be viewed alternatively as necessary workarounds (Table 43).

No single thread ties all of the improvisations together, but two themes–unrealistic prior planning assumptions and an inflexible command and control apparatus that stumbled in the face of change–dominate. These themes did not originate with the Gulf conflict and may be as old as war itself.[9] In fairness to the "unrealistic" planners and architects of "inflexible" command and control systems, such themes are a lot easier

[9]Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (New York: Cambridge University Press, 1977), pp 202-211. Van Creveld goes further to state that there does not appear to be any clear connection between amount of prior preparation and success or failure.

Table 43
Major Logistics Improvisations

Improvisation	Successful Innovation because:	Workaround to/because:
Desert Express	Users loved it. High priority response–reduced time for delivery from as much as 2 weeks to 3 days.	"Broken" priority system that viewed all movement requests as equal urgency. Limited asset in-transit visibility.
CENTAF Supply Support Agency (CSSA)	Fast, effective ability to perceive need for and source critical parts.	Combat Supply System was limited in capability; out-of-date, unusable Tactical Shelter Systems.
CENTAF Rear to Langley	Took advantage of in-place, knowledgeable capability.	Impossibility of CENTAF (9AF) moving itself forward and creating CENTAF rear simultaneously.
Blue Ball Express	Got the stuff moving from ports to in-theater bases.	Army inability to mount line-haul–teeth before tail kept assets in the CONUS.
Air Force Logistics Information File (AFLIF)	Linked transportation and supply together to provide intertheater in-transit visibility.	Lost track of parts as soon as they entered the transportation system–Supply system tracks by requisition number, transportation system by transportation control number.
Intermediate-level maintenance (ILM) in Europe and Pacific	Took advantage of in-place, mature technical capability.	Limitations on setting up ILM in AOR, cap imposed on population in theater.
MAC Requirements Augmentees	Not an innovation, reversion to manual methods.	JOPES and FLOGEN inability to handle rapidly changing requirements.
Manual tracking of munitions	Not an innovation, reversion to traditional methods.	Absence of an institutionalized alternative.

to detect in retrospect. Why, however, did they not impact the outcome? The answer is: a superb resource base plus five and one-half months to get ready. Unfortunately, the resource base that made the difference is currently being reduced; future wars may or may not be preceded by nearly six months in which to prepare. The potential outcome with a different mix of resources and time deserves consideration.

A Longer View of Logistics Performance

To this point, the context for logistics performance has been the Gulf War. Lessons worth noting may apply to other contexts. The following brief history of logistics may give the reader a longer view of logistics performance.

Historically, airpower logistics has been concerned with lines of communication–described eloquently, if colloquially, as the logistics "tail." The problems with picking up a base (the tail) and moving it across an ocean were clearly evident in the Gulf War. Perhaps not every reader will recognize that this tail is largely an invention of the present century. In fact, before the end of the 1800s, a moving armed force was easier to support than one that was stationary because support mostly meant providing food. Food was obtained through organized plunder of the land over which an army travelled, and a fixed army quickly stripped the land clean.[10] The advent of WW I's heavy armament and the munitions and fuels signaled a change. Before WW I, food made up the bulk of supplies provided; ammunition was only a minor part. By the end of WW II, food accounted for less than twelve percent of supplies. Before WW I, an army had to keep moving. Afterwards, armies (and air forces) had difficulty moving. The relevance of this change is that the logistics tail became a fundamental limitation of air power: Air power can move forward *and be sustained* no faster than its lines of communication can supply and support it. To quote Hoffman Nickerson: "Airpower is a thunderbolt, launched from an eggshell, *invisibly tethered to a base* (emphasis added)."[11]

The experience of the Gulf War suggests that another change is underway, a change with the potential for once again reshaping the logistics tail. In the World War II Normandy Invasion, in the Vietnam

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[10] *Supplying War*, pp 232-233.

[11] *Arms and Policy*, in W. Thomas McDaniel, Jr., *Logistics in High Intensity War* (pre-publication draft), (Washington, DC: National Defense University Press, 1991), p 47.

conflict, and in the Gulf War, supplies initially moved forward by means of what is sometimes called a "push" system.[12] Rather than waiting for units in theater to requisition (i.e., "pull") supplies, the logistics system sent what it believed would be needed. In the Normandy Invasion, Vietnam, and the Gulf War, those in theater and in the rear quickly lost track of what was where because no effective process was available for accounting for or managing materiel as it moved forward. The solution was to send more and more, again and again–the logistics snowball. However, a remarkable change was evolving. In Normandy, visibility of supplies in transit was never really regained, except for the most basic commodities such as petroleum, oil, and lubricants and ammunition. In the Vietnam conflict, the forces in theater took three years (from 1965 to 1968) to establish visibility over what they had and where it was. The factor that made it possible at all was the 1050-II computer, introduced in the United States beginning in 1965 and then in Southeast Asia beginning in 1967.[13] The equivalent period in the Gulf War was August 1990 through early November 1990–roughly three months.[14] The factor this time was the marriage of computer and instantaneous telecommunications, reified for Air Force logistics in the CENTAF Supply Support Agency, among other newly created enterprises.

Both the popular press and other reports forming this study highlighted the importance of information to successful Gulf War operations. The same was true for logistics. The ongoing logistics changes, however are incomplete: visibility over what was in theater was established in three months, but visibility over items in transit was never fully established.[15] Neither were the information needs of maintenance, munitions, or fuels resolved.[16] There are undoubtedly other examples.

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[12]*Supplying War*, pp 202-215; *Lt Col David C. Rutenberg, USAF, The Logistics of Waging War: American Logistics 1774-1985 Emphasizing the Development of Air Power* (Gunter AFS: Air Force Logistics Management Center, ca 1984), pp 152-153.

[13]*Logistics of Waging War*, pp 152-157.

[14]It is difficult to pin down an exact date when visibility was constructively established. Early November is consistent with the CENTAF/LG's after action report. See William W. Rider, After Action Report, pp 19-23.

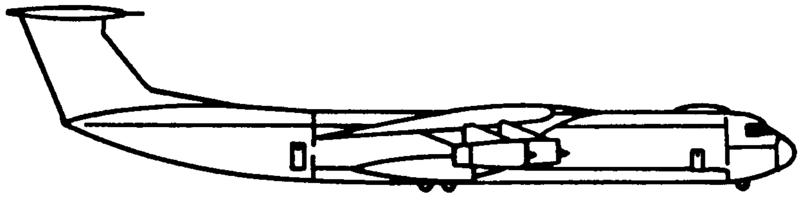
[15]Capt Raymond T. Daly, Jr., *Desert Shield/Desert Storm Supply Lessons Learned* (Gunter AFB, AL: Air Force Logistics Management Center, Mar 1992), p 8. There are other references to this problem scattered throughout our documentation.

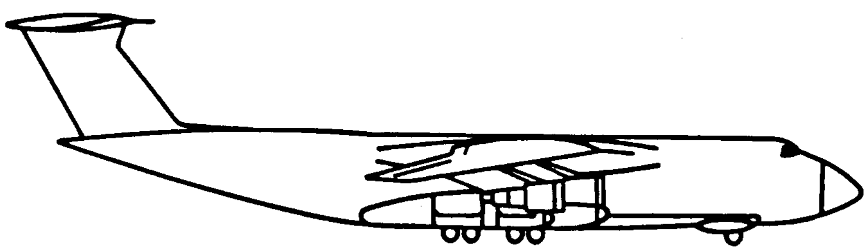
[16]Capt James T. Silva, *Desert Shield Maintenance Automation Needs* (Gunter AFB, AL: Air Force Logistics Management Center, Jan 1992).

The change in warfighting that created the tail coincided with the change from an agrarian to an industrial economy, a shift usually marked at between 1900 and 1910 for the United States.[17] Today's ongoing logistics transformation is in the context of what is sometimes called a shift to a postindustrial or information society. Causative factors aside, the realized and potential influences on strategy and tactics are important. Pushing more and more supplies and people into a theater with the hope that if enough is pushed forward some will get where they belong is one solution to lack of knowledge of where things are and what is needed. It is the substitution of mass for knowledge, and we saw that take place in the Gulf conflict just as in previous conflicts. But we also saw the effective application of organizations, computers, and information systems to the knowledge problem accompanied by a considerable increase in the velocity with which a small number of high priority parts could be moved–Desert Express and European Express. Although we cannot prove it, we believe that a much smaller "tail" resulted than would have been the case otherwise. A smaller tail enables greater mobility, greater agility, and a change in vulnerability. Before, in-place supplies and people themselves were vulnerable. Now it is possible to have fewer of either in-place, and what is not there in the first place is obviously invulnerable. If better logistics information and faster transportation systems are substituted for mass, they become more vital, must be in place to be effective, and as a consequence become targets to be interdicted.

While progress is being made to achieve more efficient and more effective logistics processes, it is evident that the logistics for the Gulf War was anything but a smooth operation. It is essential that logistics problems encountered be understood because the lessons learned can help those preparing for future wars, to the extent that future conflicts have features in common with the Gulf conflict. The authors would not suggest that all or even many of the problems and "friction" encountered in the Gulf War have solutions. The very fact that serious problems, such as overwhelming initial loss of control over deployed supplies, have occurred in every major U.S. campaign of this century argues persuasively for skepticism. At the same time, political, technological, and other forces at work have clearly ushered in significant change. Whether the logistics of war accommodates it, counters it, or simply goes along for the ride is yet to be known. Our task in this report was to create a framework to facilitate bringing the immutable and changing into focus.

[17]Dwight Waldo, *The Study of Public Administration* (New York: Random House, 1955), p 19.





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Report Acknowledgements

When the survey of support areas was assigned to the Logistics, Support, and Space Task Force under Mr. Richard A. Gunkel, it was decided that the functional areas would heavily contribute written materials in developing the Support Report. The responsibility for coordinating and managing these efforts, providing guidance, assessing inputs, editing, and rewriting materials fell upon Mr. Fonce E. Gipson. In addition, Mr. Gipson authored the chapters on materiel and contracting; morale, welfare, and recreation; and coauthored with Mr. Ted Beck the conclusions. Mr. Beck also produced the chapter on personnel. The other chapters were written by Dr. Ronald B. Hartzer (air base engineering), Lt. Col. Donald G. Belle (air base defense), Capt. Ariane L. Desaussure with Lt. Col. Harry L. Heintzelman, IV (law of aerial warfare), Maj. Thomas R. MacPhail (weather operations), Dr. Albert C. Pierce with Lt. Col. Michael L. Warden (media and public affairs), Lt. Col. Lorraine K. Potter (chaplaincy), Mr. Edgar L. Franklin (finance), Maj. Michael H. Whitaker (postal operations), and Dr. James S. Nanney (medical affairs). For writing the stories of these functional areas, these authors are to be highly commended.

In the technical production of this work, we are indebted to Ms. Cecelia French and Mr. Alan P. Heffernan (for their adroit electronic manipulation), Mr. Chris Pankow (for his thorough editing), and Ms. Barbara L. Gardien (for skillful layout and design).

Security Review

The Gulf War Air Power Survey reports were submitted to the Department of Defense for policy and security review. In accordance with this review, certain information has been removed from the original text. These areas have been annotated as [DELETED].

Introduction

The intent of this report is to capture and tell the stories of functional support areas. It is a truism that military commanders must carefully choose the exact mix of combat and support forces. Out of balance, this mix may spell disaster for combat operations and, in some cases, determine the difference between victory and defeat. In view of rapidly changing geopolitical and world economic trends, the need to learn more about combat support operations for limited and regional contingencies is of obvious importance. This report, we hope, will contribute to that end, with focus on those support areas that project air power. This support can best be characterized as either direct support: supporting the air base and air operations; or indirect: supporting the people conducting air operations. Within this framework, support forces must be structured to provide support for both normal, noncombat operations and intense combat operations (twenty-fours, seven days a week).

This characterization lends itself to a three-part description. The first concentrates on supporting the air base, with chapters on air base engineering and services, protecting the air base with its materials, and contracting support. The second part, supporting air operations, discusses the law of aerial warfare, weather operations, mobilization, and personnel support. The third area, supporting the people, consists of media and public affairs, providing for troop morale, and medical support. The final chapter identifies specific problems for further investigation and offers conclusions on support operations.

To elaborate on the first part, supporting the air base, the author examines air base engineering and services functions that pertain to building the air base infrastructure needed to support the overall mission of assigned aircraft. This chapter traces background material on air base construction and the force structure needed to accomplish that mission. It reviews Saudi modernization and industrialization program efforts concerning air base engineering, facilities, and support capabilities prior to the arrival of U.S. forces. The author addresses deployment of engineering forces to about twenty air bases throughout the region and the initial employment of those forces during Operation Desert Shield, interweaving Services-related functions, since they reported through engineering channels. The transition to war in Operation Desert Storm and the engineering postwar denial of Iraqi access to southern Iraq airfields conclude the deliberation on air base engineering and services.

Discussions on protecting the air base include prewar planning and security police manpower determination standards. Particularly emphasized are air force structure requirements for protecting the air base and its assets. Here the author analyzes differences between the Army and the Air Force with regard to air base ground defense, their differing concepts of rear area security, and a deliberation of the different doctrinal perspectives. This part of the report then focuses on employing security forces as a joint effort between Army, Air Force, and Coalition forces at various sites in the theater. The author discusses relations with host nation security forces as well as the gradual acknowledgment of mutual capabilities to protect both U.S. and Coalition assets and personnel and analyzes command and control issues with emphasis on the ground defenses in terms of Air Force and Army relationship. The Air Force contends that rear area security is more important than does the Army, since the majority of Army combat forces operate on the front lines. The Air Force contends, however, that Army close air support requirements provided by the Air Force justify protection of high-dollar value assets by Army combat units. The final discussion of this part centers on maturing the security structure at beddown locations, materiel and contracting support related to the air base, including the services that support the air base.

The second major area of this report contains chapters that address direct or indirect functions that support air operations. A chapter on law of aerial warfare discusses mobility, deployment, legal issues surrounding the activation of the Civil Reserve Air Fleet, communications between forward and rear echelons, and international law pertaining to the Status of Forces Agreements between the United States, host nations, and civilian contractors. Air refueling of Coalition aircraft also involved the Status of Forces Agreements between the United States and host nations. Authors further deliberate rules of engagement, with specific emphasis on legal involvement in the targeting process, use of civilians, prisoner of war issues, and war claims. Civil law and legal assistance absorbed attention with regard to Service members and their families; the Soldiers and Sailors Relief Act particularly emphasizes reemployment rights of those returning from the Gulf War. Contracting in the theater of operations, contract law dealing with leasing, and blanket purchasing agreements commanded attention because of their volume. A discussion of judge advocate redeployment includes issues surrounding property leased by the U.S. Government and property turned over to host nations.

The author identified the impact of the weather support structure on air operations in Southwest Asia, dealing with climatology as it was predicted and comparing it to actual conditions. The chapter deals with the impact of weather on tactics and the ability to launch missions in the theater of operations. It shows how joint weather support is provided and examines problematic issues of sharing weather information between Services; the value of weather support; examples where missions were planned on the basis of accurate weather forecasting; and in conclusion, what type of equipment is needed to support air operations.

Concluding the second major part of the report is a chapter on mobilization and personnel support. This chapter analyzes the U.S. Armed Forces structure and the call-up of Reserve and Air National Guardsmen. It addresses practices facing mobilization of reserve forces, training exercises, problems resolved over the last ten years, and deals with Reserve and Air National Guard volunteerism. The chapter describes how in the build-up phase the United States created an offensive capability to extract Iraq from Kuwait in conjunction with the presidential use of a partial mobilization authorization at the beginning of hostilities. It covers personnel accountability of Active, Reserve, National Guard and demobilization issues, procedures and capabilities of Personnel Support Continuing Operations (PERSCO), casualty services, and Operation Yellow Ribbon along with family support services. The chapter also addresses civilian personnel issues along with the use of contracting personnel in the Gulf War.

The last functional area, supporting people, begins with coverage of the media and the air war. It focuses on several central issues that may have multiroles relating to wartime media coverage. It deals with information affecting decisionmakers, politicians, the public, and the war fighters in the field; it analyzes influence on the will of a nation to fight. Three primary themes direct the attention of the reader: media coverage and public opinion as measured by the government in weighing public opinion and how the public weighs the progress of the war; media coverage and political-military decisionmaking based on media coverage with its impact on future decisions; and media coverage of combat operations with inherent problems of allowing the media to cover actual combat operations. Such may stem from a logistical perspective, from the risk of danger to media personnel, or they may involve operational security.

In providing for troop morale, a number of areas came under scrutiny: those of chaplaincy, morale, welfare and recreation, finance, and postal services. Planning and deployment of chaplains, their role on the CENTAF commander's staff, and restriction placed on them during the Gulf War posed a number of problems and offered challenges associated with operating in an Islamic country. Practicing of one's faith in the Gulf region, such as observing Jewish Holy days and the increased interest displayed by armed forces members in studying the scriptures provided chaplains with valuable insight. Counseling was a major concern, both to Service members and their families back home. Discussion also focusses on problems associated with deployment and redeployment.

The limited facilities available to provide for recreation and boost morale and welfare in a desert environment and the disparity of operating conditions throughout the area of operations afforded some investigation. Service members did benefit from rest and recuperation activities, celebrity tours, and from donated equipment and supplies provided by the general public. On the home front, discussion centers on support activities provided to family members of deployed personnel and Congressional intervention due to a lack of support associated with deployment.

A central responsibility of the deployed finance and comptroller personnel was to accommodate the financial needs of Service people and to satisfy contracting requirements. A discussion addresses the skills and knowledge levels of financial personnel and how associated training prepared them for their mission in a combat environment. It also reviews the problems associated with a lack of a central command and control structure and the quality of instructions being provided to field finance personnel by some nineteen different agencies.

A brief survey of postal operations provides background material on mail operations during World War II and the role of the Air Force as single service manager in Southwest Asia. Further discussion centers on deployment planning, existing postal infrastructure within the theater, mail-handling equipment and supplies, as well as interface requirements and restrictions imposed by host nation customs. Discussion explores Congressional intervention and establishment of free mail, as well as "Any Service Member" mail issues, the roles of the United States Postal Service, Military Postal Service Agency, Military Airlift Command, Federal Aviation Agency, and commercial mail-handling services.

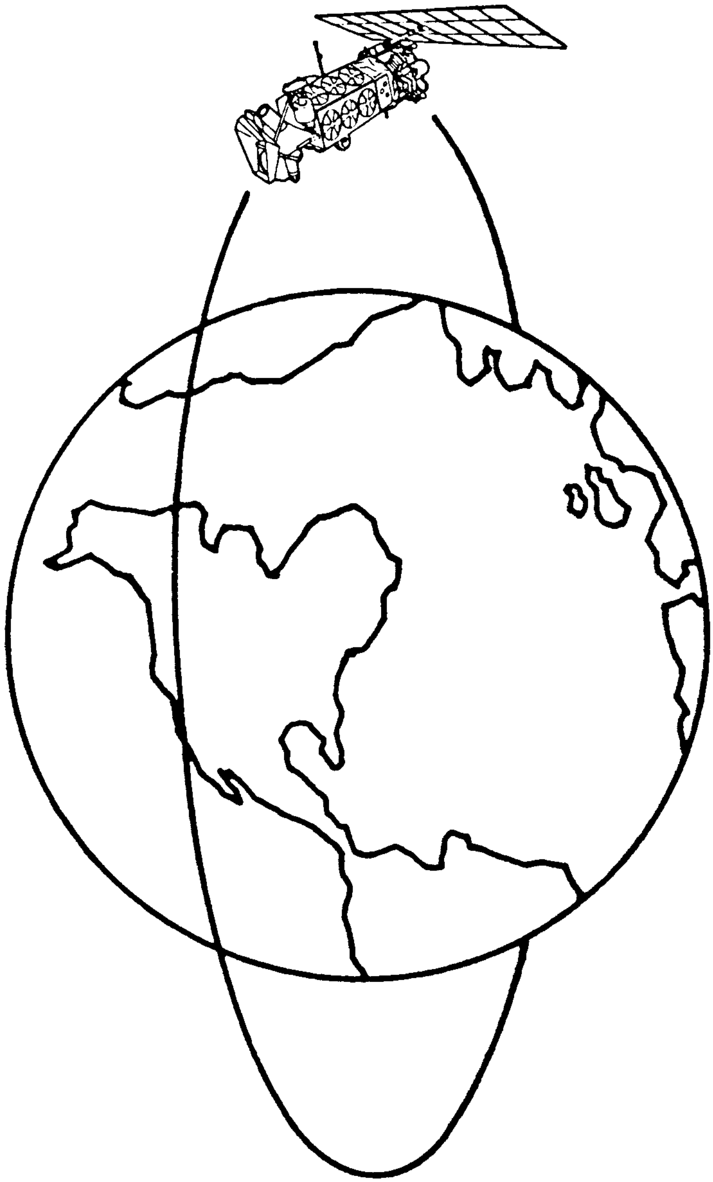
Medical support analysis begins with a description of mobile medical facilities during the Gulf War, with central themes on deployment and setup of the first medical facility on 14 August 1990. The analysis highlights medical and dental problems of Reservists and the lack of sufficient medical equipment and supplies during the early stages of the deployment. The author addresses the activation of contingency hospitals in Europe along with inadequate facilities and slow movement of medical equipment and supplies to set up operations. Some did not become operational until as late as 28 February 1991. An outline of aeromedical evacuation procedures and problems emphasizes Joint Chiefs of Staff casualty estimate planning. Other medical areas cover preventive medicine and aircrew medical support issues, prediction rates for in and out patient versus actual experience (which were much lower than expected), aircrew problems such as fatigue and grounding of aircrews, biological and chemical warfare defense, as well as precautions taken against casualties and their associated problems.

Many of the writers involved in compiling this survey participated in the support force that deployed to the Middle East. In reflecting on the Gulf War, the reader should keep in mind the purposes of the deployment. The first one, in August 1990, supported defensive operations to deter further aggression by Iraq; the deployment in November 1990, supported offensive operations intended to extract Iraq from Kuwait.

Though this survey does not exhaust every conceivable source, it does include materials provided by functional areas, which consist of:

- Written accounts from all levels, perspectives, and functional areas
- Unit histories and interviews with key personnel
- DOD, JCS, and Service reports and studies
- SITREPS, message traffic, briefings, and official reports
- Air Force Remedial Action Program lessons learned
- Joint Uniform Lessons Learned System (JULLS)

Hopefully, the conclusions reached as a result of this survey along with a discussion of issues and specific recommendations will spur further investigation within the functional areas discussed. It is realized, however, that firm conclusions and implications for future combat support operations will take time to evolve.



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Air Base Engineering and Services

Air Bases and Aerospace Operational Art

Background

A major contributing factor to the successful prosecution of the air campaign during Operation Desert Storm was the availability and operability of a network of bases needed to support air power. To identify air power, Gen. Curtis E. LeMay said: "*When I speak of air strength, I am not speaking only of airplanes. I am speaking of airfields, depots, stockpiles, control and communications centers, highly trained and skilled manpower–and airplanes. These constitute air power.*"[1]

Air bases have undergone a vast transformation since the early days of World War I, when they consisted of no more than grass or dirt runways, a few structures, and often livestock. The limited range of early aircraft dictated that most airfields be located as near the front lines as practical. Although simple in design, they were quite expansive. The Amanty field in France, for example, was large enough to accommodate assembly and take-off formation of eighteen to twenty aircraft.[2]

Recognizing the paramount importance of air bases and their need for dedicated engineering support, with the approach of WW II, Gen. Henry H. Arnold organized battalions of Aviation Engineers to support basing requirements of the growing Army Air Corps. By the end of the war, these units served in all theaters and had built or upgraded 568 airfields

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[1](S) Air Force 2000: Air Power Entering the 21st Century, HQ Air Force Special Projects, 1982, p 167. Information cited is unclassified. Cited in AFM 3-2, Civil Engineering Combat Support Doctrine, L.C. Meilinger, AF/XOXWD, 26 Apr 1991, published by Dept of the Air Force, Wash DC, p 29.

[2]*The Final Report*, ed Maurer Maurer, *The U.S. Air Service in World War I*, Vol I (Washington: Office of Air Force History, 1978), p 357.

overseas.[3] Army Air Forces planners generally divided airfields into 2 types: dry-weather and all-weather. Dry-weather fields had dirt or sand runways and parking areas unusable in wet weather. All-weather fields were surfaced with concrete, asphalt, crushed stone, coral, or matting. The IX Aviation Engineer Command was created to rehabilitate and construct airfields on the European continent. By V-E Day, 8 May 1945, they had constructed or reconditioned 241 airfields.[4] In the Pacific, airfields became a primary objective of island-hopping toward Japan, and the capture of an island's airfield or the construction of a new one was key in defending the region and extending the range for bombers.[5]

The Korean War renewed the appreciation for adequate air bases. The introduction of several new aircraft, including jets, required longer and wider runways, larger taxiways and parking aprons, and more stringent design criteria. Engineers constructed 9,000-foot all-weather runways at Osan, Taegu, Kunsan, and Suwon, and during the Korean War, they built or upgraded 55 airfields.[6]

Inadequate basing limited the build-up of American forces in Southeast Asia in the mid-1960s. To overcome the limitations, the Air Force built four major air bases in South Vietnam (Cam Ranh Bay, Phu Cat, Phan Rang, and Tuy Hoa). Often parked dangerously close together, aircraft offered a lucrative target for terrorists and presented a safety hazard. On one occasion, the accidental explosion of a bomb on a parked B-57 at Bien Hoa triggered a series of blasts that killed or injured 100 people and destroyed more than 50 aircraft and vehicles. In the face of

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[3]IX Engineer Command, *The History of IX Engineer Command: From its Beginning to V-E Day* (Wiesbaden: Information Control Command, 1945), p 146 (located at Air Force Historical Research Agency [AFHRA]; Capt L. Dean Waggoner and Lt M. Allen Moe, *A History of Air Force Civil Engineering Wartime and Contingency Problems from 1941 to the Present*, AFIT Thesis, 1985, p 60.

[4]IX Engineer Command, *The History of IX Engineer Command*, pp 62-75.

[5]Wesley F. Craven and James L. Cate, eds, *The Army Air Forces in World War II, Services Around the World*, Vol VII (Chicago: University of Chicago Press, 1958 [New Imprint: Washington, Office of Air Force History, 1983), pp 304-308.

[6]HQ Far Eastern Air Forces, *FEAF Report on the Korean War*, Book 3, 15 Feb 1954, p 2 (located at AFHRA).

such experience, engineers initiated a major program to construct revetments and aircraft shelters to protect the valuable assets.[7]

Engineering and Services

Air Force Engineers are organized into 2 basic types of units with complementary missions: Base Civil Engineering units and Civil Engineering RED HORSE units. Base Civil Engineering units, including Prime BEEF (Base Engineer Emergency Forces), participate with combat forces, providing direct support to the operational mission at each air base. The workforce in the United States is comprised of roughly 50 percent military and 50 percent civilians, who establish, maintain, and restore the base infrastructure and provide critical operational support, such as fire suppression and crash rescue. Prime BEEF is part of a Base Civil Engineering unit earmarked to deploy as 50-, 100-, 150-, and 200-person teams in support of contingencies. Civil Engineering RED HORSE units are wartime-structured engineers that provide a heavy engineering capability but not base-level operations and maintenance. Mobile, rapidly deployable, and largely self-sufficient for limited periods of time, they perform wartime tasks, such as major force beddown, heavy damage repair, bare-base development, and heavy engineering operations.

The Army, Navy, and Marine engineer units train essentially full time for their combat roles. These units have no peacetime base maintenance tasks although they may accept specific projects for team skill training. Two-thirds of the Army Engineer capability consists of reserves, and they focus on joint operations, Coalition warfare, with a theater of operations orientation. They train to support battlefield functions–mobility, countermobility, survivability, general support engineering, topography engineering, and sustainment of all forces in the theater. The Navy Seabees focus on the sea-land bridge engineering problem and advanced base support; their force consists of about seventy percent reserves, and their battalions rotate from home stations to deployed locations for about six months at a time. Their training is conducted in close concert with the Marines for amphibious operations, and usually they are included in the amphibious assault follow-on force. The Marine engineers focus primarily on

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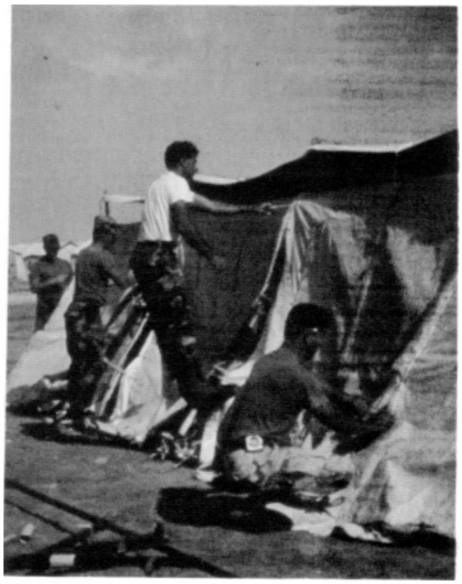
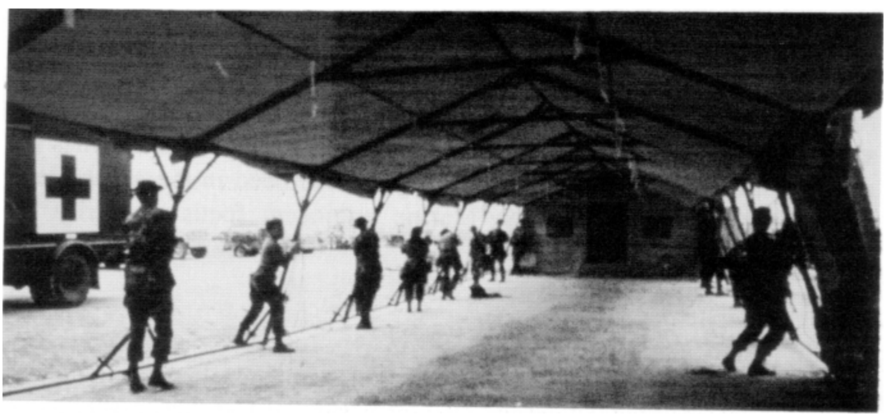
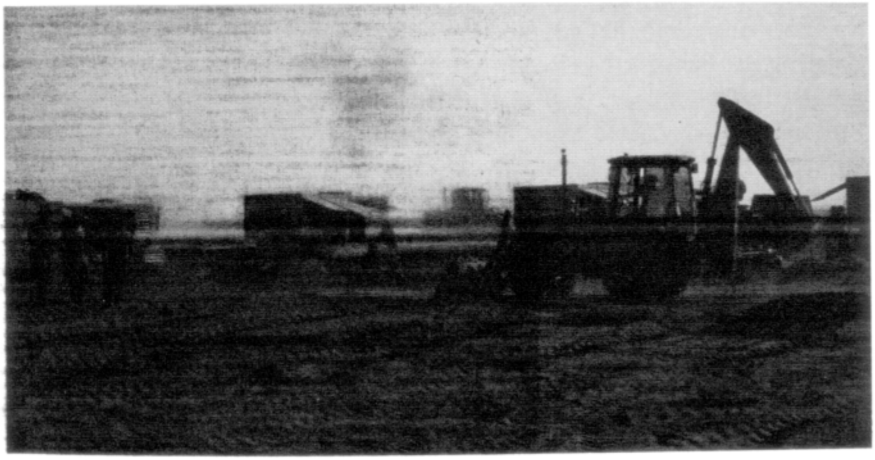
[7]HQ USAF, Director of Civil Engineering Activity Input to Project Corona Harvest, *Civil Engineering Support in Southeast Asia*, 1 Jan 1965 - 31 Mar 1968, p 240.



Prime BEEF establish, maintain, and restore base infrastructure and provide critical operational support.





RED HORSE provides heavy engineering capability including runway preparation for airfields (above), and constructing ammunition storage sites (right).

ground and air combat roles and have a very structured training program. Army, Navy, Marine, and Air Force engineer units are self-sufficient, but with different definitions. For example, Air Force RED HORSE units are self sufficient for about sixty days; Seabee battalions for ninety days. The key common ground is that all units need logistics support from host nation resources.[8]

[8]"Engineering Support for U.S. Forces: Air Force, Army, Navy, Marines" New Mexico Engineering Research Institute, 1988, pp vi-viii.

Services personnel adopted the basic Prime BEEF concept in 1978 by creating the Prime RIBS (Readiness in Base Services) program. Using the mobile team concept, they provided base operations with food services, billeting, laundry, field exchange, and mortuary services. They deploy in teams of nine, eighteen, and twenty-five people.

The Air Force first developed air transportable facilities in the 1950s, initiating the original portable-basing set, Gray Eagle, during the Vietnam War at Cam Ranh Bay and Phan Rang Air Bases. It was then renamed Harvest Eagle.[9] In the 1960s and 1970s, basing sets incorporated new designs and were known as Harvest Bare.[10] Then in the 1980s, the Harvest Falcon[11] concept was originated, which combined aspects of both

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[9]An air transportable, lightweight package consisting of limited housekeeping equipment, operational support assets, spare parts, and supplies required to support U.S. Air Force general-purpose forces and personnel in bare base conditions. Each kit provides softwall housekeeping support for 1,100 personnel. Harvest Eagle was not intended to be an all inclusive package of logistics support for air operations; however, it was used until augmented by Harvest Bare. Harvest Eagle equipment, for example, may contain water purification units, tents, showers, and runway lights. Twelve kits are available, four each at TAC, USAFE, and PACAF. During peacetime, two kits in each storing command are untouchable.

[10]A nickname for an air transportable [(436L) compatible] package of modular shelters, equipment, and vehicles required for base and personnel housekeeping and aircraft support in bare base conditions. Base and personnel support packaging consists of modular hardwell shelters and equipment designed to house, feed and conduct normal functions for populations up to 4,500 people of a combat support unit. Aircraft support consists of maintenance shelters, operations shelters, and shop equipment required to support an operational unit.

[11]An air transportable package of hardwall shelters, Tent Extendable Modular Personnel (TEMPER) tents, equipment, and vehicles designed primarily to provide bare base support for U.S. Air Force personnel and aircraft in the USCENTCOM Area of Responsibility, but capable of being deployed worldwide. Support provided includes power and water distribution, billeting, dining, aircraft and vehicle maintenance, warehouses, fire rescue, RRR, airfield lighting, and administrative facilities. Harvest Falcon provides the capability to bed-down 55,000 personnel and 750 aircraft. This capability is composed of 37 squadron packages that provide support at 14 separate beddown locations. The 37 squadron packages consist of nine 2,200-person nonmunitions carrying hosts, four 2,000-person nonmunitions carrying hosts, one 1,700-person SOF host, and 23 1,100-person munitions carrying and nonmunitions carrying tenants. The package is designed to overcome host nation or U.S. infrastructure limitations and is prepositioned at planned operating bases, alternative storage locations inside and adjacent to the area of responsibility or at CONUS aggregation sites. Weapon-carrying host and tenant packages are stored at Holloman AFB, NM. Assets stored in CONUS are more readily available than those

Harvest Eagle and Harvest Bare designs. Harvest Falcon was designed specifically for the Southwest Asia theater of operations (i.e., no freeze protection).[12] During Operations Desert Shield/Desert Storm, major components of Harvest Falcon sets were used as shown in Table 1.

Table 1
Harvest Falcon Major Components Used in the Gulf War

Major Item	Qty Avail	Qty Deployed	Held in Reserve
TEMPER Tents	5,873	4,902	431
9-1 Kitchens	35	30	4
Gen-Purp Shelters	241	206	27
A/C Hangars	51	42	4
Latrines	246	215	16
Shower/Shave Units	214	177	16
750kW Generators (Diesel)	93	89	0
750kW Generators (Turbine)	31	19	7
Secondary Distribution Centers	898	654	64
Primary Distribution Centers	43	31	4
50,000 GL Fuel Bladders	679	579	0
20,000 GL Water Bladders	275	204	18
Tactical Field Laundry Units	117	91	8
Reverse Osmosis Water Purification Units	44	31	6
Environmental Control Units	7,420	5,846	490
High-Voltage Cable Sets	298	153	60

prepositioned to support NOPlan crises or contingencies worldwide, as directed by HQ USAF with USCENTCOM coordination.

[12] "Civil Engineering Support in Southeast Asia," pp 60-62; Lt Col Clifton T. Windham and Joseph H. Smith, "Bare Base: A New Frontier," *Air Force Engineering and Services Quarterly*, Vol 24, No 4 (Winter 1983), pp 24-26; Capt Kenneth M. Weaver, "An Historical Analysis of the Air Force's Bare Base Concept and Equipment," AFIT Thesis, 1989.

Engineering contingency teams had concentrated on developing wartime skills, such as rapid runway repair, damage assessment, and operation of Harvest Eagle field kitchens. Yet, in August 1990, Air Force engineers found themselves performing beddown operations with equipment and mobility basing sets they had never seen before.[13]

Laying the Foundation for Air Operations in the Gulf Region

The U.S. Army Corps of Engineers has been developing projects in the Kingdom of Saudi Arabia since 1951. Their first was rebuilding the airfield at Dhahran. Initially completed in 1956, this base became an important stopover point for U.S. Air Force and Navy aircraft.[14] Under a May 1965 Engineer Assistance Agreement, they constructed the King Khalid Military City (KKMC); it was finished in 1988 as a complete city and base facilities to support a projected population of more than 50,000, with an airfield, hospital, and engineer center and school. In addition, the Royal Saudi Air Force working with the U.S. Air Force Logistics Command completed 2 major efforts to upgrade aircraft support facilities.[15]

Under a phased modernization and industrialization program implemented by the Saudi government in 1974, the U.S. Army Corps of Engineers and Headquarters Air Force Logistics Command (AFLC) Foreign Military Sales Construction Engineers designed and constructed several bases, including three major bases–Dhahran, Taif, and Khamis Mushait. Five of these state-of-the-art bases were each capable of supporting nearly the entire Royal Saudi Air Force. In August 1990, the Air Force still had an eighteen-man engineer group in Riyadh, Saudi Arabia working on the Peace Shield program. When Coalition aircraft began arriving at these locations, facilities were sitting empty or nearly empty. In addition, Saudi Arabia had specifically identified forty-five civil airfields to support

[13]Fact Sheet, "Air Base Combat Support Training Complex," HQ AFCESA/PA.

[14]*Military Review*, Lt Gen Henry J. Hatch and Historian Janet A. McDonnell, Mar 1992, pp 3-13.

[15]*Ibid.*

pilgrimages and the oil industry [forty-three supported the oil industry and two (Jeddah and Taif) supported pilgrimages].[16]

Contingency Planning

Planning air operations for the Middle East was the responsibility of CENTAF, the air component of CENTCOM. Their engineering plans primarily consisted of prepositioning assets in Southwest Asia and conducting training exercises in the theater. Beginning in 1979, training exercises such as Bright Star were held every two years to practice deployment, beddown aircraft and people, and fly combat sorties. Beginning in 1981, the 4449th Mobility Support Squadron began limited bare base training at Holloman AFB, New Mexico, enrolling in the first class members of the Langley AFB, Virginia, and Shaw AFB, South Carolina, base engineer team.

In anticipation of deployment, operational planners at CENTAF began selecting bases on 2 August 1990. Their initial criteria for selecting air bases and regional airfields included those with 10,000-foot runways or longer, at least 500,000 square feet of parking ramp, and with load classification numbers high enough to support aircraft under consideration. They evaluated both civilian and military airfields. However, since published airfield reference information was dated 1985, much of the needed information was not available, thus complicating the selection process. In addition, Saudi Arabia and its neighbors had undertaken building or improving many of these airfields. Between 1985 and 1990, the following airfields were constructed: Al Kharj and King Fahd International Airport in Saudi Arabia, and Al Ayn in the United Arab Emirates and Shaikh Isa in Bahrain. Major airfield improvements had also been undertaken at Al Dhafra, Khamis Mushait, and Taif in Saudi Arabia, Seeb and Thumrait in Oman, and Sharjah in the United Arab Emirates.[17]

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[16]Lt Col Harry W. Glaze and Lt Col Larry G. Garrison, "The Saudi Arabian Construction Program," *Engineering and Services Quarterly*, Vol 21, no 2, (May 1980), pp 20-23.

[17]CENTAF/DE planners did have detailed knowledge on Seeb and Thumrait ABs, Oman because of the previous Air Force experience at the bases. Intvw, Capt Wayland H. Patterson with Dr. Ronald B. Hartzer, 10 Jul 1991.

Consequently, the CENTAF staff and later the HQ TAC Battle Staff put together basing packages for individual air bases on the basis of very limited airfield data and no formal site surveys. Nevertheless, this information was critical in determining munitions storage, power generation, water requirements, and other infrastructure considerations to support sortie generation. With each plan, they determined base engineering and services requirements and prepared time-phased force and deployment data worksheets, passing this information to the Tactical Air Command Battle Staff for personnel and equipment sourcing.[18]

Deployment of Forces

A CENTAF engineer deployed to Saudi Arabia on 7 August 1990. Working from the Royal Saudi Air Force Headquarters in Riyadh, he assigned personnel to conduct site surveys of potential Saudi airfields for use by incoming U.S. forces. Planning called for augmentation with the 10th Civil Engineering Flight, a Reserve unit from Bergstrom AFB, Texas.[19] However, the speed of deployment and a delay in the call-up of reserves prompted cancellation of this unit's mobilization. As an alternative, Col. Michael A. McAuliffe, Deputy Chief of Staff for Engineering and Services at Tactical Air Command headquarters, quickly elected to assemble active duty personnel to fill this role.

Colonel McAuliffe selected Lt. Col. Karsten H. Rothenberg, the Director of Air Force Foreign Military Sales Construction Engineers, Headquarters Air Force Logistics Command, to head the staff at Riyadh. Colonel Rothenberg was familiar with Saudi construction programs but had not been involved with the CENTAF mission or the bare base assets program. The deployment and number of all engineering and services forces to the theater of operations by the bases they supported is reflected in Appendix A.

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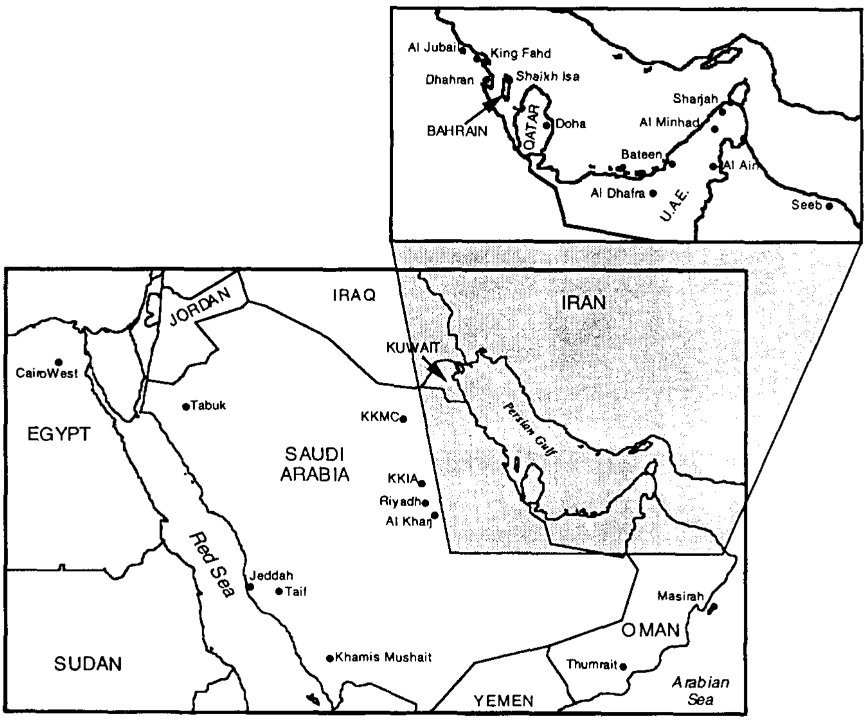
[18]Lt Col David Ruschmann, "Operation Desert Shield," *TAC Engineering and Services Digest*, Vol 12, no 3 (Jul-Sep 1990), pp 4-8.

[19]*Ibid*; Intvw, Capt Wayland H. Patterson with Dr. Ronald B. Hartzer, 10 Jul 1991.

Force Beddown

U.S. Air Force personnel were initially deployed to two primary locations, Dhahran and Riyadh. This soon grew to twenty locations in the region, one of which was King Fahd International Airport, near Dhahran. Under construction since the mid-1980s, this airport was scheduled to open in 1993. Although not all of the infrastructure had been built, the contractor suspended construction activities while American forces were present. Then there was Khamis Mushait Air Base, Saudi Arabia, a modern military airfield that provided state-of-the-art facilities. The aircraft shelters spread throughout the base, and the existing utilities, billeting and dining facilities, fire station, and fueling capabilities offered outstanding working and living accommodations. Appendix B provides air base characteristics of the bases supporting U.S. air operations.

Figure 1
AOR Air Bases



Engineering Tasks

Engineer taskings upon arrival at a base fell into four main categories:

1. Preparation of runways, runway lighting, navigational aid sites, and installation, utilities, fire protection, facility sitting, and latrines;

2. Sweeping aircraft ramps and aprons, ammunition storage areas, aircraft revetments, and erection of facilities;

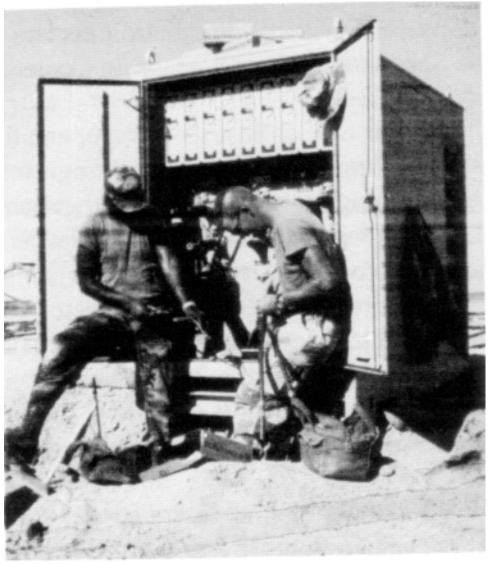
3. Environmental and sanitation concerns, facility hardening, and road construction; and

4. Basic operation and maintenance of the base and continued training.

The priorities and timing of the above tasks varied according to the threat, timing of the deployment (August versus December), host nation resources, and availability of equipment and bare base assets. The primary tasking was normally force beddown.

Electrical power became a critical element at all beddown locations, not only for aircraft support equipment but for computer operations and air conditioning as well. For bare base operations, the Air Force used 60kW, 100kW, and 750kW generators, while early in the deployment, the smaller 60kW and 100kW portable generators provided primary electrical power to small clusters of tents or facilities. Such improvisions required frequent servicing of the equipment and refueling of generators, and often generator overload resulted in equipment failure. When those generators were later replaced or supplemented by 750kW diesel generators, those Air Force power production personnel not familiar with the CENTAF mission were unfamiliar with them. The problem was compounded by the unavailability of Technical Orders for the equipment. CENTAF Engineering did, however, overcome this situation by establishing power grids at the sites to provide electricity.[20]

[20]USAFE/DE also sent approximately 140 assorted generators (30 kW and smaller) to Southwest Asia sites. History, CENTAF/DE, C-day to C+30.



Base engineers provide primary electrical power for base facilities early in deployment.

Generators began failing because of around-the-clock operations, and a severe shortage of filters and spare parts reduced the scheduled maintenance that could be accomplished. The Air Force established an eight-person depot repair capability for the 750kW generators at Thumrait, Oman. Of the 90 750kW diesel generators initially used, 50 came from prepositioning sites in Southwest Asia; only 10 were operational. Another 40 generators came from Holloman AFB, New Mexico; only 6 were operational. Of the 74 generators that failed to operate, some were missing parts, some had defective parts, and others required minor adjustments. The problem was attributed to the lengthy time in storage and nonuse.[21]

In August, a shortage of primary distribution centers complicated the establishment of efficient power distribution systems, which resulted in a lack of hookups to the primary electrical distribution source. By 26 September 1990, however, the Civil Engineering Maintenance, Inspection, Repair, and Training team at Kelly AFB, Texas designed acceptable replacements from commercial off-the-shelf components and shipped

[21]Briefing, "Desert Storm Lessons Learned," CEMIRT, nd.

thirty-four primary distribution centers to the Gulf region sites and one to Sheppard Technical Training Center.[22]

Water availability, its storage, and distribution were critical elements at beddown locations. CENTAF Engineering established minimum secure water storage requirement of 100 gallons per person for 5 days of usage. Drinking water initially was supplied as bottled water from local sources, and at some sites, it came from existing water distribution systems connected directly to commercial water sources. Other locations, such as Cairo West, had to truck-haul water and store it in bladders, most common of which was the 20,000-gallon bladder. Seventeen sites possessed water purification units capable of producing up to 600 gallons of potable water per hour from either seawater or freshwater.[23]

Beddown of firefighters should take place before arrival of aircraft. However, in August and early September, aircraft sometimes preceded adequate fire services. At Cairo West, for example, few firefighters and no vehicles were available for the first two weeks, and this was true to varying degrees at other sites.[24]

Engineer teams also assisted in planning and construction of air base defense works such as berms, concertina wire fences, and bunkers to protect vital equipment and power plant sources, as well as barriers on roads to slow down vehicles. Base engineers assisted in bedding down medical personnel, which normally consisted of pouring concrete or asphalt floors for air-transportable hospitals, connecting utilities, maintaining generators and environmental control units, and erecting the TEMPER tents used to house the hospitals. The sophisticated medical equipment and water and waste requirements for sanitation posed particular power

[22]"Center's Support to Desert Shield/Storm Outlined," *E&S Update*, Vol 3, no 3, pp 1-3; Mr Jack Struebing, "Bullet Background Paper on Harvest Bare Power Distribution Centers" 31 Aug 1990.

[23]CENTAF/DE, "Status Report," 9 Feb 1991.

[24]Personal History. CMSgt Hans P. Finkbeiner, 7 Sep - 6 Oct 1990.

requirements. Specialized dietary requirements for patients imposed additional strains on the food service system.[25]

Services Tasks

Although the Air Force feeding concept called for eating MREs (Meals, Ready to Eat) for the first ten days of a deployment, commanders were anxious to supplement the rations. Services personnel began to explore the availability of A Rations (fresh fruit, vegetables, meat, and baked goods) in the local area. Meanwhile, the HQ TAC Battle Staff worked with the Air Force Commissary Service to push B Rations (dehydrated and canned products not requiring refrigeration) to Southwest Asia. The Commissary Service also established a central distribution center for MREs and B Rations at the port of Ad Dammom, Saudi Arabia.

Contract cook and mess attendant support augmented Air Force Services personnel at approximately half of the sites. Host nation assistance was generally limited to KP, serving, and ration handling services. Three sites, Jeddah, Khamis, Mushait, and Tabuk, were totally host nation contract feeding. Security and sanitation were major concerns wherever contractors were used. The potential for food sabotage and food-borne illness existed throughout the deployment. The use of contract food service workers required constant supervision by Services personnel. They trained the contract workers in sanitary food handling methods, but language and culture were barriers. The workers were third country nationals and few understood English or Western sanitation practices. Although measures were taken to prevent foodborne illness (FBI) or sabotage of the food supply, approximately 2,500 USCENTAF personnel experienced acute gastroenteritis in 15 FBI outbreaks.

Billeting cadre placed incoming personnel in either tents or hard billets, maintained records of occupants, and assisted engineers in planning tent cities. Those who had been using automated systems stateside found themselves reverting to the stubby pencil and an index card system. When Gen. H. Norman Schwarzkopf ordered all troops out of hotels in

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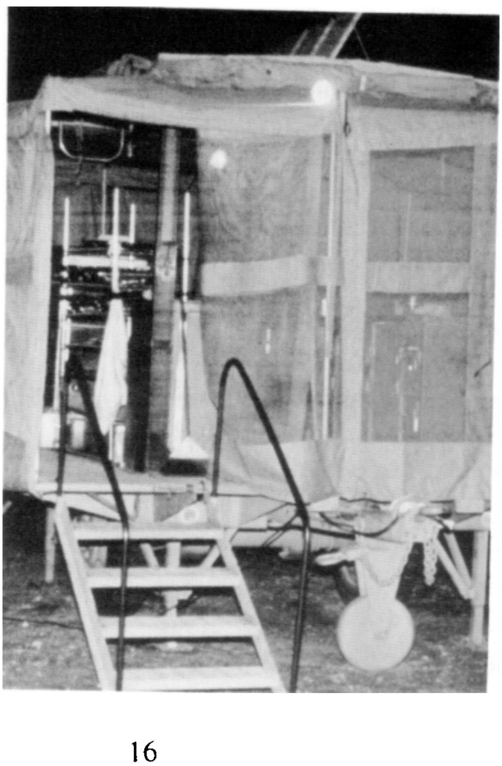
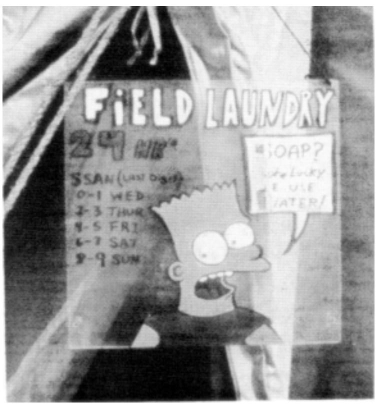
[25]History, CENTAF/DE, C+30 - C+60; Personnel History, Capt Wayland H. Patterson, CENTAF/DE, 6 Oct 1990 - 12 Mar 1991, p 8.



Billeting personnel placed incoming troops in tents or hard billets and worked with engineers in planning tent cities (above). Mobile Kitchen Trailers fed troops at several sites (left).



Tactical Field Laundry system was used to provide laundry capability in the desert (above and right).

late August 1990, and on to a base because of the terrorist threat,[26] the majority of the people then lived in TEMPER tents, but others lived in facilities such as Eskan Village at the southern edge of Riyadh, a massive housing compound of multibedroom villas in single-story and high-rise configurations, which the Saudi government offered to the U.S. military in mid-August.[27] General Horner selected Col. George G. Giddens to serve as the Vice Commander for Combat Support operations at Eskan Village because of his prior experience in supporting contingency operations in Korea. Prior to the start of hostilities, about 18,000 U.S. Army, Air Force, Navy, and Marine personnel were housed there with monthly base support contracts exceeding $2 million. The move into Eskan Village involved a $26-million contract through the Saudi government to provide furniture and other necessities.[28] Prime RIBS provided field feeding support at the compound, operating three Harvest Falcon 9-1 kitchens, augmented with Saudi-provided contract laborers.

Among the services provided was the Tactical Field Laundry system used to provide a laundry capability, but it fell short of expectations. The system consumed high volumes of water (240 gallons per hour) and suffered frequent and continuous mechanical failures. Of the 62 laundry systems in theater, fewer than half were in operation; 13 sites provided some level of contractor laundry service.[29]

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[26]History, CENTAF/DE, C+30 - C+60.

[27]Eskan Village is a modern housing complex of high-rise and single-level villas built by the Saudi government for the Bedouin people, who refused to live in these facilities. Because of lack of use, many of the vacant units needed plumbing repairs–some minor, others major. These repairs were done for the most part by USAF civil engineers.

[28]Maj Gen Robert A. Buethe, Jr., Command Surgeon, HQ TAC, blamed the reliance on host nation feeding for the large number of FBIs. "I know you [Gen McAuliffe] worked hard during Operation Desert Shield to get airlift for field kitchens. Unfortunately in most cases our bases relied on host nation feeding. We paid a price for not having our own food service . . . . " Jeddah AB experienced four separate FBIs attributed to food prepared in off-base facilities. One case affected 648 Air Force personnel during the Air War. Contaminated ice used to cool canned drinks was the culprit in two outbreaks at Bateen and Al Dhafra. Letter w/atch, Maj Gen Robert A. Buethe, Jr., HQ TAC/SG to Brig Gen Michael A. McAuliffe, HQ TAC/DE, 5 Jun 1991; CENTAF/DE "Weekly Status Report," 9 Feb 1991; Capt Robert W. Jensen, 2 SVS (Deployed) 9 May 1991.

[29]CENTAF/DE, "Weekly Status Report," 19 Jan 1991.

A mortuary capability, critical from the outset of the deployment, was a task assumed by the Air Force as the Executive Agent for mortuary affairs until outbreak of hostilities, when the Army became responsible. On 15 August, a six-member team (four military and two civilian) led by Maj. Keith A. Howell, from Headquarters Air Force Engineering and Services Center, Tyndall AFB, Florida, deployed to assume control of mortuary affairs at Dhahran Air Base, Saudi Arabia. Upon arrival, the team coordinated with the other Services and assured that people in the field were well-trained and possessed the equipment needed to handle casualties. Each of the sites received a Mini-Morgue kit to establish their own remains processing capability. Although the sites were well-prepared for casualties, issues such as contaminated remains and procedures for the transfer of executive agency to the U.S. Army were problem areas throughout the deployment.[30]

Engineering and Services Challenges

The fact that combat crews were deployed ahead of the support tail created problems for engineers and other support functional areas. For example, at Al Dhafra, United Arab Emirates, F-16 pilots from Shaw AFB, South Carolina slept under the wings of their aircraft upon arrival. In many cases, adequate latrines and shower facilities were unavailable to handle the number of people arriving. Food services personnel faced many similar obstacles. In some cases, contracts for food handling had already been established, causing confusion and often resulting in contract modification or renegotiation.[31]

Most engineers had never trained on the setup of Harvest Falcon equipment, and when TEMPER tents and utility systems began to arrive, many without technical orders, the engineers were uncertain as to what constituted a complete set, how they were to be assembled, or how to repair the equipment. To remedy this situation, CENTAF Engineering obtained three sets of technical orders, reproduced sufficient copies, and

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[30]History, CENTAF Mortuary Assistance Team, 7 Aug 1990 - 6 Sep 1990.

[31]Intvw, Capt Deborah Van De Ven, 375 SVS, with Dr Ronald B. Hartzer, 2 Dec 1991.

distributed them to the sites.[32] Furthermore, the delivery of Harvest Falcon equipment was delayed, parts were missing, shipping containers inappropriately marked, and in some cases, equipment was appropriated by organizations other than the consigned.[33]

War Readiness Spares Kits (WRSK) for several Harvest Falcon items often did not accompany the delivery or were incomplete. In October 1990, CENTAF reported: "We only have to date, 60 percent of the required WRSK kits in theater for electrical generators and the fill rate on some kits is less than 30 percent."[34] Inevitably, the most critical items were missing from the kits. Filters for generators were scarce, and engineers resorted to improvising with panty hose. Spares shortages forced operators to "abuse" their equipment. Many generators, for example, were operated for 16 maintenance cycles without any routine maintenance.[35]

A major problem for engineering and services personnel was their inability to monitor and control prepositioned equipment (primarily Harvest Falcon assets) and vehicles, a release, delivery responsibility assigned to the CENTAF Logistics Directorate. In mid-November, Colonel Rothenberg observed: "CENTAF Engineering continues to have little to no insight into the availability of Harvest Falcon assets, and the organization was often in a quandary over the management, division, and delivery of unknown numbers of equipment to sites that needed the equipment"[36] Even as late as February 1991, CENTAF Engineering reported they did not

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[32]History, CENTAF/DE, C-day - C+30; Memo, TSgt Robert D. Blevins, HQ TAC/DE Battle Staff to HQ TAC/LGXW, subj: Tech Orders, 27 Sep 1990; Msg, USCENTAF FWD HQ Element/DE to USCENTAF TAC Langley AFB, VA/BS-DE, subj: Technical Order Library, 171731Z Oct 1990.

[33]An entire L-1011 aircraft load of B-rations disappeared off the Dhahran AB flightline in mid-Aug. Maj Howell discovered a complete Harvest Falcon 9-1 Kitchen set up and operating at an Army camp. History, 363 CES (Deployed), 2 Aug 1990 - 25 Sep 1990.

[34]Capt Wayland H. Patterson, "Notes for the Worldwide WRM Conference," 19 Oct 1990.

[35]*Ibid.*

[36]History, CENTAF/DE, C+60 to C+90, p 2.

know how many water purification units, laundry units, latrines, mobile kitchens, and 150-cubic-foot refrigeration units were available for use.[37]

The multicommand and multiService presence at some bases also presented challenges for the engineers and Services people. At King Fahd, for example, elements of the 1st Special Operations Wing, the 23d and 354th Tactical Fighter Wings, and units from the U.S. Army's 101st and 82d Airborne Divisions were collocated, and engineers found themselves in separate living and working compounds. Although this contributed to unit integrity, it led to base operating inefficiencies.[38] Additionally, Prime RIBS provided Tactical Field Exchange services to Special Operations and U.S. Army forces. They were also tasked to assume remains recovery, since these units deployed without Mortuary Affairs capabilities.

Base Sustainment

Air Force, Army, and Navy engineers began to formulate a base construction policy in September 1990. Two standards applied during Operation Desert Shield: the "initial" standard characterized by austere facilities with minimal engineer construction efforts and intended for use from one to six months, and the "temporary" standard characterized by minimum facilities and intended to increase efficiency of operations for up to twenty-four months. On 6 September 1990, USCINCCENT Logistics adopted the policy in the theater to "build to initial standards. Construction or upgrade to temporary or permanent standards will not be accomplished without the approval of USCINCCENT."[39] A Project Review Working Group chaired by Maj. Gen. Thomas R. Olsen validated requirements and designated priorities for possible RED HORSE support. At the initial meeting in October, the Working Group assigned highest priorities to a

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[37] CENTAF/DE, "Weekly Status Report," 9 Feb 1991.

[38] The engineers from the 834th CES, Hurlburt Field, FL, supported the 1st SOW, yet relied on the 354th CES for vehicle and equipment support. The Hurlburt engineers constructed and maintained a separate cantonment area for the 1st SOW, requiring inefficient use of critical Harvest Falcon assets. After Action Report, 354th CES, Engineering Branch, nd.

[39] Msg, USCENTAF/DE to multiple addressees, subj: Policy and Planning Guidance for Theater Construction, 151708Z Sep 1990.

munitions storage area at Al Kharj and a munitions haul road at Dhahran, Saudi Arabia for the Army.[40]

In October, engineers began exploring the possibility of connecting with host nation's commercial power or water systems. Sites without cable to hook to a commercial power source continued using portable or 750kW generators. However, with growing power requirements and a protracting deployment, connection with commercial power became imperative. They began paving roads and walkways, constructing fixed latrines and showers, and preparing their equipment and people for a prolonged deployment.

One major problem for sites was the disposal of waste and sewage. Wastewater was distributed either to underground storage tanks and pumped out by contractors or to a gray-water pond for evaporation or absorption. However, some sites with clay-sandy soil and a hard sandstone subbase did not permit absorption. Seeking solutions, engineers constructed lagoon-like systems to pipe the gray water further from the cantonment area and thereby reduce potential health hazards. As the deployment wore on, more permanent designs called for connections to host nation sewage systems.

Fire Protection

Firefighters established a fire protection capability by assembling vehicles, equipment, and firefighting agents (halon, dry chemical, and aqueous film-forming foam). They assessed the fire protection requirements of the site, evaluated host nation capabilities, and assisted engineers in planning site layouts.

Their vehicles arrived from prepositioned storage sites in theater, some from European War Reserves Material storage, and one from Korea. Many of them were not operational, arriving with broken pumps, dry-rotted fan belts and hoses, and few tools, hoses, or firefighting agents. Firefighting agent was not prepositioned and did not come with the vehicles. Empty prepositioned flightline fire extinguishers had to be refilled on the local economy at a much higher cost. Firefighters also

[40]History, CENTAF/DE, C+90 to C+120, p. 3.

encountered problems with connections required to service halon tanks on vehicles, since the threads of U.S.-made vehicles did not match British-made equipment and required fabrication of connectors. As with other combat support areas, communication problems plagued the firefighters in the early weeks of the deployment. It was not until December, when the programmable radios arrived, that the communications shortfalls were remedied. Throughout the deployment, nearly all sites relied to some extent on host nation firefighting assistance whose capabilities varied from site to site. In the early weeks, Air Force firefighters often shared facilities and equipment with host nation firefighters.[41]

Prime BEEF firefighters establish a fire protection capability by assembling vehicles, equipment, and firefighting agents.

The Buildup

In November, when President George Bush ordered additional forces to the Persian Gulf region to provide an offensive capability, Air Force operations expanded at several bases with additional planes and people. As many sites stretched to maximum capacity, General Horner requested

[41]Unit History, Fire Protection Program Manager, CMSgt Finkbeiner, 7 Oct 1990 - 1 Mar 1991

more bases. For Engineering and Services this meant another push to beddown deploying forces. This time, however, support forces prepared the support structure for the arriving forces. Nearly every existing base added blocks of tents, erected bath houses, and assembled aircraft hangers, general-purpose shelters, and weapons storage areas, connecting them to power sources.[42]

RED HORSE engineers tackled larger and heavier jobs such as parking ramps and taxiways. At Shaikh Isa Air Base, Bahrain, the project called for constructing two concrete hardstands, 550 by 204 feet and 450 by 240 feet, with aircraft grounds, laying 100-foot-wide asphalt taxitracks around each hardstand, tying taxitracks into the main taxiway, and constructing a 100-foot by 3,200-foot asphalt taxiway running parallel to the northern side of the south loop. They erected 36 revetments for the incoming aircraft. At Al Minhad Air Base UAE, they constructed a 390-foot by 1,050-foot concrete and asphalt parking apron for an additional F-16 squadron.[43] At Jeddah, the engineers moved more than 150,000 cubic yards of earth and created more than 400,000 square feet of weapons storage area. The availability of a large-scale construction industry in the region enabled Air Force engineers to complete this type of work on time by contracting it out or by leasing equipment.[44]

To put more aircraft closer to the Kuwaiti border, Lt. Gen. Charles A. Horner directed his engineers to open two new sites in Saudi Arabia. The first, about 60 miles south of Riyadh near the town of Al Kharj, had been programmed as a massive Saudi military installation, but only a runway, taxiway, and parking apron had been constructed. This project presented one of the biggest challenges facing Air Force engineers during the war. On 12 November, RED HORSE accepted overall responsibility for construction, and the 4th Civil Engineer Squadron (CES) and other engineering personnel would augment them. The squadron would operate and maintain the base after completion. On 25 November, RED HORSE and Prime BEEF and contractor personnel went to work. The engineers built a pad 12 inches thick, compacting more than 200,000 cubic yards of red

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[42]History, 363 CES (Deployed) 5 Dec 1990 - 3 Jan 1991.

[43]820th RED HORSE CES, Desert Shield/Desert Storm After Action Report, Jun 1991; 823d RED HORSE CES, Desert Shield/Desert Storm After Action Report, nd.

[44]Letter w/o atchs, Lt Col Timothy N. Beally, Commander, 1701 PRW/DE, to HQ SAC/DE, 14 Feb 1991.

clay to serve as the foundation for a tent city. Eventually, 630 TEMPER tents, 4 kitchens, a gymnasium, 21 latrines, and 26 shower and shave units were erected. They constructed a sanitary system, and a power plant of seventeen 750kW turbine generators, assembled an air-transportable hospital, and built 6 K-span structures. Al Kharj was ready for aircraft in early January, and by the beginning of the war, the base was home to 4,900 Air Force personnel.[45]

RED HORSE engineers tackled large and heavy jobs such as the creation of this munitions storage site.

At the same time, another RED HORSE team was busy building a forward operating location only 50 miles from the Iraqi border at King Khalid Military City (KKMC), Saudi Arabia. This was initially planned as a small, 800-person site with a quick turn-around capability for aircraft flying missions to Iraq and Kuwait and to recover damaged aircraft. This required the installation of aircraft arresting barriers and an expanded fire response capability. The base continued to expand until it reached a population of 1,650 in mid-January and nearly 2,000 in February 1991.

Once hostilities began, Khalid was prohibited from using contract employees because of security concerns, which caused a number of problems. One problem at Khalid was airfield lighting. After two air-

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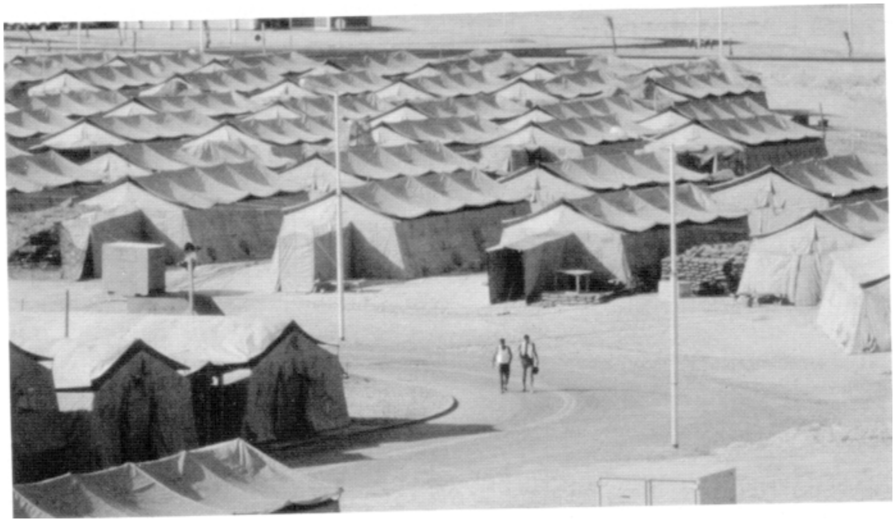
[45] *Ibid*; 823d RED HORSE CES, After Action Report.

craft crashed trying to locate the airfield in dense fog, the engineers set up a remote area lighting system for approach, but it was not until February 1991 that a strobe light set was available for installation. RED HORSE also had to complete integrated combat turn-pads on 17 January.[46]



RED HORSE and Prime BEEF prepared beddown tasks in advance including construction of the blocks of tents above.

One of the outstanding engineering accomplishments of the war was the construction of more than seven linear miles of revetment at King Fahd. The effort paid dividends when a missile on a parked A-10 accidently fired into a revetment wall. The aluminum revetment stopped the missile and prevented damage to aircraft parked nearby.[47] Also, when several collapsing bunkers at different bases killed American military personnel, prompting CENTAF Engineering to issue guidance to all units, including the U.S. Army, on techniques for constructing personnel bunk-

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[46]Civil Engineering Unit History, KKMC, nd; 820th RED HORSE CES, After Action Report.

[47]Personal History, Capt Patterson, 6 Oct 1990 - 12 Mar 1991, p 2.

ers. Apparently, the weight of sandbags piled on plywood or a 463L pallet roof collapsed the bunker and suffocated the inhabitants.[48]

During the buildup, mortuary affairs people continued to acquire refrigerated trailers, transfer cases, human remains pouches, fingerprint kits, and related materials. Major Howell and the CENTAF Mortuary Assistance Team visited twenty sites to provide training, answer questions, and distribute mortuary supplies and equipment. By 15 January 1991, the teams had processed forty-nine remains. The one issue that was never satisfactorily resolved, however, was the disposition of nuclear, biological, or chemically contaminated remains.[49]

Operations Outside Southwest Asia

Air Force Engineering and Services personnel also deployed in Turkey, Spain, the Indian Ocean, England, Germany, France, Italy, Greece, and within the United States. Torrejon Air Base, Spain, and Rhein Main Air Base, Germany, served as major transit bases for deploying to and from Southwest Asia. Rhein Main engineers redesigned the hydrant system enabling them to double the refueling capacity by using more trucks over a shorter distance.[50]

The demands placed upon U.S. Air Force, Europe (USAFE) stopover bases stressed their base-level services functions to unprecedented levels. Table 2 illustrates the substantial billeting demands placed upon USAFE bases. Rhein Main and Torrejon both constructed tent cities to handle the flow of people. At Moron Air Base, Spain, rooms intended to house two people were packed with as many as six. Air crews, however, were given priority for on-base quarters because of crew rest requirements.[51]

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[48]*Ibid*, p 4; Msg, CENTAF/DE to AIG 10322, subj: Personnel Bunkers, 201906Z Jan 1991.

[49]History, CENTAF Mortuary Assistance Team, 7 Nov 1990 - 6 Dec 1990, p 1; CENTAF/DE, "Weekly Status Report," 19 Jan 1991.

[50]The Tip of the Sword, HQ USAFE ES&ABO: We Keep the Fighters in the Fight," 3 Jan 1992, p 6.

[51]*Ibid*, p 4; Intvw with Mr. Tim Wyble and Mr. Charles Johnson, 435 SVS, with Dr. Ronald B. Hartzer, 30 Jan 1992.

Table 2
USAFE Billeting Support[52]

Base	Daily Avg*	Peak 24-Hour Period
Rhein Main	560	4959
Ramstein	1100	2893
Mildenhall	839	1608
Upper Heyford	70	3594
Torrejon	213	2500
Aviano	166	1000
Zaragoza	450	980
Incirlik	700	5000

* Pre-Desert Shield

In December 1990, the Engineer and Services forces in Europe began deploying to bases in Turkey–Operation Proven Force. A seventeen-member engineering team from Ramstein Air Base, Germany, quietly worked inside a warehouse at Incirlik, ordering supplies and preassembling tent floors. When the Turkish government granted approval on 16 January, engineers, aircraft crews, and other support personnel deployed to the base at Incirlik. The engineers constructed "Tornado Town" and helped beddown deployed personnel.[53]

Preparations for deployment assumed a feverish pitch throughout many areas of the world. Engineering teams reopened RAF Fairford, United Kingdom, and Moron Air Base, Spain, to support flying operations at Moron, they patched the runway between missions to keep it open during Operation Desert Storm. Tankers were bedded down in France, Greece, and Italy. While support was supplied primarily by host nations, Air Force firefighters deployed to provide crash and rescue operations for the

[52]Briefing Slides, USAFE/MWX, 17 Jan 1992.

[53]"Tip of the Sword," pp 13-17.

aircraft.[54] In the United Kingdom, engineers opened World War II-era contingency hospitals at Nocton Hall, Bicester, and Little Rissington, where water storage capabilities had to be supplemented with bladders.[55] Mortuary Processing Centers were established at RAF Lakenheath, Incirlik Air Base, and Torrejon Air Base. Specialized equipment and supplies were procured for each location to enable the facilities to process the remains resulting from deaths in medical facilities in Europe.[56]

Operation Desert Storm

At CENTAF, the Engineering staff could tell that the air war had begun because the phones stopped ringing. Coincidental with the onset of hostilities, ARCENT assumed Executive Agency of the Mortuary Program. At the Air Bases, firefighters assumed 12-hour shifts to support Coalition Air Forces with fire protection for integrated combat turns with hot pit refueling operations. As combat sorties increased, so did the in-flight and ground emergencies, barrier engagements, and malfunctioning ordnance responses. Firefighters also extinguished fires on armed aircraft but not without problems resulting from battle damage. At one base, Khalid, the firefighters responded to 157 in-flight emergencies and 785 integrated combat-turn standbys during Operation Desert Storm. Appendices C and D reflect selected Engineer and Services equipment available or used to support base operations shortly after the initiation of hostilities in January 1991.[57]

For the U.S. Army Patriot batteries at Riyadh Air Base, King Khalid International Airport, and near Eskan Village, RED HORSE personnel constructed security berms. They rigged front-end loaders to assist in reloading batteries, reducing the reload time from forty-five to five minutes. The Air Force also provided electricity to Patriot Batteries at Riyadh, Saudi Arabia and Shaikh Isa, Bahrain Air Bases. On 17 January, the 820th deployed to Khalid to complete the integrated combat-turn

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[54] "Desert Shield/Desert Storm Engineering and Services Support," HQ SAC/HO, nd; "Lessons Learned and Problems Discovered, Deployment to Royal Air Force Station Fairford," 97 CES, nd.

[55] Trip Report on Fire Department Deployment, MSgt Richard L. Baker, 513th CES/DEF, nd; After Action Report, 48 CES Nocton Hall Contingency Hospital Support, nd.

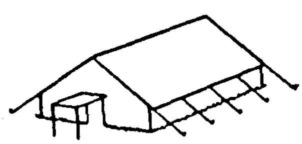
[56] "Tip of the Sword," pp 7-8.

[57] History, Fire Department, KKMC, nd.

project abandoned by the contractor.[58] At the onset of hostilities, the Air Force was without contract support at nearly every site. Either the contract workers did not report for work or the base was closed to them.

A joint RED HORSE-Explosive Ordnance Disposal team tackled the most challenging postwar project on 26 February, when General Horner tasked them to deny two air bases in southeastern Iraq any future use by returning Iraqi forces. Working with Explosive Ordnance Disposal personnel on 6 March, two teams of engineers arrived at Tallil and Jaliba Air Bases in Iraq. At Tallil, RED HORSE used approximately 80,000 pounds of explosives, consisting primarily of 40-pound shape charges and MK-82, 500-pound bombs, to make cuts in the runway and taxiway every 2,000 feet. At Jaliba Air Base, the engineers denied a concrete runway and two parallel asphalt taxiways, with 27 cuts (72 craters up to 40 feet wide and 12 feet deep) in the pavement. Only 4 days later, on 10 March 1991, the final members of the team were aboard CH-47 helicopters returning to Saudi Arabia. When they were finished, the engineers concluded that it would cost less to build a new base than to clean up and repair the denied bases.[59]

During the Gulf War, 3,000 Air Force engineers bedded down 55,000 people and 1,200 aircraft at nearly 30 sites. They erected 5,000 tents and constructed 300,000 square feet of building space. Nearly 1,200 Services personnel prepared more than 20-million meals, provided billeting services and Tactical Field Exchanges, and worked to return deceased personnel with dignity. Air Force Commissary personnel managed receipt and distribution of over $55-million in rations supporting Army, Air Force, and Marine personnel.



[58] 820th RED HORSE CES Report, p v.

[59] "Desert Finale After Action Report," (in 823d RED HORSE Report).

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Protecting the Air Bases

During Operation Desert Shield, the initial deployment of combat forces took place much faster, while support forces deployed at a much slower pace. The plan also called for CENTAF forces to operate from ten main bases and four forward operating locations. By the end of the Phase II build-up period that had began in November 1990, CENTAF was operating from twenty-five locations.[1]

The fact that there were 25 locations meant that twice as many security police and ground defense forces were required than identified in the OPLAN. However, due to CENTCOM-imposed Air Force manning levels, only 4,500 Air Force security police were deployed throughout Operations Desert Shield/Desert Storm. Since CENTAF did not have sufficient security forces to adequately defend the air bases, joint security and ground defense operations were imperative.

The total number of U.S. Air Force security police deployed to the theater almost exactly equaled the number deployed to Vietnam during that conflict. In 1970, at peak strength, there were approximately 5,000 U.S. Air Force security police protecting 8 bases in the Republic of Vietnam. During Operations Desert Shield/Desert Storm, a total of 4,500 security police, with approximately 3,900 plus at its peak, defended 3 times that number of beddown sites.[2]

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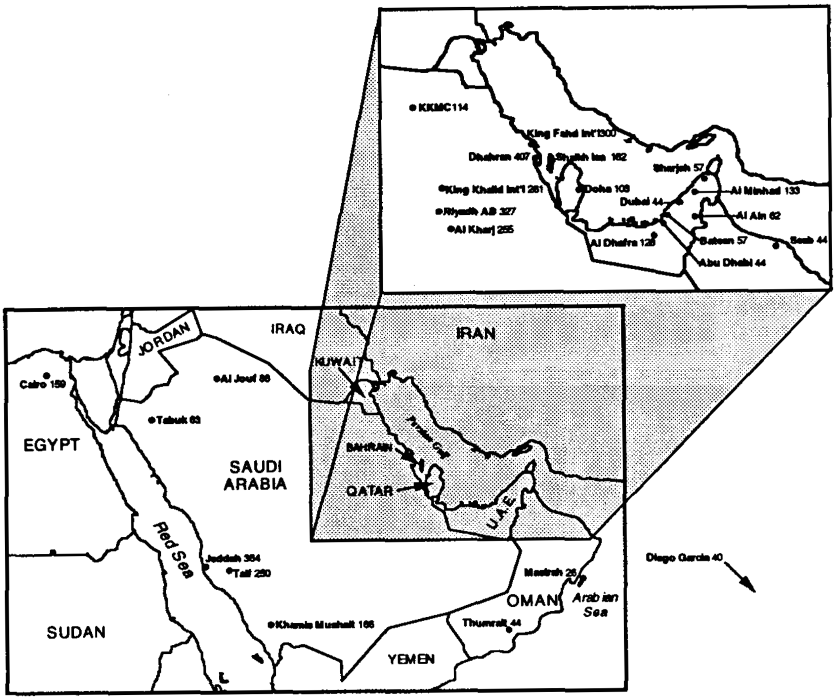
[1](S) OPLAN (S/OADR) OPLAN 1002-90, pp C-7 and A-2-1; Intvw, Lt Gen Charles A. Horner, COMUSCENTAF, 28 Jan 1992, p 7.

[2]Roger P. Fox, *Air Base Defense in the Republic of Vietnam*, Office of Air Force History, Washington, 1979, p 82; USCENTAF Deployed Roster, 21 Feb 1991.

Figure 2
USAF Ground Defense Forces

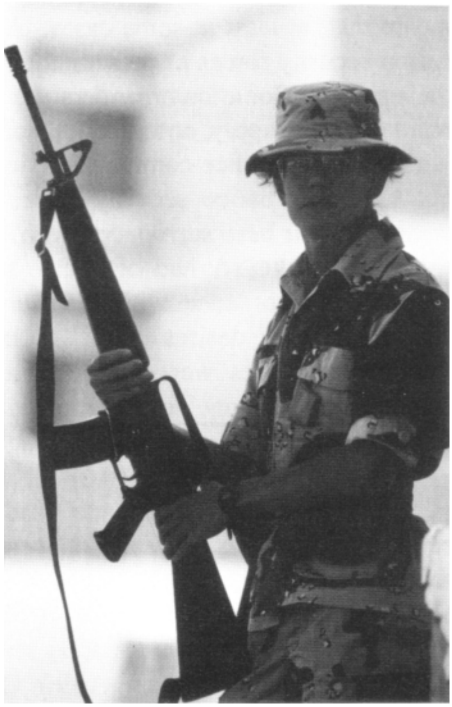


Almost a quarter of a century after Vietnam, a security police manpower standard for wartime operations did not exist. In the late 1960s, U.S. Air Force officials had abandoned the manpower standards based upon the number of aircraft or other resources assigned, in favor of one tied to "hot war" conditions and other factors such as terrain, rules of engagement, and the area to be defended. Several surveys were conducted, but they all produced different answers and, as a result, the U.S. Air Force never developed a standard.[3]

The decision to deploy combat forces into the theater first, as well as the priorities assigned for deployment of support forces, resulted in the arrival of aircraft in theater ahead of security forces. This also

[3] *Ibid.*

Security police guard the air base. Rear area security operations must assure adequate protection of air bases in order that the theater commander can fight the battles without disruption of the aii campaign.



meant that, at least in some cases, U.S. commanders had to rely on host nation security forces or provide their own personnel to protect them and their assets. Some commanders did augment their security forces with maintenance, supply, and other personnel. In addition, some of the more junior security police commanders, in the beginning of the operation, did not trust host nation security forces to provide that protection. They wanted the air base surrounded with U.S. Army military police or infantry forces. ARCENT had of course massed its forces near the Kuwaiti border, in accordance with their understanding of the air-land battle concept and the desires of the USCINCCENT.[4] Commanders wanted to ensure their bases were protected against potential threats that could attack their personnel or equipment. Types of threats, examples, and appropriate responses to those threats were as indicated in Table 3.

CENTAF security police leaders had been working with their host nation country counterparts for years and were well aware of their air base defense capabilities. For example, when it was decided to beddown transport aircraft at Thumrait, Oman, CENTAF did not have sufficient security forces to protect the base, but host nation security forces were available to fulfill this role. Yet, the Military Airlift Command questioned this decision, primarily because of a lack of U.S. security forces to guard the aircraft. CENTAF security police argued that Omani guards could provide the protection. The greatest threat to U.S. personnel and assets was during the early part of the deployment when there were insufficient forces to withstand an Iraqi ground attack into Saudi Arabia. However, the threat in Oman was low, due to their distance from Iraqi forces, and after all, the operation was a Coalition effort. At first, Military Airlift was reluctant but, after further consultation with CENTAF, accepted its recommendations. Omani guards protected the C-130s for two days, until CENTAF could move its own security forces into position.[5] The primary danger came from terrorists and surface-to-surface missiles. In Saudi Arabia, especially, the terrorist threat decreased considerably because the Saudi government deported anyone suspected of harboring pro-Iraqi sentiments.[6]

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[4]USCENTAF/SP Battle Cell Log, pp 1, 44, and 50; Conduct of the Persian Gulf War Final Report to Congress, Apr 1992, Vol 1, p 51.

[5]USCENTAF/SP Battle Cell Log, p IX.

[6]Patterns of Global Terrorism 1991, Dept of State Pub 9963, Apr 1992, p 28.

Table 3
Threat Level Matrix

Threat Level	Examples	Response
Level I	Agents, saboteurs, sympathizers, terrorists	Unit/base/base cluster self-defense measures
Level II	Small tactical units, unconventional warfare forces, guerrillas	Self-defense measures and response force(s) with supporting fires
Level III	Large tactical force operations including airborne, heliborne, amphibious, infiltration operations, and major air operations	Requires commitment of a tactical combat force

Host nations had not been willing, in some cases, to undertake joint security-related operations in the past. Furthermore, CENTAF and ARCENT had differing opinions regarding rear area security.[7] Thus, air base security was bound to be a contentious issue during the deployment.

CENTAF built its security police force on the basis of criteria outlined in Air Force Regulation 207-1, "The Air Force Physical Security Program," and Air Force Regulation 125-37, "The Installation and Resources Protection Program," with added manpower requirements factored in for force protection, internal air base ground defense, and limited external screening missions. Ground defense operations focused primarily on internal base security operations and placed the responsibility for external security on host nation or ARCENT forces.

[7]Fox, pp 82-83; and Minutes of Worldwide SP Lessons Learned Conference, 20-25 Oct 1991; HQ USCENTAF/SP Battle Cell Log, 7 Aug 1990 - 27 Mar 1991.

Rear Area Security During Joint Operations

Rear area security operations must assure adequate protection of air bases in order that the theater commander can simultaneously fight the deep, close, and rear battles without disruption of the air campaign. Inherent in rear area security operations is the need for early establishment of a theater-wide air base ground defense network that incorporates U.S. Army support during threat levels II and III. Evolving doctrine draws heavily on command, control, communications, and intelligence (C^3I) and places demands on sensor and deep strike weapons technology.[8] Associated host nation warning and detection mechanisms that appropriately assess and counteract hostile threats must also be an integral part of the C^3I network and must be compatible with U.S. equipment.

According to General Horner, "The initial deployment of air, naval, and ground forces was intended to deter an Iraqi ground attack and defend key ports and air fields along the Saudi northern gulf coast–disposition of forces eventually was expanded to block the two eastern avenues of approach."[9] The area defense plan called for establishing initial defenses near Al Jubay and Dhahran and for using air power to reduce Iraqi combat capabilities that could be applied against U.S. and Coalition forces. During this initial phase, USCINCCENT considered air power crucial in deterring an Iraqi attack, thereby putting attendant stress on U.S., host nation, and Coalition security forces.[10] For example, there was a fury of activity to ensure that stinger missile teams and other point air defense systems were quickly moved into the bases. Work shifts were extended and military working dog teams deployed to give air bases an early warning capability, especially at the most critical bases.[11]

However, there was some difficulty in establishing the Army's role in the defense of air bases and how air bases fit into the joint rear area security scheme. This was exacerbated by the fact that very few Air Force and U.S. Army security force leaders were thoroughly familiar with rear area operations. Except for limited discussions above the unit level,

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[8] *Army Times*, 12 Mar 1990, p 5.

[9] Intvw with Lt Gen Horner, COMUSCENTAF, 20 Jan 1992, p 6.

[10] *Ibid.*

[11] HQ USCENTAF/SP Operations Battle Cell Log, pp 7-9, 20, 27.

there was little knowledge and even less understanding of the U.S. Army's role in establishing theater rear area operations and when they would participate in airbase ground defense operations. Despite years of exercises and joint training efforts at the unit level, the divergent expectations of Army and Air Force leaders became manifest throughout the initial employment of their forces.[12]

Security planners at CENTAF expressed concerns to ARCENT with regard to rear area security procedures, and while there was agreement that there should be a focus of primal combat operations, these operations were constrained by U.S. Army and Air Force force structures. As long as the U.S. Army leadership was reluctant to commit combat maneuver forces to rear area operations, and as long as Army reservists represent the bulk of rear area personnel, including rear area security, all requiring a Presidential call-up of reserves, rear area security will remain a source of irritation to both the Air Force and the U.S. Army.

These conflicts of interest stemmed from differing Army and Air Force views of joint rear area security concepts. As noted, the Army is primarily concerned with front-line troops, where it concentrates its combat forces.[13] New Army doctrine stressed "base defenses, an increased combat role for military police, and the employment of major combat units in the rear area"–but only when necessary.[14] The Air Force, on the other hand, tended to believe that rear area bases had to be defended at all costs, because from these bases close air support and battlefield air interdiction missions were launched in support of the land campaign.[15] However, the Air Force realized that some bases were more critical than others and did not want to extend this policy to all its bases. [DELETED][16]

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[12]AFRD-PM (S), Memo for Chief, USCENTAF/SP, subj: Military Police Support to Air Bases, 3 Dec 1990; (S) Msg, 231400Z Jan 1991, 35 CSG Provisional/CC, subj: SITREP, p 4.

[13]U.S. Army Field Manual 100-5, p 218.

[14]*Ibid*, p 218; Report to Congress on Gulf War, Appendix I, p 331.

[15]John L. Romjue, *From Active Defense to Airland Battle: The Development of Army Doctrine*, 1973-1982, U.S. Army Training and Doctrine Command Historical Office, 1984, pp 8-9. JCS Pub O-2 states that "maintaining the security of the command involves the development of contingency plans for self-defense."

[16][DELETED]

While the Air Force viewed air base ground defense as a crucial Army mission, the U.S. Army's major concern naturally lay at the front or forward line of troops. In the Army's view, air base ground defense was just one of many rear area security issues. Its slightly more than 17,000 military police guarded some 9,000 kilometers of supply routes, 172 critical facilities, and eventually more than 84,000 prisoners of war and civilian internees, in addition to normal "police functions." In some cases, Army and Air Force rear area security interests coincided–but not necessarily for the same reasons. A good case in point was Dhahran and the smaller bases around it. From an Air Force perspective, air base ground defense in this area was critical because of the number of high-value assets and personnel bedded down there. In this instance, the Army agreed, but mainly because Dhahran was the primary port of entry for its equipment and personnel. In other words, where Army and Air Force interests coincided–there was little conflict.[17]

While they agreed in principle on the major aspects of rear area security, the Air Force and Army differed on the methods and procedures necessary to achieve it. For example, CENTAF's position was that at some point, Air Force ground defense force commanders should have operational control of forces designated for the air base ground defense mission, so that they would have them available when and where they were needed. On the other hand, ARCENT was concerned with rear area security issues that went beyond the scope of air base ground defense and wanted to maintain operational control over all its forces until such time as the threat of attack on CENTAF sites became imminent.[18] The Army was prepared to provide what it called "active" air base ground defense to those locations within the "combat zone," but the Air Force rarely established bases or bedded down valuable assets in areas that close to the front lines.[19]

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[17]Bfrg, Third U.S. Army, "Blue Flag 92-1, Airland Battle," nd; USCENTAF/SXS, 3 Aug 1992; Bfrg, Third U.S. Army Provost Marshall, 8 Jan 1992.

[18]Bfrg, Third U.S. Army, "Blue Flag 92-1, Airland Battle," nd; HQ USCENTAF/SP Operations/Battle Cell Log, p 3; (S) Appendix 5 to Annex C to Operations Desert Storm, Unclassified extract from Airbase Ground Defense, p C-5-3.

[19]Bfrg, Third U.S. Army Provost Marshall, 8 Jan 1992.

Despite these differences, ARCENT and CENTAF did join together on some issues. One such point of agreement was that base clusters should be used as the building blocks for the rear area security system.[20]

Fundamental to the resolution of the issues was the need for Air Force planners to acknowledge the Army's view with respect to the difficulty and complexity of the security problems. For example, designation of the front and rear lines may become "blurred," and the commitment of combat ground forces to static defense could render decisive offensive operations ineffective and thereby delay enemy defeat. On the other hand, U.S. Army planners had to acknowledge the pivotal role of air power to the theater campaign and to acknowledge the fact that the air component projects its combat power from the rear area, and as such must be appropriately protected. In fact, these issues were never completely resolved, despite the fact that both General Horner and Lt. Gen. John Yeosock, ARCENT, discussed it in official letters.[21]

> The operational objectives of U.S. and Allied forces in Operations Desert Shield/Desert Storm evolved in concept with the ongoing buildup of U.S. military capabilities in the theater. The relationship between strategic goals and force potential is interactive and variable over time. . . . early-deploying forces played more [of] a deterrent [rather] than a defensive role. . . . As the U.S. buildup continued and allied defensive positions were consolidated, a broader range of military options to enhance both deterrence and defensive prospects became possible. Logistics support and command and control in the theater influenced other options and capabilities. A defense with air and light ground forces was probably feasible by mid-September. This type of defense would have worn down the Iraqi forces at the sacrifice of territory.[22]

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[20]Memo, DAMO-FDQ, 21 Nov 1989, "Agenda for the Joint Air Base Ground Defense Working Group Meeting," p 2.

[21](S) Ltr, COMUSCENTAF to COMUSARCENT, subj: Military Police Support to Air Bases, 21 Sep 1990; (S) Ltr, USCENTAF/SP to USARCENT/G3, subj: Base Cluster Management, 31 Dec 1990. Unclassified Extracts.

[22](S) R-4147, AF, Project Air Force Assessment of Operation Desert Shield, Vol I, The Buildup of Combat Power, Mar 1992, Rand Corp., Santa Monica, CA, p 15.

For Air Force planners, the key issue was to ensure that no Air Base was sacrificed. With the further arrival of ground forces through October, the defensive potential of the allied forces was more fully realized. The Phase II buildup in early November assured a successful defense and opened a range of offensive options.[23]

Development of Rear Area Security

The joint rear area security structure was slow to materialize. In fact, the rear area security command structure was so slow in maturing that it was difficult to address security requirements of the Coalition forces without some confusion and duplication of effort.[24] This occurred because many of the combat service support units that make up the rear area security system consist primarily of reserve and national guard units. They are mobilized and deployed in the later stages of the force deployment schedule and do not compete well against combat units for early air and sea lift.[25] The preliminary CENTAF security police contacts with CENTCOM and ARCENT military police units had been established prior to Operations Desert Shield deployment. The initial air base ground defense priorities were identified to ARCENT by a CENTAF message on 8 August 1990.[26] On 27 August 1990, the CENTAF security police and ARCENT military police staffs met to prepare more formalized plans for air base ground defense support. They identified the King Fahd and Dhahran areas as the initial two priorities for military police support, followed by the Riyadh and King Khalid International Airport areas. CENTAF informed ARCENT that it would reassess its priorities and refine them once evaluations of the air bases were clarified. ARCENT then informed CENTAF that their military police support to air bases would assume number one priority in their operations order.[27] There was, however, no mutual understanding of what constituted an acceptable level of risk with

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[23](S) *Ibid.*

[24]Msg, 1223092 Sep 1990, COMUSARCENT Main/AFRD DCG to USCINCCENT Rear MacDill AFB, FL, subj: Situation Report; Minutes: Provost Marshall Security Meeting, USCENTCOM, 13 Dec 1990, 24 Dec 1990.

[25]HQ USCENTAF Operations Battle Cell Log, pp 24, 27, 32.

[26]Msg, HQ, USCENTAF/SP, 08200Z Aug 1990.

[27](S) Ltr, USCENTAF/SP to ARCENT/G3, subj: Base Cluster Management, 31 Dec 1990.

respect to vulnerability of air bases.[28] Also, it did not take into account the requisite degree of "dedicated" support that military police forces would be able to provide. This was significant because the military police forces were a vital, if not pivotal, element that linked the Air Force air base ground defense troops with other rear area support units.[29]

By 28 September 1990, officers from the U.S. Army 22d Support Command made initial contact with CENTAF security police to begin a formal process in developing the rear area support group structure. The intent was to coordinate unit actions for rear area operations. They determined the number of air base ground defense liaison teams made surveys of the terrain, and determined among other things where the Rear Tactical Operations Centers would be established.

The primary focus of security and air base ground defense initiatives was to contribute to a cohesive rear area security system and to combine the right force mix to stifle, thwart, or take away the initiative from the enemy. As stated earlier, the rear area security concept used base clusters as the building blocks of the security scheme. The air bases were considered clusters within themselves; therefore, the ground defense commanders developed directives and operating procedures to provide a capability to increase responsiveness of units to react to enemy activities. This was achieved by continuously sorting and assessing intelligence data provided by the security intelligence network–with confidence that the system would provide the early warning necessary to alert base units of potential attack. This, of course, required an iterative methodology in which each successive step in developing the rear area security plan continuously refined the previous one.

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[28]Ltr, USCENTAF/SP to USARCENT/G3, subj: Rear Area Security Scheme, 6 Dec 1990; USCENTAF/SP Info Report to COMMUSCENTAF, subj: Security Police Issues; Ltr, USCENTAF/SP to USARCENT/PM, subj: MP Support to Air Base, 27 Dec 1990.

[29]USCENTAF/SP Operations Battle Cell Log Book, pp 47, 57, and 60.

The Dhahran area was one of two priorities for air base ground support. Photo above shows open storage at Dhahran.

In this process, the commanders' assessments of risk was a critical factor. The command relationship provided unity of command as well as the impetus for determining a deliberate and decisive response to any impending threat. Rear battle officers, acting for Maj. Gen. William G. Pagonis, U.S. Army, 22d Support Command, the rear area commander, consulted with air base commanders and other cluster commanders to determine which procedures provided the greatest overall security to the rear area based on the threat and forces available. However, this was not formally established until early January 1991.

Operation Desert Shield air base survivability assessments prepared by the Office of Special Investigations (OSI) at each location were used to assist in formulating decisions on security force structure and design. In concert with continuous analysis of threat level and the development of passive security measures at each location, including communication, operations, and tactical deception, measures were integrated to reduce the probability of attacks and to minimize their effects if they did occur. These elements included counter-surveillance operations, reconnaissance patrols, and concentration of available resources at fixed positions and at critical points along main supply routes, alternate transportation routes, and lines of communication. They also included appropriately interfacing passive security measures, including counter-surveillance teams, reconnaissance patrols, and, in some locations, sensor-enhanced security without additional expenditure of manpower. Host nation forces provided security for key terrain surrounding critical facilities or bases. For example, at Dubai Air Base, United Arab Emirates, the Dubai civilian police heavily patrolled the outside perimeter and reported any suspicious activity to U.S. security forces. Also, camel and goat herders that worked in the area around the base possessed cellular telephones and assisted with lookout and surveillance. Any suspicious activities were called into the Minhad local civilian police.[30]

While host nation security forces exerted rigorous circulation control over the indigenous population, Air Force security police provided circulation control within defended localities. As an added measure of flexibility, CENTAF security police staff developed a quick-reaction force of forty-four men, billeted at Riyadh Air Base, with the capability of being airlifted to any base. For example, this team moved forward to reinforce King Fahd Air Base when security police units responded to aircraft crashes that occurred during the intensive training leading up to the war. Safeguarding classified information demanded particular attention.[31]

Command and Control

While Coalition Coordination Communications and Intelligence Center (C^3IC) was not a command echelon, it was used primarily to "harmonize" operational planning in areas such as host nation support and movement control. It became the "combined operations cornerstone," especially for rear area security operations conducted by other host nation and Coalition forces in the Communications Zone (COMMZ), and for the coordination and execution of defense security operations. Overall planning and coordination was the responsibility of liaison officers of the

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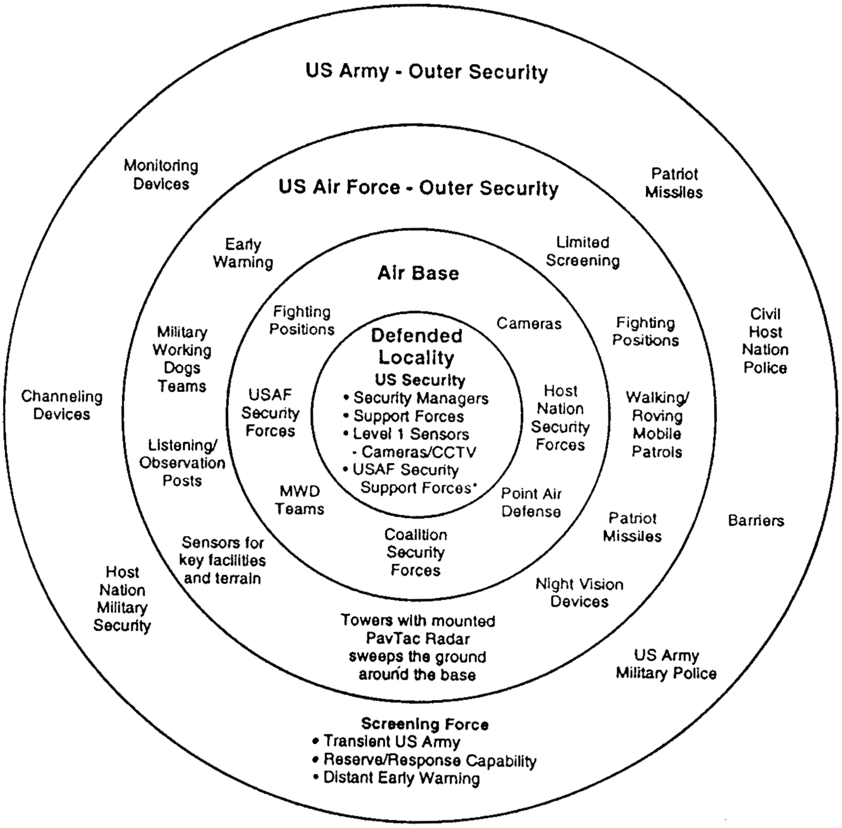
[30]Msg, 180405Z Sep 1990, from 388th TFW Deployed to CENTAF, subj: SITREP.

[31]Msg, 140030 Nov 1990, subj: Situation Report, Shakiza AB, p 4; HQ USCENTAF/SP Operations Battle Cell Log, pp 74, 93.

Figure 3
Air Base Ground Defense



Weapons
Side Arms
Shoulder Fired Arms
Stinger Missiles
Light Anti-Tank Weapons
Recoilless Rifles
Crew Served Weapons
Automatic Grenade Launchers
Mortars
Hand Grenades
Claymore Mines
Command Detonated Mines (Key Locations)
Smoke Grenades

Equipment
Radios (Armored/Mobile)
Vehicles Serving as Fighting Platforms
Convoy Vehicles
AC-130 Gun Ships
Army Helicopters
Early Warning Devices (Infra-red sensors, Ground Surveillance Radar, etc)
Trip Flares
Night Observatin Devices
Microwave Sensor Devices
Seismic Devices
Sensor Closed Circuit TV (CCTV)

*Maintenance and owner/user personnel that can be armed to supplement Security Forces.

participating forces.[32] Once the rear area became formally established, security police units within the zone reported through one of three Rear Tactical Operations Centers. Those outside the zone, reported directly to the CENTAF security police operations cell at Riyadh.[33]

Early during Operation Desert Shield when security-alerting system networks were strained to the limit, it became crucial that the joint communications electronic operating instructions (JCEOIs) used to coordinate U.S. Army support be addressed at CENTAF as well. After several meetings between CENTCOM and ARCENT, the Air Force obtained authorization to receive the same instructions. The U.S. Army military police accepted the CENTAF security police proposal for a classified joint emergency frequency that would be used by all police forces, including Royal Saudi Air Force police, the Ministry of Defense police, and all other Coalition military and civil police agencies. The frequencies were to be used only for emergency operations–and they were incorporated into the joint electronic operating instructions.

Close Air Support for Rear Area Security

Close Air Support for rear area security was both preplanned and available to meet more immediate requests.[34] For example, the 130th Rear Tactical Operations Center was assigned to the commander of the 22d Support Command to plan and coordinate rear area security operations in the Communication Zone.[35] Coordination between directorates of General Security, Traffic Internal Security and Civil Defense, played a crucial role, especially outside the zone, as host nation forces were responsible for external air base ground defense, port security, and harbor defense for bases and ports outside the combat zone, but within the theater. Command and control systems identified for rear area security operations had to be compatible with those of the tactical combat force (maneuver ele-

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[32]*Ibid*, p 336; (S) Annex J-1, Combined OPLAN for Security of Riyadh, 28 Jan 1991.

[33]USCENTAF Battle Cell Log, 7 Aug 1990 - 27 Mar 1991, p 20; (S) Msg 221100Z Nov 1990, USCENTAF/SP to SWA AIG (All SP Units), subj: Security Reporting and Alerting System Procedures.

[34](S) Concept of Operations for Command and Control of TACAIR in support of land forces, Desert Shield 1 Jan 1991.

[35](S) Appendix 9 to Annex C to Combined OPLAN Operation Desert Storm.

ment) and systems used by CENTAF air base ground defense units. Liaison teams reported significant rear area activities through the C^3IC.

Air Base Defense

The development of security schemes at the beddown sites did have its problems, which were mostly resolved, however, after the first few weeks when personal relationships and cultural differences were worked out and procedures established. For example, at Shaikh Isa Air Base, Bahrain, CENTAF and MARCENT aircraft shared the runway, along which the Air Force wanted to disperse its aircraft, the Marines wanted to group theirs in order to facilitate air operations coordination. Grouping caused concern for Air Force security officials because it presented lucrative targets and exposed a potential for multiple explosions should one or more aircraft be sabotaged. The CENTAF security police staff at Riyadh found it necessary to send a field grade officer to resolve the differences, and the result was an agreement that the Marines would provide external security, the Air Force internal.[36] Therefore aircraft parking issues were resolved using the Air Force parking scheme to enhance security of the aircraft. This was accomplished because RED HORSE engineers constructed additional parking pads and provided additional security barriers.

Defending allied personnel and assets in Riyadh presented a more complicated problem. CENTCOM assumed responsibility for protecting British and French elements, as well as its own, with the British and French providing a platoon of security forces to assist. If the security situation in Riyadh deteriorated, CENTCOM planned to use elements of the 82d Airborne to protect the area, in which case it would be designated as the Tactical Combat Force. As long as the situation was not serious, each allied or component command basically provided security for the office buildings and quarters for its personnel. Thus, in the 130th RADC area and the Riyadh community CENTAF staff duties were limited to defense of Riyadh Air Base, the Royal Saudi Air Force Headquarters, and Eskan

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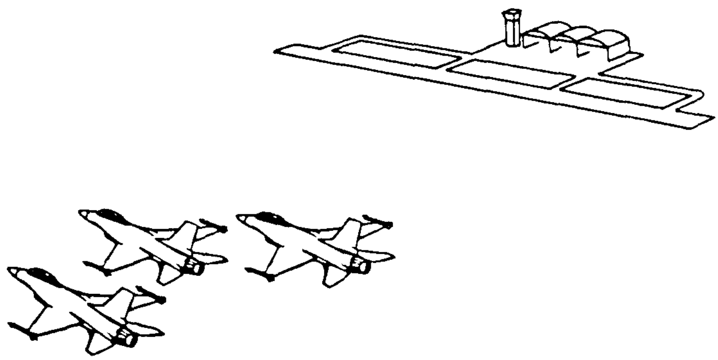
[36](S/NF/WN/OADR) AFOSI Air Base Operability "Threat" Assessment, Shakisa AB, Section B, 30 Oct 1990.

Village.[37] To implement this plan, each allied or component command sent representatives to several coordinating committees. They functioned as elements of the Coalition Coordination Communication Integration Center, which operated on a twenty-four hour basis. In this manner, problems could be presented immediately and resolved quickly.[38]

Each unit assigned to CENTAF developed security operations plans that outlined cooperation among CENTAF, allied, and host nation security forces. The final scheme was a "three tier defense system." The outer tier consisted of plain-clothes detectives augmented by a second tier of civil police. The third tier was the internal security provided by Saudi and U.S. Air Force security forces.[39] Individual host nation sensitivities were key factors in determining the degree of interaction between Air Force and host nation security forces in the employment of air base ground defense techniques. [DELETED][40,41,42]



[37](S/OADR) Combined OPLAN, "The Security of Riyadh," 28 Jan 1991, p 3; (S) Security Police Issues Report, USCENTAF/SP to COMM USCENTAF, 8 Sep 1990, Memo for Record, subj: Provost Marshall Security Meeting, USCENTCOM, 13 Dec 1990, dtd Dec 1990, p 2.

[38]Conduct of the Persian Gulf War: Final Report to Congress, Vol I, Apr 1992, p 336.

[39](S) Office of Special Investigations Survivability Assessment for Taif, Saudi Arabia, nd, p B-1-11.

[40][DELETED]

[41][DELETED]

[42][DELETED]

In some cases, as in the United Arab Emirates, CENTAF security police formed armed patrols off-base. Generally, such less stringent rules regarding employment of U.S. security police forces were in force in nations farther away from the Iraqi-Kuwaiti borders, where there was less danger of direct enemy air or ground attack and less complicated fire support coordination requirements. In such cases, terrorists posed the biggest perceived threat in the form of sabotage or other small-scale strikes. Those bases closer to the perceived battle area were protected by Army forces, even though those units were not necessarily located immediately adjacent to or within the base itself.[43]

Base security at Dhahran (specifically King Abdul Aziz Air Base) included Saudi Royal Air Force troops, U.S. Army air defense artillery units, and an initial contingent of about 209 Air Force security police from the 1st Combat Support Element out of Langley AFB, Virginia. Navy security forces provided port security. Due to changes in the perceived threat, CENTAF increased its security force strength at Dhahran to 409 prior to the opening of hostilities.[44] Once again, Air Force security police provided weapon systems security, assisted by a 90-man Saudi Royal Air Force contingent. The Saudi Royal Air Force security forces protected the perimeter, and the U.S. Army 11th Air Defense Artillery Battery manned a combination of Patriot and Stinger missiles.[45] CENTAF Security advised aircrews to take off and land in patterns that avoided dense and populated areas that were within the range of hand-held SA-7 and SA-14 shoulder fired infrared surface-to-air missiles. These areas were rigorously patrolled by Air Force and host nation security forces.[46]

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[43](S) Security Police Issues Report (USCENTAF/SP), 14 Jan 1991; AFRD-PM Memo for Chief, CENTAF/SP, subj: Military Police Support to Air Bases, 3 Dec 1990; Conduct of the Persian Gulf War: Final Report to Congress, Vol I, Apr 1992, pp 51-53.

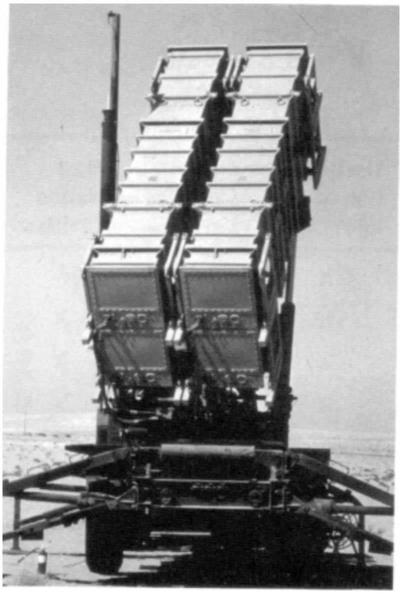
[44](S/OADR) Brfg, USCENTAF Briefing Chart, 17 Feb 1991.

[45](S/NF/WN/OADR) AFOSI Threat Assessment, "Dhahran AB," Section B; See *Space* report, Chapter 5 for additional information on the Patriot.

[46]Msg, 071103Z Jan 1991, 1 CSE Deployed (Dhahran) SP, subj: Situation Report.

Table 4
Integrated Security Forces of U.S. Air Bases

Air Base	U.S. Air Force	Other U.S. Service	Host Nation Military	Other Coalition Partner	Host Nation Civilian
Abu Dhabi, UAE	X		X	X	
Al Ain, UAE	X		X		X
Al Dhafra, UAE	X		X		X
Al Jouf, SA	X	X	X	X	
Al Kharj, SA	X	X	X		X
Al Minhad, UAE	X		X		
Bateen, UAE	X		X		
Cairo, Egypt	X		X		
Dhahran, SA	X	X	X	X	X
Doha, Qatar	X		X	X	
Dubai, UAE	X		X		X
Jeddah, SA	X		X		X
Khamis Mushait,	X		X		
King Fahd, SA	X	X	X		X
KKIA, SA	X		X		
KKMC, SA	X	X		X	X
Masirah, Oman	X		X		
Riyadh, SA	X		X	X	
Seeb, Oman	X		X		
Shaikh Isa,	X	X	X		
Sharjah, UAE	X		X		
Tabuk, SA	X		X	X	
Taif, SA	X		X		X
Thumrait, Oman	X		X		X



Base security at Dhahran included a combination of Patriot and Stinger missiles. Patriot is shown at left.

Initially, at some locations, such as Thumrait, Oman, the host nation did not allow arming any foreign military person. Therefore, it became the responsibility of Coalition partners to use their own security forces for external air base ground defense at sites where allied units were located.[47] In these areas, security police forces initially functioned as liaison and an adjunct security reporting, alerting, and response force, much as security support forces (functional area owner/user, maintenance, and combat service support forces) supplement security at all U.S. Air Force bases. And in some cases, U.S. security forces were restricted to operations with concealed weapons. These initial problems, however, were eventually resolved. U.S. security forces were armed and security police commanders given authority to expend war readiness material munitions for confidence and familiarization training and to train with Coalition forces.[48]

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[47]Msg, HQ USCENTAF/SP to 1702 AREFWD Deployed/CC, 221400Z Oct 1990, subj: Security Police Utilization.

[48]Msg, 250800Z Jan 1991, 1702 CSG(P)/SP to USCENTAF/SP, subj: SITREP; Msg USCENTAF/SP to AIG (all SP units), 250300Z Nov 1990, subj: Expenditure of excess war reserve material munitions.

Coalition partners use their own security forces for external air base ground defense.

The base beddown complicated security planning for several reasons. The protection of high value assets remained a concern throughout the war. For example, the E-3 AWACS aircraft were all initially located at Riyadh but were eventually dispersed to three different locations, primarily for security considerations.[49] In addition, security forces at many bases were also strapped with manpower-intensive weapon/logistics convoy and escort duties, since cantonment complexes were dispersed as far as five to fifteen miles apart. As a result, air bases in the theater precluded any attempt to secure them in a "traditional" air base defense concept. Units developed air base ground defense concepts, devised security schemes, and secured key resources (dispersed aircraft parking areas, POL areas, munitions storage areas and billeting areas, etc.). Reliance on mobile response was widespread because of the distance between locations requiring protection. Furthermore, exercises and evaluations of security requirements had demonstrated that the density of detection mechanisms and the location of response forces were key to successful air base ground defense efforts.

As stated above, rapid response was crucial to the rear area security system. Therefore, vehicles and communications quickly emerged as the primary problems for Air Force security–issues also of a major concern during previous conflicts. Security police vehicles did not receive priority

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[49]USCENTAF/SP Battle Cell Log, pp 24, 29.

for early airlift during deployment.[50] Because these specialized armored vehicles were required to support responses over austere terrain and to serve as weapons platforms for heavy and crew-served weapons, they were considered crucial to the successful defense of air bases.

In this constantly changing environment, rear area security missions sometimes were redistributed, as U.S. Army units flowed in and out of various locations.[51] When U.S. Army forces shifted positions, especially from places like Dhahran and King Fahd, the Air Force security police relied more heavily on sensor technology to provide force multipliers.[52]

The Terrorist Threat

Gen H. Norman Schwarzkopf and Lt. Gen. Charles A. Horner considered terrorism as a top priority, and anti-terrorism initiatives essential.[53] After the initial Coalition buildup, intelligence assessments indicated that the feasibility of an invasion of Saudi Arabia had dropped from the most likely to the least likely Iraqi option. During the Christmas holiday period, respective staffs were informed that General Schwarzkopf had become increasingly concerned with the possibility of a preemptive or surprise attack by Iraq. Such an attack might well be expected during the Christmas or New Year's holidays, or prior to the deadline imposed by the United Nations for Iraq to get out of Kuwait.

General Horner met with General Schwarzkopf to obtain approval of the CENTAF-recommended security plan for coping with this potential threat. CENTAF security police had developed the plan and disseminated it to all Air Force units. Instructions in it [DELETED] included physical security and anti-terrorist checklists to be used by all units and submitted as addendum to situation reports to CENTAF Security Police. The status of "open items" which represented potential areas of vulnerability were reviewed on a daily basis.

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[50]Fox, Roger P., Air Base Defense in the Republic of Vietnam 1961 - 1973, Office of Air Force History, Washington, DC, 1979, pp 76-92.

[51]Msg, 071410Z Jan 1991, ICSE Deployed to USCENTAF/SP, subj: Tactical Sensor System for Dhahran AB, SA.

[52]Army Times, 12 Mar 1990, p 5.

[53](S) USCENTAF/SP, Battle Cell Log, pp 24, 29; Memo for Record (Minutes) subj: Security Meeting, p 2.

The final preparations for Operation Desert Storm were masked by placing many aircraft on ground alert that would permit mission planning, crew rest, and aircraft reconfiguration without revealing Coalition plans. Obviously, this put increased burdens on the security forces. The internal dispersal of aircraft increased the posting requirements for both Air Force and host nation security police forces. Emphasis was placed on security status reporting to step up the intensity of rear area security and air base ground defense network during this period of vulnerability. Another period of vulnerability took place when U.S. Army units were shifted to the left flank in preparation for the ground offensive. During this period, military police units protected lines of communication, and only a squad-size force remained in Dhahran area.[54]

During this period, CENTAF security police continued to receive sporadic and isolated reports of threats. Most of these reports were terrorist-related, but some indicated potential small arms sniper fire adjacent to installations.[55] For example, on 3 February 1991, a civilian contract bus carrying three U.S. military, a Saudi military guard, and civilian driver from the Al Khalid hotel to the Jeddah Air Base and was fired upon. The incident occurred approximately three miles from base, in the city of Jeddah, on a major six-lane highway. The terrorists fired ten to fifteen 9-mm shots, all hitting the passenger side of the bus, spaced from front to rear, inflicting minor injuries on two U.S. military personnel. The Saudis apprehended four Palestinians and two Yemenis as a result of the incident. As the concerns that more attacks would follow, the importance of accurate intelligence became more pronounced, and multisource intelligence became a cornerstone of the rear area security and air base ground defense system. Each Service remained responsible

[54]Report to Congress, p 141.

[55]Air Force Office of Special Investigations Briefing (undated) presented to OSI Commanders Conference 1991, p 3. USCENTAF/SP Battle Cell Log (multiple entries), pp 23, 29-30, 42.

for its own counterintelligence network, with intensive liaison to ensure a coordinated effort.[56]

Security police guards perimeter of air base.

[56](S) Memo for Record, subj: Provost Marshall Security Meeting, USCENTCOM, 13 Dec 1990.

3

Contracting Support

Background

The CENTAF Contracting Directorate was responsible for contracting support for all CENTAF activities in the Southwest Asia theater of operations. They also provided lateral contracting support to the other CENTCOM Services that participate in activities sponsored by the Joint Chief of Staff. They assisted in contract management for Southwest Asia prepositioning program, including a $51-million Air Force Caretaker Maintenance contract in Oman to support the prepositioning of more than $2-billion in vital war reserve material and equipment.[1]

Many statutory and regulatory documents have been provided to contracting officers to help guide them in the performance of their duties during contingency operations. Congress enacted some 350 laws which provide for a quick response in times of crisis. Two of them affect contracting in foreign countries during contingency operations:

- 50 U.S. Code 1431-1435, The "National Defense Contracts Exempt From Certain Statutory Limitation," authorizes the Department of Defense to enter into, modify, or make advance payments on contracts in the interest of the national defense without regard to certain statutory limitations.

- 10 U.S. Code 2304(c)(2) authorizes the Department of Defense to forego formal advertising when its need for property or services "is of such an unusual and compelling urgency that the United States would be seriously injured. . . . "

The Defense Resources Act is designed to provide the authority necessary to meet various contingencies. Contingency Contracting Officers

[1]USCENTAF Operational Contracting Guide, Capt William J. Hauf and Capt Michael S. Hall, AFLMC Guide LC 922137, Mar 1992, p 1.

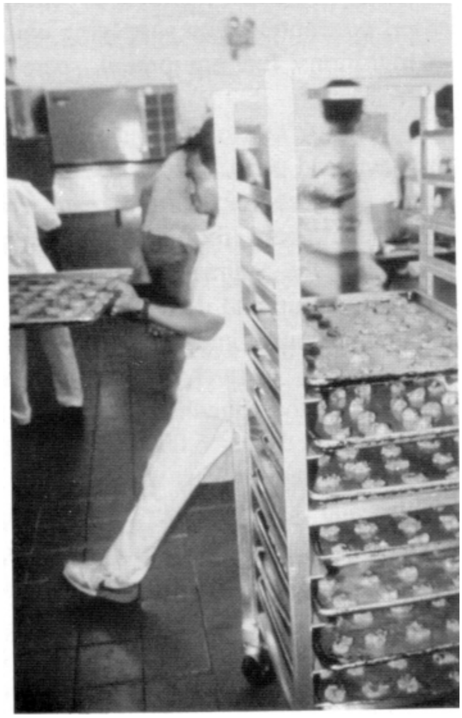
cers should ensure that they are aware of exactly what has been authorized before using this authority. Some specific aspects of this Act reveal how far-reaching potential waivers could be. For example, Section 401 provides the President with authority to authorize entering into contracts and into modifications of contracts without regard to the provisions of law whenever he deems such action would facilitate the performance of the national defense; except it does not authorize the use of the cost-plus-a-percentage-of-cost system of contracting or any contract provision in violation of law relating to limitation of profits. Section 1214 states that all laws and parts of laws in conflict with the provisions of this Act are hereby suspended to the extent of such conflict for the period during which this Act shall be in force. Even so, contracting officers are still required to adhere to sound contracting principles to the extent possible, and contracting records are subject to audit. Also, the contracting officer must thoroughly document reasons for not following normal procedures.[2]

Deployment

The inability to conduct site surveys in the area of responsibility resulted in paying up to sixty-five percent more for the supplies and services than what would normally be expected. Contingency contracting officers use site surveys to determine requirements, sources of supply, distance to market, contractors' access to base, etc. However, contracting officers had to depend on host nation governments for sources of supply. They also used "jobbers" that were aware of local sources of supply. To make matters worse, some wing commanders and resource managers would not provide the contracting officers with the needed resources to do their job (i.e., locate sources of supply, obtain rental vehicles for use to identify sources, and provide mobile telephones to facilitate their work). As a result, contracting officers found it necessary to rely on vendors who came to the gate, where the contracting officer would provide them a list of requirements which the vendor would buy from the local market, then deliver to the location. This also resulted in much higher prices for the items being procured. As a result, the CENTAF contracting officer discussed this problem with wing commanders and pro-

[2]Wartime Contingency Contracting Handbook Update, Capt Tom Robinson, AFLMC Rpt LC 922141, Jun 1992, pp 16-17.

vided justification to support contracting officers. Once wing commanders understood this, they normally supported their contracting officers.[3]



Contingency contracting officers established Blanket Purchase Agreements for food service.

With an operational philosophy of getting "the iron on the ramp" for Operation Desert Shield and no predeployment site surveys, contracting support was severely degraded; as a consequence, thousands of military personnel slept on aircraft hanger floors and ate only Meals-Ready-To-Eat for approximately one week after arriving at beddown locations. Air Force units, almost without exception, deployed to Saudi Arabia ahead of logistical support teams even though many bases offered very little in the way of food, billeting, transportation, laundry, bottled water, ground fuel, etc. CENTAF contracting began to deploy contingency contracting officers from their headquarters to the beddown locations one or two days before

[3]Trip Report, Desert Shield Orientation, Capt Michael E. Hall, Lessons Learned, 19 Nov 1990.

the arrival of incoming units. These personnel established Blanket Purchase Agreements for hotel and other suitable contract quarters, food service catering, bottled water deliveries, rental cars and buses, and other necessary items on the local economy. Such foresight helped keep airlift assets concentrated on supplying units with warfighting capabilities, such as munitions, fuel equipment, spare parts, etc.[4]

The CENTAF Contracting Directorate deployed on 7 August 1990 with the advanced party. Initial concerns upon arrival in Saudi Arabia were to set up contracts for quarters, rental vehicles, material handling equipment, heavy equipment, food service, bottled water, and ground fuels. During this phase, the contracting officer was responsible not only for purchasing but the pick-up and delivery of items to customers as well. CENTAF contracting personnel initially provided all contracting support for headquarters at CENTCOM, ARCENT, NAVCENT, CENTAF, and two Air Force operating locations in the Riyadh area along with fourteen attached units. Overall, they supported over 6,000 people in the Riyadh area. More than 13,000 contracting negotiations worth almost $18 million were written between 7 August and 30 September 1990 to support these units. During this time frame, 70 percent of the purchase requests were bought, picked-up, and delivered to the supported customers within a day or two of the order.

Early in the deployment, contracting had problems interfacing with finance. Wing commanders and resource managers placed greater emphasis on finance, performing check-cashing and currency exchanges, rather than on their support as paying agents. In many cases, at least initially, contracting personnel performed both contracting and paying agent responsibilities. Finance hours of operation were inflexible and did not coincide with contracting needs. In many cases, contracting required paying agents to accompany them after normal business hours, which resulted in placing contracting officers in an awkward position where there were no checks and balances between buyers and payers. There were no procedures for submitting contractors' invoices to finance for payment, and some invoices had to be hand-carried by contracting offi-

[4]Trip Report, Desert Shield Orientation, Capt Michael E. Hall, Acting Director of Contracting, Lessons Learned, 19 Nov 1990.

cers through the payment process in order to get contractors paid within a reasonable time.[5]

By the end of August, the number of personnel and unit locations severely strained contracting capabilities to support the units. However, a few support units had arrived in Saudi Arabia with some contracting personnel. Lt. Col. Bradley R. Busch, Director of Contracting, CENTAF, used them to supplement his staff of eight in Riyadh, bringing the total at any given time to between twelve and fifteen contracting personnel. In order to meet the needs of combat forces arriving without support personnel, Busch divided the Riyadh-based contracting officers into small teams that were sent to beddown locations, some of which were "just a patch of runway and some sand and maybe a source of water."[6]

Although port-handling and inland transportation fell within the scope of Army responsibilities, CENTAF contracting was tasked on several occasions to contract for offloading ships and arranging for transportation of critical assets to Air Force operating locations. The contractors responded to the challenge: off-loading critically needed munitions, special purpose vehicles, and Harvest Falcon assets from ports at Jeddah, Abu Dhabi, Muscat, and Raysuit to various beddown locations. These contracts were valued at more than $200,000.

Unfortunately, Middle East businessman will not conduct business with females. In at least one case, the Tactical Air Command sent a female contracting officer to Saudi Arabia (Tabuk), and she was unable to negotiate contracts. Neither do Arab businessmen like to deal with enlisted men. Once contracting officers were allowed to wear civilian clothing, however, the problem with rank was resolved.[7]

Contract Transfers to Saudi Arabia

In October 1990, HRH Prince Bandar bin Sultan accepted a proposal to send a U.S. team to work out procedures for host nation support. The

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[5]Lessons Learned, Contracting/Finance Interface, USCENTAF/LGC, Lt Col Busch, nd.

[6]"Shopping From Scratch," *Air Force Magazine*, Dec 1991, pp 78-79.

[7]Trip Report, Desert Shield Orientation, Capt Michael E. Hall, Acting Director of Contracting, Lessons Learned, 19 Nov 1990.

director of the Joint Staff, Lt. Gen. Michael P. C. Carns, directed Maj. Gen. James W. Ray, U.S. Army, director of Military Programs, Headquarters, U.S. Army Corps of Engineers, to travel to Saudi Arabia to put in place an operating process that used Saudi money to pay for fuel, water, transportation, and facilities. It was an excellent selection, since General Ray had spent five years in Saudi Arabia and three in Europe working on projects that involved host nation support agreements and was well qualified for the mission.

General Ray and a team of specialists drawn from the Joint Staff and the Office of the Secretary of Defense arrived in Saudi Arabia on 17 October, where they developed and negotiated a support agreement. General Dan Starling, CENTCOM/J4 (logistics director), and Saudi deputy commander for Saudi Joint Forces, Maj. Gen. Abdul Aziz Al Sheik, signed the agreement. Under the agreement, which became effective 1 November 1990, the Saudi government would provide, at no cost to the United States, fuel, transportation, water, food, and facilities to support U.S. forces from the time of initial deployment. Before General Ray left, the Saudis presented him with a check to the U.S. Treasury for $760 million to cover in-country expenses from 7 August to 1 November. General Ray's team recommended to the CENTCOM commander that he establish a 16- to 17-person cell, headed by a general officer, to monitor and implement host nation support, and CENTCOM approved the recommendation. Brig. Gen. Patrick M. Stevens IV, division engineer from the corps' North Pacific Division, arrived in late November to head this cell and serve as General Starling's deputy.[8]

As a result, the Air Force transferred to the Saudi government 141 contracts valued in excess of $20 million at seven locations. The categories of the contracts and their dollar values are as indicated in Table 5, opposite page.

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[8]Military Review, Lt Gen Henry J. Hatch, Cmdr, U.S. Army Corps of Engineers and Dr. Janet A. McDonnel, Historian, Laying the Groundwork for Theater Operations, Mar 1992, pp 6-7.

Table 5
Contracts Transferred to Saudi Arabia

Contract Category	No. of Contracts Transferred	Estimated Monthly Dollar Value
Fuel	12	$96,060
Transportation	68	$12,898,688
Water	13	$442,055
Food	18	$2,287,356
Facilities	30	$4,521,500
Total	**141**	**$20,245,659**

However, the Saudi government did not have the contracting infrastructure to administer the contracts, provide responsive support, or disburse prompt payment to contractors. Because of this, contractors were reluctant to enter into negotiations with the Saudis, with an end result of late delivery or no contract. There was also a tendency of awarding contracts based purely on the "low-bid." Moreover, the centralized system used by the Saudis for contracting everything in Riyadh did not respond to U.S. Air Force bases scattered throughout the kingdom. Fuel trucks, linehaul trucks, and construction equipment were all examples of inoperative or broken equipment rented for the United States by the Saudis, wasting their money and Air Force contracting officers' time. The CENTCOM components lost faith in the system and contracted for critical operational requirements themselves. For example, the U.S. Army elected to contract for the majority of its requirements and only started to transfer their contracts to the Saudi government in March 1991.

The biggest problems arose in trying to switch contract responsibility in mid-deployment–after the contracts had already been written and the equipment was in use. Colonel Busch said, "You can't just turn it in and have the Saudis write contracts from scratch. You just can't do that when you're in the middle of a deployment."[9]

Also, in many instances, our own supply system could have supported requirements, but was not utilized.[10]

In addition, new bases that came on-line after 1 November were heavily financed through Host Nation Support. For example, Al Kharj used $18.2 million in Saudi contracting support between 1 December 1990 and 31 January 1991. In spite of these successes, there were problems with Host Nation Support. CENTAF contracting devoted one full-time person as liaison with the Ministry of Defense for Aviation (MODA) to ensure that all contracts were successfully transferred and accepted.

Sustaining the Bases

Between October 1990 and February 1991, the local suppliers learned the law of supply and demand. Rental rates for some logistic items, such as forklifts, tractor trailers, vans, and buses, quickly increased to such a magnitude that the equipment often could be purchased for what had been paid in several months' rental. The immediate need, however, along with the uncertainty, and the lengthy process in obtaining approval often times precluded purchasing as an alternative to leasing.[11]

Once the initial "combat" contingency mode of contracting transitioned into the sustaining phase, CENTAF established a rear area contracting office at Shaw AFB, South Carolina. This provided for the purchase of medical supplies and equipment, computer and communications equipment, etc., in the United States and transported it to the theater much more effectively. By changing the contracting strategy to "two fronts,"

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[9] "Shopping From Scratch," *Air Force Magazine*, Dec 1991, pp 78-79.

[10] JULLS Rpt, 31705-45206 (00089), submitted by Col Downey, CCJ4/7-C, 17 Jan 1991.

[11] JULLS Rpt, 52237-50100 (00261), submitted by CUSNCR N9, Lt Snook, 17 May 91.

it was estimated that the U.S. government realized a cost savings of up to thirty percent.[12]

Contracting During the War

When Operation Desert Storm began, contracting had to compensate for some adjustments. Contracting officers were restricted to base in most instances which meant that purchases could only be arranged over the phone. Most contractors closed after dark, thereby reducing the buying day by half. Contractors started demanding cash and carry only. Some contractors refused to come to work unless they were provided a gas mask. Some food services contracts were terminated, since protection of food sources from terrorist contamination could not be guaranteed. During Threatcon Charlie[13] conditions, contractors were also restricted from entering installations. All such readjustments could result in paralyzing operations. Some D-day requirements for immediate contracting negotiation, included halon for F-16s, fuel trucks, linehaul trucks, concertina wire, sand bags, crash recovery vehicles, high-speed copiers to support Air Tasking Order production, and ¾-inch videotapes for aircraft gun cameras.

At the peak of combat operations, the United States had received more than $444 million in assistance from Saudi Arabia, Germany, and Japan. Much of this support was in the form of contracts awarded by the Saudi government to Saudi-owned companies, and by Saudi law any business operating in Saudi Arabia must be at least partly owned by a Saudi citizen. The success of such assistance depended heavily upon the relationship between the U.S. forces and the Saudi government.[14]

Sustaining this volume of support proved to be exceptionally challenging after 17 January 1991, when the air campaign began. Once the Iraqis began to retaliate by launching Scud missiles at cities in Saudi Arabia, laborers, stevedores, and truck drivers stopped working. (The

[12]Trip Report, Desert Shield Orientation, Capt Michael E. Hall, Acting Director of Contracting, Lessons Learned, 19 Nov 1990.

[13]Threatcon Charlie applies when an incident occurs or when intelligence indicates an imminent terrorist action against U.S. bases and personnel.

[14]Military Review, Lt Col Norman F. Hubler, U.S. Army Reserve, Jul 1992, p 76.

majority of the Saudi work force is composed of third-country nationals under contract with Saudi companies.)[15]

Closing Out the Contracts

With the cessation of hostilities, Lt. Gen. Charles A. Horner established a policy to cease new contracts except those required to support redeployment. Therefore, most of the contract effort shifted to terminating contracts, paying claims for damaged facilities and rental equipment, canceling contracts, and disbursing final payments to close out contracts. While contracting officers were the first in theater, they were the some of the last to leave. Even though many of the troops were leaving, the base close out teams still needed the same type contracts to support them in tearing down tent cities and reconstituting vehicles, hotel, food service, transportation, and other miscellaneous services. As of 30 June 1992, CENTAF had spent in excess of $244 million on contracts supporting the area of responsibility.

One of the concerns upon arriving in Saudi Arabia was to set up contracts for food service. At the end of the war, new contracts were needed to support redeployment.

[15] *Ibid*, pp 77-78.

4

Legal Support to Air Operations

Operations Law

The working relationship developed between CENTAF judge advocates and operations and intelligence personnel during exercises Gallant Knight/Gallant Eagle 88, Internal Look 90, and Bright Star 90 facilitated the early involvement of judge advocates in both the planning and execution of the air campaign. Throughout Operations Desert Shield and Desert Storm, judge advocates provided legal advice that helped craft operational guidance for defensive air operations, develop wartime rules of engagement, and review master attack plans, target selection, and weaponry decisions for all nominated targets.

Transitional Rules of Engagement

When the circumstances giving rise to the Persian Gulf War came about, there was no "off-the-shelf" reviewed and CJCS-approved Operations Plan available on which to base combat operations. When the Warning Order was issued, CENTAF lawyers assembled copies of the draft 1002-90 plan and of USCENTCOM Regulation 525-11, the regulation containing the approved peacetime rules of engagement for the USCENTCOM area of responsibility. These rules had a strong maritime orientation consistent with their use during Operation Earnest Will. Although USCENTCOM Regulation 525-11 contained a four- or five-page annex setting out rules for "Air Forces Not Supporting Carrier Operations," the rules of engagement were not designed to support the operational scenario presented by Operation Desert Shield.

The problem posed by the absence of rules of engagement tailored to the defensive air operations conducted during Operation Desert Shield was complicated by the deployment of USAF units that had not supported CENTAF and did not have copies of the governing rules. After ensuring that the F-15 squadrons at Dhahran and the AWACS and Rivet Joint crews at Riyadh had been briefed on the rules of engagement, the Director of Air Defense and the Chief of Operations Law worked together to overcome this by drafting supplemental rules tailored to support Operation Desert Shield air operations.

On 16 August 1990, USCENTCOM approved the release of supplementary guidance consistent with 525-11, and CENTAF transmitted its transition to subordinate, Naval, and Marine aviation units. Because the message constituted a "summary" of USCENTCOM Reg. 525011 and supplemental rules of engagement approved by the National Command Authority,[1] it also acted as a means of lawfully conveying SECRET NOFORN U.S. rules of engagement to other members of the Coalition involved in air operations.

During the initial, defensive phase of air operations, CENTAF's principal focus in the promulgation of the rules was the protection of high value airborne assets and responses to penetration of Saudi airspace. Working with the Royal Saudi Air Force and the Royal Air Force–the other Coalition partners flying combat air patrol–CENTAF developed Operational Guidance, on 2 September 1990, that set out combined rules of engagement and Beyond Visual Range weapons release procedures. These procedures were distilled from the Transition Rules of Engagement transmitted on 16 August 1990 and could only be properly applied within the context of those rules. The Operational Guidance was designed to respond to both potential airborne Iraqi defectors[2] and preemptive strikes. [DELETED][3]

In mid-October 1990, an Iraqi fighter penetrated the Saudi border and was almost shot down. As a result of this incident, Gen. H. Norman Schwarzkopf expressed concern about the provocative impact of shooting down an Iraqi aircraft near the border and suggested modification of the Operational Guidance [DELETED][4] On 4 November 1990, CENTAF forwarded the revised Operational Guidance to the CENTCOM Directorate of Operations for coordination. In a 13 November 1990 message, CENTCOM approved the guidance and directed CENTAF to transmit it to the other components.

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[1]CJCS message, "ROE Authorized Serial #1," 091335Z Aug 1990.

[2][DELETED]

[3][DELETED]

[4][DELETED]

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[DELETED][5] [DELETED].[6][DELETED][7] Ultimately, six nations agreed to the procedures contained in the operational guidance supplementing Operation Desert Shield transition rules of engagement.[8]

Wartime Rules of Engagement

At the same time operations personnel and judge advocates were working issues regarding transitional rules, they began drafting wartime rules of engagement. This was complicated by the fact that the Director of Air Defense, the person principally responsible for promulgating the rules, was not aware of the planning activities of the Special Planning Cell, or "Black Hole."[9] In contrast, CENTAF's principal operations lawyer had been busy in the Black Hole advising planners on legal issues associated with the offensive air campaign since August 1990. Upon direction of Brig. Gen. Buster Glosson and with the assistance of operational planners from the Special Planning Cell and CENTCOM, CENTAF lawyers drafted the first wartime rules of engagement in the Black Hole, in August 1990, and incorporated them into the Strategic Bombing Plan. These first wartime rules were drafted to cover the possibility that strategic bombing would begin before a more thorough version of rules could be staffed through the other components and CENTCOM.

In September 1990, the Director of Air Defenses and the Judge Advocate's Office began a more structured and formal review of wartime

[5][DELETED]

[6]CENTAF/DO letter, subject "CAP Manning," dated 15 Dec 1990.

[7]Msg, JHQ High Wycombe, 162006Z Dec 1990.

[8]AF Form 1768, Operational Guidance for Desert Shield, dated 21 Dec 1990.

[9](S) Only a select group of planners directly involved with the development of the campaign and the senior staff were allowed into the planning area, or even had knowledge of their activities. Very few members of the CENTAF Combat Plans Division and Combat Operations Division were granted access. *Command and Control* report, Chapter 6.

rules. After reviewing the combat rules contained in the USCENTCOM OPLAN 1021, CENTAF lawyers suggested reducing wartime rules to their most basic precepts, only covering those contingencies that friendly operators might face. Their goal was to make the rules more "user friendly." This suggestion was driven, in part, by a concern that the rules be universally understandable by U.S. aviators and air defense personnel and amenable to Coalition partners with a limited command of English.

The revised rules of engagement were organized using an "onion peel" approach, establishing separate sections to cover rules of engagement for specialized missions such as "Air to Air Engagements" or "Ground-Based Air Defense Systems." This revision permitted operators to shred out the rules of engagement pertinent to their mission for quick, easy reference. It also solved certain foreign releasability problems, as relevant sections could stand alone and be distributed to, or withheld from, Coalition partners on a need to know basis.

With concurrence of the Director of Operations, the Judge Advocate at CENTAF drafted a new version of wartime rules of engagement that eliminated references, deleted definitions not pertinent to air or air defense operations, and reduced the rules to basics. The initial draft contained less than twelve paragraphs. Four major areas discussed were beyond visual range rules, ground-based air defense rules, long-range deployment rules, and command and control wartime identification procedures.

As a way of illustrating how the rules of engagement were drafted, the final approved version of the basic Joint Force Air Component Commander (JFACC), COMUSCENTAF, the Wartime Rules of Engagement read as follows:

- Upon the direction of USCINCCENT, the following rules of engagement apply:

  [DELETED]

  - All reasonable measures must be taken to spare, as far as possible, buildings (such as mosques) dedicated to religion, historic monuments, hospitals and places where the sick and wounded are collected, provided they are not used for military purposes.

  [DELETED]

Targeting

The essence of targeting is to exert every reasonable effort to pinpoint bombs on a military target. Absent specific target restrictions established under international law or imposed by commanders through mechanisms, such as the CENTCOM Joint No-Fire Target List, there are essentially two legal principles considered in targeting decisions–military necessity and proportionality.[10]

Strategic Targets

General Glosson gave the Special Planning Cell's legal advisor the original strategic target list for review as soon as it arrived in theater in mid-August 1990. Many of the 84 targets on the original list were familiar to the legal advisor because they had been included in target sets compiled during Internal Look 90. The strategic target list was expanded to 238 targets over the next several months. The legal advisor worked with intelligence and operations personnel to ensure that the methods of engaging targets met the legal criteria for a military target and proportionality. In most instances the legal issue raised by a given target was how to design a means of attack that met the criteria of proportionality.

Unquestionably, the strategic targets that posed the most challenging legal problems were Iraq's Nuclear/Biological/Chemical (NBC) assets. The intelligence and scientific community provided the Planning Cell with detailed information that helped in the development of attack methodologies meeting the requirements of international law.

[DELETED] For example, the potential collateral damage caused by venting radioactive fallout into the atmosphere precluded conventional bombing attacks on the nuclear reactor where the fissile material was probably stored. After extensive discussions with engineers and studies

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[10]Most legal scholars opine that targeting decisions encompass three legal principles rather than two. These scholars would include the principle prohibiting the use of weapons that cause unnecessary suffering, according to Annex to Hague Convention Number IV, 18 Oct 1907, paragraph 27(e). This principle is not germane to most combat targeting decisions. Except for questions concerning the possession and use of expanding (dum dum) bullets, munitions deployed for use by U.S. forces undergo a legal review during the development and acquisition process to ensure their employment will not violate this prohibition. See DOD Instruction 5500.15, AFR 110-31, paragraph 6-7a. HHh.

of the building housing the reactor, an acceptable plan of attack that met collateral damage concerns was developed. Precision-guided munitions were employed against key points of the structure causing the building to collapse and precluding Iraqi access to or employment of nuclear material. Similar approaches were taken to develop attack sequences for the engagement of biological and chemical research and storage facilities.

Planners demonstrated an appreciation of the legal issues involved in reviewing targets and weapon system and munitions selections to use against a target. Attacks on "dual use" facilities such as electric power generation stations, petroleum manufacturing and storage, communications, and transportation nodes were designed to temporarily disable the facility to avoid collateral damage concerns. POL storage tanks were destroyed rather than the cracking towers. In most cases electronic grids were targeted rather than electric generators. In each case, a lawyer reviewed the master attack plan and rarely had to voice legal concerns that required further review of the method and means of attack.

Within CENTAF there was complete agreement between operators and lawyers on even the two most contentious targets–Saddam Hussein's statue and the Al Firdos bunker. The Hussein statue was one of several "psychological targets." When this target was evaluated prior to the war, it was deemed a legitimate military objective because by its nature, location, and purpose, it contributed to the Iraqi war-fighting and war-sustaining capability. Its destruction would reduce psychological support for Saddam's regime and possibly sap the Iraqis' will to resist. As the air campaign progressed, characterization of the statue as a legitimate military target changed. CENTAF lawyers argued that the statue remained a lawful target and that any decision to deploy a weapon system, put an aircrew at risk, and expend munitions to destroy it was a commander's decision. Lawyers at CENTCOM and in Tactical Air Control did not share this view. Ultimately, the Secretary of Defense decided against targeting Saddam's statue because at that stage of the conflict such an attack would be gratuitous.

The Al Firdos bunker was one of the command and control bunkers listed on the final approved strategic target list. Because these command and control facilities were located in civilian sections of Baghdad and were not operational, planners in the Black Hole did not intend to target them. However, after inputs from the intelligence community indicated that the bunker at Al Firdos was operational, it was selected as a target.

The review of imagery indicated the bunker was fenced off from adjoining public buildings, and civilian bomb shelters were located elsewhere in the vicinity. Based on the weapon system and munitions selected against the bunker, no legal problems were presented. Credible evidence supported the conclusion that Al Firdos was an operational command and control center and a legitimate military target. As an added precaution, the attack was scheduled before dawn to avoid potential collateral injury to civilians outside the bunker's perimeter.

Targets in the Kuwaiti Theater of Operations

From mid-August 1990 through the cessation of hostilities, the Joint Target Coordination Board (JTCB) met daily.[11] For the first several months, target lists were built and updated by Army, U.S. Marines, MARCENT, and CENTAF representatives. (Only three people that participated on the board–two CENTAF targeteers and a CENTAF operations lawyer–were also involved in the initial planning of the Offensive Air Campaign in the Black Hole). When the air campaign shifted to targets in the Kuwaiti Theater of Operations (KTO), the JTCB became the mechanism to feed validated targets nominated by Army, Navy, Marine Corps, and Coalition representatives into the Black Hole's KTO Cell.[12]

Dependent on USCINCCENT's announced priorities and the allocation of sorties by the Joint Forces Air Component Commander, the board consolidated validated target nominations submitted by the supported land and naval components into a single list in order of priority.

To thwart potential criticism of the United States in its target selection within the KTO, the CENTAF Judge Advocate (with COMUSCENTAF approval) reviewed target nominations with representatives of the Kuwaiti Air Force and obtained concurrence on the nominated targets. Using a mosaic of overhead imagery of the KTO, the lawyer and the Kuwaitis would review the daily target lists. They would annotate the target lists with information that could be used in selecting the right mission package that would limit collateral damage. For example, when an Iraqi unit in Kuwait City was to be attacked, warnings were provided to the aircrew

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[11] *Command and Control* report, Chapter 6: Black Hole and its Impact.

[12] *Ibid.*

assigned the mission to avoid damage to a nearby oil-gathering center that serviced the Kuwait City desalinization plant.

After the list was created and approved at CENTCOM, it was returned to the planners in the KTO Cell for inclusion in the Air Tasking Order, subject to allocation by the Joint Force Air Component Commander. Judge advocates also resolved target selection issues raised by the combat operations section of the control center. For instance, when operators sought to strike Matherra airfield in Baghdad, known to be the location of the Iraqi Air Force Headquarters, lawyers were asked if it was permissible to strike commercial aircraft found on the field. Based on intelligence reports, judge advocates determined that Iraq had clearly used its civilian air fleet for military purposes, such as the movement of troops and equipment in and out of Kuwait City. Therefore, any protection which would otherwise be afforded civilian aircraft had been lost.

[DELETED][13] [DELETED][14]

Supporting Deployed Forces

Use of Civilians in Combatant Roles

Attorneys in the Gulf were confronted with situations requiring knowledge of the law of armed conflict. This was especially true regarding the status of civilians and service noncombatants involved in the Gulf War. Judge advocates helped interpret the sections of the 1949 Geneva Conventions that recognized a role some civilians could play in armed conflict without necessarily losing the protection accorded them as civilians. For instance, civilian members of aircrews and war correspondents were considered to be "noncombatants" for the purposes of the Convention Relative to the Protection of Prisoners of War so long as they did not directly take part in hostilities.[15] However, upon capture they would be considered as combatants and therefore entitled to be protected as prison-

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[13](S) Memo for Record from Col Kansala, CENTAF/JA, to Brig Gen Glosson, CENTAF/DO, 18 Feb 1991.

[14](S) Letter from Maj Harry Heintzelman, CENTAF/JAI to USCINCCENT/CCJA, 18 Feb 1991.

[15]Geneva Convention Relative to the Protection of Prisoners of War, 12 Aug 1949, Art. 4, 6 U.S.T. 3316, 75 U.N.T.S. 135 [hereinafter GPW].

ers of war. This status was vital to members of the news media who had been authorized, by the Secretary of Defense, to accompany aircrews on B-52, tanker, and AWACS missions in-theater.[16]

The crew of the Joint Stars aircraft included civilian contractor personnel largely responsible for on-board analysis of technical information acquired by mission-related systems.[17] Although civilian members of military aircrews were specifically protected under the convention, some argued that opposing forces would construe their participation as a direct support of the war, therefore removing any protection to which they may have been entitled. Nor would these civilians be considered as "lawful combatants," because they did not satisfy the necessary requirements for such status (i.e., authorized by a competent authority to engage directly in armed conflict, commanded by a person responsible for his subordinates, wearing a uniform or having a fixed, distinctive sign, recognizable at a distance, and carrying any arms openly). For civilians, the consequences of losing the protection of combatant as well as noncombatant status are serious: if captured they can be tried as spies under the criminal law and incarcerated or executed, as the offense permits. For this reason, civilian personnel participating in support of the Gulf War received careful legal scrutiny as well as legal briefings on the possible consequences of their participation.

Medical and Religious Personnel

Medical personnel and chaplains are also accorded noncombatant status. The 1949 Geneva Conventions recognized two categories of medical personnel: those "exclusively engaged" in medical duties (including administration of medical units)[18] and those considered part-time medical personnel.[19] Those considered exclusively engaged in medical duties are to be accorded respect and protection at all times. Upon capture, they are not to be considered as prisoners of war, and are to be

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[16]Msg from USCINCCENT/CCCS to USCENTAF FWD/CC. "B-52 Media Coverage," 5 Feb 1991.

[17]Peter Grier, "Joint STARS Does Its Stuff," *Air Force Magazine*, Jun 1991, p 40.

[18]Geneva Convention for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field, 12 Aug 1949, Art. 24, 6 U.S.T. 3114, 75 U.N.T.S. 31 [hereinafter GW].

[19]*Ibid.*

retained only until their services are no longer needed.[20] Those that are considered part-time medical personnel are also to be respected and protected if they are performing medical duties at the time they fall into enemy hands.[21] However, they are considered prisoners of war and are retained by the enemy until the end of active hostilities. By Air Force policy, permanent medical personnel are not assigned duties incompatible with their medical service.

Despite this policy, questions arose regarding the protected status of medical personnel. In response to these questions, the CENTAF Judge Advocate promulgated opinions delineating the nonmedical duties of auxiliary medical personnel and describing permissible protection for aircrew members in the event of capture.[22] Requesting agencies were informed that it was not permissible to "sanitize" their flight suits, remove all identification, such as rank, name tags, and patches) to be certain they would be accorded protected status as noncombatants. However, it was permissible to arm themselves if extreme caution were exercised.[23]

[DELETED][24] [DELETED][25]

International Law

Addressing issues of international law between U.S. and host nations was difficult because of the limited presence of U.S. forces in the region prior to Operation Desert Shield. The only official relationship took place through military assistance programs and annual or biannual exer-

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[20]GW, *supra*, note 19, Art. 33.

[21]GW, *supra*. note 19, Art. 25.

[22]Letter from Lt Col William Schmidt to HQ USCENTAF/SG, 30 Jan 1991. Memo from Lt Col William Schmidt to Col Kansala, 22 Feb 1991.

[23]Letter from 1611st Aeromedical Evacuation Squadron (Provisional) to All Operating Locations, 27 Jan 1991. See also Air Force Pamphlet 110-31, Chapter 7, "Uniform, Insignia, and Marking Requirements," para 7-3, 19 Nov 1976.

[24](S) Letter from Capt Steven Miller, 401st TFWP (CENTAF) to USCENTAF/JA, 16 Jan 1991; (S) Letter from CENTAF/JA to TFWP 401/JA, 14 Feb 1991.

[25]Letter from Capt Kniffen to Col Kansala (CENTAF/JA) undated; See also letter from CENTAF/JA to CENTCOM/JA regarding "Operational Law Issue at Shaik Isa" (undated).

cises. Status of forces and other international law issues had only been raised on an ad hoc basis.[26]

At the outset of Operation Desert Shield, the United States had status of forces agreements in effect with Bahrain, Egypt, Saudi Arabia, and Oman, all of which were primarily designed to cover security assistance personnel. Subsequently, Saudi Arabia extended the same immunity covering the diplomatic mission to all deploying forces.

[DELETED][27]

Without a status of forces agreement in Qatar prior to Operation Desert Shield, judge advocate personnel were rebuffed during negotiations more than once by the ambassador and his staff when they tried to determine the status of negotiations.[28] In the absence of any formal agreement, attorneys, security police, and the Office of Special Investigations coordinated with the Qatar Ministry of Information and Police and established informal procedures covering the exercise of criminal jurisdiction and other status of forces agreement issues. Pursuant to these informal procedures, several U.S. military personnel who committed minor criminal offenses were turned over to U.S. forces for disciplinary action. Canada and France also adopted such informal policies and procedures.

The deployment of U.S. civilian contractors to the Gulf region presented the judge advocates a unique problem. Under the terms of the U.S. Saudi Exchange of Notes of 12 October and 3 November 1990,[29] civilian and military personnel were to be accorded status equivalent to the technical and administrative staff of the U.S. Embassy. What wasn't clear was whether civilian contractor employees were considered part of the "United States Forces" as used in the agreement. The Joint Chiefs of

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[26](S) Msg from HQ AFTOSA to USCENTAF Forward, "AOR Criminal Jurisdiction," 29 Aug 1990.

[27](S) Message from USCINCCENT/CCJA to USCENTAF Forward, "Host Nation Jurisdiction Over U.S. Forces Personnel Deployed in Saudi Arabia," 3 Sep 1990. See also Agreement Between the Government of the United States of America and the Government of the Kingdom of Saudi Arabia Concerning United States Forces in Saudi Arabia, 17 Aug 1990, U.S.-Saudi Arabia.

[28]Lessons Learned from Capt Miller, 401st TFW/JA.

[29](S) See note 28, *supra*.

Staff legal advisor and the Service's Judge Advocates General's offices all agreed to interpret the agreement to include contractor employees as part of the U.S. Forces in the absence of any negotiated status for such personnel. However, because of the unilateral nature of this interpretation, U.S. contractors could have been placed in a rather precarious position had the Saudi Arabian Government ever challenged their presence in Saudi Arabia.

In addition to the lack of status of forces agreement interpretations, operations were hampered by the lack of agreements to cover such contingencies as air refueling between host nations and third-party countries. U.S. law itself occasionally impeded actions because it was not flexible enough to respond immediately to the exigencies of the war. For example, the Arms Export Control Act prohibits U.S. personnel from performing duties of a combatant nature, including "training and advising" foreign forces engaged in combat activities outside the United States.[30] As written, the Act seemed to preclude U.S. technical teams from continuing to assist Saudi forces because they were engaged in combat, even though they were allies. Without time to amend the law, key Congressmen resolved the issue at a briefing, agreeing to interpret the law in a broader sense.

Legal advisors provided critical advice to commanders regarding the legal limits of their authority. For example, commanders were not generally aware that their authority to loan or transfer property to host governments was practically nonexistent. At Incirlik Air Base, Turkey, the host nation commander requested the U.S. loan or transfer essential equipment to his forces in support of the war effort.[31] Another time, the Turkish commander requested chemical gear for Turkish personnel guarding the base. In some cases, the only viable fix proved to be a demand for the return of the equipment provided, to the embarrassment of the U.S. commander and the frustration of the host nation commander.

Claims

The Department of Defense, through DOD Directive 5515.8, assigned the Air Force responsibility, as Executive Agent, to administer claims for the entire theater (with the exception of Bahrain, where this responsibility

[30]Arms Export Control Act, 22 U.S.C. Sect 2751, 2761-2762, as amended.

[31]Lessons Learned from Col Dennis Yoder, HQ TUSLOG/JA.

fell upon the Navy).[32] The Air Force, in turn, delegated this authority to the CENTAF staff judge advocate (for CENTCOM) and the staff judge advocate of each air base, station, and fixed installation in the theater.

However, during Operation Desert Shield, claims authority was redelegated to military attorneys in the other military Services.[33] The senior military attorney at each installation became the staff judge advocate with delegated claims authority. Ultimately, judge advocates from other military Services were appointed as Foreign Claims Commissions to process and approve claims.

Egypt and Oman waived intergovernmental claims with the United States. However, these agreements affected only a small portion of the military members deployed to the theater. At the commencement of Desert Shield, for example, the Air Force paid claims to Saudi Arabia and the United Arab Emirates for damages to government property. Subsequently, at the direction of the Joint Chiefs of Staff, the Air Force accepted claims for damaged Saudi military property but declined to pay pending negotiation of a mutual waiver of claims. Similarly, the Air Force did not pay claims for death or injury to Saudi military personnel caused by its personnel acting in the scope of their official duties.

During the Gulf War, payment of claims to individual claimants was also complicated by cultural and logistical differences. Because of this, the Air Force procedure for progovernment claims processing became largely unusable.[34] For example, claimants in the Middle East were accustomed to asserting claims verbally and objected to signing any claim document, particularly a Standard Form 95.[35] In cases where potential claimants were illiterate, however, it was necessary to accept verbal requests for compensation as long as the requests were accompanied by sufficient proof of injury or damage.

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[32] Policy Letter from CENTAF/JA to All CENTAF Judge Advocates and Paralegals, Atch 1, 31 Aug 1990.

[33] Lessons Learned Report, HQ USAF/JACC.

[34] Lessons Learned (unsigned).

[35] *Ibid.*

Military Justice

Overall, the military justice system functioned successfully during the Gulf War. However, there was an early, fundamental problem: the military justice system depends on the existence of properly created organizations (and officers to command them). Early in Operation Desert Shield those organizations did not exist.[36] Air Force personnel deployed primarily by Unit Type Code, not by unit, and in the theater of operations, there were no CENTAF or CENTCOM units to which Air Force personnel could be attached. As a result, deploying major command commanders had no units to command when they arrived in the theater. Without a definitive USAF organizational structure, Air Force officers were initially without authority to administer military justice, and confusion arose as to who was in command for administrative and disciplinary purposes, especially where active, Guard, and Reserve personnel were deployed.

Under the terms of Air Force Regulation 26-2, CENTAF was not authorized to create units (only HQ USAF had that authority). To resolve the organizational problems, the participating major commands deployed provisional units, attached deployed personnel to them, and appointed commanders of the units. Strategic Air Command, Military Airlift Command, and U.S. Air Force Europe activated provisional units; Tactical Air Command initially set up "deployed" units [e.g., 1 TFW (Deployed)], then converted to provisional units.[37] A comprehensive organizational structure was not in place until about four months into Operation Desert Shield. Ultimately, CENTAF/CC recognized Air Force hosts for each installation (from the participating major commands), and designated the senior commander of the host unit as a special court-martial convening authority.[38] CENTAF/CC was the only such Air Force general authority in the theater.

The Air Force reconsidered its position on the imposition of nonjudicial punishment (Article 15, UCMJ) on Air Force members of a joint command, when the joint commander represented a different Service.[39]

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[36]Lessons Learned Report from Col William At Lee, Jr.

[37]Special Order G-12, from HQ TAC, 13 Sep 1990. *See also* Msg from HQ TAC/JA, 17 Sep 1990.

[38]Special Order G-4 from USCENTAF/CC, 10 Nov 1990.

[39]Lessons Learned Report, Col William At Lee, Jr.

Tension existed between the competing interests of a joint commander needing the disciplinary authority of command and a Service's interest in the consistency applying the code of military justice on its members. The Air Force regulation on nonjudicial punishment (AFR 111-9) defines "commander" for Article 15 purposes as being an Air Force officer only. In at least one case, Article 15 action was delayed to find an appropriate Air Force officer to impose the Article 15, while the joint commander (Army, Joint Communication Support Element) was available and willing to take action. Ultimately, the rules of 337 Article 15s were imposed in the theater during Operations Desert Shield/Desert Storm, all by Air Force Commanders. The Air Force did designate a joint commander to act on appeals from nonjudicial punishment imposed by CENTAF/CC.[40]

Military justice problems did not end once nonjudicial punishment was imposed: punishment implementation problems were varied and pervasive. Forfeitures of pay often were not deducted in a timely manner,[41] obtaining pay statements while deployed was problematical, and installation-level administrative teams and CENTAF Directorate of Personnel staff were unable to enter new dates of rank into the personnel system for members reduced in rank.[42] Additionally, personnel information sheets were unavailable for processing military justice actions. In each case, a message had to be sent to the member's home station requesting that the data be sent to CENTAF.[43]

Another impediment to the administration of theater military justice was the unavailability of drug and alcohol deterrence and detection measures [blood alcohol (BAT) and urinalysis testing].[44] This could have led to a host nation demanding surrender of an Air Force member for testing, a potentially serious problem, particularly in Saudi Arabia where alcohol consumption is a serious crime.

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[40]Msg from HQ USAF/JAJM to HQ TAC/JA, 21 Dec 1990.

[41]Lessons Learned (unsigned).

[42]*Ibid.*

[43]*Ibid.*

[44]Letter from USCENTAF/J to USCENTAF/SG, 5 Jan 1991.

Administrative Issues

Mobility and Deployment

Operation Desert Shield was the first rapid deployment of any magnitude ever undertaken by the Air Force Judge Advocate General. At the peak of the war, the theater was manned with forty attorneys and forty-two paralegals at twenty-three offices.[45]

Judge advocate provided legal assistance for more than 55,000 Air Force members deployed to the Gulf, as well as family members remaining behind. In spite of a concerted effort in recent years to ensure that everyone on mobility is counselled on the need for a will, roughly 46,000 wills had to be prepared in conjunction with deployment.[46]

Except for judge advocates at CENTAF, deployed attorneys lacked sufficient security clearances and were initially denied access to critical operational information needed to provide legal advice during combat operations.[47] For example, the CENTCOM No-Fire Target List was initially a TOP SECRET document for which most attorneys were not cleared. To ensure deployed (wing-level) attorneys had access to this information, CENTAF judge advocates requested and received approval from CENTCOM to downgrade the classification to SECRET.

From August through December 1990, only two attorneys had access to Special Compartmented Information (SCI) material necessary to determine the legality of targeting decisions. Because offensive air information was compartmentalized, access to strike plans and target lists was restricted to the CENTAF Special Planning Cell legal advisor. When the legal

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[45]Because the Time Phase Force Deployment Date (TPFDD) utilized to support Desert Shield was cobbled together from previously approved OPLANs, it was not Force Sized appropriately; consequently, TAC and CENTAF elected to individually source legal personnel in order to tailor installation legal sections to meet the anticipated legal requirements of the supported organizations. See also Bullet Background Paper from Colonel Kansala, CENTAF/JA, 23 Apr 1991.

[46]Letter from HQ USAF/JACA to HQ USAF/JACI, 26 Mar 1991.

[47]Intvw with Lt Col Harry Heintzelman, former CENTAF/JAI, at the Pentagon, Washington, DC, 3 Aug 1992.

advisor performing this function received augmentation in December 1990, it took two weeks for the augmentee to obtain SCI access authorization.[48]

Judge Advocate Reservists

Gulf War operations resulted in widespread reliance on reserve personnel,[49] both in the theater and in backfill assignments. At the conclusion of the war, judge advocate Individual Mobilization Augmentees (IMAs) had served more than 8,000 man days at 35 locations. In addition to attorneys, approximately 36 Category B IMA paralegal augmentees served in support of Gulf operations. Furthermore, approximately 117 Air Force Reserve attorneys and 45 paralegals were mobilized. Of these, one attorney and one paralegal were assigned to Southwest Asia.

Unlike the Reserves, members of the Air National Guard (ANG) extensively deployed to the Persian Gulf. Although ANG and active forces worked well together, the initial policy of rotating personnel by the National Guard approximately every thirty days made it difficult to establish judge advocate continuity with theater commanders.[50]

Computer and Communication Support in the Theater

Legal operations were given a low priority for using communications systems, which impeded their ability to provide timely legal services. Communications between theater legal offices was also a problem.[51] Some bases were equipped with TACNET (the local equivalent of AUTOVON communication lines; some had commercial only, or a mixture of commercial and TACNET capabilities; others had a local system without a long-distance capability. Only a few offices had both systems).

Since the staff judge advocate at CENTAF believed communications between major commands was essential, in August 1990 he began send-

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[48]*Ibid*; Lessons Learned input from Lt Col Schmidt, HQ USAFE/JAI. See also Lessons Learned from Maj Walter Skierski, Jr., 67th TRW/J.

[49]Reserve personnel consisted of Category B IMA, Ready Reserve and Air National Guard personnel.

[50]Lessons Learned, (unsigned).

[51]Lessons Learned from Col Morris Tanner, Jr., 1st TFW/J.

ing weekly messages to bases and their headquarters informing them of essential judge advocate activities.[52] In this way, CENTAF was able to keep judge advocate offices, both in and out of the theater, informed of developments affecting operations.

Nor did legal offices have a legal research capability. In September 1990, the Judge Advocate's Legal Information Services moved to resolve this problem. They scanned the Manual for Courts-Martial, a set of selected treaties, Status of Forces Agreements, and sixty-nine USAF regulations into electronic format. The information was archived, transferred to 3.5-inch floppy disks, and sent to the theater in December 1990. Known as the "REFLEX" system, it became the core of base legal research.

Connecting theater base-level legal offices to the on-line Funded Legal Information Through Electronics system used for on-line legal research was difficult because of connectivity problems. This system was hosted on a mainframe operated by the Computer Service Center, in San Antonio, Texas,[53] and attempts to access this database through the use of toll free and commercial number access points in the United States were unsuccessful. Finally, CENTAF contracted with a local company in Riyadh to pay for access to the data, and subsequently the Legal Information Services office was able to program their minicomputer to dial automatically and connect via the Defense Data Network.

[52]Lessons Learned from Col John Duncan, Jr., HQ TAC/J.

[53]Letter from AFLSA/JASF to HQ USAF/JAI, 28 Jul 1992.

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Weather Operations

On 7 August 1990, the Air Weather Service initiated deployment of weather support forces.[1] By the start of the Gulf War, this force consisted of 475 men and women organized as the 1690th Weather Group (Provisional) under the command of the CENTCOM Staff Weather Officer, Col. Jim Goldey. Equipped with the latest generation of tactical weather equipment, weather satellite receivers, and tactical communications, they were collocated with supported customers at operating locations throughout Southwest Asia (see Figure 4).[2] The worldwide air weather service structure and the global weather communications system supported their efforts.

A "Benign" Environment–The Influence of Expectations

During Operation Desert Shield, weather played an inconsequential role in military operations. Week after week of clear skies, hot temperatures, and operations in areas without blowing sand confirmed the view already held by senior military leaders and planners that weather in the Persian Gulf was and would remain benign.[3] This lack of significant weather minimized the perceived value of having a capable weather support force on scene and fully integrated into operational planning. Climatology provided by staff weather officers only further confirmed this view. Weather which could detract from air operations was indeed a climatologically rare event in the Persian Gulf region as compared to theaters in which U.S. or allied forces trained or had previous experience,

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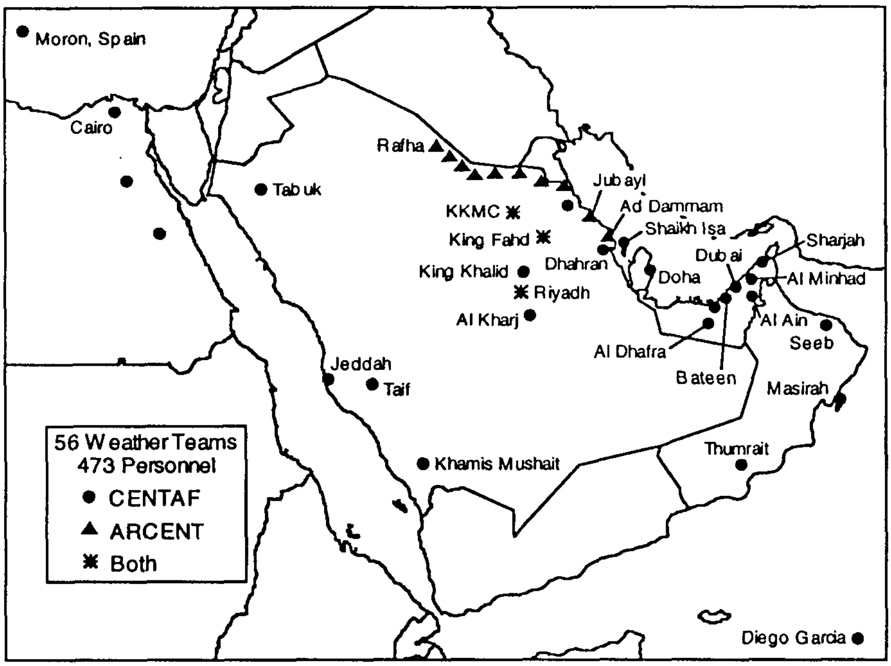
[1](S) Air Weather Service Historian (AWS/HO) Special Study, *AWS Role in Operation DESERT STORM/DESERT SHIELD*, Dr. William E. Nawyn, 27 Feb 1992, p 13.

[2](S) Air Weather Service DESERT SHIELD/DESERT STORM Report No. 2, *An Analysis of AWS Support to DS/DS*, 6 Dec 1991, p 25.

[3](S) USAF Environmental Technical Application Center Technical Note 92/003, *Gulf War Weather*, pp 2-1 to 2-2-57; AWS DS/DS Report No. 1, p 3.

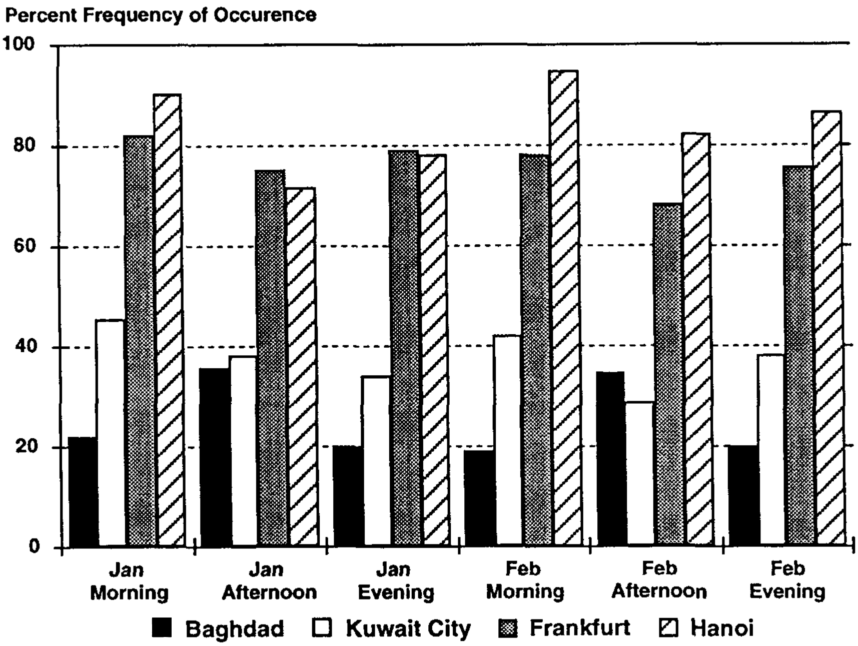
such as Europe or Southeast Asia. For example, as shown in Figure 5,[4] a climatological comparison of Baghdad, Kuwait City, Frankfurt, Germany, and Hanoi, North Viet Nam for an operational go/no go threshold of cloud ceilings at or below 10,000 feet shows that "normal" January and February conditions would have been at least twice as bad in Germany or North Vietnam as in the Persian Gulf region. Looking at the frequency of weather which could affect low-level operations (clouds at or below 1,000 feet), the chances become dramatically smaller–less than 5 percent of the time. From a climatological viewpoint, the Persian Gulf is a relatively "benign" environment.

Figure 4
Weather Support Forces



[4]USAF Environmental Technical Applications Center Study, *Comparison of Germany, Viet Nam Climatology to Persian Gulf Climatology and DESERT STORM–January through March*, 19 May 1992, Capt R. D. Arnold and TSgt R. C. Bonam.

Figure 5
Climatology for 10,000 Ft or Lower Ceilings



Comparison of climatology in the Persian Gulf also points out a valuable lesson for future contingencies in less "benign" climates like Europe or Southeast Asia. The successful high-level tactics employed in the Gulf War, which required visually acquiring and attacking targets from above 10,000 feet, would be nearly impossible during a typical European winter or Southeast Asian monsoon. Targets in those theaters would be obscured by clouds ceilings at or below 10,000 feet 80 to 90 percent of the time. In fact, in comparing regional climates around the world, the Persian Gulf region is exceptional even in the cloudiest season, when high-level tactics could be used effectively.

Prepared for War

Centralized forecast guidance flowed via the Automated Weather Network (AWN) from Air Force Global Weather Central (AFGWC) at Offutt AFB, Nebraska, to the Desert Storm Forecast Unit (DSFU) and the ARCENT Weather Cell at Riyadh, Saudi Arabia. These theater weather centers then blended the global guidance with theater weather data to support staff weather officers at CENTCOM, CENTAF, ARCENT, and SOCCENT and with field-deployed weather teams. Weather teams then built mission-tailored products for their operational customers, coordinating their operational forecasts back through their component staff weather officers when needed. At each level, weather support products were built using past information (climatology), current data (field observations and pilot reports), and centralized guidance.

By January 1991, the widely dispersed weather support force was tied together by reliable theater-wide weather communications. Defense Meteorological Satellite Program (DMSP) meteorological satellites provided critical weather intelligence from data-denied enemy territory, and a light-weight, transportable upper air sounding system measured winds, temperature, humidity, and pressure for the upper atmosphere. The forecast unit was providing forecast guidance to staff weather officers and deployed weather teams based on expertise developed by the preceding months in theater. Weather teams at CENTAF airfields were providing face-to-face support to wing commanders and flyers, and Army commanders received support from attached Air Force weather teams that were trained and equipped to follow them into battle.

Climatology Versus Actual Weather

Weather during January and February 1991 was not typical for the winter months in the Persian Gulf. An analysis of cloud cover performed by Air Force Global on the basis of fourteen years of nephanalysis confirmed abnormally cloudier weather over Baghdad, Iraq, between 15 January and 28 February. This analysis was a blending of cloud data compiled from Defense Meteorological Satellite Program imagery with surface and upper air observations. The 14-year January average of 1.7 mean eighths of cloud cover compared to 3.4 mean eighths in January 1991; the 14-year February average of 1.5 compared to 2.5 in February 1991. This amounted to nearly twice the cloud coverage that would lead climatology to anticipate.

Such analysis for Kuwait produced similar results. In fact, February was more than twice as severe over Kuwait–2.2 versus an expected average of 0.8. The United States Air Force Environmental Technical Applications Center conducted a further statistical analysis of the fourteen-year climatology for Baghdad and the Kuwaiti theater of operations to estimate the likelihood of the weather for 1991. The probability of that much cloud cover over Baghdad was about two percent in January and five percent for February and less than one percent for both months over Kuwait. The 1991 Persian Gulf winter was indeed an unusually poor weather year–about twice as unusual as normal.[5] The effects of this deviation from normal on the air war was significant.

Weather Impacts Compounded by Tactics

Though the 1991 Persian Gulf winter was worse than normal, weather over target areas became a major impediment to the conduct of the air war only after its effects were compounded by the change in air tactics. The achievement of air superiority by the third day of Operation Desert Storm meant the elimination of the threat of detection and enemy counterair. Since the necessity to fly low to avoid detection no longer existed, the aircraft faced the only remaining enemy threat: antiaircraft artillery. It became apparent that it was more effective to ingress, attack, and egress above enemy antiaircraft artillery–above 10,000 feet. This new attack profile also dramatically increased the importance of cloud ceilings that obscured targets. Rather than focusing on a threshold of cloud ceilings at or below 1,000 feet, a cloud ceiling up to 10,000 feet became the important criterion in mission planning and target selection. During Operation Desert Storm operational thresholds increased the amount of time targets were below weather thresholds from around 1 to 2 percent (for 1,000 foot ceilings) to about 33 percent of the time. In 1991's "bad" weather year, clouds obscured targets over Baghdad and Kuwait as much as 40 percent of the time. Weather thus became a major impediment to the air campaign.[6]

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[5](S) AWS DS/DS Report No. 1, pp 1-3.

[6](S) *Ibid*, p 1.

Weather Support to Desert Storm Planning

Senior military leaders and force planners used weather information in the early planning of operations of the Gulf War. The region's climatological data were produced by the Air Force's Climatology Center, the Environmental Technical Applications Center, and other agencies, such as the Air Force Global Weather Central, 2d, 5th, and 7th Weather Wings, National Oceanographic and Atmospheric Administration, the Naval Oceanography Command, and the U.S. Marines. The most useful product was the "descriptive climatology" of Iraq and the Arabian Peninsula, a distillation of all available meteorological information (scientific studies, reports, and data–both published and unpublished) about the region.

Staff weather officers used it to help planners predict weather impact on Gulf War operations including air and sea deployment; desert survival; nuclear-biological-chemical warfare; equipment storage, maintenance, and performance; targeting and bombardment; precision-guided munitions; and amphibious, airborne, and air assault operations.[7] In particular, early planning focused on conditions expected to affect offensive air operations–low-level attacks, air refueling, landings and departures, etc.–and Army ground combat maneuvers. Staff weather officers and planners, therefore, focused on climatology for percentage occurrences of low cloud ceilings, restricted surface visibility, and precipitation. Early planning did not focus on the middle or high cloud ceilings which later became an important operational threshold. Accordingly, aside from the extreme heat, occasional sand/dust storms, or an isolated thunderstorm, the Persian Gulf was expected to be and to remain a relatively "benign" environment for combat operations.

Limitations of Climatological Support

Accurate climatology provided to military leaders and planners was useful in preparing military forces to operate in the Persian Gulf region. However, climatological support alone did not anticipate the entire range of potential impacts to operations. For example, the strategic bombing of Baghdad was affected by persistent cloud cover which, according to

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[7](S) AWS DS/DS Report No. 2, pp 117-125.

climatology, was unlikely.[8] Clearly, weather anomalies experienced during the winter were not anticipated by using climatology which focuses on historical means and averages. Rare events are smoothed out. Furthermore, climatology for a region is only as good as the historical weather data upon which it is based. At airfields where both Air Force and host-nation observers took observations, practices were observed that raised questions about the climate database for that region. In general, host-nation observers appeared to report better weather than it was.[9] These differences of typical observation practice may partially explain the "optimistic" climatology for the Persian Gulf region. It is also likely that the winter of 1991 was an unusual occurrence–the likes of which happen once every twenty years in the Persian Gulf.

Early Weather Planning at the Pentagon

Detachment 2, HQ Air Weather Service began satisfying requirements for climatology of the Persian Gulf region in August 1990. In September, detachment planners presented a point paper to the Chairman of the Joint Chiefs of Staff, Gen. Colin Powell, on the climate in Saudi Arabia, Iraq, and Kuwait for October 1990 through March 1991. As Operation Desert Storm planning accelerated in the fall of 1990, Air Staff planners and others provided climate information such as the probability of clouds at specific levels, monthly temperature extremes, monthly precipitation, dust and visibility conditions, and winter weather at European ports.[10]

Weather Support to HQ CENTCOM

The amount of weather information needed by the CENTCOM staff increased dramatically at the start of Operation Desert Storm. Weather officers presented 4 briefings each day, with informal updates as often as every 3 hours, as weather began to affect the air campaign. The scope of the briefings also expanded from the next 24 hours to a detailed 0- to 72-hour unfavorable-marginal-favorable forecast for the theater. To prepare for the start of ground operations, CENTCOM staff weather officers briefed an extended outlook–14 days beyond the 72-hour point–in catego-

[8]USAFETAC/TN-92/003, Gulf War Weather, USAF Environmental Technical Applications Center, Mar 1992, pp 3-1 - 3-106.

[9](S) AWS DS/DS Report No. 2, pp 117-118 and 123.

[10](S) *Ibid*, pp 119-120.

ries of cloud ceilings (10,000-foot threshold), precipitation, wind direction, and speed.

Weather support, particularly the provision and interpretation of weather satellite imagery, was particularly important to the CENTCOM Intelligence Directorate. Staff weather officers used this imagery along with climatic wind data for Kuwait City, to help the Directorate assess the impact of Iraq's "scorched earth" policy. They also briefed weather to intelligence action officers, emphasizing impact of weather on intelligence collection and bomb damage assessments.[11]

Weather Support to HQ ARCENT

The ARCENT staff weather officers, as well as staff weather officers collocated with U.S. Army corps, divisions, regiments, and separate brigades in the field, were fully integrated for ground operations. Climatology was a key support input. During Operation Desert Shield, staff weather officers briefed climatology monthly to commanders and staffs, with emphasis on the impact of the desert environment on man and machine. For the ground war, the ARCENT staff weather officer provided General Yeosock with detailed climatology for key stations–Basra, Iraq; Kuwait City; Dhahran, Hafar Al Batin, and Rahfa, Saudi Arabia. In particular, staff weather officers, in concert with the ARCENT terrain team, helped identify areas where there was significant potential for flash flooding.[12]

As ARCENT ground forces began the transition from build-up to offensive action, HQ ARCENT weather support requirements increased dramatically. On 23 January, staff briefings increased to four per day; a daily planning briefing for General Yeosock, the Operations Fire Support Element, a seventy-two-hour outlook for targeting, and the situational weather briefing for the Intelligence staff twice daily at shift changes. On 16 February, two briefings were added for the Operations and Intelligence Center, and after 23 February, an afternoon briefing was added for General Yeosock. All briefings included a forecast weather map, a twenty-four-hour plain-language forecast covering the entire area of responsibility, a color-coded matrix showing potential weather effects, and illumination data. The ARCENT weather cell also produced a seventy-two-hour

[11](S) *Ibid*, pp 77-78.

[12](S) *Ibid*, pp 119-120; (S) AWS DS/DS Report No. 1, p 24.

outlook forecast for Riyadh, Dhahran, and King Khalid Military City, Saudi Arabia. A similar product was also disseminated through ARCENT intelligence channels.[13]

ARCENT Tactical Operations

Weather support personnel provided ARCENT commanders with Tactical Operations Area Forecast and the Contingency Weather Package. The area forecast provided them with a tailored weather prediction for respective operational areas. Additional weather forecasts were presented for up to five days. On-site staff weather officers tailored ARCENT's area forecast to their supported commander's requirements.

On 18 January 1991, the XVIII Corps and 101st Airborne moved in support of the CENTCOM War Plan. The units stationed in and around King Fahd at the start of the air war were to shift to the vicinity of Rahfa, 500 miles northwest–an airlift vital to the success of the operation. The Rahfa airfield was not fully instrumented, and Saudi weather observers took only periodic observations. On 18 January, at the Rahfa airfield, Military Command aircraft aborted the mission because of weather in attempting to land. The Airlift Control Element at Rahfa reported that the Saudi observations did not represent actual conditions–weather was worse than reported.

The 101st Air Assault Division deployed a three-man Air Force weather team to Rahfa, Saudi Arabia on 19 January to take weather observations. These accurate Air Force weather team observations were reported to the Airlift Control Center and its staff weather officer, who was then able to forecast windows of opportunity when conditions would improve enough to permit landing. The center and the commander of airlift forces scheduled missions accordingly, enabling the airlift's completion on schedule despite marginal weather.[14]

As units moved forward, ARCENT imposed radio silence. Since the primary means of weather communications to deployed Army weather teams was dispatched via high-frequency radio, units could only receive weather information, while the data from the field became unavailable to

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[13](S) AWS DS/DS Report No. 1, pp 24-25.

[14](S) *Ibid*, Report No. 1, p 31.

other weather support forces. The second problem was the speed and frequency of the Army's advance into Iraq and occupied Kuwait. Weather teams attached to those units often did not have time to set up communications or weather equipment. The ARCENT Weather Cell began disseminating the weather package on 8 February to solve that problem. This package, a consolidation of the Tactical Operations Area Forecast, focused on information needed to bring the mobile weather team up-to-date on the weather situation.[15]

At the height of the ground campaign, an air assault by the 3d Brigade of the 101st Air Assault Division into the Tigris-Euphrates River Valley to secure the northern flank was scheduled for the evening of 25 February. Based on a forecast of strong wind, the mission was cancelled. Observed conditions verified winds of thirty knots and rain showers. The same cycle was repeated on 26 February with winds to thirty-five knots. The Assistant Chief of Staff for Intelligence requested the 101st Airborne Assault Division staff weather officer to forecast the next available "window" of opportunity. He predicted a window covering 26 February at 1300Z to 27 February at 0000Z. Based on the forecast, the mission successfully flew the evening of 26 February and dense fog closed the window at 0030Z on 27 February as forecasted.[16]

Compromised on the early morning of 25 February, a long-range surveillance team from the XVIII Airborne Corps near Tallil Airfield in Iraq, called for emergency extraction. Confronting raging winds of thirty-five to forty-five knots and visibility about one-half mile, the XVIII Airborne Corps staff weather officer advised aviators charged with the extraction not to launch immediately but to delay takeoff until the weather front passed, then fly due north to approach the area from the west. They did delay the mission, waited until the front had just passed the area, approached the landing zone safely, and extracted the team just as winds diminished and visibility improved. Had they launched immediately, success would have been questionable.[17]

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[15](S) *Ibid*, p 24; (S) AWS DS/DS Report No. 2, pp 90-93.

[16](S) AWS DS/DS Report No. 1, p 31.

[17](S) *Ibid*, pp 30-31.

Support to HQ SOCCENT Planning

Weather support to HQ SOCCENT included mission-tailored forecasts and briefings based on the Forecast Unit's Joint Operations Area Forecast. Most execution planning for Operation Desert Storm was downloaded to the Special Operations Command–Army as well as Air Force.[18] The daily weather briefing package contained a weather map, area forecasts, and forecasts for key bases. Area forecasts included forecasts for maximum pressure altitude, night vision goggle ranges, temperatures, and minimum cloud ceilings. Forecasts for electromagnetic refractive conditions using the integrated refractive conditions prediction system and sea state conditions at key locations were also included.[19]

Support to Strategic Reconnaissance

The CENTCOM staff weather officers directly supported theater reconnaissance missions using Forecast Unit theater forecast guidance and forecasts issued by weather personnel supporting the Strategic Reconnaissance Center at HQ Strategic Air Command. The reconnaissance center validated nominated targets and recommended platforms using numerous planning inputs, including forecasts from their weather personnel at the Directorate of Weather for Strategic Reconnaissance at Offutt AFB, Nebraska. [DELETED] The CENTCOM staff weather officer updated weather information and assumed go/no go forecast responsibility. Satellite imagery was the best source of data for these last-minute forecasts.[20]

[DELETED][21]

Support to CENTAF

Building the Air Tasking Order

By the time the air war began, weather support to the Strategic Planning cell and Guidance, Apportionment, and Targeting consisted of two

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[18](S) *Ibid*, p 6; (S) AWS DS/DS Report No. 2, pp 94-95.

[19](S) *Ibid.*

[20](S) AWS DS/DS Report No. 1, pp 8-10.

[21](S) *Ibid*, pp 9-10.

daily briefings to Gen. Buster C. Glosson and his staff. Two-day horizontal weather depiction charts showing major cloud areas, precipitation, and fronts, along with satellite imagery, were also posted in the Black Hole. This level of support, however, proved inadequate as weather began to affect missions, particularly the F-117 precision strikes on Baghdad. The importance of weather inputs to the target planning process grew dramatically, and staff weather officers "beefed up" their support to meet the need for timely and accurate weather intelligence and assistance necessary for decisions.

The CENTAF staff weather officer instituted a planning support worksheet that covered successive 24-hour periods. Each sheet divided the theater into 4 broad regions and gave cloud conditions for the critical 10,000-foot threshold in 6-hour segments. These sheets were then color-coded (red unfavorable, green favorable) and posted on the primary target allocation maps in the Black Hole. The weather officers also presented formal briefings at key points in the planning process. Figure 6 depicts the planning cycle, indicating those points where weather inputs were made.

Staff weather officers presented a weather briefing to General Glosson at 0000L to help determine which targets could be potentially fragged or held in reserve. They presented another briefing to the Guidance, Apportionment, and Targeting cell twenty-four hours later for a final scrub of nominated targets. Another weather briefing to General Glosson at 1300L would allow retargeting of missions scheduled for that night (tasked in the previous day's air tasking order) and the following morning (primarily F-117s). Opportunities for weather intelligence, of course, did not always wait for formal weather briefings. Staff weather officers met with planners frequently in the CENTAF weather office to discuss specific missions.[22]

The CENTAF planning cycle allowed enough flexibility to adapt quickly to changes in the operational situation. By 29 January, weather support for this system provided structured three-day planning forecasts based primarily on the Desert Storm Forecast Unit's Special Support Bulletin. Issued at 0000L, the forecast became most critical because the planning "machinery" was initially set into motion on the basis of this target weather guidance. The 0000L forecasts were correct about seventy-five percent of the time for Baghdad and about seventy percent for Kuwait City. Compared against a

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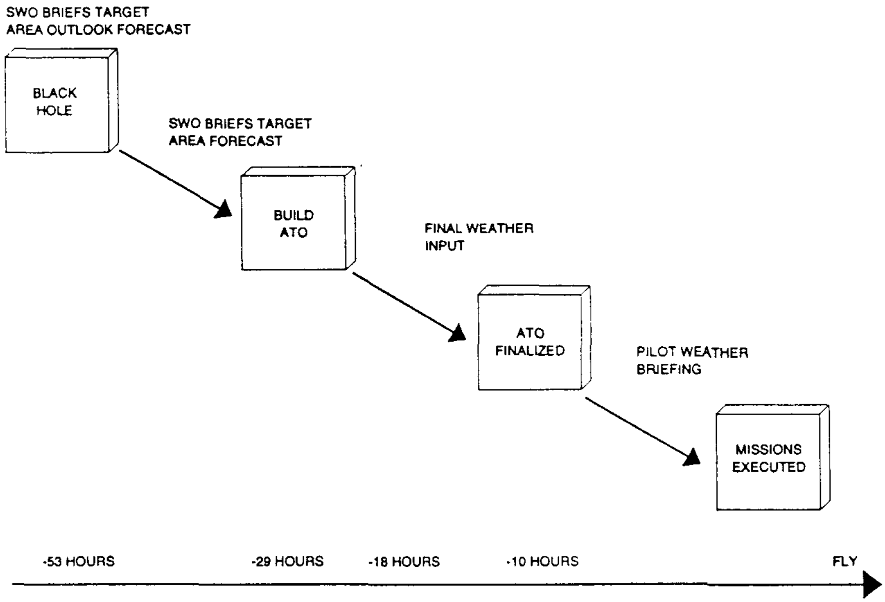
[22](S) *Ibid*, pp 10-14.

"no skill" forecast based on persistence (what it is now is what it will be), forecasters improved twenty-four-hour planning effectiveness by more than fifteen percentage points with their 0000L forecast. This, of course, does not account for any additional value added by weather intelligence in the dynamic force and mission execution process that permitted some on-the-fly targeting and/or weapons changes as the weather situation changed.[23]

Figure 6
Joint Air Component Planning Cycle



Collocated staff weather officers and weather teams provided CENTAF unit-level execution. The volume and nature of the support depended on the aircraft mission profile and weapons delivery system. Most base-level weather support involved standup briefings from the wing commander and staff, including flight weather briefings and alert flimsy packages.

[23](S) *Ibid*, pp 14-18.

F-111 Weather Support

Since the forecast provided for each F-117 mission flown was carefully recorded along with mission pilot debriefs, the procedure facilitated the reconstruction of an accurate picture of forecast support. During Operations Desert Shield/Desert Storm there were 1,832 F-117 sorties. Staff weather officers accurately forecasted the weather for 1,477–an 81 percent correct rate. Forecasts were overly optimistic for 193 sorties–unfavorable and overly pessimistic on 162–unfavorable when conditions were actually favorable. Some missions were flown, nevertheless, despite an unfavorable forecast, as dictated by the priority of the target. As the war progressed, forecast accuracy improved significantly as forecasters benefited from valuable pilot feedback and familiarized themselves with the weather in the target areas.[24]

Since each mission flown by the F-117 was verified, air weather service was able to calculate directly the value of weather support. By weighing the actual weather observed in a specific region by the percentage of missions to that region, it was determined that F-117 missions would have encountered favorable conditions about 65 percent of the time. Using weather forecasts, the F-117s actually had a mission success rate of 74 percent. This 9-percentage-point improvement results directly from the inclusion of weather intelligence in mission planning and execution. In terms of sorties, this means 160 fewer sorties were required to strike the same number of targets, or in another way, those same targets were all hit 3.7 days sooner.[25]

The change in mission profiles by the third day of the air campaign greatly affected the weather support concept for deep interdictors. The planned mission profile of a low-level ingress and pop-up weapon delivery that required support tailored for low-level weather, target acquisition, and lock-on ranges using electro-optical tactical decision aid software became invalid. Such software only helped a pilot anticipate his target scene. As with the F-117, a cloud ceiling at or below 10,000 feet was the key go/no go weather support threshold. The need to predict a cloud-free line of sight to the target further complicated support requirements for missions using laser-designating weapons. Forecasters became adept

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[24](S) *Ibid*, pp 19-21.

[25](S) *Ibid*, pp 28-30.

at predicting cloud layers and amounts in the area; they were less capable of predicting percentage of cloud cover along a diagonal line-of-sight through the atmosphere.[26]

Close Air Support

The tactics employed for close air support missions drove aircrews and mission planners to rely upon weather forecasts more for situational awareness than operational go/no go decisions. A-10s, for example, flew missions in assigned "kill boxes." Each kill box measured one-half degree latitude by one-half degree longitude, or about 900 square miles. The controller in the Airborne Command and Control Center cleared one or two A-10s into the box for a thirty-minute period to shoot any available targets. CENTAF tasked such missions around the clock.

At King Fahd, for example, half the A-10 squadrons were placed on a daytime schedule and half on a night schedule. Forecasters supported missions with a weather flimsy package that included forecasts for cloud conditions in target areas. If the forecast predicted no ceiling above 10,000 feet, the entire first wave launched. If weather was suspect, CENTAF launched a weather scout to find a suitable area before launching the entire wave. Once aircraft launched, real-time weather "nowcasts" were provided by the staff weather officer via an Airborne Command and Control Center voice link to the A-10 pilots, and forecasters got feedback from pilot reports. During several periods of marginal weather over target areas, the A-10 staff weather officer was able to help redirect A-10s to areas with more favorable weather.[27]

Support to Air Force Special Operations

Psychological operations–leaflet drops–required precise wind forecasts provided by the staff weather officer. MC-130s completed 17 leaflet drops from above 10,000 feet, and aircrew feedback indicated that the forecast wind direction was 94 percent accurate wind speed was 98 percent accurate. Such precise forecasting was largely possible due to the real-time upper level wind measurement capability data provided by Air

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[26](S) *Ibid*, p 22.

[27](S) *Ibid*, p 22.

Force Special Operations Command weather team members deployed near the Iraq/Kuwait border with a portable rawinsonde system.[28]

Value Added by Weather Support

Air weather service postanalysis of forecast support, based largely on the F-117 and F-111 missions, quantifies the value added of their forecast support to the air campaign.[29] Many nonquantifiable measures, particularly related to ARCENT support, were documented as anecdotes and testimonials from supported commanders. Together these quantitative and subjective measures indicate that on-scene weather support forces contributed significantly in minimizing the cost, saving lives, fortifying resources, and winning the war.

Factors Affecting Weather Support Effectiveness

Operation Desert Storm was not always a smooth road to success. Commanders encountered several challenges in the course of deploying, building, and operating a capable weather support force during the operations. The most significant of these are indicated below.

Joint or Combined Interoperability

Joint Chiefs of Staff Memorandum of Policy No. 5 assigned responsibility for weather support to the Air Force. Execution of the policy and coordination of joint weather support requirements fell upon the 5th Weather Wing and 1st Weather Squadron, whose commander served as the CENTCOM Staff Weather Officer. The execution of joint weather support, however, did not proceed according to deliberate plans. From the start, there were coordination and interoperability problems between CENTCOM and the independent weather support forces of NAVCENT and MARCENT.

Differing views on the role of the unified command staff weather officer and inadequate joint guidance pointed to the need for the joint doctrine to define "joint" weather operations under a unified command. Moreover, weather support interoperability extended beyond the Air Force weather support forces. The Navy weather support force operated auton-

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[28](S) *Ibid*, p 24.

[29](S) *Ibid*, pp 24-32.

omously throughout the Gulf War, but it did receive transmissions of the Joint Operations Area Forecast and land-based observations and forecasts via automated network from the Forecast Unit. MARCENT weather forces also operated autonomously, although the Marine Corps staff weather officer attempted to obtain and use Forecast Unit products and guidance. Unfortunately, USMC-Navy tactical weather communications incompatibility, personnel shortages, and equipment maintenance problems continually hampered his efforts.[30]

Weather Support Tools

To operate effectively, weather forecasters and observers must have a full arsenal of weather support tools in theater. In the early days of Operation Desert Shield, some weather support "pillars" such as upper air rawinsonde sounding equipment were eliminated or delayed until later in the deployment and therefore unavailable to meet theater weather support requirements. The demands for upper wind data during operations pointed to the error of excluding a "doctrinal" weather support tool without sufficiently analyzing the impact of that loss in capabilities. Operation Desert Storm also demonstrated that weather support force equipment should not be planned to meet "best case" weather requirements or on assumptions about "benign" environments.

Desert Shield and Desert Storm also confirmed that smaller was better. Ironically, some standard weather equipment that had been excluded from deployment because of constrained airlift was replaced by smaller, more easily transportable substitutes. For example, the tractor trailer-sized GMD-5 upper air system was replaced with a footlocker-sized, tactical MARWIN upper air system that successfully provided needed upper air data. Similarly, a small Rapidly Deployable Imagery Terminal was deployed to provide increased imagery capabilities in place of additional DMSP Mark IV vans that require an entire C-141 to transport.

Tactical Communications

Never had an Air Force weather support force, such as in the Persian Gulf, employed tactical communications on a large scale. Weather forecasters at deployed locations produced weather data and supervised theater

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[30](S) AWS DS/DS Report No. 2, pp 242-246.

guidance for customers from nearly the first hours on the ground. However, these systems–the Quick Reaction Communications Terminal (QRCT), GOLDWING, and USAREUR Automated Weather System (UAWS)–relied on high-frequency radios. Such communications are inherently difficult to establish and maintain, being subject to ionospheric fluctuations, assigned frequencies, and other environmental conditions difficult to control. Operators also require an understanding of high-frequency radios, radio wave propagation, and network control procedures beyond those typical of most weather personnel. Consequently, weather support sometimes suffered as a result of inadequate communications. Air Force weather teams made their tactical communications work only with nearly constant attention that detracted from their primary weather support duties.

Even then, the high-frequency systems were barely adequate to meet requirements for continuous, high-volume theater weather communications. Units supporting the Army during the ground campaign found that the communications systems took too long to set up, and by the time they could be established, it was time to tear down and move again with their rapidly advancing Army customer. As a result, weather teams with the Army in Iraq and Kuwait often did not send critical battlefield weather data or receive needed theater forecasts with which to support their Army commanders.[31]

Meteorological Satellite and Other Support Capabilities

Defense Meteorological Satellite Program imagery was the most valuable source of weather data in the Persian Gulf. It was the only source of high-resolution cloud data for data-denied enemy target areas. However, because the satellites of this program are polar-orbiting, there were six- to eight-hour periods between satellite passes, resulting in a lack of data for that time period. Though the National Oceanographic and Atmospheric Administration polar-orbiting satellites helped fill this void, they produced imagery of lower resolution. Their signal, moreover, was unencrypted and could have been shut off to deny the imagery to the enemy. Other foreign geostationary satellites also helped fill gaps in the imagery coverage, but their coverage produced even less data than the civilian polar-orbiters, since the Persian Gulf was situated on the extreme

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[31](S) *Ibid*, pp 171-181.

edge of their coverage footprint. All in all, Operation Desert Storm demonstrated the value of and necessity for weather satellite imagery.[32]

Although weather satellite imagery provided a critical capability to detect clouds and large-scale weather features over enemy territory, other, finer resolution weather data were needed. The lack of surface-derived weather data from Iraq and Kuwait such as temperatures, winds (speed and direction), pressure, visibility, precipitation (intensity and amount), and detailed information on cloud types, heights, and extent significantly degraded our capability to characterize battlefield/target area conditions or to forecast future conditions accurately. Improved weather support to contingency operations in data-denied regions requires the capability to sense remotely and report key weather parameters.[33]

To forecast the Persian Gulf region's weather accurately, weather forecasters relied on automated numerical weather prediction models run on high-speed, mainframe computers at Air Force Global Weather Center. Using worldwide weather data collected via the Air Force's automated weather network, the center's computers forecast global weather parameters, such as winds and temperatures at various level of the atmosphere, and produced forecast products transmitted to field units. This chain of centralized support exhibited some weak links during Operations Desert Shield/Desert Storm.

Weather facsimile circuits between the Forecast Unit and Global Weather Center were not operational until December 1990. This limited capability deprived deployed weather support forces of the full benefits of sophisticated automation and numerical weather prediction capabilities. In the interim, the Desert Storm Forecast Unit relied on facsimile products received from the Naval Oceanography Commands Fleet Numerical Oceanography Center and foreign sources including the British and Saudi meteorological services. These sources, however, did not include Air Force data collected from the theater and transmitted to the Global Weather Center via the automated weather network and were not specifically tailored to Air Force or Army operational requirements.[34]

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[32](S) *Ibid*, pp 159-170.

[33]AWS/DO Joint Universal Lessons Learned Input (31852-41900), Maj Norman Buss (AWS/DOJ), 29 May 1991.

[34](S) AWS DS/DS Report No. 2, pp 207-213.

Even after facsimile support was available from the center, the numerical model guidance received was based on global-scale numerical models. Theater-level support required a finer resolution model–a regional forecast model that could predict smaller, theater-scale weather events. The center's global model, though extremely useful for describing and predicting large-scale global weather patterns, was not able to predict the development or progression of small, theater-scale storms or weather events that were prevalent. Operation Desert Storm demonstrated the need for improved forecast accuracy available from a regional, finer-resolution forecast modeling capability.[35]

DMSP van receiving data from orbiting DMSP satellite.

[35](S) *Ibid*, pp 111-112.

Mobilization and Personnel Support

The call-up of more than 34,000 Air Force reservists during the Persian Gulf War provided a new perspective of mobilization and management of the Air Reserve Component. It also provided personnel managers the opportunity to implement wartime policies and procedures, some for the first time. This chapter focuses on Air Force mobilization, manpower, and personnel support actions during the Persian Gulf War.

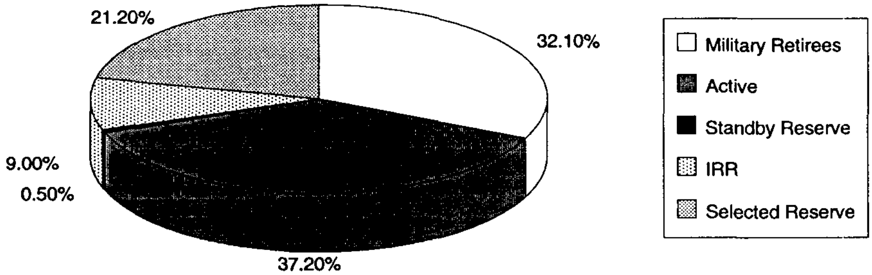
Air Reserve Component: Structure, Mobilization and Readiness

The United States armed forces depend on reserves and national guard to augment active forces during contingency operations. The concept of "citizen soldier" and "minutemen" indeed outlines the tradition of active forces. However, prior to World War II, the U.S. reserve force structure differed considerably from today's composition. Prior to WW II the only reserve organizations of any relative size were the Army National Guard and the Army Organized Reserve.[1] These included Air Corps units of the reserve and guard that now comprise the Air Force Reserve and Air National Guard.

The major Reserve categories consist of the Ready Reserve, Standby Reserve, and Retired Reserve. With the exception of the National Guard, each Service component has members in each category. As of 30 September 1990 5,501,380 DOD personnel were available for mobilization (Figure 7).

[1] David Rodney, Robert W. Downey, Jonathan Geithner, *Desert Storm Reconstruction Report, Volume X: Reserve Manpower* (Virginia: Center for Naval Analyses, Oct 1991), p 1.

Figure 7
Total Force Mobilization Resources



Source: DMDC

The Chairman of the Joint Chiefs of Staff declared the Selected Reserve as essential to wartime missions, and it is the most combat-ready Air Force resource of the Ready Reserve. Funded and equipped, its members actively train to augment active duty forces in times of national emergencies. Comprising the Selected Reserves[2] of the USAF are the Air National Guard, Air Force Reserves, and Individual Mobilization Augmentees or IMAs (members of the Air Force Reserves assigned to an active duty Air Force unit for training and utilization purposes). Table 6 illustrates the composition and strength of the Air Force Ready Reserve as of 30 September 1990.

The Persian Gulf War marks the first large-scale operational use of reservists in a total force concept since DOD adopted the "Total Force Policy" in 1972.[3] Figure 8 compares activation of Air Force reservists in support of the Korean War, Berlin Airlift, Cuban Missile Crisis, Vietnam

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[2]The term "reserves" includes both the Air National Guard and Air Force Reserves.

[3]Rep. Les Aspin, Rep. Beverly Byron, and Rep. G.V. (Sonny) Montgomery, *Iraq, Saudi Arabia, and the Reserve Components: Missing Lessons for a Future Force Structure*, 15 Oct 1990, p 2.

Table 6
Composition and Strength of USAF Ready Reserve

United States Air Force Ready Reserve: 265,493				
Selected Reserve: 201,291			**Ind Ready Reserve: 64,202**	
Guard and Reserve Units 187,976				
Guard	Reserve	Reserve IMAs	Air National Guard	Air Force Reserve
116,933	71,053	13,315	0	64,202

Source: DMDC

War, and the Persian Gulf War.[4] The mobilization of the Air Reserve Component during Operations Desert Shield/Desert Storm can be divided into five phases.

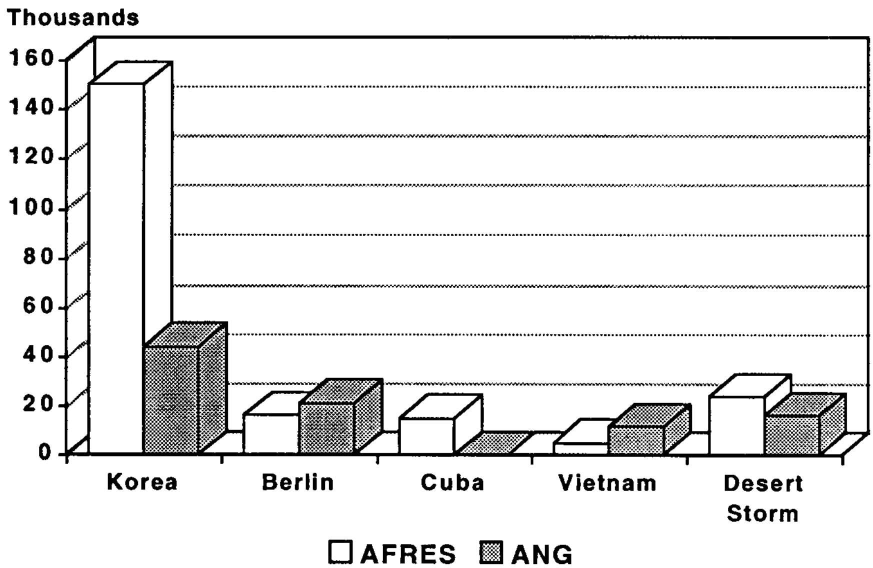
2 August 1990, Invasion of Kuwait: Reserve Volunteerism

After the invasion of Kuwait, but before call-up authority (22 August 1990), Air Force reservists volunteered under Title 10 U.S. Code 672 (d) to participate in Operation Desert Shield for service in the United States and in the theater of operations. By the end of August, more than 6,000 reserve volunteers were supporting the active component.[5] They formed strategic and tactical airlift, air refueling, reconnaissance, and special operations crews, and served as maintenance and aerial port personnel.

[4]*The Reserve Components of the United States Armed Forces*, "Reserve Components," Jun 1992, pp 23, 24.

[5]Issue Paper, HQ USAF/DPXCX, "ARC Participation in Desert Shield/Storm," 21 Aug 1991.

Figure 8
Past Use of the Air Reserve Component



Source: OASD Reserve Affairs

The volunteers played a major role in completing the largest airlift in history. Thousands volunteered within hours of the initial U.S. response to support the defense of Saudi Arabia.[6] Guard and Reserve volunteers flew 42 percent of all strategic airlift missions and 33 percent of refueling missions.[7] Near the end of August 1990, reserve volunteers had moved 7 million tons of cargo and 8,150 passengers to the theater of operations.

Before the decision to activate reserves, volunteers provided manpower in direct support of reserve and active duty missions. The absence of these reserve volunteers from their parent units prior to mobilization

[6]*The Reserve Components of the United States Armed Forces*, "The Contributions of the Reserve Components to the Persian Gulf War," Jun 1992, p 40.

[7]*Ibid.*

could affect readiness and their ability to meet subsequent mobilization requirements.[8] During Operation Desert Storm this was averted because units were not activated in structured form, and commanders generally controlled more people than tasked under mobilization orders.

At the beginning of fiscal year 1991, the Air Force determined all man-days normally allocated to major commands for reserve active duty tours would be used exclusively for the Persian Gulf War. Fiscal year 1990 Operation Desert Shield man-days totaled 353,000 at a cost of $50 million. During fiscal year 1991, more than 1.2 million Operation Desert Storm man-days were used at a cost of $161 million.

22 August 1990 Presidential Call-up (200K)

On 22 August 1990, President Bush provided the Secretary of Defense, Richard Cheney, recall authority under Title 10 U.S. Code 673 b.[9] This legislation allows the President to authorize the Secretary of Defense to order to active duty up to 200,000 members of the Selected Reserve to augment active forces for any operational mission for a period of 90 days. The law also provides for an extension of an additional 90 days if it is in the interest of national security.

For Operation Desert Shield, Mr. Cheney's initial DOD guidance for the recall of Selected Reserves was:[10]

- Limited to the projected needs of Operation Desert Shield.
- Based on the current force structure.
- Not to provide support for other possible contingencies.
- Not to include Army Reserve or Coast Guard Reserve combat units.

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[8] *The Reserve Components of the United States Armed Forces*, "The Contributions of the Reserve Components to the Persian Gulf War," Jun 1992, p 40.

[9] Title 10 of the U.S. Code and Presidential Executive Order of 22 Aug 1990, "Ordering the Selected Reserve of the Armed Forces."

[10] Memo, Dick Cheney, Secretary of Defense, to The Secretaries of the Military Departments and Chairman of the Joint Chiefs of Staff, subj: Call of Selected Reserve Units and Personnel Active Duty, 23 Aug 1990.

- To apply the ninety-day limitation on a unit-by-unit basis, and to be measured at the time the unit was actually called to active duty.[11]
- Limited to a unit, group, or detachment of two or more individuals organized to perform a particular function, regardless if it is part of a larger group.[12]

Initial DOD call-up authorities are shown in Table 7.

Table 7
Presidential Selected Reserve Call-up, 22 August 1990

Service	Authorities
Army	25,000
Navy	6,300
Marine Corps	3,000
Air Force	14,500
DOD Total	**48,800**

The process for the call-up of reserves to support Operations Desert Shield/Desert Storm began with U.S. Commander in Chief, Central Command, Gen. H. Norman Schwarzkopf, U.S. Army. His staff determined the overall force size needed to support CENTCOM's mission. The Secretary of the Air Force, Air Force Chief of Staff, and supporting major commands determined requirements for Air Force reservists, which were reviewed by the Joint Chiefs of Staff with recommendations sent to Mr. Cheney, and finally to the President. Once the call-up authority was granted, Mr. Cheney informed the Service secretaries the overall strength ceilings authorized for recall.

[11]Ltr, Everett G. Hopson, Chief, General Law Division, Office of the Judge Advocate General, to HQ USAF/XOOTC, subj: Questions on the Order of Reserve Components to Active Duty, 17 Aug 1990.

[12]*Ibid.*

On 23 August 1990, the Secretary of Defense authorized the Secretary of the Air Force, Donald Rice, to recall 14,500 members of the Selected Reserve (Air Force Reserve, Air National Guard units, and Individual Mobilization Augmentees) for a period of 90 days. This authority was further delegated to General Michael Dugan, Air Force Chief of Staff. (See Table 7 for the numbers of personnel authorized by the Department of Defense.)

During the call-up, the Chief of Staff approved major command requests, a time-consuming procedure, in some cases taking as long as fourteen days.[13] However, during partial mobilization, MAJCOM commanders were assigned quotas and managed force mobilization.

14 November 1990, Call-up Authority Increased

The President extended the period of active duty of personnel of the selected reserve to 180 days.[14] Mr. Cheney increased the call-up ceiling twice. On 14 November it was increased to 126,250.[15] This included a 1,250 authority for the Coast Guard. On 1 December 1990, the total was increased to 189,250.[16] The first change increased the Air Force authority from 14,500 to 20,000. It remained at that level until 19 January 1991. The second increase provided additional call-up authority for the Army, Navy, and Marine Corps. DOD call-up authority remained at 188,000 until Partial Mobilization on 18 January 1991. The increased DOD ceilings are shown in Table 8.

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[13]HQ USAF DPXCX, "GWAPS After Action Input," 29 Apr 1992, unnumbered.

[14]Presidential Executive Order, "Authorizing the Extension of the Period of Active Duty of Personnel of the Selected Reserve of the Armed Forces," 13 Nov 1990.

[15]Ltr, Donald J. Atwood, Assistant Secretary of Defense, to The Secretaries of the Military Departments and Chairman of the Joint Chiefs of Staff, subj: Call of Additional Selected Reserve Units and Personnel to Active Duty, 14 Nov 1990.

[16]Ltr, Dick Cheney, Secretary of Defense, to The Secretaries of the Military Departments and Chairman of the Joint Chiefs of Staff, subj: Call of Selected Reserve Units and Personnel to Active Duty, 1 Dec 1990.

Table 8
Selected Reserve Call-up, 14 November 1990

Service	Increase	New Authority
Army	90,000	115,000
Navy	23,700	30,000
Marine Corps	20,000	23,000
Air Force	5,500	20,000
DOD Total	**139,200**	**188,000**

18 January 1991, Presidential Partial Mobilization

On 16 January 1991 the air campaign began. Two days later the President declared a National Emergency and authorized Partial Mobilization under 10 U.S. Code 673.[17] This legislation allowed the President to authorize the involuntary mobilization of up to 1,000,000 members of the Ready Reserve for a period up to 24 months. However, for Operation Desert Storm, the President authorized the mobilization of 360,000 members of the Ready Reserve (Selected Reserve units, Individual Mobilization Augmentees, and Individual Ready Reserve) for a period of 12 months. The Air Force share of 52,000 included the 20,000 allocated during call-up.[18] The Coast Guard call-up of 1,250 was not part of the 360,000 DOD authority. Mobilization through these authorities worked as shown in the following table:

[17] Presidential Executive Order, "Ordering the Ready Reserve of the Armed Forces to Active Duty," 18 Jan 1991.

[18] Ltr, Richard Cheney, Secretary of Defense, to The Secretaries of the Military Departments and Chairman of the Joint Chiefs of Staff, subj: Call of Ready Reserve Units and Personnel to Active Duty, 19 Jan 1991.

Table 9
Partial Mobilization, 18 January 1991

Service	Increase	New Authority
Army	105,000	220,000
Navy	14,000	44,000
Marine Corps	21,000	44,000
Air Force	32,000	52,000
DOD Total	**172,000**	**360,000**

With inputs from commanders and approval from Secretary Rice and General McPeak, Air Staff operational and personnel planners developed mobilization requirements for each command and operating agency. Carefully scrutinizing the requirements, Secretary Rice allocated 41,560 [of the 52,000-authorization] to Major Air Force components of Unified Commands and Special Operating Agencies.[19] The commands and agencies received a ceiling of 39,660. Two hundred mobilization augmentees and 1,000 members of the individual ready reserve were authorized to be activated. Each command had authority to mobilize reservists and guardsmen to meet operational needs as they saw fit, both in the United States and in the theater of operations. Additionally, the Secretary of the Air Force, under Title 10 U.S. Code 688, authorized the activation of 700 active duty retirees.

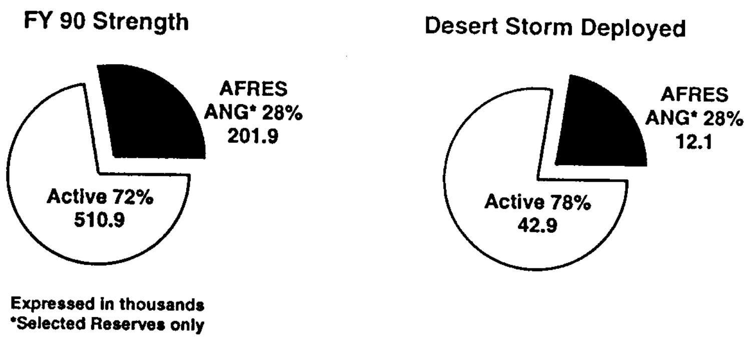
A comparison of Air Force selected reserve and active duty strength levels during Operation Desert Storm is illustrated in Figure 9.[20] Figure 10 shows the numbers and functions the reserves performed during Operation Desert Storm deployment.[21]

[19]Msg, SAF to ALMAJCOM-SOA Commanders, subj: Presidential Declaration of Partial Mobilization, 222245Z Jan 1991.

[20]Strength figures for Desert Storm represent peak period of Mar 1991. Source is Defense Manpower Data Center.

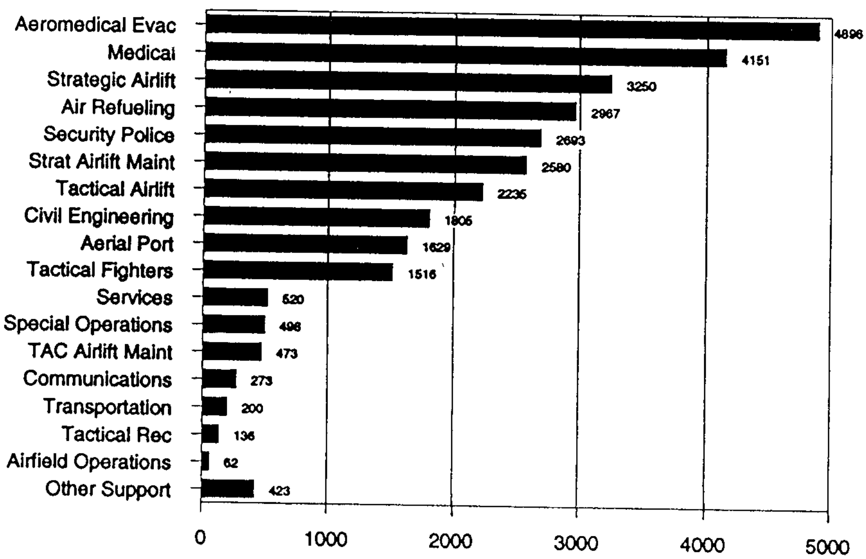
[21]*The Reserve Components of the United States Armed Forces*, "The Contributions of the Reserve Components to the Persian Gulf War," Jun 1992, p 48.

Figure 9
Selected Reserve and Active Strength Comparison



Source: DMDC

Figure 10
Employment of Reserve Components During Desert Storm



As of March 1991

Source: OASD Reserve Affairs

For the first time, on a large scale, the Air Force utilized members of the Individual Ready Reserves, active duty retirees, Stand-by Reserves, and retired reserves, otherwise known as the Pretrained Individual Manpower (PIM), which do not train with an active unit. Generally considered less ready from a military perspective, this resource of personnel does possess many critical skills (medical, engineering, scientific, etc.) needed during wartime. On 12 January 1991, under Title 10 U.S. Code 688, the Secretary of the Air Force implemented Push-Pull and eventually recalled 118 active duty retirees,[22] who filled specific needs as physicians, enlisted medical technicians, and explosive ordinance disposal technicians. The medics provided critical skills needed to backfill medical facilities in the United States, and the ordinance technicians assumed duties at munitions facilities and ranges. During partial mobilization, 842 individual ready reservists were activated.[23] Again, the medical personnel were mainly utilized as backfills in the United States.

Members of the U.S. Air Force debark from a C-141B Starlifter aircraft upon their arrival in Saudi Arabia.

[22]Msg, SAF to ALMAJCOM-SOA Commanders, subj: Presidential Declaration of Partial Mobilization, 222245Z Jan 1991.

[23]JCS-J1 Operation Desert Storm Manpower & Mobilization Report, 171800Z Mar 91.

A concern voiced by pretrained reservists was the short time-span given between notification and reporting dates.[24] Since the overwhelming majority were doctors, it was necessary to transfer patient loads before reporting to active duty. Although policy allowed for delays and exemptions, some reservists were not aware of this option. For that matter, a number of problems in command and control surfaced between planning and reality in mobilizing the reserves.

Unlike the Army and Marine Corps, where entire units deploy as one warfighting entity, the Air Force planned and used during the Gulf War deployment by unit type codes (UTC). That is, the Air Force deployed in groups of less than unit size and strength that were combined with other functions and units to form larger force packages of both combat and support functional areas. Such "units" brought with them the people and equipment needed to perform a specific wartime mission.

In the past, both active and reserve planners assumed that air reservists would be mobilized and utilized as entire units and accessed into the active duty personnel system. The unit and individual reservist would then be completely transferred into the active component. This concept was not based on limited regional contingencies, but on post-World War II experiences and global war scenarios. It was also assumed that mobilized reserve units would be utilized for an extended period of time, certainly more than the six months of Operation Desert Storm.[25]

During the Gulf War, the reserve component was mobilized, deployed, and utilized exactly like the active forces–by unit type codes. Mobilized in small functionally aligned groups, and in some cases split and simultaneously redeployed to multiple locations in theater, the non-unit integrity approach was a departure from previous planning assumptions. Economy of force, the nature and relative size of the contingen-

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[24]HQ ARPC/RC, "JULLS Long Report Number 52447-93900 (00039)," 12 Feb 1991, p 72.

[25]Global war scenarios (Base Case) were the major planning assumptions behind mobilization planning since JCS began exercising Mobilization in NIFTY NUGGET 78.

cy–compared to a global war scenario–were factors leading to the less-than-whole unit approach.[26]

Operational control of reserve component personnel and units passed to the gaining major commands as planned. However, administrative control remained with the Air Reserves. This was not planned, and the division of administrative and operational control created confusion among personnel planners at all levels.

This confusion resulted in conflicts of policy guidance in the areas of reserve personnel programs and entitlements. Reservists called to active duty fell under active-duty personnel policies for accountability, benefits, and entitlements. Moreover, they remained under administrative control and management of the Air Reserves, and they also fell under reserve personnel policies for promotion, pay, leave accounting, and records (automated as well as paper) management. This led to further confusion in determining administrative treatment of mobilized reservists.[27] Furthermore, mobilized reservists would frequently receive conflicting guidance from major commands, the reserve component personnel planners, as well as their home units.

In a survey conducted by the General Accounting Office of forty activated reservists from eighteen different reserve and guard units in all three services, ten Air Reserve members from Aerial Port units indicated a broad range of problems associated with their mobilization,[28] specifically dissatisfaction with:

- limited notice received before mobilization,
- uncertainty of the period of mobilization,
- calling up only parts of units and disregarding unit integrity,
- assignment to jobs not trained to perform,
- initially, not receiving timely pay and travel reimbursement.

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[26] Rep. Les Aspin, Rep. Beverly Byron, and Rep. G.V. (Sonny) Montgomery, *Iraq, Saudi Arabia, and the Reserve Components: Missing Lessons for a Future Force Structure*, 15 Oct 1990, pp 5-7.

[27] HQ ARPC/RC, "JULLS Long Report, 52130-73600 (00006)," 12 Feb 1991, p 10.

[28] *Operation Desert Shield Problems Encountered by Activated Reservists*, "Report to the Assistant Secretary of Defense for Reserve Affairs," United States General Accounting Office, Sep 1991 (GAO/NSIAD-91-290), p 1.

As discussed earlier, the Air Force did not mobilize entire units. Since Air Reserve Component support personnel who normally provided services to their units were not mobilized, active duty units were not staffed or trained to handle the problems raised in mobilizing reserves. Mostly, the survey participants considered the difficulties inherent to the mobilization process, especially during a short contingency.[29] The assistance they sought dealt primarily with the uncertainty of reemployment rights following demobilization.

To achieve cooperation and understanding among reservists, guardsmen, and their employers with regard to mobilization and employee rights, reservists chartered the National Committee for Employer Support of the Guard and Reserves. The committee was active during and after the Persian Gulf crisis,[30] through advertising campaigns targeted at employers and other postwar assistance programs. During a 14-day period in August 1990, the committee's Ombudsman Program handled more than 5,300 telephone inquiries–more than a 200 percent increase for assistance concerning reemployment rights, compensation, and the implications of voluntary versus involuntary activation. Legal opinions of Title 38, U.S. Code Chapter 43, Section 2024, rendered during the Gulf War indicated that reserve component volunteers activated under Title 10 U.S. Code 672 (d) authority had the same reemployment rights as those involuntarily activated. As a result of Operations Desert Shield/Desert Storm, many employers developed personnel programs and improved policies to support their reservist-employees.[31]

28 February 1991, Cease Fire: Demobilization

Offensive operations ended, and on 8 March 1991 the Secretary of the Air Force directed early demobilization of reservists,[32] delegating this authority to the major commands.[33] This flexibility allowed them to

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[29] *Ibid*, p 2.

[30] *The Reserve Components of the United States Armed Forces*, "Employer Support," Jun 1992, p 53.

[31] *Ibid*, p 56.

[32] Msg, SAF to ALMAJCOM-SOA Commanders, subj: Execution of Demobilization, 080100Z Mar 1991.

[33] Msg, SAF to ALMAJCOM-SOA Commanders, subj: Execution of Demobilization, 080100Z Mar 1991

demobilize forces when they were no longer needed. On 18 April 1991, DOD published demobilization guidance to the Services.[34]

From a planning perspective, demobilization had been treated as a low priority. The last opportunity requiring demobilization on this scale was at the close of the Berlin Crisis in 1961-62.[35] As mentioned earlier, mobilization plans were based on post-World War II scenarios designed for global war. No real emphasis had ever been placed on practicing demobilization, even during JCS annual mobilization exercises. Therefore, existing policies and procedures were sketchy and untested.

Inexperience with the demobilization process coupled with early demobilization presented situations not anticipated by personnel planners.[36] To help reservists transition to civilian status required modification of policies dealing with problems such as finance, medical, etc. As with mobilization, tracking the progress of demobilization manually was a difficult task. Table 10 compares the selected reserve manpower ceiling compared to the number activated by each Service as of 17 March 1991.[37]

Readiness of the Reserves

Readiness, sustainability, modernization, and force structure are the four components of combat capability. The Defense Department defines readiness as the ability of forces, units, weapon systems, and equipment to achieve the results for which they were designed. It also includes the ability to deploy without unacceptable delays, quality, training, and manning levels of military personnel, condition and maintenance of equipment, state of training in units, and others. Measuring the readiness

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[34]Ltr, Christopher Jehn, Assistant Secretary of Defense for Force Management & Personnel; Stephan M. Duncan, Assistant Secretary of Defense for Reserve Affairs, to: Secretaries of the Military Departments and Chairman of the Joint Chiefs of Staff, subj: Policy Guidance Regarding the Separation Processing of Members of the Ready Reserve being released from Active Duty in Support of Operations Desert Shield/Desert Storm, 18 Apr 1991.

[35]*The Reserve Components of the United States Armed Forces*, "A Brief History of the American Citizen Soldier," Jun 1992, p 1.

[36]HQ ARPC/RC, "JULLS Long Report Number 52434-57600 (00028)," 12 Feb 1991, p 55.

[37]JCS/J-1 Manpower Mobilization and Accession Status Report, 171800Z Mar 1991.

of a unit is a complex issue and should consider both the objective as well as the subjective.

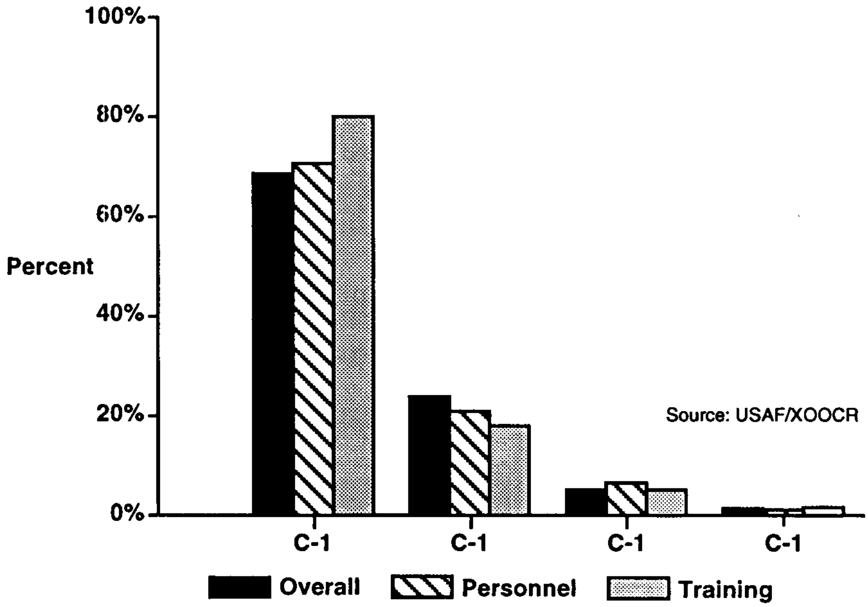
Table 10
Partial Mobilization Authorities Compared to Number Activated

	Army	Navy	Marine	Air Force	Total
Authority	220,000	44,000	44,000	52,000	360,000
Activated	133,060	20,433	25,720	34,341	213,554
Percent	60%	46%	58%	66%	59%

The Joint Chiefs of Staff designed the Status of Resources and Training System to provide active and selected reserve units with criteria for reporting the level and condition of unit resources and level of training on a particular date. These criteria consist of four resource areas: personnel, equipment and supplies on-hand, equipment condition, and training. The category levels, or C-levels, progress from C-1 through C-5. Category C-1 identifies a unit with required resources and training to undertake a *full* wartime mission for which it is organized or designed. Level C-2 identifies a unit that can undertake the *bulk* of the wartime mission for which it is organized or designed. Units reporting level C-3 can undertake *major portions*, while units reporting C-4 *require additional resources and/or training in order to undertake its wartime* mission but could be directed to undertake portions of the mission with resources on-hand. Units undergoing a service-directed resource change and not prepared to undertake wartime mission report category level C-5.

As indicated in Figure 11, ninety-five percent of the guard and reserve support units reported a level of readiness in categories C-1 or C-2 during the Gulf War, while only five percent reported C-3 or C-4.[38] Of the support units reporting C-3 or C-4, less than one percent reported C-4.

Figure 11
Guard and Reserve Support Unit Sorts July 1990



A unit's readiness cannot be reflected in such a report alone. Other considerations, including subjective and intangible factors such as age, job stability, education, skill retention, and career continuation, as well as leadership, morale, and physical fitness, also affect combat readiness. Results of mobilization tests, operational readiness inspections, combat readiness evaluations, and combat skills competition should also be considered.

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[38]USAF/XOOCR Jul 1990 SORTS Report for Flying and Non-flying units. Note: Reserve units were activated by UTC. SORTS data represent the entire unit.

The most critical concerns affecting the readiness of Air National Guard units during fiscal year 1990, according to the Reserve Forces Policy Board, were a shortage of state-of-the-art simulators and computer-based training systems, as well as aircraft and ground support spares. The Reserves reported an inadequate number of fully trained personnel in aeromedical evacuation, combat communications, liquid fuels maintenance, and rapid runway repair units. Nevertheless, even with these known shortages, the evidence indicates that the Guard and Reserves were ready to perform their wartime mission in August of 1990.

Air Force Guard and Reserve units continue to have the highest personnel continuation rates among all Selected Reserves in the Department of Defense.[39] For fiscal years 1988 through 1990, continuation rates for first-term and career personnel averaged eighty-four and ninety-one percent respectively, a six percent higher rate for first-term and a three percent higher rate for career personnel than the other Services. For fiscal year ending 1990, the Air Force Reserves and Air National Guard also had the highest percentage of enlisted personnel fully qualified in their current duty positions with ninety-six and ninety-four percent respectively.[40] In comparison, the Navy Reserves had ninety-two percent; Army Guard, eighty-two percent; Marine Corps Reserve, seventy-five percent; and the Army Reserve, seventy-three percent. Additionally, the Air Reserve Component continues with higher than average numbers of reservists having prior active duty experience.[41]

Keeping trained and talented people provides for a level of stability in the reserve force. In this respect, the Air National Guard and Air Force Reserves also have a higher percentage of personnel between the age of thirty-five to fifty than the active force. In particular, when comparing ages of active and reserve officer corps, the Reserves and Guard have almost thirty percent of their officers between the age of forty-one and forty-five, compared with only about fifteen percent of the active officer corps.[42] While not absolute, it does reflect a more mature and experienced reserve force to work and train with the same equipment.

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[39] *Defense Almanac 90*, OASD/FM&P, Nov/Dec 1990, p 34.

[40] FY 1990 Report of the Reserve Forces Policy Board, Mar 1991, p 68.

[41] *Ibid*, p 82.

[42] *Defense Almanac 90*, p 34.

Some reserve crew chiefs have been assigned to the same individual aircraft for as long as ten years, while their active counterpart may average only three to four. This aspect manifests itself in air-to-air and air-to-ground competition and in performance, gunnery, and maintenance.[43]

Personnel Management

The focal point for Air Force Personnel management during wartime is the Air Force Manpower and Personnel Readiness Center network made up of manpower and personnel planners from base level to the Air Staff. Empowered to monitor and coordinate wartime manpower and personnel actions, the Center is the lead activity responsible for monitoring and informing senior leadership of significant wartime situations that can affect personnel policies.

Beginning in August 1990, this network operated on a twenty-four-hour schedule. The Air Staff Personnel Center, collocated with the Air Force Combat Operations Staff, served as the lead manpower and personnel agency for the JCS and Air Staff operational and personnel planners. Augmented by Personnel and Manpower planners from the Air Staff, Center staffers became a part of the Air Force Chief of Staff's Crisis Action Team. During the war, they undertook hundreds of personnel and manpower actions and inquiries affecting every facet of personnel management. The immensity of this task was tremendous in deployment and strength accounting.

While the Air Force had vigorously trained for mobility, no one expected to deploy so many people from so many units to so many bases in such a short period of time. The speed of the deployment was unprecedented–10,000 personnel deployed during the first 10 days–and 30,000 deployed within the first 39 days of the operation.[44]

The need to deploy as many combat aircraft to the theater as quickly as possible prevented commanders from taking the number of support personnel normally needed. This situation exerted such a strain on the

[43]Air Combat Command History of William Tell and Gunsmoke, ACC/HO.

[44]Ltr, Lt Col Jerry W. Crowe, Chief Personnel Readiness Division, HQ TAC/DPXX, to Col Henry L. Cyr Jr., Chief Personnel Readiness Division, HQ USAF/DPXC, subj: Gulf War Air Power Survey, 2 Mar 1992

Contingency Operation Mobility Planning and Execution System that it never caught up. Additionally, the lack of a plan that would identify a starting point for personnel requirements was a contributing factor in matching requirements with deployed resources. The lack of a centralized statement of Air Force manpower requirements compelled each supporting command to develop its own manpower document. As a result, many command documents used nonstandard codes, which made automated consolidation of all Air Force requirements next to impossible.[45]

Since the plan was being modified daily, requirements could not be built as fast as personnel deployed. This lack of planning created situations where people were not properly accounted for in the theater of operations. Commanders lacked accurate information on current or future requirements for their mission, or type of personnel arriving in the near future. Manpower planners, not part of the initial deployment, established requirements upon later deployments at each site based on schedules when personnel had deployed. Once in place, they made progress in catching up, until the push to double the force in December 1990, and again the accountability system became cumbersome and inflexible. It was not until January 1991 that the requirement numbers began to reasonably match the personnel numbers in theater.

Exacerbating the accountability problem was the lack of in-theater trained Combat Personnel Control System operators. When personnel requirements data did arrive, many of the operators did not know how to process the incoming data.[46] Inaccurate projections sent from stateside bases complicated matters even more. When this loop broke, so did accountability.

To fix the accountability problem, bases in the United States established work-arounds, such as projection of all personnel departures, then transferred this information by modem to each site. CENTAF-Rear Manpower and Personnel planners sent people to the theater to help with communication and personnel control, requirements documents, and modem interfaces. Although this method of transferring data was not planned, timely, or accurate, it did allow CENTAF to pass accountability

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[45]AFWMPRT, "JULLS Long Report Number 51540-06748 (00002)," 17 Oct 1991, p 2.

[46]The Inspector General of the Air Force Report, *Functional Management Review of the Combat Personnel Control System (CPCS) II*, 17 Jun 1992, pp 1-3.

information to the Military Personnel Center, U.S. bases, supporting major commands, and the Air Staff.

Personnel Support for Contingency Operations

As a result of lessons learned from the conflict in Vietnam, in 1973 the Air Force established Personnel Support for Contingency Operations (PERSCO) teams. This team concept was introduced to provide deployed commanders with basic strength accounting and casualty reporting. Additionally, Combat Personnel Control Systems were developed in 1989 to give deployed personnel support teams an automated means to perform strength accounting and other personnel actions. The Gulf War was the first time that the Combat Personnel Control System was used in a wartime environment. At the height of the contingency, 41 support teams representing almost 200 personnel along with 33 Control System machines were deployed to the theater of operations. These personnel represented 39 Air Force bases. By the end of the conflict more than 370 control and personnel support staff had served in Southwest Asia.[47]

Operations Desert Shield/Desert Storm identified the need to redesign personnel control for deployed commanders with more long-term personnel sustainment support. During Operations Desert Shield/Desert Storm, deployed commanders requested more routine personnel support than had been envisioned. Early deployed teams did not have the right mix of expertise and training to provide commanders with full service personnel actions. In many cases the personnel office based in the states had to support the member. Later in the deployment, line remarks added to the deployment requirements document identified the added specialized qualifications for each team. A combined staff assistance visit by the Air Staff, the Personnel Center, and the CENTAF-Rear staff to the theater confirmed the need for a broader range of personnel services.

After-action reports noted training deficiencies in all personnel support areas. Very few people knew how to operate the Combat Personnel Control System, and even fewer were prepared to process automatic

[47]Ltr, James H. Ermis, Chief Readiness and Mobilization Division Air Force Military Personnel Center, to: HQ USAF/DPXC, Lt Col Kenneth Roy, subj: PERSCO Demographics From the Persian Gulf War, 17 Aug 1992.

digital network data.[48] Of 342 deployed members in the Personnel Support for Contingency teams, only 28 percent had received the special experience identifier to certify as a fully trained team member.[49]

Stop-Loss

The President extended to the Services authority to suspend provisions of the law relating to promotions, retirements, and separations. This authority is known as Stop-Loss. As in the call-ups, the President delegated this authority to the Secretary of Defense, who in turn delegated it to the Service secretaries on 27 August 1990.[50] Stop-Loss was limited to members of the armed forces who:

- were or were about to be involved in operations in or around the Arabian Peninsula,
- were or were about to be involved in direct support of Persian Gulf operations,
- possessed critical skills associated with Gulf operations,
- possessed skills in short supply.

On 17 September 1990, the Secretary of the Air Force implemented a limited Stop-Loss for individuals with separation or retirement dates between 2 October and 31 December 1990.[51] This affected approximately 1,500 Air Force personnel whose separation or retirement date was adjusted to 1 January 1991. In the months following September, the Air Force revised the Stop-Loss list, adjusting both the scope and period, so that airmen could not leave the Air Force indefinitely because of the uncertainty created by the Gulf Crisis. The revised list would have affected nearly 11,500 members. In January 1991, 75 officer and 63 enlisted specialties were on the list.[52] People in these career areas made up ap-

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[48]AFMPC/DPM, GWAPS After Action Input, "PERSCO Operations," 29 Apr 1992, unnumbered.

[49]*Ibid.*

[50]Memo, Maj Delores Street, Chief, Officer Retirements and Separations Policy, HQ USAF/DPXO, to Col Henry L. Cyr, Jr., Chief, Personnel Readiness Division, HQ USAF/DPXC, subj: 1991 History, 5 May 1992.

[51]*Ibid.*

[52]Maj David E. Edwards, AFMPC/DPMARS, *Position Paper on Expansion of Stop-Loss*, 21 Feb 1991.

proximately 44 percent of the Air Force. However, only about 2.4 percent were potentially prevented from leaving the Air Force.[53]

Guidance from the Air Force Chief of Staff and Deputy Chief of Staff for Personnel, however, "minimized" the impact of Stop-Loss on its members.[54] While the Army initially applied Stop-Loss to all its personnel, then later relaxed its policy, the Air Force began by limiting it to specific units or specialties identified by the commands. A limited Stop-Loss had never been exercised. While this approach proved to keep only those people needed to support the war, it also proved that the Personnel Data System was not as flexible as the personnel policies it was intended to support.

During the war, the Air Force Military Personnel Center studied the varying degrees of Stop-Loss implementation.[55] They determined that while it would have appeared more appropriate to expand Stop-Loss throughout the Air Force, the discriminate approach with modifications as needed met the immediate warfighting needs and minimized the effect on Air Force people. Additionally, the expansion of Stop-Loss would have been inconsistent with several ongoing and planned force reduction programs.[56]

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[53]It was difficult to determine how many people were actually prevented from leaving the Air Force. While numbers are not available, many Air Force members whose separation date was affected by stop-loss would have reenlisted any way.

[54]*Ibid*, Note 53.

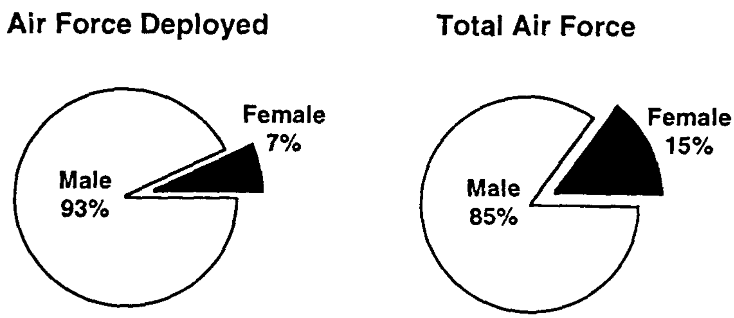
[55]See note 53.

[56]*Ibid.* Note: Force reduction programs implemented prior to and during the war were enlisted date of separation rollback, officer voluntary early release program, lowered high year of tenure separations, and Selective Early Retirement Boards (SERBS). Those under consideration were officer and enlisted RIFs, and additional SERBS. All these were part of the DOD-wide drawdown. It would appear counter-productive to implement Stop-Loss and drawdown at the same time. However, the pressures to meet end-strengths after the (assumed to be of short duration) war was over were not going to go away. The Air Force did, however, later receive end strength relief for FY 91.

Role of Women

(U) More than 40,000 U.S. Service women deployed to the theater of operations.[57] As of March 1991, the Army had sent 30,094; Navy, 4,685; Marine Corps, 1,225; and Air Force, 4,095 women to the Persian Gulf. That equates to about 7 percent of all the deployed forces.[58] Percentages of Air Force women in the total force with those deployed to the Persian Gulf War is illustrated in Figure12.

Figure 12
USAF Women Deployed and Total Force



Source: DMDC as of March 1991

Women performed a myriad of functions–administrators, security police, communicators, reconnaissance and airlift pilots, and crew members, as well as jet engine, aircraft maintenance technicians, and crew chiefs. Although they did not serve in direct combat units, five Army women were killed in action and twelve wounded in action. Two Army women were also taken prisoners of war by the Iraqis. No Air Force women were killed in action or captured.

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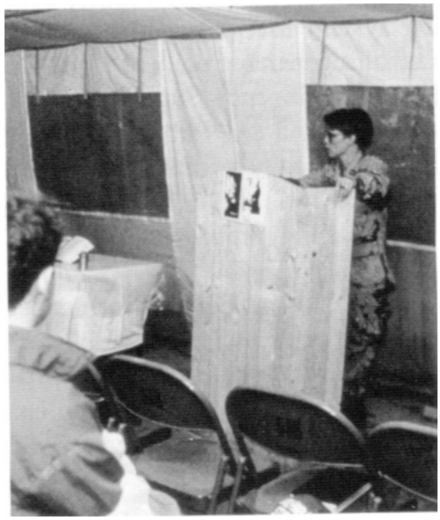
[57] DMDC statistics as of Mar 1991.

[58] 9.6% of Army, 4.4% of Navy, and 1.5% of Marine Corps deployed were female.



Women performed many functions during the Gulf War. Here, female chaplain holds services.

In the very early stages of the deployment, there was some hesitation in deploying some functional areas and women on the first departing aircraft. It was associated with determining what the Saudi position would be regarding U.S. Service women deployed to Saudi Arabia. This concern was soon dismissed, however, and commanders as well as functional areas deployed personnel without regard to gender.

Air Force Casualty Services

This function, controlled and administered by the Directorate of Casualty Matters at Randolph AFB, Texas, served as the single focal point for Air Force casualties during the Persian Gulf War. The twenty-four-hour-a-day Casualty Operations Center included receiving all reports of casualties, coordinating notifications, and directing assistance to the next of kin. Casualty reporting by Personnel Support teams, however, was sometimes hindered by deployed commanders, directors of operations, and the medical community. Casualty message traffic would sometimes be overclassified or critical identification information would not be immediately released to the Personnel Support team for reporting to the Casualty Center.[59] This generally occurred, with concern over security, and was often unavoidable.

[59] *Ibid.*

Air Force Casualty Matters developed an automated casualty reporting system that provided a capability to produce cumulative casualty statistics generated daily and provided to the Joint Chiefs of Staff and Air Force Contingency Support Staff, Air Force Military Personnel Center, Air Staff, and SAF Public Affairs. Guidance concerning the public release of casualty information from OSD, Public Affairs was lacking.[60] The Air Force was the only Service to develop an automated capability to report casualty information.

The CENTAF-Forward personnel staff served as a vital link to the deployed personnel community working with CENTAF-Rear to ensure that casualty information was appropriately declassified and released to the Personnel Support teams. Additionally, they coordinated casualty issues with field hospitals and the other Services.

Operation Yellow Ribbon

Upon cessation of hostilities, releasing prisoners of war and reuniting family members became the universal concern. The Defense Department had not faced such an undertaking since the release of POWs from the Vietnam War. During the Persian Gulf War, however, all U.S. POWs were returned and there were no people missing in action.

The coordinating agency for repatriation became the task of the Air Force Deputy Chief of Staff for Plans and Operations on 1 March 1991, three days before release of the first POW. The Air Force Operation Yellow Ribbon After Action Report, issued on 16 May 1991, recommended that the Air Force be appointed as the executive agent for organizing and beginning formal POW/MIA repatriation planning for future contingencies.[61] During the Gulf War itself, the United States suffered few casualties, as indicated in the figures released by the Defense Department shown in Table 11.

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[60] *Ibid.*

[61] DOD After Action Report, *Operation Yellow Ribbon Desert Storm POW Repatriation*, p 28.

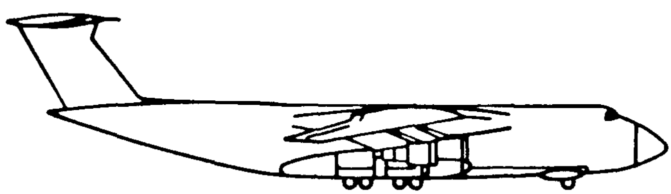
Table 11
DOD Casualty Figures

Service	KIA	WIA	POW	Non-Hostile Dead
USA	96	365	5	127
USN	6	9	3	48
USMC	23	87	5	44
USAF	20	9	8	15
Female*	4	16	2	7
Total	**145**	**470**	**21**	**234**

Source: Washington Hq Services, Directorate for Information Operations and Reports and JCS/J-1. *Female casualties are included in Service counts. KIA: Killed in action; WIA: wounded in action; POW: prisoner of war.

Air Force Personnel Nondeployable Rates

To assess the efficacy of the reserve program, in September 1990 and February 1991 the Air Force conducted a survey of the dependent care program. The results in Table 12 indicate the number of reported nondeployables relating specifically to dependent care problems.[62]



[62]AFMPC/DPM, GWAPS After Action Input, "Dependent Care Responsibilities Program," 29 Apr 1992, unnumbered.

Table 12

Deployablity Problems Associated With Inadequate Dependent Care Plans

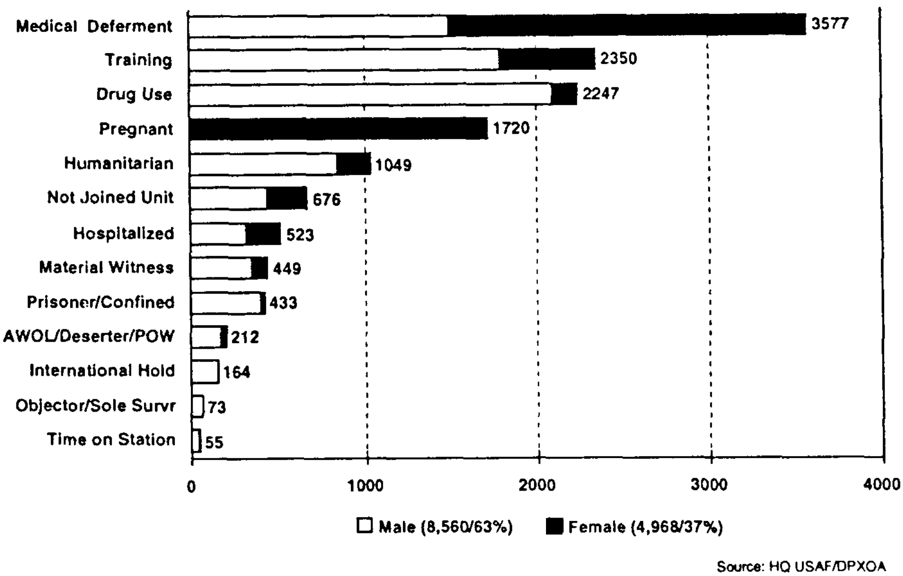
USAF Single Member Sponsors (SMS) 10,487	Military Couples w/Dependents (MCD) 13,707
Total Deployed SMS: 1,398	Total Deployed MCD: 235
Percent of SMS Deployed: 13.3%	Percent of MCD Deployed: 1.7%

- Members not able to deploy: 73 (4.5%)
- Members returned to CONUS due to dependent care reasons: 88 (5.4%)
- Members revising care plans after notification of deployment: 69 (4.2%)
- Members who revised care plans and deployed: 62 (90%)
- Members with civilian spouses incapable of self-care deferred from deployment due to inadequate dependent care plans: 30

Guard and reserve nondeployability rates were partially masked, since they were not mobilized by entire units, and commanders selected volunteers that were most fit to deploy. In that regard, there were no reportable nondeployables. The active-duty forces deployed in much the same manner as the reserves, and their commanders also could choose from a large pool of qualified personnel. However, there were numbers of active-duty personnel coded nondeployable in the Personnel Data System.

Since the active-duty Personnel Data System can only indicate who was deployed, there is no basis to determine who was asked and did not deploy. Since the numbers of nondeployables is a snapshot in time, a person coded nondeployable in the morning could be deployable in the afternoon. For an accurate picture of the active Air Force nondeployables during the Persian Gulf War, three snapshots in time were taken at the end of September and December 1990 and March 1991 with the results averaged. They revealed a total of 466,752 deployables and 81,925 nondeployables.[63] Of the nondeployables, 68,452 were changing permanent duty station. (Personnel are coded nondeployable until they have at least 60 days at their new duty station.) These codes are routinely waived by commanders making them deployable. Figure 13 shows 13,528 active personnel coded nondeployable (excluding the 68,452 personnel coded for permanent duty station moves). Comparing male and female rates in all categories shows that 1.8 percent of the total male population was coded nondeployable, and 6.4 of the females.

Figure 13
Active Air Force Nondeployables By Type



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[63]Briefing, undated, "Air Force Non-deployability, Presidential Commission Tasking," HQ USAF/DPXOA.

Family Support Activities

At the outset of Operation Desert Shield, 107 family support centers provided a wide range of programs to address family needs[64] as the on-base focal point. During the deployment, the centers augmented their ongoing programs in financial management, information and referral, and volunteer assistance to meet the increasing needs of the community. After the initial deployment, support centers also implemented new programs to assist family members. In January 1991, Air Force Family Matters conducted a survey of center directors to assess the early response to families and found a significant increase in the use of Family Support Centers by Guard and Reserve families.[65] The survey pointed out that the family support network transcended family support centers in that they provided emotional, educational, informational, and social support–but especially "peace of mind" for family members and military alike. While the effect of family worries or distractions on combat operations may not be directly measurable, such factors certainly contribute to morale and affect job performance.

During combat operations, the need for services and support increased as families faced ongoing media updates on the events of the war. In the category of "support during family separation," for example, contacts multiplied from an average of 3,000 per quarter prior to Operation Desert Shield to more than 75,000 during the period associated with the war.[66]

Air Force Civilian Personnel and Contractor Support

Air Force civilian employees and independent contractors became an integral part of the total force during the Persian Gulf War, even though they were not technically in the armed forces. They worked along side their military counterparts and suffered the same unpleasantries. More than 200 Air Force civilian employees served in Southwest Asia during

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[64]HQ USAF/DPP, GWAPS After Action Input, "Family Support Activities," 29 Apr 1992, unnumbered.

[65]Data Analysis of United States Air Force (HQ USAF/DPPH), *Desert Shield Survey for Family Support Centers*, 4 Mar 1991, pp 1-1–1-7.

[66]*Ibid.*

Operations Desert Shield/Desert Storm.[67] In addition, approximately 6,000 Air Force civilian employees were called to active duty as part of the Reserves or National Guard, which represents 1.4 percent of the total DOD reservists activated during the Persian Gulf War.

"Tech Reps" were also used by the Services to provide technical assistance on many weapon systems deployed to the Persian Gulf War. They were both civil service and independent contractors, often retired military and always highly trained by the manufacturers in the maintenance of various aircraft and other high-tech systems. They offered years of experience and corporate knowledge during the war.[68] At the 388th Tactical Fighter Wing Provisional, for example the Air Force Engineering and Technical Service Reps fixed as many as seventy items a month for F-16s that would have normally been sent back to Hill Air Force Base, Utah for repair. They also developed a method to cool aircraft canopies for protection from the extreme desert heat while parked on the ramp. Given the nickname "Old Guys" by Lt. Col. Bob Gilloth, assistant deputy commander for maintenance, these civilians played a vital role in the completion of the 388th wartime mission.[69]

The Tactical Air Command provided the largest number of civilian employees deployed, and the single largest group (forty-one) came from TAC's Air Force Engineering and Technical Services. They provided technical advice and support for the F-15, F-16, F-111, RF-4, F-4 G/E, A-10, AWACS, Compass Call, ground TACCS, Combat Communications, and the Corps Automated Maintenance System.

Seventy-nine defense contractor representatives from Grumman, Martin Marietta, Chicago Aerial, Northrop, McDonnell Douglas, and

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[67]Ltr, Roger L. Schermerhorn, Acting Chief, Requirements and Applications Division, Directorate of Civilian Personnel, HQ USAF, to Colonel Henry L. Cyr, Jr., Chief Personnel Readiness Division, HQ USAF/DPXC, subj: Gulf War Air Power Survey, 9 Mar 1992.

[68]At the 388th TFW(P) the six members of the Air Force Engineering and Technical Service Team had a combined military and civilian maintenance experience of almost 200 years.

[69]*Fighter in Country*, Vol 2, Number 14, "Old Guys Play Vital Part in 388th," Sgt Gary J. Kunich, 388th TFW(P), Public Affairs, 10 Feb 1991.

Hughes Aircraft also deployed to the theater of operations.[70] They provided essential wartime technical support to a myriad of systems including radar systems, navigation target pods, RF-4C cameras, and electronic warfare systems, to name a few. One very successful air-to-ground mission was a direct result of a Grumman Corporation contractor. Aboard one of the surveillance aircraft, the Tech Rep picked out a cluster of forty Iraqi armored vehicles on the ground, resulting in the destruction of twenty-nine by U.S. aircraft.[71]

Air Force civilian employees also provided support for logistical, civil engineering, intelligence, procurement, personnel systems, and mortuary affairs. Prior to the invasion, 123 Air Force civil service employees were already assigned to permanent duty stations in Southwest Asia. A departure of nonessentials reduced that number to 87. Another 66 deployed to the theater of operations during Desert Shield from Air Force Logistics, Military Airlift, Systems, Strategic Air, and Special Operations Commands, and U.S. Air Forces in Europe. They performed a myriad of functions in battle damage repair, fuels quality assurance, telecommunications, and others.

Akin to their military counterparts, accountability of deployed civilians was also a problem.[72] Currently, the Manpower and Personnel Module of the Contingency, Operation, Mobility Planning and Execution System does not interface with the civilian personnel data system; hence, procedures to account for civilian or contractor employees deployed in support of a contingency did not exist. Furthermore, policies and procedures on issuing identification cards, uniforms, chemical defense gear, and passports for contractor personnel must be included in base mobility plans. While not a show stopper, the lack of firm guidance created minor problems.[73]

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[70]Ltr, Dick Speakman, Chief Engineering and Technical Services Division, HQ Air Combat Command, to Mr. Ted Beck, Research Analyst, Gulf War Air Power Survey, 26 Oct 1992.

[71]*Wall Street Journal*, "Tech Reps Taste Battle in Desert Storm, Civilians Make House Calls to Repair High-Tech Military Gear," Rick Wartzman, 15 Mar 1991, p A5A.

[72]HQ USAF/DPCR, "JULLS Long Report Number 32066-19312 (00001)," 4 Feb 1991, p 1.

[73]*Ibid.*

7

Media and Public Affairs

Operations Desert Shield/Desert Storm demonstrated that press coverage is an unavoidable yet important part of military operations. Experience again proved that while the press could be *managed* more or less successfully, it could not be ignored, and it could not be *controlled*. More specific to the air campaign, the military also learned new aspects of public relations.

For example, the inaccessibility of American air bases in the Persian Gulf during Operation Desert Shield hampered the creation of a comfortable working relationship between the press and the United States Air Force. Also, many Air Force commanders were skittish about talking to the press, having witnessed the dismissal of Air Force Chief of Staff, General Michael Dugan for indiscretion. During Operation Desert Storm, a number of factors contributed to distribution of press coverage of the air war: journalists' lack of understanding of air operations, restricted access by reporters to air crews, bases, and aircraft, and the misleading nature of television footage covering precision-guided weapons.

This chapter examines two important and interrelated aspects of coverage of the air war: what the press covered and how the military, particularly the Air Force, organized to manage that coverage. To that end, the two parts of this chapter address the different public affairs aspects of the campaign. The first is a qualitative examination of press coverage of the war, with particular emphasis on the air campaign and its impact on public support for the war effort and on decisionmakers, and the second elaborates on the public information mechanism that was put in place by the military for handling press coverage, with specific interest in the manner that military public affairs organizations handled the air war story, followed by conclusions.

Part I

The Media in the Gulf War

This chapter focuses on central issues related to media coverage of the Gulf War, especially the air campaign. It is important to make clear at the outset what this chapter is *not*. It is not a chronological or thematic explication of the full range of broadcast and print coverage of the entire war or the air war, nor is it an after-action report on how DOD, Air Force, or other Service public affairs personnel handled the media during the war. It is not a blow-by-blow, who-did-what-to-whom account of military-media relations.

Rather, this essay selects a small number of important issues related to media coverage of military operations and attempts to illuminate them in the context of the Gulf War air campaign, while looking towards future conflicts. The issues discussed were selected because they not only played a significant role during the Gulf War air campaign, but are likely to reappear. Thus this chapter has one eye on the past and one on the future.

It should be noted that extensive literature on the press/media and the Gulf War has developed and is likely to continue to build during the next several years. At least three types of books have appeared so far: anthologies, insider accounts, and interpretative analyses. The most comprehensive of the anthologies is *The Media and the Gulf War: The Press and Democracy in Wartime*, edited by Hedrick Smith.[1] The insider accounts were written by working journalists or someone working within a major news organization. An example of the former is *Hotel Warriors: Covering the Gulf War* by John J. Fialka of the *Wall Street Journal* [2]; an example of the latter is *How CNN Fought the War: A View From the Inside* by Major General Perry M. Smith, USAF (ret).[3] The interpretative analyses were sometimes written with an ideological bent, sometimes without. Three examples are *War and the Media: Propaganda and Persuasion in the Gulf War* by Philip M. Taylor[4]; *Second Front: Censor-*

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[1]Washington, D.C., Seven Locks Press, 1992.

[2]Washington, D.C., The Woodrow Wilson Center Press, 1991.

[3]New York, A Birch Lane Press Book, published by Carol Publishing group, 1991.

[4]Manchester, England, Manchester University Press, 1992.

ship and Propaganda in the Gulf War by John R. MacArthur[5]; and *The Persian Gulf TV War* by Douglas Kellner.[6]

Many of the important issues that emerge from a study of broadcast and print media during wartime fall into two clusters–media coverage and the public, and media coverage and the policymakers. These clusters overlap, to be sure, but they are analytically distinct.

Media Coverage and the Public

Here, there are two issues of special significance–first, how the public learns from the media what it most wants to know, i.e., how the war is going, and second, how press coverage of civilian casualties affects public support for the war. It would also be useful, after exploring those two issues, to examine briefly overall public support for the Gulf War.

What the Public Wanted to Know

Once military operations are underway, the first and most basic question most citizens probably ask is, "how is the war going?" The problem in answering this straightforward question is that there are few if any handy, public, widely accepted measures of progress, or lack thereof, in a war or any other military operation. Not since Korea has a single, simple line on a map provided reasonable indication of progress.

It is certain, however, that almost everything the public learns about an ongoing military operation is learned from the media, especially television. (The importance of television as the principal source of news for most members of the public is difficult to exaggerate; for example, a Gallup poll conducted in the first days of the Gulf War found that eighty-nine percent described television as their "main source of information about the war," eight percent radio, and two percent newspapers).[7]

Almost as certain is the tendency of government officials, reporters, editors, producers (the counterpart in broadcast news to editors in the print media), and citizens to search for simple measures of progress. In

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[5]New York, Hill and Wang, 1992.

[6]Boulder, Colorado, Westview Press, 1992.

[7]*The Gallup Poll Monthly*, Jan 1991, p 21.

an age of instant information usually conveyed in abbreviated, almost short-hand form, the search for a "measure of merit" may pose problems not just for the journalist and the professional analyst but also for the average citizen, newspaper-reader, and television-viewer.

One of these measures used frequently during the early days of the Gulf War was aircraft losses. Newspapers and television news programs provided coverage of daily and cumulative losses, allied and enemy. These were simple numbers, and there were only a few of them to track. While not providing as comprehensive a measure of progress as the forward-line-of-troops in Korea, the aircraft loss figures could provide a simple, easily understandable, albeit partial measure of progress in the war.

For government and military public affairs offices, it was an easy, obvious, and useful task to publish these figures on a regular basis–if for no other reason than that it was an easy, obvious, and useful question for reporters to ask at news briefings! But these same numbers also posed a potentially difficult problem for those managing the politics and public affairs dimensions of the war. In a campaign such as the Gulf War, in which one side was flying hundreds of aircraft in thousands of sorties every day, and the other was essentially hunkering down, the former could easily find itself losing more planes than the latter. This could be a political problem for the former if such results, when released, were to lead its public to conclude that it was losing, or at least not doing very well, or doing well at too high a cost.

In fact such a problem never materialized during the air war, in part because comparative aircraft losses were not prominent in the coverage, in part because other aspects of the war (especially the Scud problem) came to dominate the news in the first days of combat, and in part because allied losses were so small.

First, aircraft loss figures, while included in most coverage in the early days of the war, were not portrayed as prominently as they might have been, and they were not used as a simple, single measure of progress. *The Washington Post* and *The New York Times*–two of the most influential daily newspapers in the country, which are read by most members of Congress, senior government officials, and journalists in Washington–provided extensive and intensive coverage of the Gulf War. A close examination of their coverage in the early days of the air campaign indicates that aircraft losses were not a prominent feature in their[8] reporting, and further that other numbers (such as comparative troop strength, numbers of aircraft in theater, sorties flown, prisoners of war, Scuds launched and destroyed) were given at least as much prominence.

A review of the relevant transcripts of network evening news stories during this same period reveals similar treatment of comparative aircraft loss figures by ABC, CBS, and NBC: they were reported, but were not prominent in the coverage.

Thus, aircraft loss figures appear to have been no more dominant in early coverage of the war than many others–including daily and cumulative numbers of sorties, and percentages of "successful" sorties–leaving the public without a single, simple measure of progress.

A second factor reducing the visibility and salience of the comparative loss figures was that even in the early days of the air campaign, there were bigger war fish for the media to fry, including allied pilots taken prisoner by Iraq and the "video-game" footage of allied precision-guided munitions destroying Iraqi targets.

By far, however, the most important development diverting press attention from aircraft losses was the sudden, very early, and (to many) surprise appearance of the Scud missile threat, which quickly took center stage. Indeed, on the front page of the *Post's* second-day-of-the-war edition (18 January), the six-column, two-line headline was "Iraq Retaliates With Missile Attacks Against Israeli Cities, Saudi Air Base."[9] Four separate articles that day, including the two leading stories on page one, focused on the Scud attacks, and the allied, Israeli, and other responses to them. The next day's paper reflected the same emphasis–another six-column, two-line, page-one headline ("More Iraqi Scud Missiles Hit Israel, Increasing Chances of Retaliation"),[10] and nine separate Scud-related stories, including the top three on the front page, one of which

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[8]It should be noted that there are no newspapers which can rival national television news (broadcast and cable) as vehicles to reach a *mass, national* audience. *The Post* and *The Times* are used here because of the elite nature of their readership, not its size.

[9]*The Washington Post*, 18 Jan 1991, p 1.

[10]*The Washington Post*, 19 Jan 1991, p 1.

added another element of drama to the Scud story–"U.S. Hunt for Missile Launchers Like 'Needle in Haystack' Search."[11]

(U) On television, the Scud story was even more dramatic, with extensive and frequent footage of damaged areas in Israel and Saudi Arabia, civilian casualties, gas-mask drills, even live reports on imminent and actual attacks, including colorful, gripping footage (which later became quite controversial)[12] of the (alleged) interception of Scuds by U.S. Patriot missiles.

For all the media, both for editors and producers, and for readers and viewers, drama always plays better than mere data. This is especially true for television, which is, above all, a *visual* medium. "Write to the pictures," is a television news byword.[13] A perverse Gresham's Law is at work: Good pictures always drive out dull data. In the words of the *Daily Telegraph*, "Television is a marvelous medium of impression, a hopeless medium of analysis . . . ."[14]

Of course, the Iraqi Scud attacks were more than human drama. Given the severe internal pressures on the Israeli government to retaliate, and the likely effects that Israeli entry into the war might have had on the cohesion of the Gulf War Coalition, serious and volatile geopolitical factors were at work. How effective the Scud attacks would be, whether they would continue, who would retaliate and how–all would have con-

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[11] *Ibid*, p 1.

[12] See, for example, Eliot Marshall, "Patriot's Scud Busting Record Is Challenged," *Science*, 3 May 1991; Theodore A. Postol, "Lessons of the Gulf War Patriot Experience," *International Security*, Vol. 16, No. 3 (Winter 1991/1992); Eliot Marshall, "Patriot's Effectiveness Challenged," *Science*, 8 Nov 1991; Barbara Opall, "Patriot Debate Resumes," *Defense News*, 18 Nov 1991; Reuven Pedatzur and Theodore Postol, "The Patriot Is No Success Story," *Defense News*, 2 Dec 1991; Charles Zraket, "Patriot Gives Stellar Gulf Performance," *Defense News*, 9 Dec 1991; and correspondence by Robert M. Stein and Theodore A. Postol in the Summer 1992 issue of *International Security*, Vol. 17, No. 1.

[13] Interesting, authoritative, and eloquent on this subject is two-time NBC News president Reuven Frank. See especially his *Out of Thin Air* (New York: Simon & Schuster, 1991).

[14] 15 Feb 1991, as cited in Philip M. Taylor, *War and the Media*, (Manchester University Press: Manchester, 1992), p 212.

siderably more to do with perceptions of the war's progress than would comparative aircraft losses.

A third factor that mitigated the potential impact of comparative aircraft loss data was the (surprisingly to many) small scale of the allied, especially U.S., losses.

For months prior to the war, the press and Congress had been publicly airing casualty estimates by well-known military analysts, and the numbers were sobering. In December *Time* reported that "analyst Edward Luttwak figures that, under the most favorable circumstances . . . the U.S. would suffer 'several thousand killed in action.' Trevor N. Dupuy, a retired Army colonel, has worked out methods of predicting casualties that have proved startlingly accurate . . . . For a war with Iraq, he calculates 1,200 to 3,000 dead, 7,000 to 16,000 wounded–in the first 10 days."[15]

The public also came to share these predictions: Even as late in the crisis as January 10-11, Gallup found that 62 percent of the public thought that U.S. casualties would number in the thousands, and only 28 percent thought they would number less than 1,000. But after the war began, and even in its first few days, public predictions of the numbers of casualties dropped significantly; they rose somewhat in early February, then dropped again towards the end of the war, as shown in Table 13.

As late as the day after the war began, some publicly circulated official or quasi-official estimates of possible losses were considerably higher than those which in fact soon occurred. On 17 January, the *Post* reported: "Total U.S. losses in the air war are uncertain. The House Armed Services Committee estimated the number at ten planes or more a day; Air Force officials believe losses to be lower."[16]

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[15]Michael Kramer, "Deadline: Jan 15," *Time*, 10 Dec 1990, p 35.

[16]*The Washington Post*, 17 Jan 1991, p A26.

Table 13[17]

Now that the U.S. has taken military action against Iraq, do you think that the number of Americans killed and injured will be . . .

	Less than 100	Several Hundred	Up to 1,000	Several 1,000's	Tens of 1,000's
24 Feb	10%	31%	20%	20%	3%
22 Feb	10	22	20	28	5
7-10 Feb	6	21	17	39	8
17-20 Jan	12	24	16	29	4
17-18 Jan	12	21	14	28	4
10-11 Jan	4	11	13	44	18
18-19 Oct	6	15	15	35	18

Not only did the allied losses remain low, but as the air campaign continued with attacks on Iraqi airfields and as many Iraqi aircraft fled to Iran, Iraqi total aircraft losses continued to mount, and the allied loss figure never exceeded the Iraqi figure.

It would probably be reasonable to assume that in future contingencies the American public will pay considerable attention to casualties, and that U.S. aircraft losses will be spotlighted not only as absolute numbers, but also in relation to enemy losses (as a measure of how much is gained at what price).

Casualties did seem to be on the media's, and by extension the public's, mind during the Gulf crisis and war. In one survey of the most frequently used terms or concepts in news coverage from August 1990 through February 1991, after Vietnam (7,299 references), those print and broadcast media surveyed used *human shields* (2,588 references) and *allied/U.S. casualties* (2,009) more often than any other of a dozen terms

[17]*The Gallup Poll Monthly*, Feb 1991, p 18. In the 18-19 Oct 1990, and the 10-11 Jan 1991, polls, the question began, "If the U.S. takes military action . . . ."

and concepts studied.[18] According to one study of ABC, CBS, and NBC television evening news broadcasts during the war, "*The most frequently televised images of the Gulf War were* not of combat or military casualties, but of *damage and injuries inflicted on civilians.* We coded 1,217 individual camera shots of nonmilitary damage . . . . Nearly *half (48%) of these shots showed damage to civilian areas inside Iraq* . . . . Ironically, *the number of air combat visuals* [594] *virtually equalled the number of images of Iraqi civilian damage* (590)." [Emphasis in original.][19]

Further, the public did seem sensitive to casualties, as one measure of the costs of a military operation or war. The results of a survey taken just before the Gulf War (11-15 January 1991) are interesting. The Roper Center for Public Opinion Research asked three questions, one to each third of a national sample; those in the first third were asked straightforwardly about support for going to war, those in each of the other thirds were asked a similar question, with the addition of a hypothetical estimate of U.S. casualties. All three questions were prefaced by, "As you may know, the United Nations Security Council has authorized the use of force against Iraq if it doesn't withdraw from Kuwait by 15 January 1991."

Sixty percent of the first third favored going to war if Iraq does not withdraw from Kuwait; in the second third, 52 percent favored going to war if that meant 1,000 Americans would be killed in action; in the last third, only 37 percent favored going to war if that meant that 10,000 Americans would be killed.[20] So in this case at least, support for going to war seems clearly related to public perceptions of the costs, the most prominent of which is casualties. It would probably be unreasonable and unwise to assume that in this dimension the Gulf War was unique.

Related to these results are those of a *Los Angeles Times* poll taken immediately after the war began, which measured the public's perception of victory in terms of cost in U.S. casualties (Table 14).

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[18]Everette E. Dennis et al, *The Media At War: The Press and the Persian Gulf Conflict* (New York: Gannett Foundation Media Center, 1991), p 42.

[19]*Media Monitor*, Volume V, Number 4, Apr 1991, pp 5-6.

[20]Roper Center for Public Opinion Research Data taken from Public Opinion Online service. Survey was taken for *The Washington Post.*

Table 14[21]

Assuming Iraq leaves Kuwait, would you consider the war with Iraq a success if ____ American troops died, or not?

Number of U.S. troops killed	Yes, a success
none	80%
500	50
1,000	37
5,000	27
10,000	20
20,000	16

Beyond the broader point about the public's concern about casualty figures and how those might be related to support for the war or other military operations, John Mueller's argument in his study of public opinion during the Korea and Vietnam wars is also relevant: " . . . one assumes that the public is sensitive to relatively small losses at the start of the war but only to rather large ones towards its end."[22] Given that with the exception of Korea, Vietnam, Beirut (1982-84), and Desert Storm, most of the more than 200 U.S. military operations since the end of World War II[23] have been measured in days or weeks, not months or years, the public's hypothesized sensitivity to low numbers of casualties in the early days of an operation may be the only part of Mueller's two-part assumption that becomes operative: The first few days may be the only days!

[21]As reported in John Mueller, "American Public Opinion and the Gulf War: Trends and Historical Comparisons," prepared for presentation at the conference on The Political Consequences of War, in Washington, D.C. on 28 Feb 1992, Table 52C, p 69. The initial question asked in the poll used 500 American troops; poll takers were instructed to accept "considers no American troops died as a success" as a volunteered response.

[22]John Mueller, *War, Presidents, and Public Opinion*, John Wiley & Sons, 1973, p 60.

[23]See Barry M. Blechman and Stephen S. Kaplan, *Force Without War* (Washington, D.C.: The Brookings Institution, 1978) and Philip D. Zelikow, "Force Without War, 1975-1982," *Journal of Strategic Studies*, Mar 1984, pp 29-54.

There is, however, some evidence that, indirectly at least, calls into question Mueller's thesis. A study of coverage of the Gulf crisis and war by *The New York Times* and *The Los Angeles Times*[24] indicates that allied casualties were not a prominent topic in *front-page* stories in the two papers during two critical periods–in only four percent of the articles during 1-23 January[25] (which includes the first week of the air campaign) and only six percent during 16 February through 1 March[26] (which includes approximately ten days of the air campaign and the entire ground campaign).

Nonetheless, it still seems reasonable to argue that in future conflicts, which might involve a more balanced (i.e., between the two sides) air war, U.S. losses may be higher in absolute and/or relative (i.e., compared to the enemy's) terms than in the Gulf War air campaign, and press coverage of those losses may be more prominent and therefore have adverse effects on public support for the war effort.

Civilian Casualties

This is another potentially volatile issue in terms of public attitudes, and it was intermittently salient for the American public during the air campaign. Stated simply, the issue is that press coverage of civilian casualties might lead to a loss of support for the war effort. In other words, public support for the war might be contingent not only on the number of U.S. casualties (see results of surveys above), but on the incidence of civilian casualties on the other side as well.

It appears that during the early days of the air campaign, this latent, potential concern was quickly and effectively mitigated by the footage

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[24]Edward S. Loomis and Paul S. Phillips, "Selected Elite Newspapers and Coverage of the Persian Gulf War," paper prepared for a graduate-level journalism class at Marshall University, 18 Nov 1991.

[25]*Ibid*, Table 19. Seven topics were more frequently included in front-page stories – in descending order of frequency: unit/soldier/equipment performance, U.S./allied diplomacy, purpose of U.S. involvement, civilian casualties, congressional debate, Iraqi commentary, and military readiness.

[26]*Ibid*, Table 25. In this case, only four topics appeared more frequently–again in descending order of frequency: unit/soldier/equipment performance, Soviet/Iraqi diplomacy, U.S./military strategy, and Iraqi commentary.

of precision-guided munitions (including the Tomahawks) and diverted by the contrast with the Iraqi Scud attacks, especially on civilian areas in Israel. Later, however, this issue was brought dramatically into the public eye, especially by the 13 February attack on the Amiriya command and control facility, which apparently also housed hundreds of Iraqi civilians that night.

The first point to be made here about the incident is that it was *big* and *dramatic* news in the United States. Less than nine hours after the attack itself, CNN was the first to run the story (at 5:04 a.m. EST),[27] and correspondent Peter Arnett's words set the tone for all the succeeding broadcast and print coverage: "We have the makings of a major tragedy here in Baghdad today."[28]

That evening all three broadcast networks included several reports on the incident, with graphic footage of the recovery of bodies from the ruins of the building. The pictures of the scene were perhaps the most emotionally striking shown up to that point during the four-week-old war. Indeed CBS anchor Dan Rather introduced the pictures with the words, "We caution you that some [of the pictures] may not be suitable for children."[29]

Likewise, the next day's (Thursday, 14 February) papers gave the story major play, minus of course the full drama of the pictures shown on television. "Bomb Strike Kills Scores of Civilians in Building Called Military Bunker by U.S., Shelter by Iraq," was the two-line, six-column headline across the top of the front page of *The Washington Post*, which ran three page-one stories on the attack. "Bombs Killed Victims as They Slept" and "Air War's Political Risks Dramatized" were the headlines on the other two. In all, the *Post* ran twelve attack-related stories that day, along with the text of the White House statement on the incident and lengthy excerpts of the Pentagon daily briefing, which was dominated by discussion of the bombing. Several of those stories focused on the politi-

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[27]According to Philip M. Taylor, *War and the Media* (Manchester: Manchester University Press, 1992), p 189.

[28]*Ibid.*

[29]*Defense Dialog*, 14 Feb 1991, p 2.

ramifications of the bombing and on the U.S. government's response to the public reports of the incident.

This was true as well of *The New York Times*' coverage of the incident.[30] The bombing was big news in the *Times*–the main headline on the 14th ("Iraq Says U.S. Killed Hundreds of Civilians at Shelter, But Allies Call it Military Post") and a total of ten articles, four of them on the first page. On the next day the main headline signalled the next turn in the story, towards the implications and aftermath of the bombing–"Allies Study New Steps to Avoid Civilians in Bombing." At the same time the U.S. version was given equal prominence, in a page one headline "U.S. Stands Firm on Bomb Attack and Says Investigation is Closed." By 16 February, the story had disappeared in the *Times*.

Thursday evening, both ABC and CBS–but not NBC–gave significant coverage to the aftermath of the bombing, featuring larger casualty estimates and the implications of the attack for U.S. and Coalition bombing strategy and priorities for the air campaign. But on the morning of 15 February (Friday), the attack was no longer the top headline in the *Post* ("U.S. Raises Estimate of Iraqi Armor Destroyed" led the front page), but the incident and its implications were featured in no less than five separate articles. By Saturday's editions, the bombing incident had receded from view, displaced by the news of Iraq's offer to withdraw from Kuwait (subject to certain conditions), a story of larger and more immediate political import.

The second major point is that the U.S. government–civilian and military, in Washington and in Riyadh–appears to have made an intensive effort to "get on top of" the bombing incident story, to coordinate its responses to the questions being raised, and to provide its own interpretation early and consistently. CENTCOM public affairs officers argue on the one hand that this incident wasn't handled any differently than any other story, but on the other hand that the issue probably received the most high-level attention of anything briefed to the press during the entire war. Indeed as evidence of the latter they cite (CENTCOM briefer) Brigadier General Neal's frequent telephone conversations with Secretary Cheney, General Powell, and Assistant Secretary of Defense Pete Williams explaining to them in advance what he would be saying about this incident.

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[30]See *Current News, Early Bird* editions of 14-16 Feb 1991.

To be sure, none of this means that the government tried, or even wanted, to distort or whitewash reality. Rather, the point is–and, for the government, was–that this was a *dangerous* story, dangerous in the sense that it could threaten domestic and international support for the war effort.

Absent such a concern, it is hard to imagine why the government went to such efforts to manage how the story was handled by its various public affairs briefers, and in turn by the press. As one government official told the *Post*, the pictures of the bombed facility would be "the story of the day and we needed to have our game together fast."[31] *The New York Times* reported "intelligence, operations, and public affairs officers scrambling from one office to the next in a concerted effort at damage control."[32]

According to the *Post*, the "public presentation appeared to have been carefully worked out,"[33] with the government having orchestrated what information and insights would be released by whom and where (Central Command in Riyadh, the Pentagon, State Department, and White House), and in what sequence. White House spokesman Marlin Fitzwater said, "We felt that the military would have to say how it happened and we would say why it happened."[34]

There is no doubt that much of the government's concern was based on the emotional power of the pictures being shown from Baghdad, from the site of the bombing incident. In Fitzwater's words, "The power of the image on television is so much stronger than the power of the word. It doesn't matter how much caveats [sic] you put in there, the picture tells a story that establishes itself in the mind's eye no matter what is said."[35]

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[31]*The Washington Post*, 14 Feb 1991, p A25.

[32]14 Feb 1991, p 17.

[33]*The Washington Post*, 14 Feb 1991, p A29.

[34]*The Washington Post*, 14 Feb 1991, p A29.

[35]*Ibid.*

Third, the issues raised by these powerful images of the aftermath of the bombing were central–the quality of intelligence, the accuracy of the weapons (even the "smart" ones), the targeting priorities (including the special problems posed by "dual-use" facilities), the number of civilians killed (at this facility and elsewhere), the possibly differing views within the Coalition on how much of what to bomb, and even whether these (and other) civilian casualties were accidental or intentional.[36] And more precisely and more importantly, there was the question of public perceptions and the effect of those perceptions on public support for the war, both in the United States and in Arab and Western European countries of the Coalition.

Fourth, there is evidence that, despite these seemingly well-grounded concerns, not only did public support for the war not drop off, but the public seems to have reached conclusions similar to the government's–whether because of the government's efforts to get out its side of the story, or independently, is not clear.

A *Washington Post*–ABC News poll taken the evening of 14 February, after two days of television news and one day of newspaper coverage of the bombing incident (Table 15), indicated no drop in support for the war from levels found earlier in the week, before the bombing.

Table 15[37]

Do you approve or disapprove of the United States having gone to war with Iraq?

14 Feb	78%	[approve]
12 Feb	78	
10 Feb	75	

[36]All of these issues can be found in TV coverage and in articles in *The Washington Post* and *The New York Times* during 14-16 Feb 1991.

[37]*The Washington Post*, 16 Feb 1991, p A19.

Further, in response to a question offering both the Iraqi and U.S. versions of the incident,[38] eighty-one percent said they thought the facility was a legitimate military target. When asked, *"Who do you hold most responsible for the deaths at the bombing site?"* seventy-nine percent volunteered Saddam Hussein or Iraq, only four percent said George Bush or the United States. On the related question, "Do you think United States bombers should pass up some possible military targets if Iraqi civilians might be killed in the attack, or not?" the results were essentially unchanged (i.e., were within the margin of error) from a survey taken almost one month before the incident: on 20 January, thirty-seven percent said pass up the targets and fifty-six percent said don't; on 14 February, the comparable numbers were thirty-four percent and sixty percent.

Another question, asked on 14 February and 12 February polls (Table 16), probed respondents' views regarding efforts of the United States to avoid bombing civilian areas; here too the results indicate no significant change after the bombing incident.

Overall the 14 February poll results reveal basic support not only for the U.S. war effort but more specifically for the U.S. version of the 13 February bombing incident and the U.S. bombing policy.

Another poll taken immediately after the Amiriya bombing gives a somewhat different impression of public attitudes towards this cluster of issues. In a *Los Angeles Times* poll[39] conducted 15-17 February, only half (fifty-two percent) felt that "what the United States has accomplished in the war against Iraq so far has been worth the number of deaths and injuries suffered by civilians in the war zone," compared to almost two-thirds (sixty-three percent) who felt those gains were "worth the number of deaths and injuries suffered by American forces."

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[38]The question was, "Iraq says hundreds of civilians were killed when the United States bombed an air raid shelter in Baghdad on Wednesday. The United States says the site was being used as a military command bunker. Do you think the site was a legitimate military target or not?" *The Washington Post*, 16 Feb 1991, p A19.

[39]As reported in Mueller, "American Public Opinion and the Gulf War," Table 68, p 96.

Table 16[40]

Which of these statements comes closer to your own view:

A. The United States should be making a greater effort to avoid bombing civilian areas in Iraq; or

B. The United States is making enough of an effort to avoid bombing civilian areas in Iraq; or

C. The United States is making too much of an effort to avoid bombing civilian areas in Iraq.

	14 Feb	**12 Feb**
A. Greater effort	13%	13%
B. Doing enough	67	60
C. Doing too much	18	22

A fifth, and more speculative, point is what effect another such dramatic, publicly revealed incident with large numbers of civilian casualties might have had on public attitudes towards the war in general or U.S. bombing policy and priorities in particular. Were there to be a repetition of such incidents, perhaps the concerns–about the competence with which the war was being waged, or about whether the civilian casualties were accidental or intentional, or about whether the United States was making sufficient effort to avoid or at least to minimize civilian casualties–would have materialized and would have adversely affected public support for the war.

A sixth and final point would be to examine whether after the 13 February incident any significant changes were made in Coalition bombing and targeting policy and practices. If such changes were made, one might reasonably conclude that senior officials, having weathered one incident in terms of sustained public support for the war, might have concluded that another one might have broken the dam of public support,

[40] *Ibid.*

or at least seriously weakened it. In fact, the record indicates that after this incident, the Coalition did not bomb any other similar facilities in the immediate Baghdad area.[41]

Public Support for the War

It is worth briefly highlighting here the results of polls concerning public approval for the war effort. A review of Gallup data during the war indicates that overall public support for the war, once it actually began, started out–and remained–at very high levels. For example, in six Gallup polls taken during the first month of the war, between seventy-nine and eighty-one percent said they agreed with the decision to go to war.[42] Six polls taken for *The Washington Post* during the same period found that between seventy-five and eighty-three percent of respondents approved of the U.S. decision to go to war with Iraq.[43] Thus, overall support for the war seems to have been high–and highly insensitive to the unfolding of events, at least during the first four weeks of the air campaign.

On another related issue, evidence from Gulf crisis opinion surveys indicates that it is not necessarily press coverage, or a change in press coverage, that leads to changes in public support for a war or other crisis policy. In a late September 1990 poll covering a range of Gulf crisis issues, those interviewed were asked: "*If the confrontation with Iraq continues for a long time, where do you think support is likely to drop first?*" One-third (thirty-four percent) said the drop would appear first among the American people, while only eight percent said it would start with the news media.[44] These results seem to indicate that some of the public, at least, thinks that people's opinions on the war might change independently of press coverage, and not necessarily because of it.

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[41]Please see Chapters 5 and 8 in the GWAPS *Operations* report.

[42]*The Gallup Poll Monthly*, Feb 1991, p 10.

[43]*The Washington Post*, 16 Feb 1991, p A19.

[44]*The Use of Force–Showdown in the Gulf 1990*, Americans Talk Security Survey #14, p 40.

Media Coverage and Political-Military Decisionmaking

The Gulf War seems to have invalidated much of the conventional wisdom and some standard hypotheses about the effects of press coverage, particularly television coverage, regarding governmental decisionmaking, especially during crises.

Part of the public policy and political heritage of the 1970s and 1980s is a sense or belief that television news reports skew the business of government, especially during crises. Prominently articulated in 1984[45] by Lloyd Cutler, the veteran Washington insider and counsel to President Jimmy Carter, this argument says that television news creates severe and dysfunctional pressures on the timing and the substance of governmental decisionmaking. Cutler concluded that "learning how to adjust to [TV's influence] is central to the art of governing today."[46]

According to Cutler, television news has an impact far greater than print journalism, first, because its audience is considerably larger–12 to 15 million for each of the three network evening news programs, compared with only one to 3 million each for the four major national newspapers (*The Los Angeles Times*, *The New York Times*, *The Wall Street Journal*, and *The Washington Post*). The second reason is because the power of videotape or film footage greatly outstrips that of cold print or even photographs run in newspapers: "If a picture is worth 1,000 words, sounds and pictures together must be worth 10,000."[47]

Despite a grab-bag of suggestions at the end of his article for how government officials might manage or even mitigate these insidious effects of television coverage on the business of government, Cutler's overall message is pessimistic, especially regarding the agenda-setting power of television news:

> . . . an appraisal of television's impact on public policy must distinguish between its damaging effect on the time available for crisis decisions

[45]Lloyd N. Cutler, "Foreign Policy on Deadline," *Foreign Policy*, Number 56, Fall 1984, pp 113-128.

[46]*Ibid*, p 114.

[47]*Ibid*, p 113.

and its sometimes harmful, sometimes helpful, effect on the substance of broad policy. The most harmful effect of TV news is its tendency to speed up the decisionmaking process on issues that TV news is featuring . . . . In a very real sense, events that become TV lead stories now set the priorities for the policymaking agenda.[48]

Following the logic of Cutler's argument, one would expect that television news would have wielded noticeable, even significant influence on aspects of the air war, parts of which, as noted above, lent themselves to the drama of television coverage. Yet, his persuasive analysis and prognosis seem not to have been supported by the events of Operation Desert Storm.

Both senior National Security Council staff member Richard Haas and Undersecretary of Defense Paul Wolfowitz are on record arguing that television had negligible influence on most of the major decisions before, during, and after the actual fighting in the Gulf War. In separate presentations to a 26 September 1991 conference cosponsored by The Johns Hopkins Foreign Policy Institute and The Annenberg Washington Program of Northwestern University, the two senior officials, both of whom played major roles in Operations Desert Shield/Desert Storm decisionmaking, identified eight (Haas)[49] or nine (Wolfowitz) key decision points and argued that television news' impact on policymaking was minimal.[50]

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[48]*Ibid*, p 121.

[49]Haas listed: 1.) policymaking before 2 Aug 1990; 2.) the decision to resist after the 2 Aug invasion; 3.) the key decisions in the fall of 1990 (to double U.S. forces and to get a United Nations resolution to support use of military force; 4.) the decision in Jan and Feb 1991 to seek a Congressional vote, as well as the Congressional debate and vote itself; 5.) the mid-Jan decision to initiate the air war; 6.) the U.S. decisions on Israeli participation in the war after the Scud attacks; 7.) the late-Feb 1991 decision to initiate the ground phase of the war; and 8.) the late-Feb decision to end offensive operations.

Wolfowitz listed decisions: 1.) to confront aggression; 2.) on the size of the force to deploy; 3.) to develop a ground offensive option; 4.) as to whether force would be necessary if sanctions didn't work; 5.) on war aims; 6.) on an extended air campaign; 7.) to try to keep Israel out of the war; 8.) to end the war; and 9.) regarding the Kurds in the north, after the end of offensive operations by the Coalition.

[50]Author's notes, taken at the conference, are the source for this section of the chapter. Author's notes, impressions, and conclusions are quite consistent with those of Walter Goodman of *The New York Times*. See his "How Bad Is War? It Depends on the TV Pictures," *The New York Times*, 5 Nov 1991, p C18.

Several of the key decision points cited by the two officials involve the air campaign. The first was the mid-January decision to initiate the air war. Haas said that television had no impact on the decision to begin or the date to begin, but that it did have an effect on the decision to exert extraordinary efforts to avoid collateral damage.

The second was the decision, cited by Wolfowitz, to pursue an extended air campaign, which he said was related to the question of ending it quickly. According to him, some officials worried that weeks of coverage of the bombing campaign would cause problems for some parts of the Coalition, but those fears never materialized. When the images came in, he said, they tended to buoy public support.

The third was the February decision to end offensive operations, which was discussed by both officials. Haas said that television may have had some effect on that decision, because there was some concern about, in his words, "piling on." The decision to end the war, Wolfowitz said, was mainly made in principals-only meetings, so the public record is thin here. Wolfowitz cited a tension between "how do you justify unnecessary killing?" and the belief that getting rid of Iraqi military power is a good thing. No one, he continued, thought that Iraqi units could do much damage if they went home. He didn't think that television coverage directly affected the decision to stop the war, but that television coverage of the so-called "Highway of Death" may have had some influence.

This last observation by Wolfowitz raises some interesting points–first, that memories of even vivid and important events (and the sequence of events) may be faulty, and second, the distinction between the effects of *actual* coverage of events and the *anticipated* effects of possible coverage.

On the first, it is important to arrange the sequence of events: Iraqis began to flee Kuwait City in large numbers the weekend of 23-24 February 1991; the ground campaign began Saturday night, Iraqi time, followed by air (and later ground) attacks on Iraqis leaving Kuwait City; and the President made his decision to end the war on Wednesday, 27 February, announcing it that evening in Washington.

There was no coverage of the so-called "Highway of Death" on the three broadcast networks evening news programs, nor was there any in *The New York Times*, prior to the President's decision to end hostilities. On the day he made that decision (Wednesday, 27 February), however, there was an article in *The Washington Post*, written by a media pool reporter from the *Providence Journal* on board the USS *Ranger*, on the allied attacks on Iraqis departing Kuwait. Its headline was dramatic–"'Like Fish In a Barrel,' U.S. Pilots Say"–but its placement–the second page of the special second section–was not. Also dramatic was much of its content, including references by U.S. pilots to "bumper to bumper" traffic and "sitting ducks."

It is difficult to assess with any certainty the effect such coverage had on the timing and substance of decisions at the highest levels of the U.S. government. The "fish in a barrel" theme was not a prominent aspect of Gulf War news coverage: The ground campaign dominated the news, whereas the *Post* article cited above appeared inside the second section and was not even reprinted in that day's Pentagon *Current News Early Bird* edition, and network evening news programs on Monday, Tuesday, and Wednesday ran no stories along those lines. Whether any senior decisionmakers read the *Post* article that Wednesday, and what effect it might have had on them, is unclear.

Nonetheless, it is plausible that such coverage, albeit limited, and, more importantly, the *anticipated* effects of additional such coverage, had some real effect. After all, such articles might become more frequent and more prominent if the war were to continue, television might gain access to and become interested in the story, and after-action reports along these lines might have reached the highest levels of political and military decisionmakers.

Gen. H. Norman Schwarzkopf's own account[51] reinforces this line of reasoning, although it differs with it in some details. He relates a phone call from Gen. Colin Powell late in the afternoon (Riyadh time) of Wednesday, 27 February, in which the Chairman told him: "We ought to be talking about a cease-fire. The doves are starting to complain about

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[51]Gen H. Norman Schwarzkopf, *It Doesn't Take a Hero* (New York: Bantam Books, 1992).

all the damage you're doing." In the book, Schwarzkopf goes on to explain:

> What had happened, of course, was that journalists were now interviewing Air Force pilots who'd been hitting the convoys fleeing Kuwait. And as soon as we'd liberated the area around Kuwait City, reporters who had once been part of the media pools had taken pictures of Highway 6, where we'd bombed a convoy Monday night. It was a scene of utter destruction that they'd named the "Highway of Death"–a four-lane road strewn with the burned-out wreckage of more than a thousand military vehicles and stolen civilian trucks, buses, and cars. That was what people saw when they sat down Monday evening and turned on their television sets. Powell informed me that the White House was getting nervous: 'The reports make it look like wanton killing.'[52]

But General Schwarzkopf's account must be put into the context of the Haas and Wolfowitz versions, and the absence of any reference to the "Highway of Death" or any other such events in the transcripts of network evening news programs prior to the President's decision to terminate offensive operations. Looking at this fuller context, one might reasonably conclude that Powell's concerns, as recounted by General Schwarzkopf, may have been triggered by such limited and low-visibility stories as the *Post*'s Wednesday morning media pool report *and* by a worry that if such coverage were to become more frequent and more prominent, then adverse political consequences might follow.

But the evidence does not support Schwarzkopf's contention that "Highway of Death" coverage was included in network evening news programs prior to the President's decision. Indeed, it is interesting to note that after his famous "Mother of All Briefings" in Riyadh on the afternoon (Washington time) of 27 February, none of the three dozen or so questions he was asked referred at all to the "Highway of Death."[53]

There is some evidence that military officials in theater were concerned about the *potential* for such coverage and its possible effects. Less than two weeks after the end of the war, *The Washington Post* ran

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[52] *Ibid*, p 468.

[53] Transcript of CENTCOM News Brfg Gen H. Norman Schwarzkopf, USA, Riyadh, Saudi Arabia, Wednesday, 27 Feb 1991 - 1:00 pm (EST).

a lengthy article ("U.S. Scrambled to Shape View of 'Highway of Death'") saying that the highway bombing "also was the focus of a public relations campaign managed by the U.S. Central Command in Riyadh–a campaign designed to shape perceptions of the war's last and most violent phase . . . ."[54]

The article cited political problems potentially posed by the way the war was ending: "Continued allied attacks raised the specter of a one-sided slaughter of retreating Iraqi troops, possibly complicating U.S. political problems in the Arab world."[55] According to the *Post*, on Tuesday the 26th U.S. military briefers in Riyadh began to emphasize that the Iraqis were not retreating, and that, in the briefer's words, the United States did not "'have any real evidence of any withdrawal at this time . . . .There are still not any indications of a significant amount of movement in any direction, north or south . . . .There's no significant Iraqi movements to the north.'"[56]

"By noon Tuesday, interviews with U.S. attack pilots conducted by media pool reporters that morning and circulated on news wire services had undermined the briefer's portrait of the Iraqi movements . . . .

"As the day wore on, senior officers with the U.S. Central Command in Riyadh became worried about what they saw as a growing public perception that Iraq's forces were leaving Kuwait voluntarily and that U.S. pilots were bombing them mercilessly, according to U.S. military sources. Relaying these worries to the Pentagon as they prepared for Tuesday's scheduled televised news briefing, senior officers agreed that U.S. spokesmen needed to use forceful language to portray Iraq's claimed 'withdrawal' as a fighting retreat made necessary by heavy allied military pressure."[57]

This led to an intense and coordinated U.S. government approach to managing the problem, including making a careful and clear distinction between a "retreat" and a "withdrawal."

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[54]*The Washington Post*, 11 Mar 1991, p 1.

[55]*Ibid.*

[56]*Ibid.*

[57]*Ibid.*

"'Saddam Hussein has described what is occurring as a withdrawal,' [Brig. Gen. Richard] Neal said [in a Riyadh briefing for newsmen]. 'By definition, a withdrawal is when you pull your forces back, not under pressure by the attacking forces. Retreat is when you're required to pull your forces back as required by the action of the attacking forces. The Iraqi army is in full retreat.'"[58] This was not a merely semantic distinction: According to the law of war, retreating soldiers are legitimate targets of attack. Nor was this concern abandoned with the end of the war. The final DOD report on the war included a four-page discussion of "The concept of 'surrender' in the conduct of combat operations."[59]

The only way to resolve these uncertainties about the effects of actual coverage of the "Highway of Death" or the effects of *anticipated* further coverage would be to interview the senior decisionmakers themselves.

Observations

Looking back on the three issues featured in this chapter, one sees different ways in which press coverage seems to have influenced public attitudes and policymaking on the war. In the first, the press did not fall into the trap of relying on a single measure of merit on the progress of the war, in particular comparative aircraft losses. In fact, the press avoided any such short-hand indicators of progress, for a variety of reasons (none of which will necessarily occur in future situations). Thus, the press did not–in this case, anyway–skew public perceptions of how well the war was going.

In the second, press coverage of civilian casualties became, albeit briefly, intense, graphic, and dominant. The U.S. government clearly went into a crisis-management mode to deal with the coverage and its possible, even (seemingly) likely, consequences. That these negative consequences in fact failed to materialize is no guarantee that they will not in future conflicts. If in the Gulf War changes were made in bombing policies and practices, it is hard to avoid the conclusion that they were made in response to the spotlight of this dramatic, powerful coverage.

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[58] *Ibid.*

[59] *Conduct of the Persian Gulf War*, Appendix O, pp O-32 to O-35.

In the third, press, especially television, coverage generally did not seem to affect government decisionmaking in the ways one might have anticipated given the experiences of the 1970s and 1980s. One exception seems to be the influence not of *actual* coverage of the so-called "Highway of Death," but rather of *anticipated* coverage of the attacks on Iraqi forces in what turned out to be the last hours of the war.

This last phenomenon is intriguing because it reflects a mind-set that takes *possible* press coverage and *possible* public reaction to that coverage very seriously. It is a damage-avoidance or damage-limitation mentality, rather than a damage-control approach. It indicates that particular kinds of press coverage can have important effects even before they occur, indeed even if they never do. It reflects a proactive approach, rather than a reactive one. In many ways, it may be the most interesting and poignant demonstration of the power of the press in wartime.

Part II

The Military and the News Media in War

Scholars and historians have noted that throughout the history of warfare the problem of communicating war news has always been a huge and intricate undertaking requiring "painstaking and elaborate planning."[60] How the press reported war was dictated largely by the degree of preparation by both, the military and the news media, in advance of covering a story. World War II popularly exemplifies the spirit of cooperation that existed between the military and the news media covering that war. At the other extreme, Vietnam poignantly illustrates a mistrust of the military and opposition to the war effort by the news media covering that conflict. Neither characterization of the relationship is entirely accurate. However, the lessons of both events helped shape the military's efforts to manage press coverage of the Persian Gulf War.

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[60]Joseph J. Mathews, *Reporting the Wars*, Minneapolis: University of Minnesota Press, 1957, p 180. Mathews' book is regarded as the most authoritative scholarly treatment of the history of war correspondence through the Korean War period.

The military and the news media bring very different concerns to the battlefield. As Gen. Dwight D. Eisenhower once observed,

> The first essential in military operations is that no information of value shall be given to the enemy. The first essential in newspaper work and broadcasting is wide-open publicity.

And, as General Eisenhower admonished reporters in Europe covering the pending invasion at Normandy,

> it is your job and mine to try to reconcile these sometimes diverse considerations.[61]

Reconciling these seemingly irreconcilable considerations in Operations Desert Shield/Desert Storm was the responsibility of public affairs.

While World War II often serves as the model of military-media cooperation, history paints a very different picture of the relationship. At its outset, the Nazis were better prepared "with official news machinery for war" than were the British and the French, and, initially at least, secured definite advantage over the Allies in the "news war." [62] The experience in the United States was not much different than in Europe. The U.S. Navy, stung by early defeats and setbacks in the Pacific, fought a more successful campaign against press disclosures that earned it the derisive label, "the silent service" from reporters and commentators of that period.[63] Admiral Ernest King, Chief of Naval Operations at the time, when asked what his public relations philosophy was for the war reportedly remarked: "Don't tell them anything. When it's over, tell them who won."[64]

The Navy followed that philosophy, at least as long as events favored the Japanese and the news was "bad" for the United States. The full

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[61]From regulations for war correspondents accompanying Allied Expeditionary Forces in World War II, 1944.

[62]Mathews, p 192.

[63]Mathews, p 189.

[64]Robert Debs Heinel, Jr., *Dictionary of Military and Naval Quotations*, Annapolis, MD: United States Naval Institute, 1966, p 258.

story of the damage inflicted by Japan at Pearl Harbor wasn't officially acknowledged by the Navy for almost a year. During the first disastrous months of the war, the American public got more dependable, though somewhat exaggerated, news of the Pacific from Japanese shortwave broadcasts than it got from its own Army or Navy.[65] But, as one scholar of war correspondence observed: "It has always been easy to tell the truth when the military news is favorable."[66] When the tide of war turned to favor the U.S. and its allies, the information flow to the American public improved markedly. It is that period of American and Allied military successes, matched with a greater military openness, that World War II is remembered for and held up for public view as a model of military-media cooperation.

Since World War II, the diverse considerations of newsgathering and warmaking have become no less contentious. In many ways, the advancement of technologies used by newsgathering organizations–particularly the growth and internationalization of television news–and the experiences of Vietnam, Grenada, and Panama all served to exacerbate, not reconcile, the media-military relationship. As we will see, the experiences of covering the Persian Gulf War would further strain the military's relations with the press.

"With an arrogance foreign to the democratic system, the U.S. military in Saudi Arabia is trampling on the American people's right to know," Walter Cronkite complained in testimony before a Congressional committee examining press policies in the Persian Gulf. "The military is acting on a generally discredited Pentagon myth that the Vietnam war was lost because of the uncensored press coverage of it, particularly

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[65]Ronald T. Farrar, ed, *Elmer Davis, Report to the President*, Austin, TX: Association for Education in Journalism, 1968, p 15. In an effort to halt "mounting (public) dissatisfaction with government information, and particularly the handling of news of military and naval operations," President Roosevelt consolidated most of the news disseminating agencies of the federal government under a single Office of War Information. In 1942, the President appointed as head of the new OWI, Mr. Elmer Davis, a civilian and former radio commentator for CBS. From then until the end of the war Davis was in charge of approving all information about the war, including military information, that was released by the agencies including the Departments of State, War, and Navy. His personal report to the President, submitted at the conclusion of the war and his tenure at OWI, was classified until its release by Congress in 1963.

[66]Mathews, p 177.

television's bloody battle scenes piped directly into American homes," Cronkite warned. "The military would do better to pattern its public relations after its handling of the press in World War II, a war we won and which left few questions about the press-military relationship," the former anchorman for CBS concluded.

The news media's experience covering Operation Desert Storm proved to be yet another contentious chapter in the relationship.

Setting the Stage

On 6 August 1990, Secretary of Defense, Richard Cheney, secured an agreement with the Saudi government to accept U.S. forces to deter or defend against an Iraqi invasion. It was decided not to announce the agreement until after the initial forces had arrived on Saudi soil. Both the Americans and the Saudis feared that a premature announcement might provoke Iraq to advance into Saudi Arabia before U.S. forces could arrive.[67] The stakes would be raised if Saddam Hussein's military attacked with U.S. forces in place.

At 9 a.m. on 8 August 1990, President Bush announced the decision in a televised address to the nation. The morning's announcement was followed by a press conference by Secretary Cheney and General Powell at the Pentagon at 1 p.m. that afternoon. However, because Operation Desert Shield was an "ongoing operation" and security of the forces was of paramount concern, neither Secretary Cheney nor General Powell would answer questions about specific unit deployments, when they would deploy, their destination, or their strength.

Recognizing that veteran Pentagon correspondents would quickly uncover much of the deployment information, General Powell appealed directly to the assembled media (and through them to the American public watching the announcement on television):

> I also would ask for some restraint on your (the press's) part as you find out information. . . . [I]f you would always measure it against the need

[67]Bob Woodward, *The Commanders*, New York: Simon & Schuster, 1991, p 275.

for operational security to protect our troops. That should be uppermost, I think, in all our minds.[68]

It was reminiscent of General Eisenhower's appeal to reporters in World War II, asking for their cooperation with the military. But this time, the military wasn't cooperating with the news media.

Details of the military commitment to Saudi Arabia were purposely vague.[69] And the military did not accommodate U.S. newsmen to accompany U.S. forces deploying to Saudi Arabia because Western reporters were not welcomed by the Saudis. Based on past experience, the Saudis were reluctant to permit Western reporters into their country–for *any* reason.[70] Because of a potential military confrontation with a fellow Arab nation, the Saudis were even less inclined to agitate their neighbors by inviting American reporters on the scene.

As a result, no Western reporters were on hand to record the historic event when U.S. Air Force F-15s, C-141s, and C-5s, as well as the 82d Airborne Division, began arriving in Dhahran, Saudi Arabia. That decision to exclude reporters, and the Pentagon's apparent acquiescence to it, drew a firestorm of criticism in the American press,[71] forcing Secretary Cheney to pressure the Saudis to accept Western reporters. They finally agreed to accept only a limited number of journalists under strict U.S. military control. The Pentagon then turned to the DOD National Media Pool to rush Western reporters to the theater.[72] Almost one week after

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[68]DOD Transcript, Secretary of Defense Dick Cheney and Gen Colin Powell Press Conference, Pentagon, 8 Aug 1990.

[69]Woodward, p 279.

[70]Pete Williams, Assistant Secretary of Defense for Public Affairs, statement before the U.S. Senate, Committee on Governmental Affairs, 20 Feb 1991, reprinted in S. Hrg. 102-178, *Pentagon Rules on Media Access to the Persian Gulf War*, Washington, D.C.: U.S. Government Printing Office, 1991. Hereafter cited as Senate Hearings.

[71]See for example, "Pentagon Pool Not Sent to Gulf," *New York Times*, 9 Aug 1990, p A14. Paul Farhi and David Mills, "Media Shut Out at the Front Lines," *The Washington Post*, 9 Aug 1990, p D1.

[72]The DOD National Media pool is a rotating group of reporters and cameramen representing U.S. national news organizations. A "typical" media pool consists of two wire service representatives, one reporter, one photographer, a television team of two or three, and DOD escorts. Membership is rotated among news organizations and networks. Although membership and composition of the pool varies with events, locations and

U.S. troops were committed to defend Saudi Arabia, an initial group of seventeen journalists, photographers, technicians, and their military escorts arrived in Dhahran on an Air Force C-141 transport.[73] This time–unlike in Grenada and Panama–the press had arrived on the scene *because* of the Pentagon, not in spite of it.

However, because CENTCOM knew the Saudis were reluctant to allow Western journalists into their country–even in peacetime–they had developed no plan in advance for accommodating Western reporters or the DOD National Media Pool. General Schwarzkopf and his staff were preoccupied, instead, with moving 250,000 soldiers, sailors, airmen, and marines along with their equipment to the theater. CENTCOM's own public affairs staff remained in Florida, along with Schwarzkopf. Therefore, when the Pentagon finally activated the National Media Pool, the only public affairs people in Saudi Arabia on hand to arrange for and accommodate the news media in theater were a few public affairs augmentees and unit public affairs people who had deployed with the 82d Airborne and the 1st TAC Fighter Wing.[74] These combined resources provided the initial "ad hoc" public affairs support in the early stages of Operation Desert Shield.[75]

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available logistics the average size of the pool prior to Desert Shield consisted of twelve plus two military escorts. For an authoritative history of the DOD National Media Pool, see Gregory H. Hartung (LCDR, USN), *Now Is The Time To Plan For Media Pools*, Newport, RI: U.S. Naval War College, 3 Feb 1989.

[73]The DOD National Media Pool arrived in Dhahran on 13 Aug 1990 after stopping off at MacDill AFB, FL, at CENTCOM headquarters to receive briefings.

[74]Two Air Force captains were sent to Saudi Arabia as augmentees to the CENTCOM/PA staff; one from Tactical Air Command headquarters, the other from Military Airlift Command. Eventually they were joined by other augmentees from EUCOM and charged with responsibility for making preparations for the DOD National Media Pool. Intvw with Maj Tom LaRock, Secretary of the Air Force, Office of Public Affairs, Pentagon, 11 Dec 1992.

[75]Maj LaRock intvw. According to Maj LaRock, the initial public affairs support in Saudi Arabia was done without any preplanning from either CENTCOM or DOD and was completely "ad hoc" from their arrival on in the AOR until the CINC's own permanent public affairs staff arrived several weeks later and began setting up an organizational infrastructure to accommodate growing news media interest in Operation Desert Shield. Even after the arrival of the CENTCOM staff, it was apparent to Air Force public affairs officers already in theater that there was no public affairs plan to accommodate news media and no "concept of operations" for press operations there.

Uncomfortable with the presence of Western reporters, the Saudi government was slow to approve their visas for lengthy stays. Initially, they approved only one entry visa per news organization. That presented problems for news organizations, especially for television networks who needed several "crews" of reporters, cameramen, and technicians to cover a military operation the size and complexity of Operation Desert Shield. Therefore, Washington bureau chiefs of news organizations appealed directly to Secretary Cheney and Saudi Arabia's ambassador to the United States, Prince Bandar, to intercede on their behalf. With their intercession, the Saudi government finally loosened their visa quotas and permitted what eventually became a flood of reporters into their country.[76]

Organizing to Tell the Story

How the military organized to tell the story of Operations Desert Shield/Desert Storm had a definite impact on the quantity and quality of press coverage. From the very beginning, the complex undertaking of Operation Desert Shield required a public affairs strategy that balanced the *military's* need for operational security and secrecy with the *political* necessity to marshall public support. This delicate balance between military and political interests resulted in highly centralized control by DOD over public affairs policies for all the Services and units involved in Operation Desert Shield. Once in theater, CENTCOM set public affairs policy–including policy for press coverage–for the command.[77]

However, when it came to dealing with the news media–whether in Washington or Riyadh–the Assistant Secretary of Defense for Public Affairs, Pete Williams, was in charge. While his responsibility for setting broad public affairs policy stemmed from his position, his unchallenged *authority* to dictate press policy even to a theater commander sprang from

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[76]There were approximately 1,200 reporters in Saudi Arabia—most of them in Dhahran—on 16 Jan 1991. By Feb when the ground campaign commenced, there were over 1,500 reporters, cameramen, and technicians. A total of over 3,500 news representatives traveled to Saudi Arabia during Operations Desert Shield/Desert Storm between Aug 1990 and Mar 1991. Another 3,000 to 4,000 were awaiting approval of visas to enter the country by the time the war ended. See Pete Williams statement in Senate Hearing.

[77]An organization chart for public affairs and information policy during Desert Shield/Desert Storm is included as an appendix to this chapter.

his close and personal relationship with his longtime boss, Secretary Cheney. Williams conferred with CENTCOM regularly, met with the directors of public affairs of the Services frequently, and negotiated directly with the Washington bureau chiefs of national news organizations. However, he alone made all the major public affairs policy decisions during Operations Desert Shield/Desert Storm. Many of those decisions directly affected the Air Force story and, ultimately, in communicating the air campaign to the American public.

When General Schwarzkopf moved his headquarters element forward to Riyadh, he brought most of his public affairs staff with him, but the staff had to be considerably augmented by public affairs personnel from the Services, Guard, Reserves, and from his supporting commanders. Joint Information Bureaus (JIBs) were established in Dhahran and in Dubai to handle media coverage of U.S. military units arriving in the region and of U.S. Navy ships afloat in the Persian Gulf. Both of the bureaus, manned by augmentee public affairs staffs, were operating before the CENTCOM staff arrived. When the CENTCOM Public Affairs staff finally arrived in Riyadh, one other JIB handled media coverage at the Hyatt Hotel across the street from General Schwarzkopf's headquarters at the Saudi Ministry of Defense and Aviation.

The joint bureaus were the sole focal point from which all the news flowed from the theater regarding Operations Desert Shield/Desert Storm, and all media activities were funneled through them. The JIBs were the theater commander's equivalent to press centers or press rooms, where public affairs staff officers could deal with members of the news media in one central location. All media support and services provided by the military to news media were handled by JIB staff. By their very nature, JIBs were jointly manned during their tenure, usually by augmentee public affairs officers and specialists provided through component commands or by the military Services.

CENTCOM's JIBs served very different functions. The Dhahran JIB, where most of the Western journalists were located, was a logical selection for reporting. Dhahran was the largest, most modern Saudi city nearest the Kuwaiti border. Its proximity to the front and modern commercial communications and Western amenities made it a natural operating center for servicing the large press contingent housed in the Dhahran International Hotel. The pools of reporters covering Desert Shield and

Desert Storm were dispatched from the Dhahran JIB.[78] Each Service component operated a press desk at the Dhahran JIB–an Army, Navy, Marine, and Air Force Desk–manned by a public affairs officer or NCO of that service twenty-four hours a day. Each desk handled Service-unique questions from the news media and all logistical operations for visits to deployed units of the component commands.

Despite their proximity to the front, the Dhahran JIB was not a reliable source of operational information for most journalists. Planning and operations staffs were in Riyadh, and the Dhahran JIB had no access to them. There were no dedicated military communications between the JIB, Riyadh, the component commands, or units in the field. Commercial telecommunications facilities served as the outlet for stories, a situation that severely hampered the Dhahran JIB's ability to keep abreast of sensitive military information and operations. Nevertheless, this was the JIB for all reporter pools from whom they would obtain logistical support and transportation during Desert Storm.

In contrast, the Riyadh JIB had fewer reporters until 16 January, when it became the center of world attention and the site of "the show"–the daily CENTCOM and Coalition press briefings televised live all over the world. Although organized similarly into Service press desks, the focus of the Riyadh JIB dealt almost exclusively with preparing daily press briefings and not in moving reporters to units in the field.

The JIB in Dubai was the smallest of the public affairs centers. Only two or three public affairs officers were assigned to that JIB at any given time, mostly to handle news media related to U.S. Navy ships in the Persian Gulf and some military units arriving at ports outside of Saudi Arabia. Dubai also became a holding area for many journalists traveling to the theater still awaiting visas for entry into Saudi Arabia. The Dubai JIB was set up to handle those reporters.

In addition to the public affairs staff at CENTCOM, and those of the JIBs, each component commander managed his own public affairs staff, each headed by a public affairs colonel or lieutenant colonel/commander. CENTAF had the smallest and least experienced public affairs staff of all the component commands–two public affairs officers (a major and a

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[78]The pools were called Combat Correspondent Pools during Desert Storm.

captain) and two noncommissioned officers (one public affairs technician and one administration specialist). The component command public affairs staffs served as the primary interface between CENTCOM, the JIBs, and units in the field. Visits by news media in theater to units in the field were channelled through the individual component public affairs office for approval and coordination with the units. Since the JIBs had no dedicated military transportation, they often depended on units or component commands for travel as well.

Every CENTAF tactical fighter unit (squadron or greater size) deployed with at least one public affairs officer or noncommissioned officer and a public affairs contingency kit.[79] Unit public affairs personnel worked directly with the JIB in Dhahran with little or no guidance from CENTAF until the CENTAF Forward public affairs office was established in Riyadh. Initially, this arrangement was not much of a problem, since most U.S. Air Force units weren't getting much news media coverage.[80] Because of Saudi sensitivities, Western reporters were permitted to visit only *two* operating air bases–Dhahran and King Fahd–each within easy driving distance from the Dhahran JIB and visible from the main highway. The only other location the press could cover CENTAF operations was in Riyadh, where the air base and international airport shared the same runway. All other locations remained closed to Western reporters because of Saudi and other host nation sensitivities.

CENTAF Forward public affairs, under pressure from the Pentagon, attempted to obtain Saudi permission for the press to visit additional

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[79]The requirement for public affairs support and deployment of Public Affairs Contingency Kits was laid out in the Public Affairs Annex F to CENTAF's OPLAN 90-1002. While TAC fighter units deployed generally well prepared for sustained operations in the desert, some MAC and SAC units did not. The CENTAF Forward Public Affairs staff deployed with no Public Affairs Contingency Kit or supplies of any kind and had to borrow typewriters and laptop computers until they could acquire their own.

[80]Intvw with MSgt Bobbie Shelton, USAF Fighter Weapons Center, Office of Public Affairs, Nellis AFB, NV, 15 Jan 1993. Sergeant Shelton was public affairs NCO for the 37th Fighter Wing (Deployed), supporting the F-117 unit in Saudi Arabia throughout Operations Desert Shield/Desert Storm.

bases where U.S. Air Force units were located; however, they were unsuccessful.[81] Due to the segregation of the kingdom's government and military into regions, each headed by a different Saudi prince, no *one* person short of King Fahd himself could issue a "blanket" approval granting access to all airfields where U.S. Air Force units were operating. With many of CENTAF's forces operated outside of Saudi Arabia, the problem of getting permission for reporters to visit these bases would entail government-to-government negotiations. Therefore, to open more air bases CENTAF had to negotiate through local unit commanders directly with local government and senior military representatives base-by-base. Negotiations to open additional bases were either unsuccessful or never took place.[82] The record is unclear–only the result is certain.

Consequently, most of the "air campaign" story remained off limits and untold to Western reporters. Certainly one reason was inaccessibility of air bases by reporters. Another reason was that commanders–those best suited to inform, educate, and prepare journalists–were too busy preparing for war to accommodate visits from Western reporters.[83] Moreover, the firing of Air Force Chief of Staff Gen. Mike Dugan for revealing certain information to the news media caused many deployed Air Force commanders to refrain from talking to reporters. Most unit public affairs officers and noncommissioned officers also lacked the necessary authority and experience to push the issue of press access with their commanders. Without a strong push through the operational chain-of-command for greater access and more openness with the news media, many public affairs officers felt it was just not worth pursuing with their commanders.[84]

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[81] Intvw, Brig Gen H. E. "Ed" Robertson, USAF, command director, NORAD Command Operations Staff, Cheyenne Mountain Complex AFB, CO, 5 Jan 1993. Gen Robertson was the director of public affairs for the Secretary of the Air Force during Desert Shield/Desert Storm.

[82] Intvw with Maj Louis J. Tiedemann (USAF, Retired), 13 Jan 1993. Maj Tiedemann served as director of public affairs, CENTAF Forward, during Operations Desert Shield/Desert Storm.

[83] Maj Tiedemann intvw.

[84] Based on intvws with several unit public affairs officers, and post-Desert Storm public affairs "lessons learned" conferences, the issue of increased access and openness with the news media in theater was never forthcoming through the operational chain of command (JCS, CENTCOM, or CENTAF).

As a result, Western reporters saw only a very *small* part of the total U.S. Air Force presence and preparations prior to 16 January 1991. The vast majority of reporters, therefore, lacked familiarity with Air Force operations, weapons systems, and their capabilities by the time the air campaign began. Unprepared and ill-equipped to cover air power, they understood little of what they saw during Operation Desert Shield or the strategic air campaign of Operation Desert Storm.

In the United States the Air Force tried to compensate for the limitations in the theater. Here too, however, DOD's centralized control over public affairs and policies relating to Operations Desert Shield/Desert Storm severely limited the Service's efforts. Services and units in the United States were permitted to provide only "fact sheet" background material that had already been cleared and released concerning weapons systems, units, and tactics. Nothing *specifically* connected to Operation Desert Shield or Desert Storm could be independently released by any unit or Service unless it had *already* been cleared and released by the Defense Department or CENTCOM. Those were the rules of engagement in dealing with the news media.[85]

In the Pentagon, Air Force Public Affairs (SAF/PA) attempted to provide the news media with a readily accessible source of background information ("fact sheets"). Once the air campaign started, its press desk became manned around the clock. A group of subject experts on fighter operations, airlift, command and control, strategic, space and reconnaissance, electronic combat, and warfighting concepts and doctrines from the Air Staff who could provide background information to members of the press were made available through SAF/PA twenty-four hours a day. The Air Force Press Desk in SAF/PA served as a clearinghouse and information "broker" for the news media–depending further upon subject experts from the Air Staff whenever public affairs staff resources and expertise were insufficient.

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[85]SecDef (ASD/PA) Msg, 171916Z Jan 1991, subj: Operation Desert Storm Release Authority. SecDef (ASD/PA) Msg, 241812Z Aug 1990, subj: Operation Desert Shield Release Authority. DOD's intent was to preserve the "jointness" of the military's efforts in the Persian Gulf, and a desire to dampen any efforts by the individual services to trumpet their own contribution to the effort at the expense of the other Services. This was one of the reasons cited by Secretary Cheney for his firing of Gen Mike Dugan for remarks the Secretary believed reflected Service parochialism. See DOD Transcript, Secretary of Defense Dick Cheney press conference, 18 Sep 1990.

Shortly after the air campaign began, this office expanded the list of experts to include transportation, munitions, and supply from the Air Staff's logistics community. All of this effort was intended to "fill in the blanks"–providing necessary background, context, and color that the Air Staff felt the news media were not getting in the cut and dry press briefings in Riyadh and Washington.[86] While those efforts and others by Air Force Public Affairs and the Air Staff served many reporters covering the war from the Pentagon, the vast majority of information concerning the war in general, and the air campaign specifically, came from the Riyadh briefings and eyewitness accounts of pool reporters in theater. Understandably, the press focused on events happening in the Persian Gulf and about to happen, *not* on the U.S. Air Force headquarters' perspective of what was occur.[87]

While the public affairs organizational structure had a definite impact on information about Operations Desert Shield/Desert Storm communicated to the American public, there were other factors that affected what the public saw and heard of the air campaign. The ground rules developed for covering combat, and the public information release system put in place for the war also had profound effects.

How the System Was Designed to Work

The daily CENTCOM update briefings held in Riyadh at the end of each day of operations (usually 11:30 a.m. Eastern Standard Time) served as the primary mechanism for communicating the war's progress to the American public and to the world at large. Pentagon briefings held in mid-afternoon (usually 2:30 pm. EST) weekdays supplemented the CENTCOM updates. These overall theater (Riyadh) and politico-military

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[86]Intvw with Lt Col Mike Gannon, 10 Dec 1992. Col Gannon was one of the team chiefs on the Air Force Press Desk's "Storm Cell."

[87]In post-Desert Storm intvws, the general consensus of most public affairs staff officers was that while these efforts aided many of the new second and third-string reporters assigned to the Pentagon for the first (and probably last) time to cover the Persian Gulf War, it made only a relatively minor contribution to the body of press coverage. Although no records were maintained that permit an objective, quantitative analysis of who made use of these services, most of the staff interviewed indicated that the most frequent callers were small news organizations and reporters from "outside the Beltway"–too small to be able to afford sending their own reporter to Saudi Arabia and not important enough to get their calls returned by DOD.

(Washington) perspectives were supplemented with unofficial and "independent" eyewitness accounts of reporters operating in "combat correspondent pools" with military units in the field would represent the public account of the war.

How many reporters there would be in the field with military units at any given time depended on the number of "slots" available for them in each pool. The Pentagon, in negotiation with CENTCOM, determined the numbers before the war.[88] The press decided which reporters from which news organizations filled those slots from the ranks of U.S. journalists assembled and dispatched out of the Dhahran JIB.

Under the operating rules of pools, each member of a combat correspondent pool would observe and record (in words, pictures, or video) what he or she saw in the field. Public affairs escort officers would review those words, pictures, and video footage for security and conformity to ground rules. Once cleared, the reports would be sent back to the JIB in Dhahran, where they would become available to all other reporters, faxed to the JIB in Riyadh, and dispatched to each pool reporter's parent news organization.[89]

DOD and CENTCOM intended to create a public information system that would provide pieces of the mosaic from the battlefield and from the

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[88]In theory, the number of slots was determined by the logistics and support that field commanders said was available to accommodate reporters. In practice, the numbers were arbitrarily determined by the Pentagon and CENTCOM–having been apportioned equally among the component commands to ensure "equitable" news coverage. Initially, each component command got two pools of about fifteen reporters per pool. Two additional smaller "quick reaction" pools of reporters were formed for coverage of unexpected events.

[89]There were 132 reporters assigned to various "pools" covering combat units in the field at the start of Desert Storm. As the ground phase of Desert Storm approached, Washington bureau chiefs, network presidents, and Congress complained that there weren't enough reporters in the combat correspondent pools. Using that criticism and Congressional interest as a wedge, Pete Williams was able to force CENTCOM to create more "slots," and the pools grew to accommodate 60 additional reporters. By the time the ground war started, there were 192 reporters operating in pools. See "Media Policy," Annex S to *Conduct of the Persian Gulf War: Final Report to Congress*, Washington, D.C., Department of Defense, Apr 1992, p 655. For a detailed description of the mechanics of the pool system, see John Fialka's, *Hotel Warriors: Covering the Gulf War*, Washington, D.C.: The Woodrow Wilson Center Press, 1991, esp. Chapter 4.

headquarters, forming the bigger picture of the war's progress for the American public. The pools, according to Pete Williams, achieved the objectives of getting *independent reporters* out to combat units to view, first hand, the battle, as it unfolded; while, at the same time, limiting the number of reporters that field commanders, charged with fighting the war, had to accommodate.[90]

The combat correspondent pools in the field with units had to operate under a strict set of ground rules established by the Pentagon. Reporters agreed to them as a precondition for accreditation.[91] As it took a long time for the major news organizations to negotiate the ground rules and the concept of combat coverage with the Pentagon and CENTCOM, the public affairs planning process developed very late prior to the war.

Negotiating the Rules for Press Coverage

In a memo dispatched on 14 December 1990, to the Washington bureau chiefs, Pete Williams outlined a *three-phased* plan for covering hostilities by the media. The plan called for the organization of *press pools*. In Phase I–which began immediately, according to Williams' memo–the CENTCOM Joint Information Bureau in Dhahran would form two pools of reporters, equipped and randomly exercised to provide training for news media representatives and U.S. military personnel. The intent of DOD and CENTCOM was to familiarize reporters with troops and military equipment they would be covering *before* hostilities broke out and to exercise a workable system of filing pool reports from the field.

Phase II would begin by enlarging the number of active pools and deploying them when hostilities were imminent–placing them with units and at locations to witness and cover the first stages of combat. Membership in the pools would be rotated to ensure continuous coverage by the maximum number of news media representatives in theater. The system for security review and dissemination of pool material was also imple-

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[90]See intvw, of Pete Williams by Larry Grossman in "Newshounds and the Dogs of War," *Government Executive*, Sep 1991, pp 26. Also, see *A Gulf War Media Review*, Williams' remarks to the National Press Club, Washington, D.C., 14 Mar 1991.

[91]The ground rules and form signed by journalists agreeing to abide by them are included as an appendix to this chapter.

mented in this phase.[92] Ground rules for what could be reported remained essentially unchanged from those observed during Operation Desert Shield.

Phase III was envisioned to provide for *open coverage* (not pooled) of combat activities. The military would disband all pools; all media would be permitted to operate and report independently. However, because of the dangers of traveling in a war zone, and the requirements of Saudi Arabia that the news media had to be under strict military control when traveling in their country, CENTCOM escort would still be required.[93]

While Phase III held out the promise of open coverage by the press, Washington bureau chiefs vehemently objected to the provision that initial coverage of hostilities combat units would be permitted only by pools. However, because of the sheer *size* of the press corps in Saudi Arabia, the *logistics* of moving them safely and providing support and accommodations in the field, commanders and public affairs officers in country determined that the only feasible way to accommodate news coverage was by forming "pools" of news media. According to Colonel Bill Mulvey, director of the Joint Information Bureau in Dhahran, "the numbers overwhelmed us . . . . We had to resort to media pools for Desert Storm because of the huge numbers. We didn't have any other choice."[94]

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[92]"Security review" was a term adopted from the military's peacetime practice of submitting all information intended for release to the public and the Congress to an administrative process of review and coordination for conformity to security guidelines and U.S. Government, DOD, and Department of the Air Force policy. This system, called "security and policy review," is used only for information developed by the military for release, not by non-military writers, journalists, and reporters. However, because there was no longer any formal authority for the imposition of wartime field press censorship, "security review" was adopted as a ready and convenient mechanism for the review of reports prepared by combat correspondent pools. Although criticized by news organizations as "censorship" by another name, final authority for determining what was published or aired did not rest with the military reviewers, it rested with the editors and producers. See Williams' testimony in Senate Hearings.

[93]Department of Defense Contingency Plan for Media Coverage of Hostilities, Operation Desert Shield, draft dated 13 Dec 1990.

[94]Col William L. Mulvey, a U.S. Army public affairs officer and veteran of the Vietnam War, was director of JIB-Dhahran. He recounts his experiences there in "Inside Media Relations: Observations from Desert Storm," *U.S. Army Public Affairs Monthly Update* (Washington, D.C.: Secretary of the Army Office of Public Affairs), Aug 1991.

Apparently, Washington and CENTCOM were concerned that field commanders could not accommodate unexpected and uncontrolled numbers of reporters traveling to their units. There was also the fear that once ground units began their move to reposition to the west for the planned flanking attack of Iraqi forces, their movements would be inadvertently revealed by independent reporters traveling outside of control by the system of pools and with lackadaisical regard for security review. Of course, these concerns could not be directly shared with reporters or their editors at this early and uncertain stage of preparing for war. But Pete Williams understood commanders' concerns and tried to balance them with the news media's legitimate role in covering the war.

Williams spent several weeks negotiating changes and clarifications to the plan he had presented to Washington bureau chiefs in mid-December before he finally issued a revision less than one week before the air campaign would begin. On 7 January Williams issued what Bill Headline, Washington bureau chief for CNN, called a "more realistic" set of guidelines. However, once again, Washington bureau chiefs wanted *more* concessions, *more* clarifications of rules, and *more* assurances from Williams that their appropriate interests and needs would be met by CENTCOM. They wanted clarification of the escort requirement and of the provision for security review so that commanders knew that the final decision for publishing disputed material rested with the news organizations, not with them or with Pentagon. But most of all, the bureau chiefs and the superiors did not want *pools*.[95]

Williams attempted to accommodate news organization concerns, incorporating last-minute changes before distributing a final set of guidelines to the Washington bureau chiefs and CENTCOM dated 14 January 1991–the day before the U.N.'s deadline to Iraq; two days before Desert Storm. The final rules went to CENTCOM/PA and to the JIBs barely in time to put them in place for Desert Storm. But they went through functional (public affairs), not operational (command), channels. There was little

[95]Report from Nancy Traver, Washington Bureau, *Time* magazine, " TV in the Gulf," *Desert Storm: The War in the Persian Gulf*, compilation of *Time* magazine correspondent reports, eyewitness accounts, photographs, audio recordings, maps, charts, and documents gathered during the war by Time-Warner's editorial staff and published on CD-ROM (Burbank, CA: Warner New Media, 1991).

time to educate or to train the news media or the military; even less time to "exercise" the system.

The final guidelines did contain the clarifications the bureau chiefs sought on escorts and security review; however, they did not eliminate the system of pooled coverage of combat. To CENTCOM and to the Pentagon, the pool system made the most sense from the military's perspective. The pool system had been instrumental in gaining for the press access to Saudi Arabia and getting reporters to visit widely dispersed units in the desert that only the military, equipped with satellite positioning hardware and accurate maps, could locate safely and reliably. The military *and* the media were familiar with pools and knew that they could work to get some reporters up to the front–representing the rest left behind–in position to directly observe and report on Desert Storm as it unfolded. The press remained skeptical, but Williams pleaded in a Pentagon press conference covering the rules: "Judge us by how well we do it."[96]

How Well Did We Do?

Of course, the pool system did what it was supposed to do the evening the war began. When the first F-15Es took off to strike targets deep inside Iraq, American reporters were on hand to report the event at their desert air bases. When the U.S. Navy fired Tomahawk cruise missiles from ships in the Persian Gulf headed toward targets in downtown Baghdad, American reporters were there as well. Whether it functioned well enough to tell the whole story of the air campaign is more difficult to assess.

Because of pools and limited access to air bases, few of the thousands of journalists assembled in Saudi Arabia to cover the war were prepared to understand or report on the air campaign. The system of public information that CENTCOM and Washington put in place for communicating the progress of the war did little to improve their understanding.

Despite the fact that the air campaign consumed five of the six weeks of the war, air commanders were featured in only two of the daily

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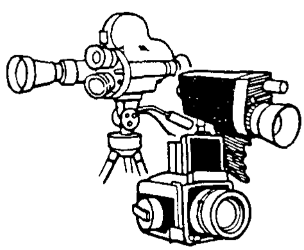
[96]DOD Transcript, Pete Williams, Assistant Secretary of Defense for Public Affairs, Press Conference, Pentagon, 8 Jan 1991.

CENTCOM briefings.[97] No air commander or U.S. Air Force senior officer ever appeared in the daily Pentagon briefings. And despite the ready availability of vast amounts of gun camera, cockpit, and other types of munitions footage through Joint Combat Camera, neither CENTCOM nor CENTAF made use of it as part of a broader public relations strategy. The only footage released by CENTCOM throughout the war was selected and released as part of General Schwarzkopf's briefings. The CINC's selective use of video served to provide a very narrow perspective of the air campaign–one that permitted Saddam Hussein to exploit and magnify the issue of civilian casualties more fully than he might have had a more accurate and comprehensive portrayal of the air campaign been presented to the press and to the public.

Finally, many of the ground rules for press coverage and the system to accommodate the news media were fashioned to meet the needs and concerns of commanders preparing to fight a *ground* war, not an air campaign. Many of those rules were unnecessary, for a majority of the war was fought in the air from fixed and relatively secure air bases and carrier decks. Briefly, there should have been a mechanism and set of rules flexible enough to accommodate all aspects of the campaign instead of the relatively inflexible rules more appropriate for a ground campaign.

These and other lessons for future public affairs planners are discussed more fully in the conclusions chapter of this report.



[97]Gen Horner appeared in one press briefing conducted by the CINC on 18 Jan 1991. Gen Glosson appeared in one other briefing conducted by the CINC on 30 Jan 1991. No other senior CENTAF or Air Force officers appeared in any other significant briefings throughout the air campaign.

8

Supporting The People

More than 55,000 Air Force personnel deployed to the deserts of Southwest Asia; fewer than ten percent were fliers. This chapter deals with the morale and welfare needs of the operational as well as support forces, and how they were met. The challenge was unique, as men and women reared in the customs of Western civilization were transplanted to fight for and beside people of ancient customs that viewed Western ways, religious beliefs, and codes of conduct with antipathy and suspicion. To bridge the cultural gap, U.S. military authorities instituted for their personnel certain guides of conduct.

The first of these, issued in August 1990, prohibited specific activities by U.S. military personnel assigned to the theater of operations. The order was necessary to preserve U.S. and host nation relations and the combined operations of U.S. and Coalition forces. Also, Islamic law and Arabic customs prohibited or restricted certain activities generally permissible in Western countries. These added to the cultural shock. Essentially, the CENTCOM General Order restricted or prohibited the purchase, possession, or use of many items normally available to Westerners. Alcohol, firearms, sexually explicit material (whether pornographic or not), and gambling were prohibited. Entrance into a Mosque or other Islamic religious sites, unless required by military necessity, was also prohibited.[1]

Religious and cultural limitations within the theater varied, depending on which Southwest Asian country personnel were deployed. Personal Bibles were allowed, but could not be distributed to local nationals. Moslems openly proselytized for converts among Service personnel.[2] Worship services on U.S. sites were not impeded, but any public gathering for non-Moslem worship outside the U.S.-controlled site was prohibit-

[1]USCENTCOM, General Order GO-1, Prohibited Activities for U.S. Personnel Serving in the USCENTCOM AOR, 30 Aug 1990.

[2]Ltr, Chaplain Lt Col James T. Elwell, CENTAF Staff Chaplain, to USCENTAF/CC, subj: End of Tour Report, 24 Sep 1990, p 4.

ed. Initially, the Saudis requested that terms such as "church services" and "chaplains" be substituted with "morale services" and "morale officers."[3] Commanders also asked chaplains to refrain from wearing the emblem of their faith on the uniform once outside a U.S.-controlled site.[4] Not until January 1991 could the ban on the terms "chaplain" and "church service" be lifted by Lt. Gen. Charles A. Horner.

Restrictions set for female personnel included modest dress codes and excluded walking or riding in a car in public together with a man, other than one's husband, and no demonstration of public affection. On military compounds in Saudi Arabia where American Servicewomen were isolated from local nationals, cultural restrictions and social prohibitions were relaxed. However, more restrictions were often imposed on people near major urban areas than in rural areas or on those deployed to the United Arab Emirates and Oman. The lack of consistency was difficult to accept for some U.S. Servicewomen. Yet, they saw the need to adhere to the restrictions as part of the military obligation.[5] For them, this was the same dichotomy that faced chaplains in the execution of their mission.

The Role of the Chaplain

The mission of the Chaplain Service is to provide a comprehensive ministry in support of maximum readiness and combat effectiveness of the Air Force, assuring the right to the free exercise of religion for all Service members. To fulfill this mission, chaplains serve on the staff of commanders as advisors on religious, ethical, and quality of life concerns. To serve commanders in these functions, the Air Force established Pastoral Ministry Teams (PMT), each consisting of a chaplain and an enlisted chaplain Service member. Their primary function is to nurture the living, provide spiritual care for casualties, and to honor the dead. The influence that Air Force chaplains provided in support of air power may be best measured by the potential for serious morale problems of the combat force created had they not deployed at all.

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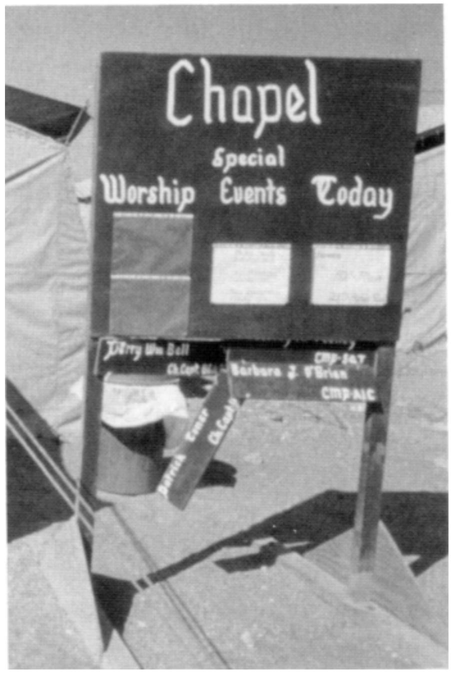
[3] *Ibid*, note 2.

[4] Chaplain, Lt Col James T. Elwell, End of Tour Report, 24 Sep 1990.

[5] *Ibid.*



The services of chaplains were available when needed to personnel of all faiths. Below, chaplain performs wedding ceremony.

Chaplain Support Planning

As of August 1990, the Headquarters CENTAF Operations Plan did not provide for a chaplain structure, and there was no designated Ninth Air Force chaplain responsible for organizing for such a contingency. This function fell upon the Tactical Air Command, CENTAF Rear, who monitored a deployment manning document, listing manpower requirements and unit taskings, and adjusted the time-phase force and deployment list as required. Accordingly, it was the Tactical Air Command chaplain mission capabilities statement that served as the manpower guideline for deploying chapel function personnel to Southwest Asia.[6]

The keys to any measure of success in ministering to the troops was adherence to existing Air Force Chaplain Service regulations and policies coupled with additional training. In December 1990, the theater had twenty-two installation staff chaplains and fifteen chapel support personnel who had never ministered under the threat of war in a bare-base environment. The implementation of the Pastoral Ministry Team concept to minister under threatening environment was emphasized during all site visits and in written communications. It also became a primary focus at the Installation Staff Chaplain and Chief of Chapel Support Activities Conference held in Riyadh, Saudi Arabia in December 1990.

By January 1991 the Pastoral Ministry Teams made a strong effort to serve in the flying squadrons and remain easily available to pilots and aircrew. When pilots were aloft, the teams focused on the maintenance and support personnel. They also served in hospital facilities, where it was important to be readily available and recognized in the event of mass casualties; their services extended twenty-four hours a day. When aircrews became the center of attention, Pastoral Ministry Teams were on hand for prayer and support during mission briefings, preflights, takeoffs, and recoveries. For example, the teams would gather people from various support functions to send off pilots with a final salute prior to missions.

In September, the CENTCOM chaplain also tasked the CENTAF chaplain to prepare a plan for Jewish personnel needs during High Holy Days. CENTAF coordinated with Army and Navy counterparts to arrange for a

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[6]History of HQ. USCENTAF/HC, Vol 1: 15 Aug - 31 Dec 1990, p 4.

central gathering place for all Jewish personnel to meet for these services.[7] Because of the limited number of Jewish chaplains in the theater, the Air Force Jewish chaplain planned site visits along the Western Star mail plane circuit. The Army Jewish chaplain worked the eastern circuit and the Navy Jewish chaplain visited Navy ships within the theater of operations.

In March 1991, the Pastoral Ministry Teams changed their focus by helping men and women cope with changes at work and by preparing them for reunion with family members after a long separation. Preparations were also made for the Jewish holiday of Passover. Headquarters U.S. Air Force and CENTAF Rear supported the theater by obtaining Kosher foods, and in conjunction with this holiday, they planned an interservice Passover Retreat for all Jewish personnel. With the approval of Gen. H. Norman Schwarzkopf, the Passover Retreat was conducted from 29 to 31 March 1991 aboard the R&R ship *Princess Cunard*, in Bahrain. The retreat included the observance of Seder services. More than 400 Jewish service members attended 3 separate worship services.

Many soldiers, isolated from their families and attempting to deal with the harsh desert environment, discovered an increased interest in religion.[8] Soldiers were cautioned, however, to refrain from displaying religious symbols out of doors and in areas frequented by the Saudis.

Chaplains in Southwest Asia conducted 17,394 Protestant services attended by 649,281 people. In addition, 9,421 Catholic services attracted 425,772 people, and 390 Jewish services drew an attendance of 9,803. The Army estimated that about 1,000 Jewish soldiers deployed to Southwest Asia. Almost 900 other types of religious services were held for 22,539 worshippers.[9] Working with the Saudi government, the chaplains also organized a pilgrimage to Mecca for U.S. Muslim soldiers.[10]

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[7]Chaplain, Lt Col Donald R. Bickers, USCENTAF, Rear, Battle Staff Operations Report, Mar 1992, p 9.

[8]Oral History Interview with Chaplain (Col) Gaylord E. Hatler, ARCENT Staff Chaplain during Desert Shield/Desert Storm, 14 Jun 1991, interviewers Dr Henry O. Malone and Dr Susan Canedy.

[9]*Ibid.*

[10]*Ibid.*

The 681 chaplains included 560 Protestants, 115 Catholics, and 6 Jewish. They distributed a variety of religious literature and material, among them more than 300,000 books and pamphlets, 150,000 audio tapes, and 700 menorahs. This material, transported to Southwest Asia by the Military Airlift Command, was not subject to mailing prohibitions. Service personnel of all faiths practiced the faith of their choice, and most had access to chaplains when needed.[11]

Morale, Welfare, and Recreation

Although several Middle East exercises held by JCS prior to the war provided valuable experience for the CENTCOM theater of operations, personnel charged with morale responsibility during base-level mobility exercises were often tasked to perform other duties. As a result, they were unfamiliar with their primary duty of setting up and operating deployed bare-base activities for morale, welfare, and recreation.[12]

Unlike situations during Operations Urgent Fury (Grenada) and Just Cause (Panama), five and one-half months elapsed between the initial deployment and commencement of combat operations. U.S. forces were training and preparing for combat every day. Quality of life became a major concern, especially since host nation laws and culture limited the scope of recreational programs that could be offered. This created a disparity in the standard of living between units deployed to different countries. The harsh environment (heat and sand) eliminated a number of possibilities to set up sports fields and similar athletic programs. On the other hand, the Persian Gulf War enjoyed overwhelming public support which led to a tremendous outpouring of contributions from the private sector. These contributions were ultimately funneled into recreational channels,[13] and the combat force was provided opportunities to relax and enjoy many of the same stress-reducing activities to which they were accustomed in the United States.

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[11]Information Paper, "Religious Support for Deployed Personnel During Operations Desert Shield/Desert Storm (All Services)," Chaplain Jack Anderson, DAPE-HR-S; Geraldine Baum, "Baptism of Fire," *Los Angeles Times*, 2 Jan 1991.

[12]Ltr, Robert M. Doane, Major, USAF, Director of MWR, CENTAF-FWD, to USCINCCENT CCJ1, subj: Deployment After Action Report, 20 Mar 1991, pp K-1 - K-3.

[13]*Ibid*, pp D-1 - D-15.

During the deployment phase, each Service provided support for morale, welfare, and recreation in a different fashion. The Navy used existing support through their fleet recreation coordinator at Bahrain and their facilities at Diego Garcia. The Marines deployed sports equipment at the unit level and assigned military personnel to recreational functions as an additional duty. During the 1980s the Army had traded military morale, welfare, and recreational authorizations for light infantry authorizations; therefore, the Army had virtually no deployable capability for this role.[14] The Air Force, adequately staffed and equipped with Sports and Recreation Mobility Kits, was able to provide such needs anywhere within the theater of operations.

Thirty days into deployment, 79 morale, welfare, and recreation personnel, were deployed to Southwest Asia. Maj. Bob Doane, chief of this support activity at Shaw Air Force Base, South Carolina, was designated CENTAF Forward Director of Morale, Welfare, and Recreation, with responsibility for coordinating Air Force support within the theater. Initially, coordination between CENTAF Forward and Rear functions and supporting major command functional managers worked exceptionally well. However, when identification of personnel requirements went outside the computer system, some support teams arrived in the theater before they were needed, and others reported to the wrong site, causing unnecessary redeployment. As additional combat units were deployed, however, more assets were redeployed and reallocated where needed. Ultimately, 221 morale, welfare, and recreation personnel, including 17 officers and 35 Sports and Recreation Mobility Kits, from 7 major commands deployed to establish and operate the programs at 22 deployed locations.[15]

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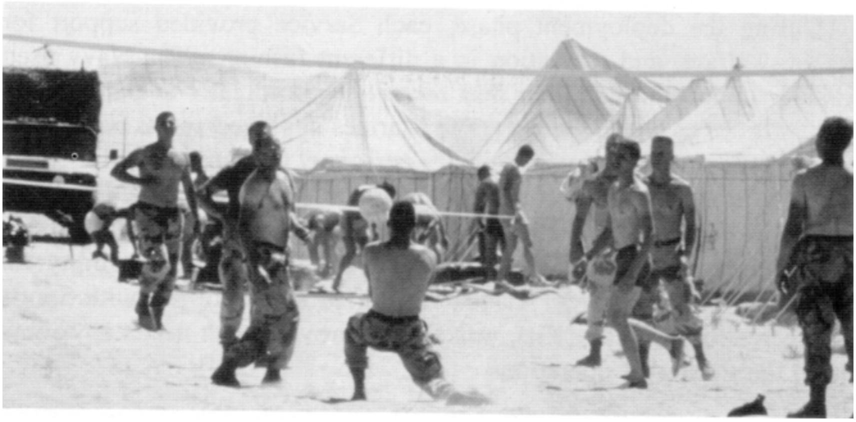
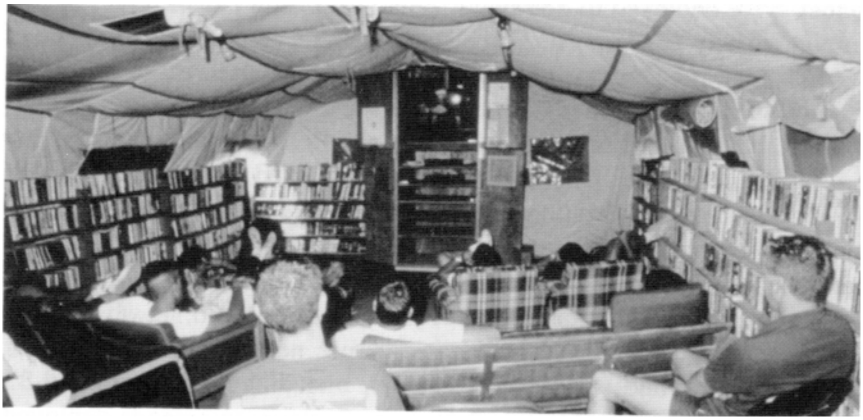
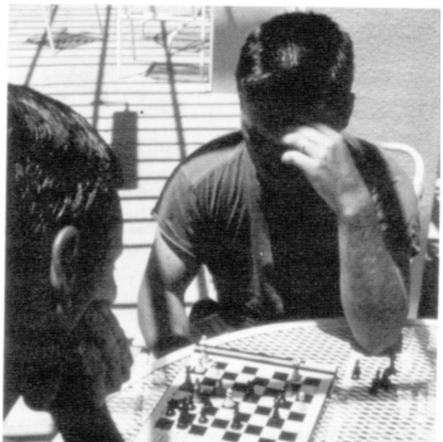
[14]Maj Robert M. Doane, CENTAF-FWD Director of MWR, "Summary of Air Force MWR Involvement in Operation Desert Storm/Desert Shield," undated, p 2.

[15]*Ibid*, pp A1 - A-5.







Various types of recreational facilities were available to Service personnel, including sports, libraries, movies (above and left), and special entertainment (opposite page).

Various types of facilities were used throughout the theater. They ranged from makeshift outdoor theaters and athletic fields to modern host nation sports complexes. Seven Air Force deployment locations were in or near major metropolitan areas that offered three or more host nation recreational facilities.[16] The bare-base Air Force locations initially relied on self-help until RED HORSE and civil engineer support provided vital support; for example, by paving volleyball/basketball courts.[17]

Basic programs, such as intramural sports, weight-training tents, recreation equipment, libraries, and movies were available at all deployed Air Force sites. Beyond the basics, there were activities such as overnight stays in hotels, shopping tours, cultural orientation tours, golf, and "better than a letter" videotaped messages to loved ones. The Army rented the *Princess Cunard* Luxury Liner, docked for the duration of the war on the northern tip of Bahrain. The ship accommodated 900 passengers at a time, out of which the Air Force received an allotment of 112

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[16]*Ibid*, p I-1.

[17]*Ibid*, p J-1.

for cycles of 4 days and 3 nights. More than 3,000 Air Force personnel eventually participated in this program.[18]

Resale operations, established at all locations, sold souvenir T-shirts, coffee mugs, baseball caps, sodas, snacks, and beer (where allowed; i.e., UAE, Oman, and Bahrain) by host nation laws. These activities generated substantial nonappropriated fund revenues.[19]

The USAFE Library Service Center served as the focal point for shipment of library materials for Air Force personnel in the Persian Gulf.[20] The USAFE Library Center shipped a total of 200,000 paperbacks; another 25,000 arrived with the mobility kits. Tactical Air Command set up a subscription for 2,500 copies of *USA Today* and *Air Force Times*, while publishers donated 20,000 copies of 21 popular magazines.

Because of the variety and scope of such activities, USCINCCENT designated the Air Force to take the lead in providing support within CENTCOM,[21] and the CENTAF Director of Morale, Welfare, and Recreation became responsible for coordinating distribution of donated goods, managing three distribution circuits of Army and Air Force Exchange Services, and coordinating all support for celebrity and entertainment visits. Three entertainment circuits established for Operation Desert Shield[22] were designed to ensure an equitable distribution of entertainment. However, this principle was changed so that most, if not all, USO tours were also scheduled for front line areas.

During the Persian Gulf War, the overwhelming public support produced an avalanche of private-donation gifts to support the troops,[23] which sent them a strong message that, unlike Vietnam, the public staunchly supported them. Early in Operation Desert Shield, handling such donations presented a problem, since no provision for them existed.

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[18] *Ibid*, pp H-1 - H-2.

[19] *Ibid*, p A-3.

[20] *Ibid*, p G-1.

[21] *Ibid*, pp D-3, E-1.

[22] *Ibid*, p E-2.

[23] Ltr, Robert M. Doane, Major, USAF, Director of MWR, CENTAF-FWD, to USCINCCENT CCJ1, subj: Deployment After Action Report, 20 Mar 1991, pp D-1 - 3.

The Defense Logistics Agency then became the donation receiving agent for the Services and assumed responsibility for shipping donated items to CENTCOM. Prior to hostilities, the Military Airlift Command transported them to Riyadh, Saudi Arabia, and CENTAF coordinated distribution to the Services. Distribution was based on a percentage of deployed population (Army 56 percent, Marines 16 percent, Navy 14 percent, and Air Force 14 percent).[24] Inadequate storage facilities within the theater, however, hampered distribution.

Funding for morale, welfare, and recreation likewise presented readjustments as a result of deployment. CENTAF decided early to fund Operations Desert Shield/Desert Storm requirements using appropriated funds to the maximum extent allowed by law. As a result, very little support costs were paid with nonappropriated funds. With the exception of library materials purchased by USAFE early in the operation, only resale items, or other goods not authorized from appropriated funds, were purchased with nonappropriated funds. Tactical Air Command Headquarters authorized a $100,000 grant, and the Air Force MWR Board authorized a $300,000 line of credit.[25] Fees were not charged for recreational programs, and resale profit margins were kept to a minimum. However, due to sheer volume, approximately $300,000 in nonappropriated profits were generated abroad.[26]

The Chairman of the House Armed Services Committee MWR Panel, Representative Lancaster, expressed concern early in Operation Desert Shield over the financial impact of deployment on such programs stateside. The estimated "lost income" impact at Air Force bases with significant deployment ranged between $1.5 and $2.5 million during the first quarter of Fiscal Year 1991.[27] DOD requested from each of the Services a request for relief to compensate for the Persian Gulf War extraordinary losses.

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[24]*Ibid.*

[25]Maj Robert M. Doane, CENTAF-FWD Director of MWR, "Summary of Air Force MWR Involvement in Operation Desert Storm/Desert Shield," undated, p 4.

[26]*Ibid.*

[27]*Ibid.*

Personnel Finance During Deployment

Beginning in August 1990, three to four accounting and finance personnel from the base comptroller organization deployed to the Persian Gulf to establish disbursing offices. They supported contracting officers for on-the-spot payments to local vendors for goods and services; they responded to inquiries from individual members regarding pay, travel entitlements, allowances, cashed checks, and currency exchange; and they accomplished basic accounting requirements to track obligations and reports to the home station.

Disbursing agents were appointed on orders to act on behalf of the home station Accounting and Finance Officer. They were legally accountable to the home station for cash, checks, and funding documents issued to them. They were also responsible for ensuring that funds were used only for those things for which they were appropriated. These agents acted as a bank in that they cashed personal checks for deployed personnel and exchanged U.S. currency for foreign currency to be used for purchases on the local economy.

Because disbursing agents were not in theater during the early stages of deployment, contracting officers were left without the financial support to make immediate payments to host nation vendors.[28] Additionally, safeguarding of funds was difficult. Field safes were deployed, but agents lacked secure facilities to store them. Security Police provided some security, but not enough to provide twenty-four-hour guard. Therefore, disbursing agents slept next to the money to provide the required security.[29]

Most of the deployed comptroller personnel were trained disbursing agents but did not have enough experience or skill to support contracting officers in the field. The initial function for disbursing agent operations was to travel with contracting officers and pay for purchases, such as

[28]Ltr, John J. Nethery, Deputy Assistant Secretary for Plans, Systems, and Analysis, Financial Management, to SAF/OSG, subj: Gulf War Air Power Survey, 24 Mar 1992.

[29]*Ibid.*

billeting, bottled water, subsistence requirements, and aircraft fuel.[30] Specifically, disbursing agents did not fully understand contracting regulations or fathom the multitude of legal requirements and restrictions.

Cash Operations

Agents deployed with cash, checks, and funding authority documents ranging from $250,000 to $1.5 million in cash, up to $21 million in checks, and up to $27 million in funding authority.[31] By 12 August 1990, disbursing agents at 12 sites had a total of 37 comptroller personnel assigned. By 30 August, this number had increased to 19 sites with 77 comptroller personnel assigned. By mid-September 1990 comptroller strength had risen to 90 personnel at 21 sites. By October 1990, these sites were staffed with 127 personnel from 7 major commands. By this time, they held $60 million in funding authority, $5 million in cash, and more than $45 million in checks. At the peak of operations, monthly comptroller activity exceeded 8,000 partial and casual payments and 47,000 cashed personal checks in theater.[32] The on-site disbursing agent responded to questions and paid all members regardless of component. Problems occurred when active duty finance personnel did not understand the reserve pay and entitlement system.[33]

These 127 people supported approximately 55,000 Air Force members, in addition to members from the other Services. Another 43 people deployed to Turkey, Greece, Spain, and Diego Garcia, and contingency hospitals in the United Kingdom and Germany, bringing the total Air Force comptroller personnel to 170 people.[34] The majority of them came from Military Airlift, Strategic Air, and Tactical Air Commands. U.S.

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[30]Ltr, C. Ronald Hovell, Principal Deputy Assistant Secretary of the Air Force, Financial Management, to Distribution List, subj: Financial Management and Comptroller Desert Shield/Storm Lessons Learned Action Items, 13 Aug 1992.

[31]Ltr, John J. Nethery, Deputy Assistant Secretary for Plans, Systems, and Analysis, Financial Management, to SAF/OSG, subj: Gulf War Air Power Survey, 24 Mar 1992.

[32]Mr Lee Franklin, SAF/FMPC Briefing, "Desert Shield/Storm Lessons Learned," undated.

[33]Ltr, C. Ronald Hovell, Principal Deputy Assistant Secretary of the Air Force, Financial Management, to Distribution List, subj: Financial Management and Comptroller Desert Shield/Storm Lessons Learned Action Items, 13 Aug 1992.

[34]*Ibid.*

Air Forces in Europe provided agent support and the Air Force Reserves and Air National Guard had comptroller personnel in theater. A sample of a typical week's business at the 21 sites is portrayed in Table 17.[35]

Table 17
Average Weekly Transactions Processed

Transaction	Number/Dollars
Pay Inquiries	9382
Allotment	1199
Entitlement Actions	4374
Partial/Casual Payments	7542
Travel Payments	233
Checks Cashed	44,660/$3.5M
Currency Exchanged	$2.1M
Vendor Payments	1071/$6.3M
SF 44 Purchases	2314/$6.3M

Entitlement and Payment Methods

The on-site disbursing agent was available to respond to questions regarding pay and allowances, including travel payments. Initially accomplished by message, mail, or phone, it became possible to provide a Leave and Earnings Statement to deployed members as time went on.

By December 1990, terminals via satellite linked deployed agent offices through the supply system communication lines. This system provided the capability to perform real-time inquiries in response to member's questions, and it provided disbursing agents with an electronic

[35]Ltr, John J. Nethery, Deputy Assistant Secretary for Plans, Systems, and Analysis, Financial Management, to SAF/OSG, subj: Gulf War Air Power Survey, 24 Mar 1992.

mail capability. Ten of the twenty-one sites were using this capability by the end of December, and all locations had it by mid-February.

Some systems for posting wartime and contingency entitlements were not up to date. For example, the program for Uniformed Services Saving Deposit Program, not used since the Vietnam War, became obsolete and needed updating.[36] Similarly, the program to post combat zone tax exclusions required work before it became usable.

Comptroller Training

Experience levels of comptroller technicians during the Gulf War indicate a need for more realistic training.[37] As mentioned previously, they deployed to the theater of operations trained in disbursing functions, well prepared to accomplish military pay and travel tasks, but not to resolve issues that required accounting knowledge.

Some commanders requested items that could not be purchased from funds at the disposal of the agent.[38] For example, to respect host nation sensitivities, a commander wanted to use operations and maintenance funds to purchase new uniform blouses that would cover women's arms. Provision for such purchases, however, is covered by a clothing allowance, and neither the agent nor the commander could have authorized a civilian clothing allowance for personnel assigned to positions where wearing short sleeve blouses posed a problem. Better training would have afforded the agent sufficient understanding of regulations to support the commander's need.

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[36] *Ibid.*

[37] *Ibid.*

[38] *Ibid.*

The early stages of Operation Desert Shield vividly revealed the need for a clear chain of command to guide comptroller policies. Without a forward headquarters accounting and finance element, there was no central authority for appealing funding, guidance, and direction for further resolution.[39] Nor was it possible to deploy disbursing agents to the theater or assign them to a central accounting and finance officer who could provide cash, checks, and funding documents. Each agent in theater reported to the Accounting and Finance Office in the United States or Europe; twenty-one agents reported to nineteen separate offices in seven different commands.[40] As a result, agents responded to direction from nineteen different sources with differing command views and to guidance from the Defense Finance and Accounting Center. Obviously, this complicated operations at the disbursing agent level.

Postal Services

Postal services were divided into domestic operations, international transportation, and overseas mail processing, each handling all mail. The U.S. Postal Service bears responsibility for domestic and international transportation of mail.[41] To support the Persian Gulf, the Postal Service also established mail gateways in New York City, and San Francisco, with liaison activities in Seattle, Chicago, Miami and Jacksonville, Florida, Dallas/Fort Worth, and Bayonne, New Jersey.[42] To accommodate large volumes of mail, the Postal Service opened an additional military distribution center in Dallas, and acquired supplemental buildings in New York City, Washington D.C., and San Francisco. They also hired 666 new personnel to handle the mail volume.[43]

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[39]Ltr, C. Ronald Hovell, Principal Deputy Assistant Secretary of the Air Force, Financial Management, to Distribution List, subj: Financial Management and Comptroller Desert Shield/Storm Lessons Learned Action Items, 13 Aug 1992.

[40]*Ibid.*

[41]Congressional Testimony Statement, Ms Diane K. Morales, Dep Asst Sec of Defense (Logistics), 20 Feb 1991.

[42]Congressional Testimony Statement, Col (P) Patricia P. Hickerson, Executive Director, Military Postal Service Agency, 20 Mar 1991.

[43]Congressional Testimony Statement, Mr. Allen Kane, Asst Postmaster General, 20 Feb 1991.

Postal Single Service Manager

CENTCOM designated CENTAF as its single Service manager for postal operations in 1982; in 1984 these responsibilities were further refined.[44] In 1986, CENTAF activated the 4401st Air Postal Squadron to serve as the single Service manager for postal operations. Though the 4401st had participated in command exercises, they primarily focused on warfighting capabilities, and because of the short duration and low mail volume, the squadron never adequately faced postal operations on the scope of the Persian Gulf War. This was the first true test of postal operations under the single Service manager concept.

Postal Operations

On 1 August 1990, there were 11 military post offices in the theater of operations employing 13 Air Force postal specialists supporting some 5,500 personnel in Military Assistance Programs, embassies, and naval ships.[45] These military post offices became the key to establishing postal operations during the initial stages of the deployment. Figure 14 depicts the location of theater postal operations.

On 15 August 1990, Maj. Michael H. Whitaker, Commander of the 4401st Air Postal Squadron and MSgt. Eugene Ickes, Director of Postal Operations, deployed to Saudi Arabia. Prior to departing, they received approval for a 16-ounce restriction on mail going to Southwest Asia. They also requested an initial cadre of 140 postal-augmentees. During a stopover in Europe, Sergeant Ickes signed for $70,000 worth of stamps. Within 3 days the stock was depleted, and within 2 months the stamp account grew to approximately $5-million. Upon arrival in Saudi Arabia, the 4401st worked out of the military post office in Riyadh located on the U.S. Military Training Mission compound.

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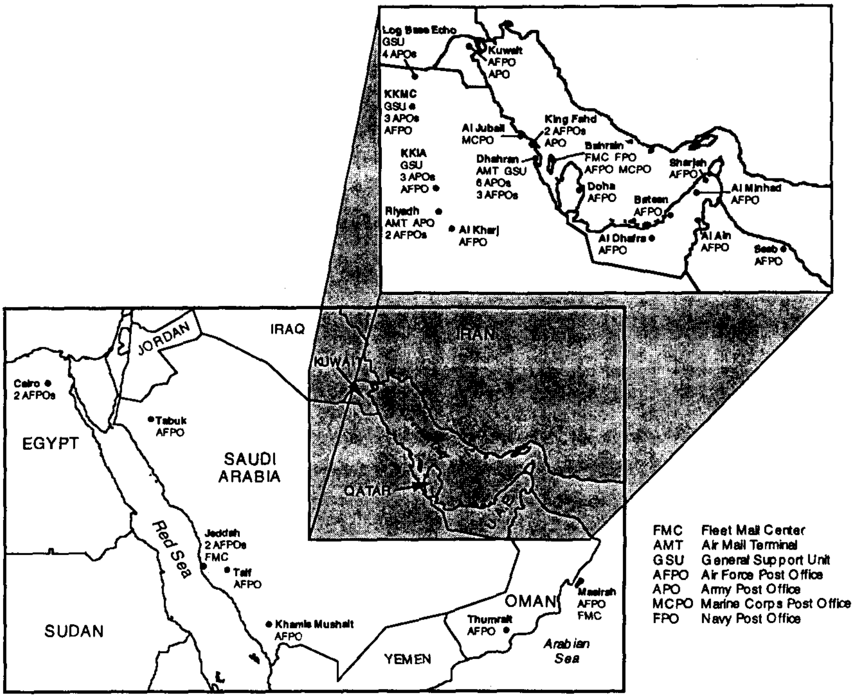
[44]Ltr, USCENTCOM to USCENTAF, subj: USCENTAF Responsibilities as USCENTCOM's Single Manager for Postal Service, 28 Nov 1984.

[45]Congressional Testimony Statement, Ms Diane K. Morales, Dep Asst Sec of Defense (Logistics), 20 Feb 1991.

Figure 14
Military Post Office Locations



Other existing military post offices were located in Dhahran and Jeddah, Saudi Arabia. Contractor-staffed post offices were established in Tabuk, Khamis, and Taif, Saudi Arabia. Embassy or DOD-staffed postal operations were located in Pakistan, Jordan, Egypt, Sudan, Kenya, and the Seychelles Islands. The only aerial mail terminal in Saudi Arabia prior to the deployment was at the Dhahran Royal Saudi Air Base, a large warehouse to become the largest air mail operation in the world. Commercial air carrier mail routes were established at Riyadh and Jeddah, which reduced mail volume at Dhahran by 75 percent. Outside Saudi Arabia, the Air Force ran a military post office at the American Embassy in Cairo, Egypt. The Navy processed mail through Bahrain, while the Marine Corps set up mail operations in Al Jubail. Eventually, 203 military post offices were operating in Southwest Asia manned by more than 1,300 full-time postal specialists supporting half a million personnel in the theater.

By late October, the mail volume quickly outpaced the postal airlift capabilities that had begun in August, with U.S. civil air carriers shouldering the load. To handle the increases, mail was trucked to Dover AFB, Delaware, from commercial gateways for airlift on Military Airlift Command organic aircraft or on civil flights. Because of other high-priority cargo, Dover's aerial port capabilities soon became stretched to the limit, and in anticipation of the holiday season, the airlift command moved the East coast mail departure point to McGuire AFB, New Jersey. Desert Mail, then nicknamed for postal airlift, quickly became the main cargo. By November 1990, there were not enough civil carriers available to carry the all the mail.

During the Persian Gulf War, the Military Airlift Command airlifted between 150 and 170 tons of mail each day to Southwest Asia.[46] That was equal to approximately 90 percent of the mail delivered to the area. Figure 15 illustrates the volume of mail into and out of Southwest Asia from September 1990 to May 1991.

On 14 August 1990, Brig. Gen. Thomas F. Sikora, U.S. Army, Executive Director, Military Postal Service Agency, requested the DOD for free mail service for active duty members of the Armed Forces,[47] which would eliminate the need for establishing full postal services in a combat zone, and streamline the delivery process. In September 1990, Congress began deliberating the issue, and provided the President or the Secretary of Defense with authority to grant, by executive order, the free mailing privileges.[48]

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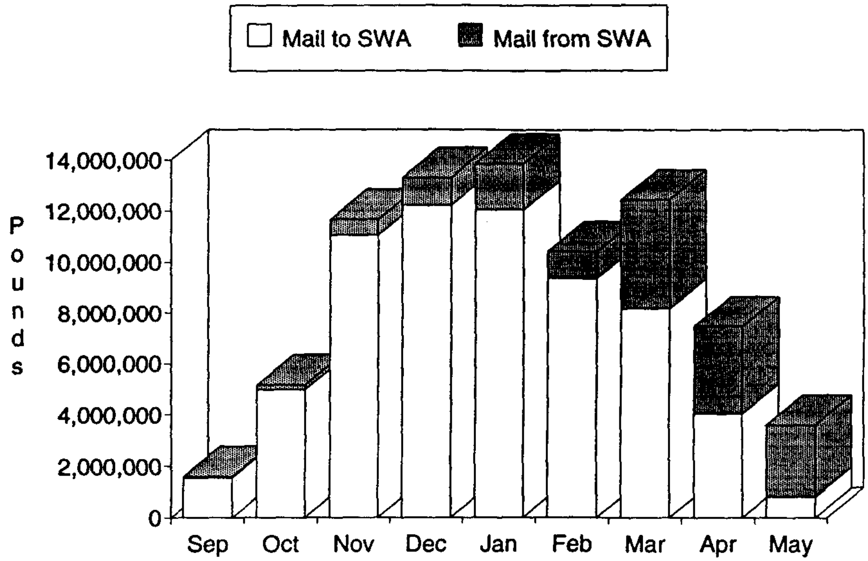
[46]Article, E. Cafasso, "Air Transport Chief: US Ready for Action," *Boston Hearld*, 28 Nov 1990, p 8.

[47]Memo Exec Dir, MPSA to Asst Sect of Def (Prod and Log), subj: Authorization of Free Mail for Active Duty Members of the Armed Forces, 14 Aug 1990.

[48]Opening Statement by Chairman Charles Hayes, Hearing on H.R. 5563 - Free Mailing Privileges for the Armed Forces Deployed in the Persian Gulf, 12 Sep 1990; Testimony of Congresswoman Beverly B. Byron before the Subcommittee on Postal Personnel and Modernization on H.R. 5561, 12 Sep 1990; Statement of Representative Frank McCloskey, 12 Sep 1990.

Figure 15
September 1990 - May 1991 SWA Mail Volume



Chancing that DOD would eventually approve free mail, the U.S. Postal Service accepted and delivered free mail from Saudi Arabia, United Arab Emirates, Oman, Bahrain–twenty-nine days before the executive order was signed.[49] The Secretary of Defense finally signed the executive order on 11 October 1990 and added the countries of Kuwait and Qatar.[50] By March 1991, free mail privileges were also authorized to members in Egypt, Israel, and portions of Turkey.[51] The costs associated with free mail, some $21 million, were absorbed by DOD.[52]

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[49]Msg, Exec Dir, MPSA to 4401st AIRPS, subj: Free Mail, 131715Z Sep 1990.

[50]Ltr, Sec of Def to Hon Anthony M. Frank, Postmaster General, 11 Oct 1990.

[51]Ltr, Sec of Def to Hon Anthony M. Frank, Postmaster General, 4 Mar 1991.

[52]Information Paper, MPSA, subj: Free Mail, 30 Apr 1991.

The increased volume of mail, especially with free mail privileges, led to increased security measures, which on 15 January 1991, the Federal Aviation Administration put into effect. This meant that U.S. and foreign carriers had to meet special FAA screening requirements before accepting mail for transport. If carriers could not meet them, alternate plans had to be developed to move mail. Screening consisted of one of the following methods: X-ray, DOD-certified bomb dogs, decompression chamber, FAA-certified explosive detection systems (none were available in overseas areas), or presenting parcels opened for inspection prior to acceptance by military post offices. At most locations, a combination of these methods was used. For example, bomb dogs and X-ray equipment were used at Dhahran, and X-ray equipment was eventually used at Riyadh and Kuwait City. The Saudi government provided the X-ray equipment. Air carriers that could not meet this requirement were required to accept mail only if it had been screened by the U.S. military using a DOD-approved explosive inspection procedure.[53] Also, by the end of January, the U.S. Postal Service implemented new mail security measures to ensure that the domestic postal system was not used as a conduit by terrorists.[54] Shortly thereafter, the U.S. customs service discovered four pounds of C-4 plastic explosives in a parcel mailed by a Service member at a military post office in Saudi Arabia.[55]

When offensive operations began in January 1991, USCINCCENT asked everyone to voluntarily limit incoming mail to first class letter mail and audio cassettes. At the same time, military post offices were directed to accept only machineable letter class mail, eleven ounces or less (both personal and official). Military post offices were instructed to return all mail that did not meet those specifications, but by 26 January, mail up to sixteen ounces was accepted.[56] In February 1991, delivery times

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[53]Msg, 6005th AIRPS to multiple addresses, subj: Mail Security Procedures, 170101Z Jan 1991.

[54]Memo, HQ, MPSA, subj: United States Postal Service (USPS) Security Contingency Plans for Domestic Mail, 31 Jan 1991.

[55]Msg, Exec Dir Mil Postal Agcy to multiple addresses, subj: Mail Security Procedures, 011410Z Feb 1991.

[56]Msg, USCINCCENT/CC to Exec Dir Mil Postal Agcy, subj: Operation Desert Shield, 181300Z Jan 1991; Msg, 4401st AIRPS to multiple addressees, subj: Mailing Restrictions for Desert Shield Operations, 181700Z Jan 1991; Msg, 4401st AIRPS to multiple addresses, subj: Mailing Restrictions for Desert Shield Operations, 261034Z Jan 1991.

increased because of Operation Desert Storm, while delays were caused only by airlift and security.[57]

Between 150 and 170 tons of mail were airlifted to Southwest Asia each day during Operation Desert Storm.

[57]Msg, Exec Dir Mil Postal Agcy to multiple addresses, subj: Mail Routing, 061510Z Feb 1991.

Medical Support

Fifteen air-transportable hospital equipment packages, comprising 14 operational hospitals at 13 sites, with help from a 250-bed contingency hospital staffed by the Military Airlift Command, supplied most of the in-theater hospital beds and staff for the Air Force in Operation Desert Storm. First-stage medical care and evaluation were available at 31 deployed squadron medical elements, including a few from the Strategic Air Command. The Air Force eventually provided almost 900 staffed hospital beds and 750 aeromedical staging beds in Southwest Asia. In Europe the Air Force identified about 3,700 beds, or two-thirds of the beds available in the European Command. In the United States, the Air Force identified 2,178 beds, and could provide more if needed. The total Air Force bed contribution amounted to about 6,800. The Southwest Asian theater was served by 4,868 Air Force medics, who accounted for 9 percent of the total Air Force deployment of 55,000 personnel to the Gulf. In addition, the Air Force deployed 6,892 medics to Europe.

Medical Assemblages

The Air Force Medical Service used three types of overseas medical facilities for Operations Desert Shield and Desert Storm–the air-transportable clinic (no beds), the air-transportable hospital (14-50 beds), and the prepositioned contingency hospital (250-1,500 beds).

The air-transportable clinic contained first aid and emergency medical supplies and was staffed by a squadron medical elementconsisting of one physician and two technicians. The elements were organic units in each flying squadron of Tactical Air Command and deployed as an integral part of those squadrons.[1]

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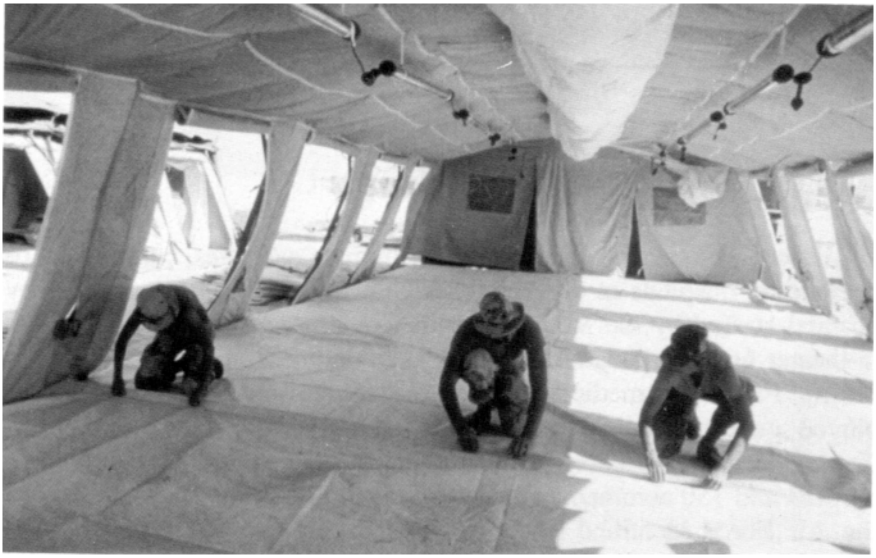
[1]Concept Paper, HQ TAC/SGX, "Air-transportable clinic (ATC) Concept of Operations," 1980.



The backbone of the deployable medical treatment system is the air-transportable hospital, here being assembled by crews.

The deployment also required the sophisticated medical services of an air-transportable hospital, a combination of hardwall shelters and modular tents. As the backbone of the deployable medical treatment system, each hospital met the short-term medical needs of a deployed tactical fighter wing of three to five thousand people. Its mission included support of squadron medical elements, air-transportable clinics, and aeromedical staging facilities. Each hospital may be constructed in any of three sizes: fourteen beds, twenty-five beds, or fifty beds. The fifty-bed version, along with its staff of personnel and mobility bags, can be transported by six C-141 Starlifters or two C-5 Galaxies. Once on site, the hospital can become operational within twenty-four to forty-eight hours.

History of the air-transportable hospital spans more than two-decades, but Operation Desert Shield was the first operational deployment for this type of hospital in a combat contingency. Development of the air-transportable hospital began with preparations for a major military crisis in the Middle East shortly after the Soviet Army invaded Afghanistan, and Iranian revolutionaries seized American diplomatic hostages in the 1980s. Military planners had assumed that modern combat would be marked by high casualty rates. In late 1983, the Air Force Surgeon General approved a five-year program to enlarge the standard twenty-four-bed air-transportable hospital to fifty beds. By mid-1990 the Air Force had acquired more than two dozen of these hospitals. Most were assigned to fighter wings in the United States for rapid deployment. The U.S. Ninth Air Force, a component of U.S. Central Command, relied on the Tactical Air Command surgeon and medical assets for mobilization planning and deployment to Southwest Asia.

By the late 1980s, the Air Staff predicted that contingency airlift would be scarce. As a result, medical service planners prepositioned medical supplies and equipment, including some air-transportable hospitals and ambulances in Europe, Southwest Asia, and the Pacific. This prepositioning included contingency hospitals, which ranged in size from 250 to 1,500 beds. Hospitals in Europe and the Pacific usually functioned as "turn-key" facilities providing sophisticated medical services and needed only round-out augmentation from the United States to begin operations. They served as an intermediate stage of care before evacuation of patients to fixed Air Force hospitals.

The Medical Deployment to Southwest Asia

The CENTAF Forward medical system encompassed six countries to include Saudi Arabia, Oman, Qatar, the United Arab Emirates, Bahrain, and Egypt.[2] In the first weeks of Operation Desert Shield, the medical deployment developed with unprecedented speed. On 8 August 1990, two air-transportable clinics from Langley AFB, Virginia moved to Dhahran while two clinics from Tinker AFB, Oklahoma, deployed to Riyadh, Saudi Arabia. The personnel and equipment of the 1st Air-transportable Hospital left Langley AFB on 11 August and arrived in Dhahran the following day. The medical facility became operational on 14 August. The CENTAF Aeromedical Evacuation Control Center and several mobile aeromedical staging facilities, staffed by active duty personnel from the 1st Aeromedical Evacuation Squadron, Pope AFB, North Carolina, began to organize in Riyadh by mid-August.[3] For the first four

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[2]Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991, p 10.

[3]Intvws, Dr. J.S. Nanney, AF/SGI, with TAC/SGX staff, Sep 1990 and Mar 1991.

weeks of deployment and until the partial activation of the U.S. Navy's shore-based Fleet Hospital No. 5, Air Force medical facilities provided the only deployed medical support to U.S. forces in the theater.

Air-transportable hospitals were flown from Langley AFB, Virginia to Dhahran and became operational within two days after arrival.

However, the deployment of reservists (and to a lesser extent active duty personnel) presented several clinical challenges. A number of mobilized reservists suffered from limiting or disqualifying dental and medical problems. In contrast, the preventive dental program for active duty troops avoided complications upon deployment. Entitled dental care only during extended active duty, many Air Force reservists (later estimated to be at least twenty percent) needed extensive dental treatment before deployment. Enroute to the Gulf, many unit commanders requested U.S. Air Forces in Europe (USAFE) to screen their troops dentally and provide corrective treatment. Some of the reserve and active duty troops deployed with a variety of other disqualifying medical conditions.[4]

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[4]Rpt, Maj Gen Vernon Chong, HQ ATC/SG to HQ USAF/SGHR, "Medical Lessons Learned–Desert Shield/Storm," 15 Apr 1991.

Furthermore, logistical shortfalls in the medical area appeared almost immediately. Generally, hospital table of allowances had never been tested in a long deployment,[5] and deploying units in the United States assigned their flight surgeons only a minor role in predeployment preparations. In addition, deployed hospitals found that they lacked equipment needed in the desert, such as spare air conditioning units, ice machines, and primary generators. Because of the oppressive desert heat, construction of the hospitals caused an operational delay of a few days, even when units worked through the night.[6] Critical logistical items, such as air conditioners, were obtained within a few weeks.

In spite of these initial problems, by the end of 1990, Tactical Air Command had readied many of its medical groups and air-transportable hospitals for war. By 18 January 1991, USAFE had also deployed an air-transportable hospital from Torrejon Air Base, Spain. On 19 December, medical personnel of the 4th Tactical Fighter Wing redeployed from Thumrait in southern Oman to Al Kharj, Saudi Arabia, about forty miles southeast of Riyadh. Lt. Gen. Charles A. Horner, CENTAF commander, then directed the Military Airlift Command to deploy medical personnel for the twenty-five bed hospital at Thumrait. Military Airlift Command had never before been tasked to staff an air-transportable hospital.[7] A summary of medical personnel is shown in Table 18.

Because air-transportable hospitals met only part of CENTAF Forward's medical requirements, the CENTAF surgeon insisted on exploring the activation of a 250-bed contingency hospital at Seeb, Oman. But the Tactical Air Command surgeon noted that Seeb, on the coast 20 miles west of Muscat, Oman, needed to improve its inadequate base infrastructure and remedy significant shortfalls in medical supplies and equipment before it would be ready to treat serious battle casualties.

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[5]Brfg, SGHR to SG Senior Staff, "Operation Desert Shield/Storm–Medical Lessons Learned: An Information Briefing," Jun 1991.

[6]Brfg, Col J. Melchiorre, TAC/SGX, [CENTAF Lessons Learned] to Medical Planners' Conference, Bolling AFB, Wash DC, 14 May 1991.

[7]Intvw, J.S. Nanney with Lt Col Robert Ferguson, CENTAF/CXM, 11 Jun 1992; Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operations Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991.

Table 18
Medical Manpower Summary

Location	Active Duty	Reserve Component	Total
Southwest Asia	2,342	2,526	4,868
Europe	3,874	3,019	6,893
CONUS	28,662	6,295	34,957

On 14 October 1990, CENTAF Forward dispatched a small advance team to Seeb, Oman, to prepare for a contingency hospital in a hard-walled warehouse. Although the target date for full activation at Seeb was 15 November, it did not become fully operational until mid-January 1991, with medical staff from Scott U.S. Air Force Medical Center. Eventually, its staff merged with a collocated Army medical unit, the 365th Evacuation Hospital.[8]

The greatest demand for patient care arose in the first months of deployment, primarily due to the excess heat and rigors of field conditions in a hostile environment. In spite of the conditions, strict water and sanitary discipline kept the disease and nonbattle injury rates to one-half of the prewar predicted levels. This represented a major victory over the greatest casualty generator in military history. In the first few months, treatment of patients related mostly to dental problems, since they carried over from civilian life.[9]

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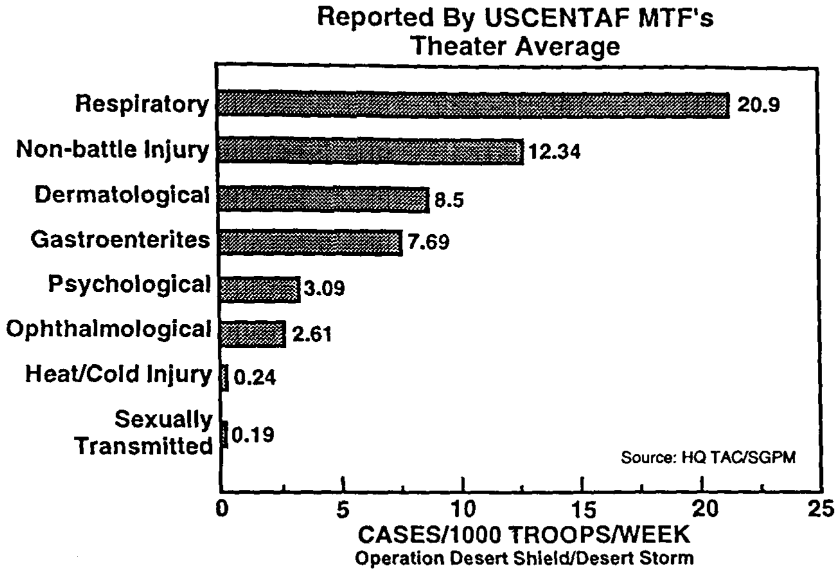
[8]Rpt, USAF Medical Center Scott, "Medical After Action Report for Operation Desert Shield/Desert Storm–1702d Contingency Hospital," 10 May 1991.

[9]Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991, p 23.

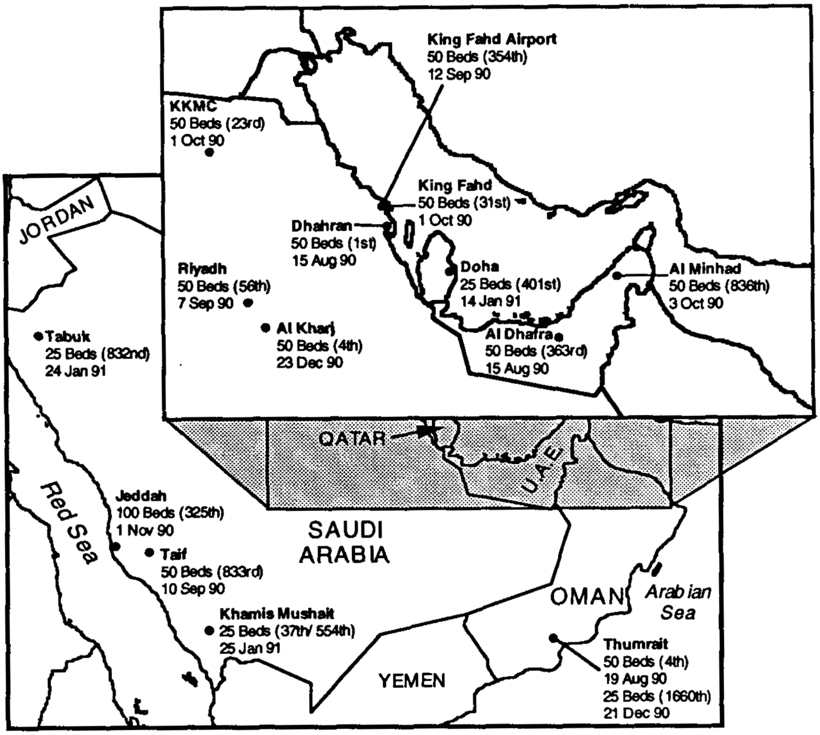
Figure 16
Disease and Non-Battle Injury Rates



The excellent aviation infrastructure of most host nations resulted in a greater number of beddowns than could be supported with a fully staffed air-transportable hospital. Furthermore, squadrons deployed with more people than predicted, forcing the clinics to care for a base population sometimes as large as 1,200 personnel.

During the first month of the deployment, thirteen of seventeen beddown sites were supported only by squadron medical elements. This was due to CENTCOM-established deployment priorities, not a shortage of deployable hospitals. Airlift priorities often precluded air-transportable clinics from arriving concurrently with the squadron medical element, or else forced a downsizing of the clinic pallets. At ten of fourteen squadron medical element locations, the air-transportable clinic equipment packages arrived more than four days after the squadron medical element, and sometimes not at all.[10]

Figure 17
Air-Transportable Hospital Locations



To alleviate this problem, CENTAF established a squadron medical element support system soon after initial deployment; each beddown site was augmented with a bioenvironmental engineer and environmental health technicians. Accompanying them was a medical technician or general practitioner to provide flight surgeons time off and allow the squadron medical element to provide twenty-four-hour coverage. Each in-theater squadron medical element was also assigned to an air-

[10]Rpt, HQ USAF/SGPA, "Aerospace Medicine: Consolidated After-Action Report–Desert Shield/Desert Storm," Jan 1992, p 7.

transportable hospital for preventive medicine consultation, hospitalization, and resupply.

Medical support was generally adequate at isolated locations.[11] Until the arrival of comprehensive medical resources, the early arriving squadron medical elements and air-transportable hospitals served as the primary sources of medical care for forward-deployed Air Force units, as well as units from other Services.

Activating U.S. Air Force Europe Contingency Support

Shortly after the deployment began, the European Command surgeon and component Service surgeons decided to rely primarily on prepositioned Air Force contingency hospitals to meet command requirements for a 5,500-bed capability. The USAFE surgeon was tasked with providing 3,750 beds, and this was accomplished primarily by manning USAFE contingency hospitals. Also, a few fixed facilities were expanded, especially the Wiesbaden, Germany, medical center. Four prepositioned contingency hospitals became operational: the 870th at RAF Little Rissington, 310th at RAF Nocton Hall, 317th at RAF Bicester, United Kingdom, as well as the 609th at Zweibrucken, Germany. Denmark also opened a contingency hospital at Holstebro. Bed capacities were increased at five preexisting medical facilities at Torrejon, Spain; Lakenheath and Upper Heyford, United Kingdom; Wiesbaden, Germany; and Incirlik, Turkey. USAFE received 6,892 medical personnel deployed from the United States. Most of these (3,874) were active duty.[12]

These contingency hospitals took longer to activate than existing facilities and encountered several major problems in achieving full operational readiness. Although Nocton Hall received ninety-three percent of its total required staff, the hospital faced staffing shortages in certain

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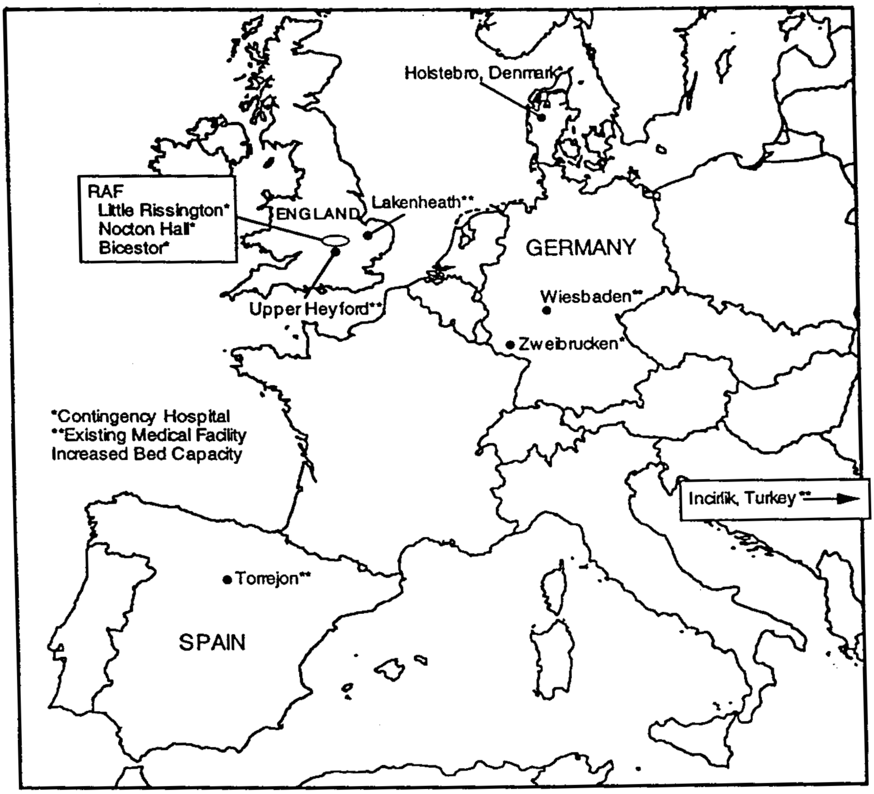
[11]Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991, p 13; Rpt, HQ USAF/SGPA, "Aerospace Medicine: Consolidated After-Action Report–Desert Shield/Desert Storm," Jan 1992.

[12]Brfg, Brig Gen Charles H. Roadman II, USAFE/SG, "USAFE Medical Support for Operation Desert Shield/Desert Storm," to USUHS Conference, "The Spectrum of Medical Support for Operation Desert Shield/Storm," 13-15 Apr 1992.

Figure 18
Hospital Support of the Gulf War



specialties; not severe enough, however, to cause a problem during the Gulf War.[13]

Although staffing levels did not present a problem at RAF Little Rissington and RAF Bicester, the staffs encountered other problems. At Little Rissington for example, laundry, electricity, water supply, sewage,

[13]Rpt, 310th USAF Contingency Hospital, RAF Nocton Hall, UK, "Medical After-Action Report–Desert Storm," 15 Mar 1991.

communications, food services, and transportation would have been a problem with a full patient load. RAF Bicester reported that it was totally unprepared to discharge its mission as the center for acute burn care patients. Bicester's physical layout was also less than satisfactory, with the operating rooms housed separately from other key sections. Low rates of admission from the Gulf War relieved the hospitals from serious challenges.[14]

A shortage of up-to-date medical supplies posed a major problem at all European contingency hospitals. At RAF Bicester, about 85 percent of the supplies were either outdated or deteriorating. The USAFE commander had recently placed a moratorium on replacement of outdated war reserve material, resulting in a large stock of useless supplies. The U.S. Army depot at Pirmasens, Germany, was eventually able to replenish the stocks.

A key obstacle that hampered USAFE's ability to make contingency hospitals operational was the relatively low priority assigned medical supplies for airlift. In early December, the USAFE medical system was tasked with providing almost two-thirds of EUCOM beds needed for Gulf War casualties. These contingency hospitals did not become fully operational until several weeks after the start of the air war. Even if all the Air Force beds were available at the outset of hostilities, it appeared doubtful that the European Command would have enough beds to handle the anticipated casualty flow for more than a few days. To make matters worse, host nation support was apparently not capable of providing sufficient help.[15]

EUCOM and CENTCOM agreed that after the war began, EUCOM would initially provide only "flow-thru support," holding 80 percent of anticipated patients in Europe no more than three days. After getting improved airlift support, the USAFE contingency hospital system was expected to achieve full operational capability within nine days after the war began. However, three hospitals were not operationally ready until 8 February, and a fourth, RAF Bicester United Kingdom, was not ready until 28 February 1991, after the ground war ended. Estimates of the number of

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[14]Rpt, 870th USAF Contingency Hospital, RAF Little Rissington, UK, "Medical After-Action Report–Desert Storm," 14 Mar 1991; Rpt, 317th Contingency Hospital, RAF Bicester, UK, "Medical After-Action Report, 17 Jan - 6 Mar 1991," 19 Mar 1991.

[15](S/DECL OADR) Brfg, Maj Mike Jones, HQ USAFE/SG to HQ USAFE/SGP/SGHR, "Medical Support," Bolling AFB, Wash, DC, 12 Dec 1990.

patient evacuees to Europe soon exceeded the contingency hospital's capability, in effect forcing the entire system into a flow-through mode.[16]

Although many of the supply, equipment, infrastructure, and personnel problems in the contingency hospitals had been resolved before the ground war in the Gulf started, the chief surgeons in Europe were worried that contingency hospitals, aeromedical staging facilities, and the evacuation system would have difficulty accomplishing their missions. The USAFE surgeon was concerned that a major ground war might cause the CENTCOM commander to downgrade the airlift priority of medical items, especially aeromedical equipment, which was already in short supply. Three-fourths of the USAFE strategic aeromedical evacuation kits, which contained the basic supplies for transporting stable patients between theaters, were incomplete.[17] The aeromedical system was not fully prepared on the eve of the ground war.

Host Nation Medical Support–Europe and Southwest Asia

To assure the highest level of care and to account for U.S. patients, the Air Force attempted to minimize host nation hospital use except for emergency cases. Although assistance with medical supplies, laboratory services, and consultation was available from some host nation military hospitals, the Air Force limited host nation contact. The Army and Navy medical services, on the other hand, who had not built facilities specifically for Southwest Asia, actively sought host nation support on the Arabian Peninsula.[18]

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[16](S/DECL OADR) Msg, EUCOM/SG to Distr., "EUCOM Medical Support for Operation Desert Shield," WIN Teleconferencing Transcript, 17 Jan 1991; After Action Reports, USAFE Contingency Hospitals, Spring 1991.

[17](S/DECL OADR) Msg, OPS Support Center Ramstein/CAT-AECC to HQ MAC/CAT-SG, "MEDRED-C as of 222400Z Feb 1991," 230411Z Feb 1991; Facsimile, HQ MAC/SG to HQ USAF/SGI, "TA 887: TAC/STRAT Kit Inventory for Gulf War," 25 Sep 1992.

[18]Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991, p 8; Intvw, J.S. Nanney with Lt Col Bob Ferguson, USCENTAF/CXM, 11 Jun 1992.

Naval medical services actively sought host nation support.

Denmark and several Mediterranean countries offered support in hospital space, but only a portion could be accepted, mainly because there was no time to inspect the facilities. Some support was accepted for burn patients and patients requiring advanced scanning techniques.[19]

Food-borne gastrointestinal illnesses, primarily caused by host nation food services, were a major problem throughout deployment. Such cases accounted for 32 percent of all gastroenteritis cases treated by Air Force medics. There were 16 separate outbreaks of gastrointestinal illnesses at ten theater locations from August 1990 through March 1991, afflicting some 2,700 personnel. The three primary sources of the pathogens were hot meals, catered meals in mess tents and dining halls, and boxed lunches.

Without a deployable food service capability, CENTAF commanders usually decided to take advantage of free host nation food to supplement standard packaged meals. This free food, however, was difficult to inspect because the host nation sources varied greatly. Food handling standards in host nations were also inadequate in many respects. Commanders generally lacked the authority to select from available food suppliers and to dismiss host nation workers suspected of harboring common foodborne illnesses. Even so, commanders were reluctant to

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[19]Memo, SGHR to SGI, "Host Nation Support in SWA and Europe," 30 Jan 1992.

follow medical recommendations to negotiate for contract food services because of the potential adverse impact on morale.[20]

Early in Operation Desert Shield, the CENTAF surgeon predicted that a number of expatriate medics working in Saudi Arabia would flee during wartime. This happened at Tabuk and Khamis Mushait precisely as expected, and wing commanders at both locations immediately requested air-transportable hospitals. The 832d TAC Hospital deployed a Coronet Bandage II capability to Tabuk, and it became operational on 24 January. Another newly built air-transportable hospital deployed to Khamis Mushait. Personnel from the 554th Medical Group set up a Coronet Bandage I facility (the 37th TAC Hospital) there on 25 January.[21]

Aeromedical Evacuation

A high-capacity, smooth-flowing aeromedical evacuation system was essential to medical support of U.S. troops. Although the airevac system in place in February 1991 could easily have handled more patients during Operation Desert Storm, the deployment revealed a number of areas that need improvement. The complexity of the airevac system, for instance, was confusing to many users. Command and control of aeromedical evacuation was divided, to varying degrees, among the Joint Chiefs of Staff logistics division, U.S. Transportation Command, Military Airlift Command, CENTCOM commander of airlift forces, CENTAF Air Evacuation Control Center, CENTCOM Joint Medical Regulating Office, CENTCOM surgeon, and the CENTAF surgeon. This division of authority corresponded to prewar doctrine, which regarded air evacuation as a multicommand, retrograde mission. A dedicated aeromedical system able to handle thousands of casualties each day would be fully configured only on an emergency basis, and only if the required airlift and medical resources did not degrade higher priority missions. In view of this doctrine, the respon-

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[20]Rpt, Col Don Butts, CENTAF/TAC, "Operations Desert Shield/Desert Storm - Environmental Health Experienced Issues," 11 Jul 1991.

[21]Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991, p 24.

sible airevac agencies could only respond with strenuous efforts in response to shifting casualty estimates and changing war plans.[22]

Aeromedical units and offices participated fully in the rapid deployment of August 1990. On 8 August, the first aeromedical evacuation support unit–active duty personnel from the 1st Aeromedical Evacuation Squadron (AES), Pope AFB, North Carolina–departed for Riyadh. The CENTAF Aeromedical Evacuation Control Center, staffed by this squadron, became operational in Riyadh in mid-August as the control unit for aeromedical evacuation. By 15 August two Aeromedical Evacuation Liaison Teams (AELT) and two Mobile Aeromedical Staging Facilities (MASFs) became operational.

On 16 August, the CENTAF surgeon established a directive that served as the basis for CENTCOM air evacuation until late December 1990. In accordance with this plan, intratheater evacuation began to use turboprop C-130 aircraft, and intertheater evacuation on C-141 jet transport aircraft. All Air Force specially equipped aeromedical aircraft, the C-9 Nightingales, remained in the U.S., European, and Pacific theaters to support further casualty distribution within their hub and spoke systems.[23] (On 8 November all aeromedical units were combined into the 1611th Aeromedical Evacuation Squadron, Provisional).

On 15 December 1990, the Military Airlift Command's Crisis Action Team distributed its first comprehensive design for posthostility aeromedical operations. By the start of the air war, initial casualty treatment in the Gulf was available at medical facilities near five specially designed strategic and tactical aeromedical evacuation hubs. Each hub contained both medical and aeromedical assets, including mobile and immobile staging facilities. For intratheater evacuation, the one or more mobile staging facilities at each hub permitted transferring of patients to the most appropriate locations in Southwest Asia. The staging facilities staff, aided by a collocated aeromedical evacuation control element, received patients

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[22]Rpt, 1611th Aeromedical Evacuation Squadron (Provisional), "Aeromedical Evacuation (AE) After Action Report/Operation Desert Shield/Storm," 17 Apr 1991.

[23]*Ibid.*

Figure 19
Air Force Casualty Movement

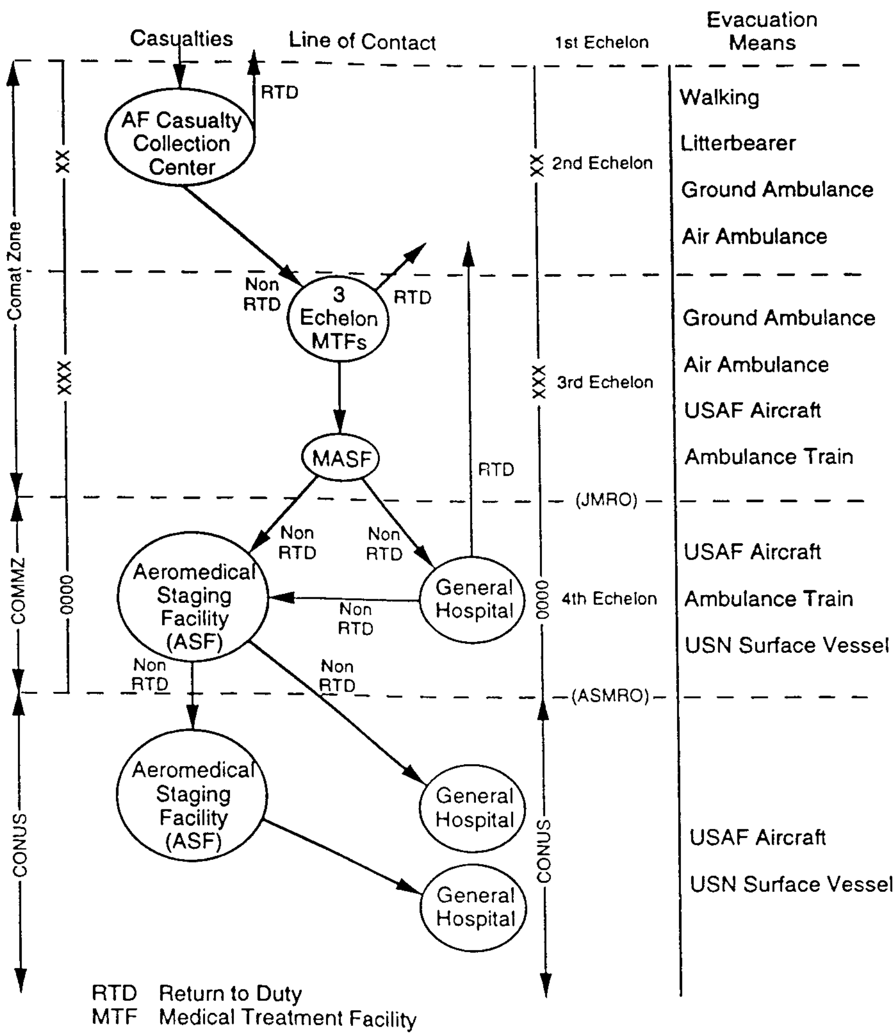
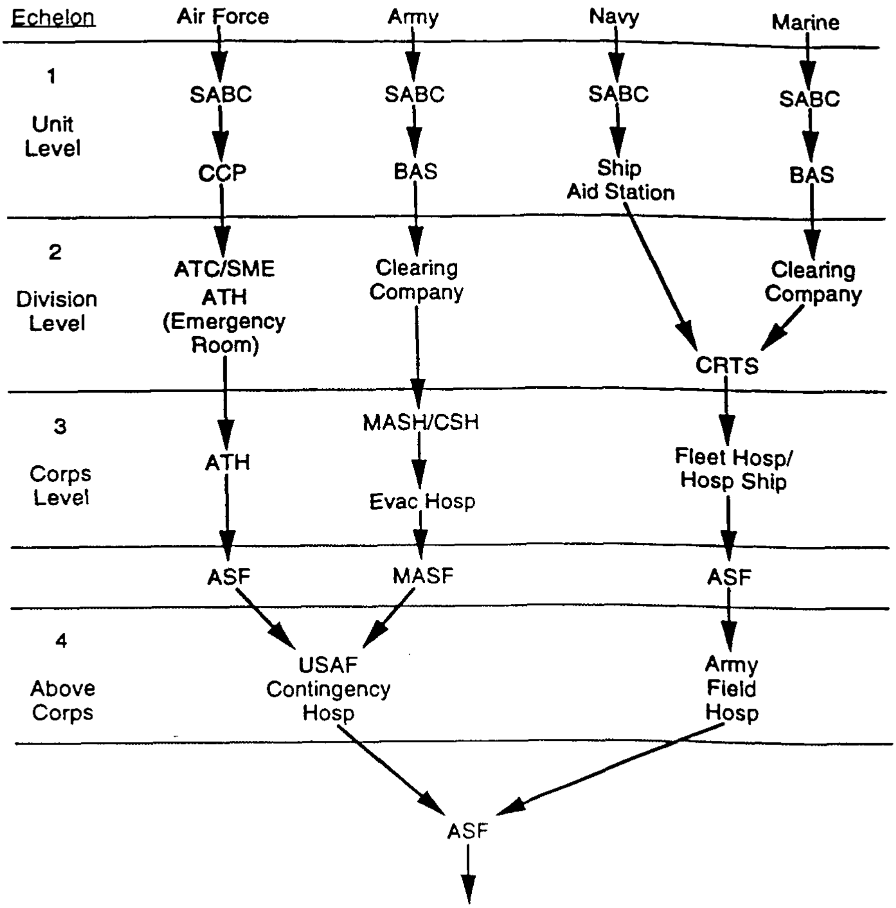
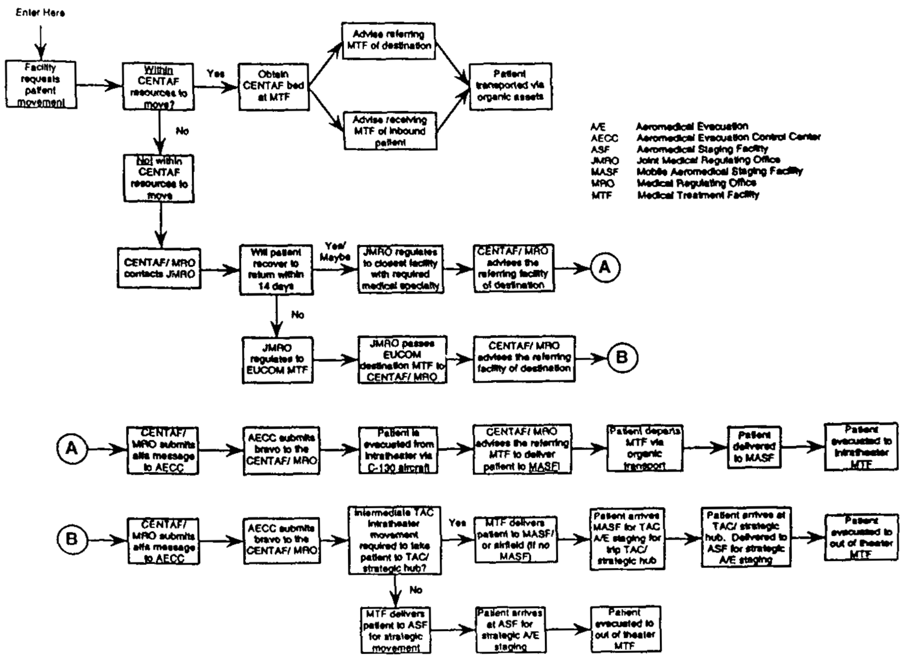


Figure 20
Theater Casualty Flow Plan



ASF Aeromedical Staging Facility
ATC Air Transportable Clinic
ATH Air Transportable Hospital
BAS Battalion Aid Station
CCP Casualty Collection Point
CRTS Casualty Receiving and Treatment Ship
CSH Contigency Support Hosital
MASF Mobile Aeromedical Staging Facility
MASH Mobile Army Surgical Hospital
SABC Self-aid, Buddy Care
SME Squadron Medical Element

Figure 21
CENTAF Aeromedical Evacuation Decision Time



from in-theater medical facilities and prepared them for movement out of theater.[24]

For the air and ground campaigns, Military Airlift Command aircraft were responsible for supporting all intertheater, intra-U.S., and intratheater aeromedical evacuation, except in the Army combat zone and to and from Navy ships and interface points. All patients with exposure to biological and chemical warfare agents were to be decontaminated before entering the evacuation chain.

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[24](S/DECL OADR) Msg, HQ MAC/CAT to Distr., "Draft Aeromedical Evacuation Concept of Operations," 151947Z Dec 1990.

An efficient evacuation system was essential to medical support of U.S. troops. Here wounded are evacuated and transported to base hospitals.

For intertheater evacuation, the Commander of Airlift Forces and CENTAF evacuation control center planned to use during the last weeks of Operation Desert Shield both retrograde and dedicated aeromedical missions to support a high casualty load during the ground war. Estimates of high numbers of daily intertheater patient evacuees forced Air Force medical planners to ask serious questions about the ultimate capabilities of the airevac system. (The estimates came from the Medical Planning

Module operating on Joint Chiefs of Staff computers in the Pentagon, with planning factors provided by Central Command.) Even so, the CENTAF Forward medical planners constructed an intratheater evacuation system that, given adequate airlift resources from U.S. Transportation Command, probably could have handled the highest estimated casualty load for only a few days.[25]

The intertheater evacuation system, however, was probably not capable of handling such a load without major reinforcements and workarounds. By the end of December, the peak evacuation requirement was expected to last one week. The estimated CENTCOM and European Command patient outflow threatened to exceed known airlift strategic evacuation capabilities in patient care equipment. It also had the potential to exceed aircraft and litter requirements. Although stocks of deployed airevac equipment were bolstered in January, CENTAF and USAFE commanders still noted shortfalls for current casualty estimates. If needed in a major emergency, civilian Boeing 767s could theoretically be used as a dedicated aeromedical fleet. But equipment needed to configure these Boeing 767 aircraft for patient evacuation was not available during the Gulf War. Although the U.S. Transportation Command contracted for accelerated production of ten airevac equipment sets, the earliest estimated delivery date was July 1991.[26]

Creating adequate reception points for patients arriving in the United States was another challenge. On 24 December 1990, Air Force aeromedical planners and operating units started to execute instructions issued by the Military Airlift Command for locating aeromedical staging facilities in the states. Casualties would arrive at one of six bases: McGuire AFB, New Jersey, Andrews AFB, Maryland, Charleston AFB, South Carolina, Kelly AFB, Texas, Scott AFB, Illinois, and Norton AFB, California with

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[25]Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991; Intvw, J.S. Nanney with Lt Col Bob Ferguson, CENTAF/CXM, 11 Jun 1992. Lt Col Ferguson, the CENTAF Forward medical planner, was also not alarmed by the highest casualty estimates because he considered them unrealistic in light of CENTAF's leadership and military capabilities.

[26]Rpt, 1611th Aeromedical Evacuation Squadron (Provisional), "Aeromedical Evacuation (AE) After Action Report/Operation Desert Shield/Storm," 17 Apr 1991; Telecon, J.S. Nanney with Col Carol Bloomquist, MAC/SGX, [Aeromedical Planning], 10 Apr 1992; Intvw, J.S. Nanney with Col Robert Brannon, 1 AES/CC, 26 Jun 1992.

the three east coast facilities receiving most patients. On 18 January 1991, CENTAF requested the Air Force to activate them and assign additional aeromedical personnel and support aircraft. On 25 February, once the ground war had started, MAC headquarters directed all aeromedical staging facilities to be ready for patients. Andrews AFB would be the primary reception center, but patient requirements could dictate routing to the other hubs.[27]

After 17 January 1991, Central Command tried to utilize its limited medical resources more efficiently. The Seeb complex, originally designated a convalescent center, on 20 January was renamed the U.S. Military Medical Complex, Oman, and tasked with receiving casualties directly from the front lines. The joint Army-Air Force complex contained 1,100 beds and 15 operating tables. The Air Force facility, the 1702d Contingency Hospital, housed 250 beds supported by a staff of 399. Before it packed up and redeployed after the war, it had admitted 91 patients and treated slightly more than 5,000 outpatients.[28]

In December 1990 and January 1991, rising estimates of patient evacuees also increased requirements for strategic aeromedical flights. With insufficient strategic crews, some tactical crewmembers were tasked with strategic assignments, but it became necessary for the Air Force to fragment many Guard and Reserve aeromedical units, a practice that caused morale problems and necessitated retraining.[29]

During the Gulf War, CENTAF departed from normal peacetime procedures and used some of its flight surgeons in the aeromedical system rather than in tactical hospitals. The prospect of very high casualties raised the specter of long evacuation flights to Europe filled with unstable patients who required special medical monitoring. The initial aeromedical

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[27]Msg, Joint Staff/J4-MRD to USTRANSCOM, "Aeromedical Evacuation CONUS CONOPS," 212323Z Feb 1991; Msg, HQ MAC/CAT to 21 AF/CAT et al, "Aeromedical Evacuation Mission/Aeromedical Staging Facility (ASF)/Aeromedical Evacuation Control Element (AECE) Support for Desert Storm," 250531Z Feb 1991.

[28]Videotape, MAC Combat Camera, "1702 AREFW Contingency Hospital, Seeb, Oman: Operation Desert Shield/Storm," Jan - Mar 1991; Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991, p 21.

[29]Memo, SGHR to SGI, "Fragmenting Reserve Units," 30 Jan 92.

physician plan called for using twelve strategic and twelve tactical aeromedical evacuation flight surgeons, with four to six physicians serving at each C-130 beddown site, while the standard strategic flight surgeon team consisted of two physicians.

CENTAF also planned to draw on physicians from the 1702d Contingency Hospital to form two-person advanced trauma life support teams at four mobile aeromedical staging facilities. Two or three physicians at each aerial point of embarkation in the strategic evacuation system advised aeromedical crewmembers, monitored the quality of patient care, reported all in-flight deaths and emergencies, and recruited additional physician support from nearby medical facilities.[30]

In mid-February the CENTAF surgeon warned squadron medical elements and air-transportable hospitals that physician support to the aeromedical system was a secondary mission. Because of the primacy of aircrew medical support, squadron medical element physicians were prohibited from augmenting aeromedical evacuation crews. Nevertheless, twenty-two Air Force flight surgeons were assigned to aeromedical evacuation duty at six C-130 beddown locations and five strategic hub locations. Partly because of this program, no deaths or morbidity were attributed to the aeromedical system.[31]

In another departure from doctrine, CENTAF's C-130s performed front-line evacuation missions when the Army aeromedical helicopters proved inadequate to bridge the long gap between the rapidly advancing Coalition forces and the slower-moving Mobile Army Surgical Hospitals. However, the lack of a good interservice and interfacility communications

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[30]Memo, CENTCOM/CCSG to AE Flight Surgeons, "Physician Support for the Strategic Aeromedical Evacuation (AE) System for Operation Desert Storm," 30 Jan 1991; Msg, USCENTAF/SG to AIG 8598/CC/SG, "USCENTAF Physician Support for Aeromedical Evacuation," 191705Z Feb 1991; Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991, p 36; Point Paper, Col Earl W. Mabry, HQ MAC/SGP, "Physician Support for the Aeromedical Evacuation System During Operation Desert Storm," n.d.

[31]Rpt, 1611th Aeromedical Evacuation Squadron (Provisional), "Aeromedical Evacuation (AE) After Action Report/Operation Desert Shield/Storm," 17 Apr 1991. See also Chapter 3 of the Logistics Report for further details on transportation adequacy of the aeromedical system.

system sometimes delayed the arrival of C-130 airevac flights by several hours.[32] Table 19 shows aeromedical evacuation data.

Despite some innovative solutions, the joint aeromedical system in the Gulf War caused considerable concern at high levels. Patient regulating, evacuation, and personnel tracking, were major problems in Operation Desert Shield for the joint command and the Air Force. These problems eased in some respects during the air and ground wars, only because of new workaround systems. After the war, both the combat surgeons testified to Congress that the Air Force was fortunate in that the low casualties sustained during the war did not tax the aeromedical evacuation system.[33]

Medics of the Air Force Reserve Components

The Gulf War deployment validated the total force policy for Air Force medical readiness. During Operations Desert Shield/Desert Storm, the Air Force activated 9,462 medics from the Air Force Reserves and 2,505 from the Air National Guard. Furthermore, 2,331 Air National Guard and 1,293 Air Force Reserve volunteered. These personnel, especially large numbers of aeromedical evacuation crews, were available from the first days of Operation Desert Shield. The reserves accounted for almost 97 percent of the aeromedical evacuation cadre, of whom substantial numbers deployed to Europe or Southwest Asia within several

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[32]Memo, SGHR to SGI, "Rotary-Wing Aeromedical Evacuation," 30 Jan 1992; Memo, SGHR to SGI, "Scope of Air Force Forward Evacuation," 30 Jan 1992; Brfg, CENTCOM/SG, "U.S. Central Command Medical Forces Overview, Operation Desert Storm," 1 Aug 1991; Rpt, 1611th Aeromedical Evacuation Squadron (Provisional), "Aeromedical Evacuation (AE) After Action Report/Operation Desert Shield/Storm," 17 Apr 1991.

[33]Rpt, HQ 375th Military Airlift Wing (MAC), "Medical After-Action Report–Operations Desert Shield/Desert Storm," 16 Apr 1991; Rpt, HQ USAF/SGPA, "Aerospace Medicine: Consolidated After-Action Report–Desert Shield/Desert Storm," Jan 1992, p 11; Testimony (FOUO), Col Leonard Randolph, CENTCOM/SG, to HASC, "Wartime Medical Readiness–Lessons Learned from Desert Storm," 5 Feb 1992, pp 40-41; Brfg, Col Carroll R. Bloomquist, MAC/SG, "The Spectrum of Medical Support for Operation Desert Shield/Storm," 13-15 Apr 1992; Intvw, J.S. Nanney with Brig Gen Charles Roadman, HQ AMC/SG, Scott AFB, IL, 22 May 1992.

months. USAFE received 26 percent of the mobilized reserve personnel; Southwest Asia, 21 percent.

Table 19
Aeromedical Evacuation Data

Aeromedical Evacuation Data
Operation Desert Shield

Patient Air Evacuation	Litter/Ambulatory	Total
Intratheater Movement	496/1,505	2,001
From Gulf Region to Europe	1,153/2,023	3,176
From Europe to CONUS	578/1,767	2,345

Aeromedical Evacuation Data
Operation Desert Storm

Patient Air Evacuation	Litter/Ambulatory	Total
Intratheater Movement	1,104/919	2,023
From Gulf Region to Europe	1,529/1,836	3,365
From Europe to CONUS	961/1,719	2,680

However, the mobilization and deployment of reserve medics, like the entire Air Force reserve mobilization, exposed several areas for improvement. Many medical service reservists, especially aeromedical evacuation crewmembers, were not always properly trained for their specific wartime missions and equipment. Many airevac crewmembers, although proficient in direct patient care, had never escorted patients inflight. Deemed qualified only as a result of wartime waivers, they were generally unfamiliar with proper procedures for using the aircraft. Many airevacs also lacked the necessary field training to establish operations in austere desert conditions. Because of high turnover rates in peacetime, about ten percent of the reserve aircrews required a course of instruction to qualify for this aircraft mission.[34]

Some reserve component physicians, although highly trained in peacetime medicine, were unfamiliar with contingency procedures, equipment, and supplies. At RAF Bicester UK, for instance, the Air National Guard augmentees required extensive training before they could qualify. After the war, the CENTAF Surgeon, Col. Leonard Randolph, testified to Congress that the level of training and familiarity with the deployable medical systems varied among Reserve units, ranging from poor to excellent. He also noted a lack of familiarity with the clinical aspects of battlefield medicine. Other senior medical managers noted that a few reservists were reluctant to use or train themselves to use "austere" medical equipment and supplies.[35] In July 1991, the Surgeon General's Medical Readiness Division noted how a substantial number of field reports commented on inadequate skills among the reserve medics. A postwar survey by the Air Force Reserve Personnel Center showed that only about one-half of the medics mobilized thought their peacetime training fully prepared them for their assignments. Nearly ten percent felt their training

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[34]Intvw, J.S. Nanney with Brig Gen Charles H. Roadman II, former USAFE/SG, Scott AFB, IL, 22 May 1992; Rpt, 1611th Aeromedical Evacuation Squadron (Provisional), "Aeromedical Evacuation (AE) After Action Report/Operation Desert Shield/Storm," 17 Apr 1991; Intvw, J.S. Nanney with Col Carroll R. Bloomquist, HQ MAC/SGX, Scott AFB, IL, 21 May 1992.

[35]Brfg, Maj Robert Munson, "Wartime Need for Aeromedical Evacuation Physician," to USUHS Conference, "The Spectrum of Medical Support for Operation Desert Shield/Storm," 13-15 Apr 1992; Rpt, 317th USAF Cont Hosp, RAF Bicester, UK, "After Action Report, 17 Jan - 6 Mar 1991," p 19; Testimony (FOUO), Col Leonard Randolph to HASC, "Wartime Medical Readiness–Lessons Learned from Desert Storm," 5 Feb 1992, p 49; Brfg, Brig Gen Charles H. Roadman II, USAFE/SG, "USAFE Medical Support for Operation Desert Shield/Desert Storm," to USUHS Conference, "The Spectrum of Medical Support for Operation Desert Shield/Storm," 13-15 Apr 1992; Brfg, Col J. Melchiorre, TAC/SGX, [CENTAF Lessons Learned] to Medical Planners' Conference, Bolling AFB, 14 May 1991; Brfg, SGHR to SG Senior Staff, "Operation Desert Shield/Storm–Medical Lessons Learned: An Information Briefing," Jun 1991; Intvw, J.S. Nanney with Brig. Gen. Charles H. Roadman II, former USAFE/SG, Scott AFB, IL, 22 May 1992.

did not prepare them for their wartime assignments.[36] The USAF Medical Center Scott (MAC), staffing the 250-bed contingency hospital in Oman, offered an assessment:

> As nurses and physicians, reserve personnel were generally well prepared to assume their roles at the deployed location. However, they generally lacked military supervisory/management experience necessary for a military deployment situation, e.g., understanding of logistical and ancillary support matters and military supervision and discipline. Regarding enlisted personnel, unless they had prior enlisted active duty service, most were not able to perform their medical duties, primarily because their civilian jobs were altogether different–many had not even attended USAF technical training schools.[37]

In spite of such problems, eighty to ninety percent of commanders and supervisors of Air Force reservists (including reserve medics) were completely satisfied with their performance. Training observations, moreover, may on occasion have resulted simply from malassigned reserve personnel. The primary Air Force skill code for individual reservists was too often an inadequate guide to their real skills, and Air Force regulations prevented their proper assignment. All told, there was a shortage of contingency training in the reserve components, despite a substantial upgrading of reserve contingency training in the 1980s.

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[36]Rpt, Maj Gen Vernon Chong, HQ ATC/SG to HQ USAF/SGHR, "Medical Lessons Learned–Desert Shield/Storm," 15 Apr 1991; Brfg, Lt. Col. Larry Hettick, SGHR, to SG Senior Staff, "Desert Shield/Desert Storm: Medical Lessons Learned, An Information Briefing," 3 Jul 1991; Rpt and Brfg, HQ ARPC/HO (Ms. Roma Simons), "Desert Storm Survey/Results," 25 Jun 1991. Almost forty percent of the 9,462 reserve medics were mobilized as individuals–as individual mobilization augmentees, individual ready reservists, or retired regulars–rather than in units. Most of the Air Force's mobilized ready reservists and retired regulars were medics, and nineteen percent of commanders and supervisors responded that such medics were not adequately prepared for their wartime mission. Telecon, J.S. Nanney with Roma Simons, HQ ARPC/HO, 23 Jun 1992.

[37]Rpt, USAF Medical Center Scott, "Medical After Action Report for Operation Desert Shield/Desert Storm–1702nd Contingency Hospital," 10 May 1991. Such observations were echoed in the Aeromedical After Action Report – Rpt, 1611th Aeromedical Evacuation Squadron (Provisional), "Aeromedical Evacuation (AE) After Action Report/Operation Desert Shield/Storm," 17 Apr 1991. The USAFE surgeon also made the observation: Intvw, J.S. Nanney with Brig Gen Charles H. Roadman II, former USAFE/SG, Scott AFB, IL, 22 May 1992.

After the Vietnam War, the Air Force Medical Service concentrated on specialized medical training for Air Reserve medics. Deciding to reverse this trend in the 1980s, the Surgeon General instituted a common core medical readiness training program for individual active duty and reserve medics. It included an eight-day Combat Casualty Care Course, Continuing Medical Readiness Training program, and a Battlefield Nursing program. In addition, the Air Force established an annual field training exercise known as Medical Red Flag.

Although recipients benefitted from this training, in August 1990 many reserve medics had enrolled in the training courses or participated in exercises. During the mobilization, accelerated contingency training programs did not fully solve the lack of contingency training, which was especially notable among reserve component aeromedical personnel. Training shortfalls, especially in combat trauma care and contingency equipment familiarization, were also noted among active duty medics, but not to the same extent as among reservists. During Operation Desert Shield, CENTAF held several special training seminars to familiarize its medics, both active duty and reservists, with contingency medical care.[38]

By the end of 1991 it became apparent that the Medical Service lacked adequate numbers of Selective Reservists in some specialties to fully staff an expanded wartime medical system, while at the same time maintaining quality services and graduate medical education programs in the United

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[38]Brfg, HQ MAC/SG to HQ USAF/SGHR, "Revised Guidance [Lessons Learned]," 14 May 1991; Brfg, HQ AFRES/SGXO to SG Conferees, Bolling AFB, Wash., DC., May 1991; Brfg, HQ AF/REM, Col. Koenigsberg, to SG Conferees, Bolling AFB, Wash., DC, May 1991; Rpt, HQ 375 Military Airlift Wing, "Medical After-Action Report," 16 Apr 1991; Art, Col R.G. Parsi et al, "ATLS Training in the Reserve: A Pilot Program," USAF Medical Service Digest, Winter 85, pp 8-10; Art, Capt P. Banus, "To Make or Break C4: The TAC Officer Takes Charge," USAF Medical Service Digest, Winter 85, pp 11-12; Ltr, HQ SAC/SGA to HQ USAF/SGHR, "Medical Lessons Learned–Desert Shield/Storm," 17 Apr 1991, w/atch: Lessons Learned; Issue Worksheets, ANG/SG, "Desert Shield/Desert Storm Lessons Learned," Mar 1992; Invw, J.S. Nanney with Maj Harry Kendrick, ANG/SGX, Andrews AFB, MD, 23 Mar 1992; Brfg, ANG/SGX to Aerospace Medicine Conference, "Operation Desert Shield/Desert Storm: An ANG Perspective," Feb 1992; Brfg, Ofc of the Air Surgeon, "Operation Desert Shield/Desert Storm–[ANG] Medical Service Participation," 8 Apr 1991; After Action Report, 37th TAC Hospital Deployed, "Medical After Action Report for Operation Desert Shield/Desert Storm," 1991; Rpt, 1611th Aeromedical Evacuation Squadron (Provisional), "Aeromedical Evacuation (AE) After Action Report/Operation Desert Shield/Storm," 17 Apr 1991; Intvw, J.S. Nanney with Brig Gen Charles H. Roadman II, MAC/SG and former USAFE/SG, Scott AFB, IL, 22 May 1992.

States. A wartime expansion would require more than 7,000 additional personnel. A possible solution would be to backfill the seven medical centers at 100 percent and the remainder of the facilities at 80 percent. Facilities backfilled at the 80 percent level would maintain full services by working longer hours and transferring patients to more adequately staffed facilities. The 80 percent backfill, however, ran counter to wishes of Congressman John P. Murtha that backfills be staffed on a one-for-one basis. Ultimately, only an overall 91 percent backfill was attainable.[39] After the war, the Air Force Surgeon General testified to Congress:

> Although we had sufficient manpower to staff our deployed medical facilities, the unanticipated requirement to maintain peacetime levels of CONUS care stressed our available ARC resources. Even with the resources gained by stop loss and partial mobilization, shortages in critical specialties (to include surgeons, nurse anesthetists, surgical technicians, and medical technicians) could have affected our ability to fully expand designated CONUS casualty receiving hospitals in preparation for heavy casualties.[40]

Despite attendant problems, the mobilization and deployment of reserve medics were essential to the Medical Service's contribution. One-half of the Air Force medics in Europe and Southwest Asia by February 1991 came from the Air National Guard and the Air Force Reserve. By late February 1991, the Air Force mobilized almost 12,000 members of its medical reserve component. These reserve medics accounted for a third of all Air Force reservists called up for Operations Desert Shield/Desert Storm.

Preventive Medicine and Aircrew Medical Support

Both heat and disease casualties were lower than expected throughout the first months of the deployment. From August to December, nonbattle injuries accounted for most of the patients who were evacuated from Southwest Asia to Europe. The most common in-theater nonbattle injury was lacerations; the second most common injury was back or ankle sprain. Orthopedic injuries alone accounted for about forty percent of the

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[39]Memo, SGHR to SGI, "Non-active Duty Beneficiaries in Desert Shield/Desert Storm," 30 Jan 1992.

[40]Statement, Lt Gen Alexander Sloan, USAF/SG, "Witness Statement (House Armed Services Committee)," 5 Feb 1992.

evacuees. Food-borne illnesses were a recurring problem at a few bases where contamination was traced to local food products prepared by host nation contractors.[41]

The disease, nonbattle injury rate was only one-half to one-third of that predicted for the theater. The predicted outpatient rate for Southwest Asia per day per 1,000 personnel was 27; during the war the rate was 17. The predicted inpatient rate was three per day per 1,000 personnel; the actual rate was .34 per day. The four most common disease categories for all patients were upper respiratory illnesses (20.9 percent), nonbattle injuries (12.34 percent), dermatological illnesses (8.5 percent), and gastroenteritis (7.69 percent).[42]

From 19 August 1990, to 28 February 1991, Air Force medical facilities in Southwest Asia treated 120,845 outpatients and admitted approximately 3,250 inpatients. Eighty percent of the inpatients were Air Force personnel, despite a heavy patient load from the other Services in the first two months of the deployment.[43]

Among aircrews, fatigue was the most significant and pervasive problem in Operation Desert Storm. Heavy air tasking orders, especially at the start of the war, forced significant deviations from normal rest and regular scheduling for aircrews. Fatigue contributed to at least two noncombat fatal mishaps during Operation Desert Storm.[44]

After the war, Tactical Air Command conducted an anonymous survey of stimulant and sedative drug use among its deployed fighter pilots, and unit after-action reports corroborated the survey's results. During Operation Desert Shield, sixty-five percent of respondents who

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[41]Rpt, Col Don Butts, CENTAF/TAC, "Operations Desert Shield/Desert Storm - Environmental Health Experience and Issues," 11 Jul 1991.

[42]Brfg, USCENTAF/SG, "Central Command Air Force Medical Operations for Operations Desert Shield/Storm," Mar 1991; Rpt, Col Don Butts, CENTAF/TAC, "Operations Desert Shield/Storm - Environmental Health Experience and Issues," 11 Jul 1991.

[43]Rpt, HQ Air Force Office of Medical Support (AFOMS), "Report of Patients," Aug 1990 - Mar 1991.

[44]Rpt, HQ USAF/SGPA, "Aerospace Medicine: Consolidated After-Action Report–Desert Shield/Desert Storm," Jan 1992. This report is the source for the remaining paragraphs in this section on aircrew medical support.

used "Go" pills reported adverse side effects. In some units, the usage was as high as eighty-three percent. During Desert Storm, "Go" medications were used by fifty-seven percent of the pilots; sixty-one percent who used them considered the pills essential to operations. Fifty-four percent of respondents used "No-go" medications at some time during the deployment, most often because of excess noise and difficulty in relaxing after a mission.

The most common reason for grounding pilots in theater was attributed to upper respiratory illness. This was true at all locations except Riyadh. The second most common reason was gastroenteritis (true at all locations except Sharjah). Spatial disorientation was also a significant problem in the featureless terrain of the Arabian and Iraqi deserts, causing two noncombat fighter losses. Although contact lenses deteriorated more rapidly in theater, and resupply was extremely difficult, they worked well for aviators who used them. Throughout Operations Desert Shield/Desert Storm, the Air Force did not cancel any planned operations due to medical reasons.[45]

Biological and Chemical Warfare Defenses

The initial deployment revealed deficiencies in preparing for biological and chemical warfare defenses, as many people deployed without chemical warfare equipment or antidotes.

Preparations for chemical warfare continued to pose a problem even into December 1990. Individual mobilization augmentees were arriving in theater without chemical gear and appropriate immunizations, mainly because they did not pass through a mobility line. There were supply shortages as well. On 3 December 1990, U.S. Forces Command (U.S. Army) reported that shortages of nerve agent antidote kits might not be overcome for at least sixty days. CENTAF-Rear eventually acquired

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[45]Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991.

adequate stocks from Europe and the United States and transferred them to the theater.[46]

The Air Force deployed decontamination teams (trained in chemical decontamination procedures) to each air-transportable hospital at risk of chemical attack. Some of these nineteen-person teams later redeployed in theater to higher threat locations. This was the first contingency that used patient decontamination teams, and Air Force hospitals were the only U.S. medical facilities that deployed with their own decontamination capability.[47]

The Air Force also used the deployment to adopt a new substance to treat nerve agent casualties. On 14 August, General Buethe asked the U.S. Army to supply the Air Force with autoinjectors of diazepam, the muscle relaxant in valium, to counteract effects of nerve agents. Within a few days, the other Services' Surgeons General approved this request and ordered their own stocks of diazepam.[48]

Physicians dressed in chemical protective gear are generally incapable of performing surgery, and in the mid-1980s, Tactical Air Command was planning to develop means to protect the air-transportable hospitals from chemical warfare agents. Shortly before Operation Desert Shield, the program transferred to the Army's research and development effort on deployable medical systems; it was still incomplete in August 1990. In November 1990, the CENTAF TAC surgeon agreed to accelerated production of the chemically hardened air-transportable hospitals to support

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[46](S/DECL OADR) Msg, USCINCCENT/CCJ3 to HQ TAC/SG, "Request for Atropine and Pralidoxme Chloride Autoinjectors," 062301Z Aug 1990; Log (S/DECL OADR), TAC/SG, "Battle Staff Log," 29 Aug 1990, 1645.

[47]Paper, Lt Col Bob Ferguson, HQ USCENTAF/CXM, to the Association of Military Surgeons of the United States (AMSUS) Convention, "Operation Desert Shield and Storm: Air Force Medical Plans and Operations," 25 Nov 1991, p 10.

[48]Information Paper, U.S. Army SGPS-PSP to Army Surgeon General, "Diazepam Autoinjector," 15 Aug 1990; Background Paper, SGHR, "CENTAF/SG Requirements for Parenteral Diazepam in Support of Desert Shield," 15 Aug 1990; Point Paper, SGHR, "CENTAF/SG Requirement for Parenteral Diazepam in Support of Desert Shield," 14 Aug 1990; Point Paper, SGHR, "Service Requirements for Diazepam Autoinjectors in Support of Desert Shield," 16 Aug 1990.

Operation Desert Storm, but the program was far from complete at the time of the cease fire.[49]

The deployment brought to light several lessons regarding the effects of biological and chemical warfare antidotes. In 1985 the Tactical Air Command had begun ground-testing all aircrews with pyridostigmine bromide. The reported side effects were so low (less than one percent) that testing was discontinued in 1987. In late February 1991, some units began using pyridostigmine bromide prophylaxis; however, only nine percent completed the full seven-day course. Side effects were much more common than predicted by prewar tests. Forty percent of respondents to a survey reported gastrointestinal effects. However, those who took the tablets reported no missions cancelled because of the side effects. Additionally, side effects were not the predominant reason for not taking the complete dose; uncertainty about a new drug and the apparent low threat of chemical contact were also reasons. Aircrews were concerned about harmful effects from long-term use, and many crewmembers in some locations, assessing the chemical threat as low, chose not to take the tablets.[50]

The anthrax vaccine also produced unexpectedly high rates of minor side effects. In one survey of aircrew members, ninety-two percent reported some reaction, although only three percent thought the reactions were severe enough to affect flying duties.[51]

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[49]Point Paper, TAC/SGXO, "Chemically Hardened Air-transportable hospital (CHATH)," 18 Jul 1991.

[50]Rpt, HQ USAF/SGPA, "Aerospace Medicine: Consolidated After-Action Report–Desert Shield/Desert Storm," Jan 1992.

[51]*Ibid.*

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Conclusions

Air Force support forces had to initially overcome the challenges of deploying after the combat forces. The challenge of playing catch-up was overcome for the most part within the first couple of months although shortages of equipment and supplies continued to surface. To a large extent, the fact that Saudi Arabia and the other Arab nations had a support infrastructure that was able to sustain the forces for a short time was a major contributing factor to the success of Operation Desert Shield. Another contributing factor was that advantage of having five and a half months to develop the needed support infrastructure to support air operations. Even so, there were significant shortcomings that surfaced that must be dealt with by the Air Force.

Air Base Engineering and Services

The deployment plan called for ten main operating locations and four forward operating locations, but in reality that number grew to twenty-five locations. There was insufficient information about military airfields available early in the planning process that could be used to plan for munitions storage, power generation, and water requirements, as well as other infrastructure considerations. Site surveys of the air bases and the local community had to be accomplished once support forces arrived in theater. This resulted in delays in establishing a base infrastructure to support air operations and affected contracting activities in the local communities.

The prepositioning program included a $51-million caretaker maintenance contract in Oman supporting the prepositioning of over $2-billion in materials and equipment. The unavailability of technical orders for much of the Harvest Falcon assets resulted in problems with maintenance and determining what constituted a set and how equipment was to be set up.

Engineering and Services had difficulty in determining bare base equipment requirements due to a lack of visibility of engineering and services assets. This problem was still manifesting itself even in February 1991. The lack of sufficient care of supplies in storage of prepositioned equipment resulted in 80 percent of the 750kW generators requiring some sort of maintenance once the equipment was issued to units. Also, 750kW generators sent to the theater from the United States experienced maintenance-related problems with 66 percent of those generators. Missing or defective parts and minor adjustments were required. Firefighting vehicles arrived with broken pumps, dryrotted fan belts and hoses, few tools, or firefighting agent. The Tactical Field Laundry system experienced a high rate of failures–less than half were operational throughout the deployment. Problems were also experienced with a shortage of parts with War Readiness Spares Kits.

The Air Force experienced difficulties with the transfer of executive agency for mortuary affairs to the U.S. Army. Also, disposition of remains of nuclear, biological, or chemically contaminated remains was never satisfactorily resolved.

Protecting the Air Base

Air Force security personnel are trained and expect U.S. Army units to provide external air base security during contingency operations. During Operations Desert Shield/Desert Storm rear area security operations evolved slowly. When the U.S. Army did not provide the anticipated external security, it caused concern to both Air Force and Army rear area security personnel.

Many of the rear area forces are reserve or national guard units (fifteen-twenty percent), whose activation and deployment to the theater was uncertain. During the Gulf War, deployment priority was given to combat forces; thus, support forces were deployed at a much slower pace leaving holes in rear area security operations. The Air Force relied heavily on augmentation of host nation security forces to make up for the shortage of U.S. Army support. While the Army seems to be content to rely on host nation augmentation, the Air Force is reluctant to do so.

Since Vietnam, the Air Force has not adopted a wartime manning standard to determine wartime security police requirements. While CENTAF security did use existing Air Force regulations to determine these requirements, it was not conducive to a rapid deployment situation. During the Gulf War, the Army envisioned using its combat forces for rear area security purposes only if the rear came under a direct attack by enemy forces.

Contracting Support

The deployment of combat forces ahead of support forces even though many bases offered very little in the way of food, billeting, transportation, laundry, bottled water, ground fuel, etc., resulted in thousands of Air Force personnel sleeping on aircraft hanger floors and eating only meals-ready-to-eat for approximately one week. On the other hand, many arriving personnel obtained quarters in modern hotels. Contracting personnel also had interface difficulties with finance personnel, placing them in a situation of no checks and balances between buyers and payers.

The transfer of support-related contracts valued in excess of $20-million in November 1990 to the Saudi government for administration was not the most effective and efficient use of host nation support. While the Saudi government was willing to pay for the support, Air Force contracting was better organized to administer them and ensure Air Force requirements were met.

Legal Support to Air Operations

Because Air Force personnel were deployed to the CENTCOM area of responsibility primarily by Unit Type Code, there were no existing CENTAF or CENTCOM units to which Air Force personnel could be attached. Furthermore, CENTAF was not authorized to create units, and therefore, MAJCOMs deployed provisional units and attached personnel to them. It was not until November that a comprehensive organizational structure was in place.

Legal offices in the theater were not able to communicate with home bases or conduct legal research with existing communication capabilities in the theater. Eventually, a contract was established with a host nation company and access gained to the online funded legal information through electronics (FLITE) system in San Antonio, Texas by means of the Defense Data Network.

The use of civilians during the Gulf War became a legal issue because of the threat of losing their protection under the Geneva Conventions as noncombatants. In addition, status of forces agreements between the United States and host nations had to be established. Although the United States adopted an interpretation that included these civilians as part of U.S. forces, it is unclear how host nations would have interpreted the agreement.

Weather Operations

The ability to provide weather services in a joint environment was hampered because of inconsistent views of the role of the unified command staff weather officer and inadequate joint guidance to support all forces under a unified command. Also, weather services were not interoperable between the Services, especially between the Air Force and Navy and Marines.

Long-range communication lines were used to transmit weather data between the United States, Europe, and the CENTCOM area of responsibility by means of landlines and satellite links. However, the frequent bridging of equipment, the use of different types of circuits, and multiple satellite hops created serious signal degradation. Furthermore, incompatible modems complicated interfaces between landlines and satellite links and connections in the United States and Europe. Also, numerous problems arose with tactical communications capabilities. For example, full duplex capabilities were envisioned at each site, but only four sites had this capability. And even so, two sites did not become operational until mid-January and one in early February 1991.

The air weather service maintenance plan called for a two-level maintenance concept, requiring equipment to be returned to the United States for repairs. While this concept works well with highly reliable equipment, it is not responsive to user needs when equipment has significant maintenance problems. For example, of the eighty-seven TMQ-34 Tactical Meteorological Observing System, fifty-one experienced failures with eighteen pieces of equipment being returned to the United States for repairs. By the end of the war, the Air Force was planning to establish an in-country maintenance capability for the tactical weather equipment.

Mobilization and Personnel Support

Air Force Mobilization, Manpower and Personnel operations during the Persian Gulf War were never "show stoppers." However, it was evident that the data systems and the Contingency Operations Mobility Planning and Execution System were not integrated nor flexible enough to effectively support the limited mobilization and wartime accountability process.

Command and control, systems policies, and capabilities were based on plans and routines to mobilize and track the reserves by entire units. The systems did not track and report anything short of complete unit mobilization. Furthermore, flexibility and effectiveness of deployed command and control systems were significantly reduced by inflexible and complicated Manpower and Personnel Data Systems. CONUS-based Manpower and Personnel data systems and deployed command and control systems together were not flexible enough to sustain the automated and integrated command and control they were designed to achieve.

Planning provides valuable insight into the processes, policies, and procedures expected to be used during contingency operations. Air Force Manpower and Personnel Data Systems and mobilization policies and procedures were in part planned and exercised based on a large-scale contingency and whole unit mobilization. What occurred during the Persian Gulf War was a limited regional contingency of limited duration and partial unit (Unit Type Code) mobilization.

Manpower and Personnel planners modified systems and implemented wartime policies and procedures–for a limited regional contingency scenario–for the first time. There is a need to plan and develop more flexible Personnel and Manpower data and command and control systems, policies, and procedures. Flexibility will enable support for the full range of military actions–from a limited regional contingency to a global war.

Media and Public Affairs

Despite the predictable and understandable frustrations it represented to the news media there, the public affairs "system" in place in the theater worked. However, some components of the system worked better than others and some components had an impact on the U.S. Air Force's ability to tell the air campaign story to the American people. We'll look at some of the more significant components of the public affairs system in place during Operations Desert Shield/Desert Storm.

The DOD National Media Pool. Because of the existence of the National Media Pool the Pentagon was able to put Western reporters into Saudi Arabia to cover deployment of U.S. troops when no reporters were already on scene. The DOD National Media Pool, subject of much criticism during the Persian Gulf tanker reflagging and Panama invasion, was used appropriately during Operation Desert Shield. Without it, negotiations with the Saudis over permitting Western reporters into their country could have been protracted.

However, the National Media Pool offered the Pentagon a ready mechanism to quickly move reporters to the theater while assuring the Saudis that the number of journalists could be manageable, their access controllable, and their care the total responsibility of the U.S. military. The pool proved to be the "foot-in-the-door" that eventually permitted larger numbers of Western reporters on-scene as the Saudis became more accustomed to and comfortable with their presence.

CENTCOM Public Affairs Planning. As scholars and historians have noted, throughout the history of warfare the problem of communicating war news has always been a huge and intricate undertaking requiring "painstaking and elaborate planning."[1] For example, preparations for the news coverage of the Allied landings at Normandy in World War II "were as carefully worked out as any other phase of the action."[2] CENTCOM's failure to plan for accommodating press interest in U.S. military operations in their theater of responsibility and the lack of a "concept of operation" for dealing with news media exacerbated tensions that already existed between the military and the media and unnecessarily strained the relationship in theater.

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[1]Joseph J. Mathews, *Reporting the Wars,* (Minneapolis: University of Minnesota Press, 1957) p 192.

[2]Mathews, *Ibid.* For an excellent history of the American experience of military-media relationship in war, see Peter Braestrup's, *Battle Lines: Report of the Twentieth Century Fund Task Force on the Military and the Media.* (New York: Priority Press, 1985).

Nevertheless, CENTCOM finally put in place a system for disseminating information to the press and the public during Desert Storm before hostilities started. The system that eventually evolved (a system of *security review* of news reports, *"pooled"* reporting, daily update *briefings*, background *education and training sessions* for less experienced "combat correspondents") developed and was in place only because CENTCOM had the luxury of time on their side–almost *five months* in which to experiment and conduct lengthy, long distance negotiations between the Pentagon, Saudi Arabia, the press and the theater commander–and was not one that had been *planned in advance* by the major participants. But for all its limitations and shortcomings, the system worked–at least initially.

And for the better part of Operation Desert Storm–particularly during the air campaign fought from fixed air bases and off carrier decks–the system functioned reasonably well. It collapsed as a viable mechanism for reporting when the ground war began and movement of military units overwhelmed logistical support capabilities, mobility requirements, and communications necessary for the pools to continue to work. That's when the pool system collapsed under the weight of events, the remarkable success of U.S. and Coalition partners, and the pressures of media competition to "get the story." When the pools started to collapse, CENTCOM was *again* caught unprepared to substitute a more workable accommodation for the legitimate and predictable needs of the press.

Combat Correspondent Pools. How well did this mechanism for release of information about the war work? For all its shortcomings, in the military's view this system also worked. While it may not always be appropriate, combat correspondent pools have been and will continue to be a workable mechanism for press coverage of combat that accommodates the press's legitimate role of providing *independent coverage* of war within militarily reasonable bounds of security, safety, and logistics. As importantly, it was a system that CENTCOM and field commanders understood and were prepared to support in the midst of fighting rapidly unfolding air and ground campaigns.

However, as a mechanism for coverage of the *air campaign*, the pool arrangement was not necessary. With U.S. Air Force, Navy, Marine, and Coalition aircraft operating against targets in Kuwait and Iraq from fixed bases and carriers, concern over control of news media, logistics, and accommodations were less severe than for the more numerous ground forces maneuvering through hostile territory in comparatively austere conditions. After air and naval superiority was well established by the Coalition, the threat to fixed air bases in the rear and carriers at sea was virtually nonexistent. Although pools were a convenient mechanism to cover swiftly maneuvering ground forces, the pooling mechanism was not necessary for accommodating news coverage of U.S. Air Force units.

Security Review. Security review of pool copy was not the onerous intrusion into the reporting process that has been popularly portrayed in news media commentary. Security review, as practiced in the Gulf War, ensured at least a modicum of control over inadvertent release of information that might compromise security, jeopardize operations, or threaten the safety of units and troops. Although there were a few isolated examples of inadvertent breaches of the ground rules sufficient to worry the theater CINC,[3] there is no verifiable evidence that Iraq was ever able to take tactical advantage of any information released through the combat correspondent pools.

Access to Air Bases. CENTCOM and CENTAF's failure to get more air bases in the theater opened to media visits reduced the Air Force's opportunity to educate news media representatives on air operations; familiarize them with units, weapons systems, and doctrine; or to establish a credible working relationship between the press and airmen *in advance* of hostilities. As a result, reporters were familiar with only a *small* part of the total air contribution to Operation Desert Shield and were unprepared to cover air power's role in Operation Desert Storm.

Gun Camera Video. The ready availability of *acceptable quality* gun camera and HUD video helped bridge a yawning gap that has always existed in portraying an air campaign–particularly a strategic bombing campaign far over enemy territory. However, not enough of it was released during Operation Desert Storm and that video which was released conveyed the mistaken notion that all ordnance dropped was *precision* ordnance, and every precision-guided munition (PGM) hit its target *every* time. A related issue has to do with Battle Damage Assessment (BDA). Use of video from precision-guided munitions inevitably generated the logical question from the press–what was the *effectiveness*

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[3]H. Norman Schwarzkopf, *It Doesn't Take A Hero: An Autobiography* (New York: Bantam Books, 1992).

of the munition? Did you not simply hit what you aimed at; was what you hit disabled, destroyed, or otherwise rendered combat-ineffective? Neither CENTCOM nor the Pentagon was able to address the important questions about BDA raised by CENTCOM's selective release of PGM video during press briefings. Therefore, despite the relatively successful use of gun camera video during Operation Desert Storm, a gap *still* exists in telling the air campaign story in an increasingly visual, immediate, and interconnected global communication environment.

Spokesmen. Because the mechanism that had been set up to release information to the press relied mainly on official briefers in Riyadh and Washington to provide the context and analysis to a largely lay audience, telling the air campaign story during Operation Desert Storm most often fell to "purple suit" spokesmen. Most of those spokesmen and briefers wore "green" or "khaki" and not "blue" uniforms. That is to say, the responsibility for telling the air campaign story fell not to aviators or airmen, but to mostly soldiers and marines.

In a quantitative analysis of network television reports on Operation Desert Storm, the Center for Media and Public Affairs, a Washington research group, determined that Air Force sources were quoted in *less than twenty percent* of footage aired by the three broadcast networks. In a war dominated by an air campaign, the most frequent sources telling that air campaign story weren't aviators by background or training, they were infantrymen.[4] The only Service component playing a *less* "visible" role–at least as measured in broadcast reports on network TV–was the U.S. Navy, whose spokesmen appeared in less than ten percent of the footage aired by network news during Operation Desert Storm.[5]

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[4]"The Instant Replay War: Television News Coverage of the Persian Gulf War," *Media Monitor* (Wash, D.C.: Center for Media and Public Affairs), Apr 1991. According to the study: "Among the services, Marines were quoted most often. Their 306 appearances outranked the Army's 262, despite frequent sound bites from Army Gen Powell (36) and Schwarzkopf (80). Air Force personnel were quoted only 159 times, and the Navy's only 75 times," p 3.

[5]The Center for Media and Public Affairs conducts continuing content analyses of broadcast news programs of the three networks. The Center, a nonpartisan, nonprofit research organization, conducts scientific studies of how the media treat social and political issues. The results of the research are published in the Center's monthly publication, *Media Monitor.* Unfortunately, they do not analyze CNN, a cable not broadcast television network.

As a partial result of the dominance of Marine and Army sources, broadcast television stories focusing on the topic "Ground War" ranked a close second (303 stories aired) behind stories coded as treating the topic "Air War" (339 stories).[6] Clearly, the air campaign story *was* affected by the mechanism that had been put in place to release information to the press and the public during Operation Desert Storm. Having few senior Air Force spokesmen appearing on television was one important reason.

Media on Combat Aircraft. The difficulty of visually portraying the air campaign–a historic problem in modern warfare–was another reason the airpower story was not fully told during Operation Desert Storm. Video from precision guided munitions and fighter aircraft heads-up displays helps tell the story, but does *not* fill the void–it only tells *part*, a very small part, of the total air campaign story. The CENTAF commander's decision to bar newsmen from combat aircraft–including B-52s–effectively crippled the press's and CENTCOM's ability to portray the whole air campaign story to the American people.[7]

Initially, the CENTAF commander's decision made sense–there were few combat aircraft that could accommodate more than one person and the risks were too great to expose untrained noncombatants to the demands and dangers of aerial missions over hostile territory. However, after establishment of air superiority those concerns became less compelling. Throughout the history of aerial warfare, newsmen have accompanied U.S. and allied airmen on combat missions in combat-coded aircraft in far more dangerous, hostile conditions than existed over Kuwait and even Iraq.[8] Those experiences and lessons from past wars were not emulated nor were they improved upon in Operation Desert Storm–they were ignored.

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[6]*Media Monitor*, Apr 1991, p 2.

[7]Maj Tiedemann, CENTAF/PA during Desert Shield/Storm, confirms that Lt Gen Horner prohibited newsmen from flying on board combat aircraft. Despite frequent appeals through public affairs channels to open combat aircraft–particularly B-52s–to reporters, Gen Horner refused to revise his policy.

[8]Edward R. Murrow and Walter Cronkite and other reporters flew on board American bomber aircraft on missions over Germany. Newsmen also flew on board FAC and EB-66s on combat missions during Vietnam. In peacetime, newsmen routinely fly on board USAF combat aircraft including the F-15, F-16 and B-52.

Educating the Media. The level of military expertise within the cadre of reporters assembled in Saudi Arabia to cover the war of the news media in theater was generally low. Although there were many excellent and experienced reporters in theater, particularly from the networks and the national daily newspapers and the wire services, there were very few correspondents (save some from the specialty and trade press such as *Aviation Week* and *Air Force Times*) who had a strong understanding of the military in general, or of the Air Force in particular. Even fewer were able to comprehend the operational concepts of a strategic air campaign. As a result, a great deal of time and resources–commanders and public affairs people–had to be expended by CENTCOM and by the various public affairs entities (Joint Information Bureaus, Pentagon, services, units, etc) to "educate" the news media about the military, the individual services and units, and operational concepts. This had to be done while being careful not to reveal operational details or planning to an enemy who was equally capable of reading, seeing, listening, and hearing *everything* that was being produced by the news media about the war for the American people and their Coalition partners.

However, the presence of some news organizations was questionable. Why, for example, did the military feel obligated to give equal treatment and accommodate *Mirabella*, a women's fashion magazine, as it did a national news weekly like *Newsweek*? The time and resources expended to bring many reporters up to a level of basic competency in military affairs detracted from communicating the war story through correspondents who already understood. Some mechanism needs to be developed, in concert with reputable national news organizations, that sets a "minimum standard" for war reporting that requires some level of subject-area competency. In Operations Desert Shield/Desert Storm the only apparent requirement for covering the war was that a reporter possess a plane ticket to Dhahran and a visa. The American public deserves a higher standard of military reporting.[9]

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[9]See John Fialka's treatment of this subject in his book, *Hotel Warriors.* Boston University's Center for Defense Journalism is the only specialized training program offered in the U.S. to prepare and educate reporters covering military affairs. According to Col Gallagher and other public affairs officers in Riyadh, CENTCOM attempted to compensate for the lack of education of many of the reporters covering Desert Storm by conducting "background" sessions with military experts in Riyadh on military subjects including amphibious landings, close air support, and mine clearing to familiarize reporters with the concepts. The sessions were conducted off camera, after official briefings,

In sum, CENTCOM's preoccupation with the logistics of supporting hundreds of news media assembled in theater, insufficient public affairs resources deployed to the theater, and lack of experience with joint military operations by most of the news media and many of the deployed public affairs officers were the most serious detractors from telling the air campaign story to the press and, through the press, to the larger American public. Access to air bases, access to commanders and airmen, access to aircraft of all types–not simply those on the ground, but those in the air; not only combat support aircraft, but combat aircraft as well–and access to senior commanders who are thoroughly familiar with and conversant in air power, *must* be dramatically improved to tell the air campaign story better. These are all lessons still to be applied to future air campaigns.[10]

Press Coverage

Numbers. Looking back on the three issues featured in this chapter, one sees different ways in which press coverage seems to have influenced public attitudes and policymaking on the war. In the first, the press did not fall into the trap of relying on a single measure of merit for how the war was going, in particular comparative aircraft losses. In fact the press avoided any such short-hand indicators of progress, for a variety of reasons (none of which will necessarily repeat themselves in future situations), as laid out above. Thus, it did not–in this case, anyway–skew public perceptions of how well the war was going.

Civilian Casualties. Press coverage of civilian casualties became, albeit briefly, intense, graphic, and dominant during Desert Storm. The U.S. government clearly went into a crisis-management mode to deal with the coverage and its possible, even (seemingly) likely, consequences. That these negative consequences in fact did not materialize is no guarantee that they will not in future conflicts. If, in the Gulf War case, changes were made in bombing policies and practices, it is hard to avoid the conclusion that they were made in response to the spotlight of this dramatic, powerful coverage and likely will be in future conflicts.

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to avoid embarrassing the news media representatives attending them.

[10]These and other public affairs-specific "lessons learned" from the war are expounded on in greater detail in U.S. Central Command Air forces, *Public Affairs Lessons Learned Report: Operations Desert Shield/Desert Storm, Aug 1990 - Feb 1991* (Vol I & II) (Langley AFB, VA: ACC/PA, 1991).

Effects of Press Coverage. Press, especially television, coverage generally did not seem to have the effects on government decisionmaking one might have anticipated given the experiences of the 1970s and 1980s. One exception to that seems to be the influence not of *actual* coverage of the so-called "Highway of Death," but rather of *anticipated* coverage of the attacks on Iraqi forces in what turned out to be the last hours of the war.

This last phenomenon is intriguing because it reflects a mind-set that takes *possible* press coverage and *possible* public reactions to that coverage very seriously. It is a damage-avoidance or damage-limitation mentality, rather than a damage-control approach. It says that particular kinds of press coverage can have important effects even before they occur, indeed even if they never do. It reflects a proactive approach to dealing with the press, rather than a reactive one, which was in evidence throughout Operation Desert Storm.[11] This may, in many ways, be the most interesting and poignant demonstration of the power of the press and the importance of public affairs in wartime.

Supporting the People

Both CENTCOM and CENTAF were without assigned chaplains at the beginning the Gulf crisis and the responsibility for organizing the deployment fell on the Tactical Air Command. Religious and cultural restrictions varied in the theater depending on which Southwest Asia country personnel were assigned. The term "church services" and "chaplain" had to be substituted with "morale services" and "morale officer" resulting in dissatisfaction among both the chaplains and other military personnel. However, the CENTCOM chaplain was able to get this restriction removed in January 1991.

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[11]Intvw with Colonel Phil Lacombe, director of Public Affairs, U.S. Space Command, Peterson AFB, CO, 29 Dec 1992. Colonel Lacombe, then a lieutenant colonel, was a USAF augmentee to the CENTCOM staff in Riyadh, serving as a special assistant to Cpt Ron Wildermuth (USN), director of Public Affairs for CENTCOM. Colonel Lacombe and other members of the CENTCOM staff, as a matter of course, attempted to be as proactive in their approach to handling issues and assessing their potential impact in the press, rather than waiting and then reacting to press coverage. But in war, as in peacetime, that's not always possible.

Morale, Welfare, and Recreation (MWR) activities varied depending on which country personnel were stationed, but the overall program was very good. The Air Force was designated the lead Service for MWR activities in the theater because of its substantial capabilities. Due to public support of the war effort, the theater was overwhelmed with private donations and the Air Force managed the distribution of these items to the other Services. However, recreational activities at home bases suffered a loss of revenues of between $1.5 and $2.5 million in the first quarter of FY91 and DOD had to request relief from those losses through the House Armed Services Committee MWR panel.

Disbursing agents did not have the experience nor the training needed to support operations in Southwest Asia. They were trained as disbursing agents and did not have the full range of financial accounting knowledge needed. Complicating the problem was the fact that guidance and direction was received from nineteen separate finance offices in seven different commands, thus complicating operations at the disbursement agent level.

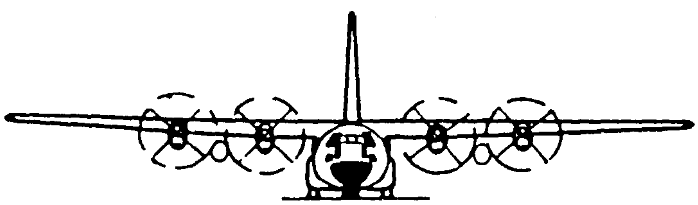
The Air Force, as the single Service manager for postal operations for CENTCOM experienced difficulties in managing postal operations in the theater. This was primarily due to the Army's inability to handle the large volumes of incoming mail and reluctance to follow procedures established by the Air Force. Furthermore, insufficient in-country transportation assets bogged down the mail, as well as mail volumes stretching the limits of even the United States Postal Service. The many complaints from both Service members and their families resulted in numerous Congressional hearings on mail issues. At the outset of hostilities, the Federal Aviation Agency established further mail security procedures, thereby creating additional mail handling precautions and backlogs. However, these precautions proved to be necessary when C-4 explosives were found in a parcel mailed from Saudi Arabia.

Medical

Besides making many adjustments during the deployment, the Air Force Medical Service engaged in an extensive postwar analysis of its readiness posture. On direction from the Surgeon General, the major medical staffs of the Air Force Medical Service surveyed the after-action reports of all Medical Service units to learn what the experience meant for medical readiness. Within a year of the Gulf War ceasefire, the Surgeon General concluded that none of areas identified for improvement were significant enough to tarnish the success of the Desert Shield/Desert Storm medical deployment.

The aeromedical evacuation system, moreover, which served as a safety valve for all the EUCOM and CENTCOM component medical systems, had only mixed success in preparing for a major ground war. On the positive side, the Air Force was able to compensate in part for some problems in Army forward evacuation, and the Air Force created its own effective intratheater evacuation system. But the limited capacity and incompatibilities of the joint patient regulating systems meant that probably not all seriously wounded and injured patients in a mass casualty ground war would have been transported speedily to the most appropriate medical facilities. Command and control of airevac missions demanded greater centralization than allowed by prewar doctrine, and the Air Force could take only minor remedial action before the ground war. Furthermore, casualty rates at the highest levels estimated by the Joint Chiefs of Staff would have demanded a major reinforcement of dedicated airevac planes and equipment from CONUS, at time when the dedicated airevac fleet of CRAF III was still not operationally ready.

Despite several areas for improvement, the Total Force policy for Air Force Medical Service worked well. Reserves provided almost half of the medical manpower committed to Desert Shield/Desert Storm. Their skills, flexibility, and hard work were essential to mission accomplishment. The Gulf War, however, emphasized the need for a continuing and substantial investment in contingency training for reserve and active duty medics.



Joyous Americans welcome home troops from the Persian Gulf War.

Appendix A

Deployment of Engineering and Services Forces

Base	1 Sep	1 Dec	19 Jan	23 Feb
Al Ayn				
Base Population	417	1300	1600	1650
Engineers	0	99	99	99
Fire Fighters	10	33	33	34
Services	0	43	49	49
Al Dhafra				
Base Population	1977	2100	2850	3150
Engineers	153	130	135	135
Fire Fighters	24	35	40	42
Services	79	71	73	73
Al Jawf				
Base Population				650
Engineers				12
Fire Fighters				12
Services				15
Al Kharj				
Base Population		150	4400	4900
Engineers		107	155	155
Fire Fighters		36	60	59
Services		2	97	99
Al Minhad				
Base Population		1650	2500	2650
Engineers		99	130	130
Fire Fighters		28	35	35
Services		32	50	50

Deployment of Engineering and Services Forces (Continued)

Base	1 Sep	1 Dec	19 Jan	23 Feb
Bateen				
Base Population	765	1050	1100	1200
Engineers	100	91	109	109
Fire Fighters	14	14	14	18
Services	25	32	29	29
Cairo				
Base Population		400	850	900
Engineers		52	57	57
Fire Fighters		48	48	48
Services		37	36	36
Dhahran				
Base Population	2354	3150	3500	3750
Engineers	50	108	108	108
Fire Fighters	12	35	44	44
Services	72	73	73	73
Diego Garcia				
Base Population	1107	1450	1450	1865
Engineers	51	47	47	47
Fire Fighters	10	35	35	35
Services	45	44	44	44
Doha				
Base Population	62	850	950	1000
Engineers	0	47	47	47
Fire Fighters	6	12	12	16
Services	0	36	36	36
Jeddah				
Base Population	1230	1650	3200	4100
Engineers	52	38	66	66
Fire Fighters	24	36	49	49
Services	9	9	41	41

Deployment of Engineering and Services Forces (Continued)

Base	1 Sep	1 Dec	19 Jan	23 Feb
Khamis Mushait				
Base Population	842	850	1300	1450
Engineers	95	56	55	55
Fire Fighters	30	24	24	24
Services	41	16	18	18
King Fahd				
Base Population	1846	3400	5200	7000
Engineers	150	245	267	267
Fire Fighters	46	58	72	90
Services	43	83	132	132
King Khalid				
Base Population	720	1300	1550	1750
Engineers	0	13	34	34
Fire Fighters	0	0	1	1
Services	0	10	15	29
KKMC				
Base Population		100	1000	1800
Engineers		0	61	102
Fire Fighters		0	25	44
Services		0	47	50
Masirah				
Base Population	606	750	950	1000
Engineers	50	17	52	52
Fire Fighters	0	22	23	24
Services	25	24	31	31
Riyadh				
Base Population	2840	5000	5550	7900
Engineers	76	114	141	141
Fire Fighters	14	37	49	46
Services	48	60	78	91

Deployment of Engineering and Services Forces (Continued)

Base	1 Sep	1 Dec	19 Jan	23 Feb
Seeb				
Base Population	517	600	800	1300
Engineers	50	51	51	51
Fire Fighters	24	23	24	36
Services	18	59	59	59
Shaikh Isa				
Base Population	1200	1550	2400	2700
Engineers	100	96	118	118
Fire Fighters	24	24	24	24
Services	27	27	45	45
Sharjah				
Base Population	203	650	750	800
Engineers	0	12	32	34
Fire Fighters	0	12	16	16
Services	9	37	37	37
Tabuk				
Base Population	70	800	850	1000
Engineers	35	30	31	31
Fire Fighters	0	24	22	24
Services	0	5	5	5
Taif				
Base Population	1192	1800	2600	2850
Engineers	100	102	105	105
Fire Fighters	48	28	48	40
Services	36	61	101	99
Thumrait				
Base Population	2040	1850	1300	1350
Engineers	200	192	195	195
Fire Fighters	26	35	35	24
Services	59	111	57	57

Appendix B

Gulf War Air Base Characteristics

Base	Location	Primary Use	Runways (Feet)	Taxiways	Ramp Space (Sq Feet)	Host Nation Crash/Rescue Fire Protection	Lighting	Facilities
Al Ayn, United Arab Emirates	15 miles E of Dubai	Civilian--Under Construction	13,124 x 148	Parallel (1) Link (13)	1,574,448	No	None	Tower
Al Dhafra, United Arab Emirates	75 miles SW of Dubai	Abu Dhabi Air Force	12, 057 x 150	Parallel (1) (taxiway to main runway), Link (11) (short taxiway that links two runways or taxiway, Dispersal (34) (leads to shelter or site away from major runway) Loop (20)	2,214,029	Yes	Runway, Taxiway, Approach, Visual Approach Slope Indicator (VASI)	Hangar (25) Maintenance, Fuel Storage, Warehouse, Dining, Billeting, Administrative

Gulf War Air Base Characteristics (Continued)

Base	Location	Primary Use	Runways (Feet)	Taxiways	Ramp Space (Sq Feet)	Host Nation Crash/Rescue Fire Protection	Lighting	Facilities
Al Jawf, Saudi Arabia	10 miles E of Al Jawf	Joint Use--RSAF/Saudi Airlines	12,000 x 148	Parallel (1) Link (3) Dispersal (4)	265,200	Yes	Runway, Approach, Threshold, VASI	Hangars (3), Maintenance, Dining, Billeting, Administrative
Al Kharj, Saudi Arabia	52 miles SE of Riyadh	Military--Under Construction	12,000 x 148	Parallel (1) Link (5)	5,000,000	No	Taxiway	None (Some facilities available at nearby King Faisal Air Academy)
Al Minhad, United Arab Emirates	14 miles S of Dubai	UAE Air Force	9,843 x 148	Parallel (1) Link (17)	494,788	Yes	Runway, Taxiway, Threshold, Approach, VASI	Hangars (4), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Dining, Administrative

Bateen, United Arab Emirates	7 miles SE of Abu Dhabi	Abu Dhabi Air Force	10,500 x 131	Parallel (1) Link (6) Dispersal (2)	3,942,509	Yes	Runway, Taxiway, Threshold, Approach, VASI	Hangars (10), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Dining, Billeting, Administrative
King Khalid, Saudi Arabia	22 miles SW of Al Batin	Joint Use--RSAF/Saudi Airlines	13,779 x 197 13,779 x 197 10,500 x 197	Parallel (3) Link (32)	6,500,150	Yes	Runway, Taxiway, Threshold, VASI	Hangars (2), Maintenance, Fuel Storage, Warehouse, Dining, Billeting, Hospital, Administrative
King Khalid Military City (KKMC), Saudi Arabia	35 miles SW of Al Batin	RSAF	10,610 x 148	Parallel (1) Line (2) Dispersal (6)	2,663,945	Yes	Runway	Hangars (3), Dining, Billeting, Hospital, Administrative
Masirah, Oman	Masirah Island, 10 E of Arabian Peninsula	Omani Air Force	10,005 x 148 8,446 x 148	Parallel (2) Link (4) Loop (1)	6,080,820	Yes	Runway, Taxiway, Threshold, VASI	Hangars (2), Maintenance, Fuel Storage, Warehouse, Dining, Billeting, Hospital, Administrative

Gulf War Air Base Characteristics (Continued)

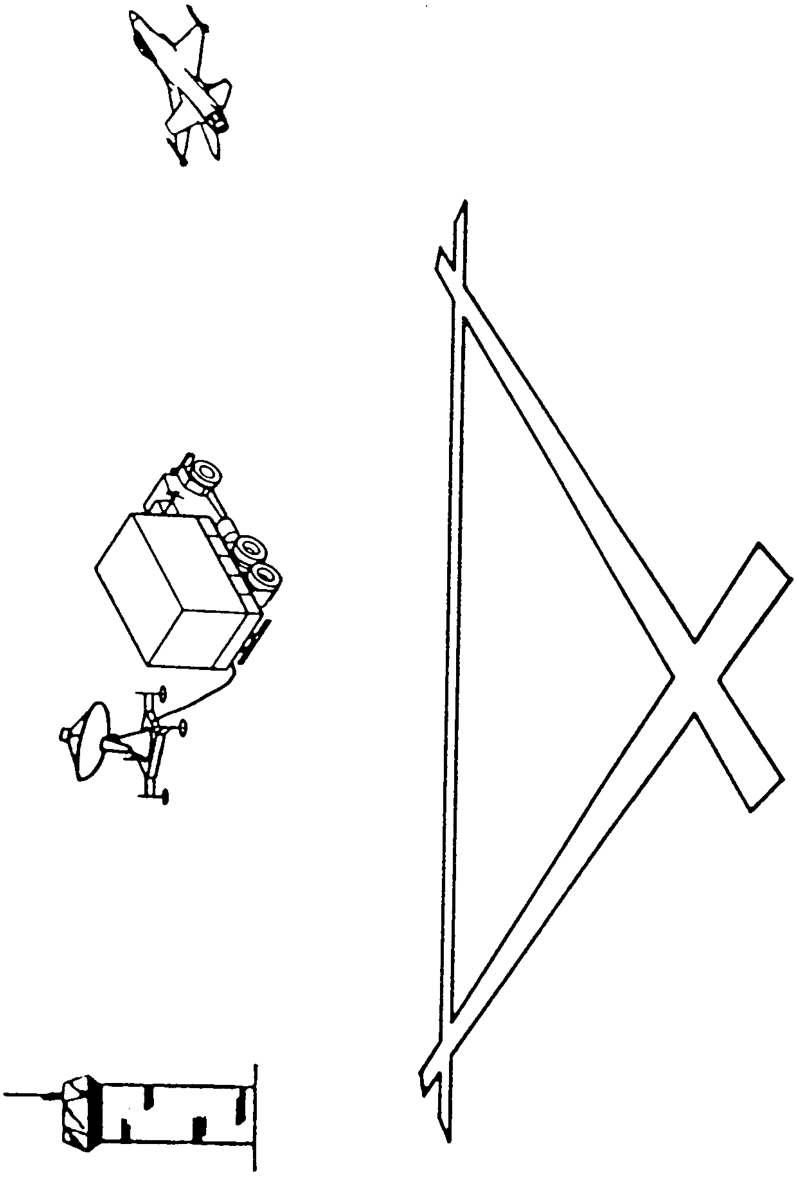
Base	Location	Primary Use	Runways (Feet)	Taxiways	Ramp Space (Sq Feet)	Host Nation Crash/Rescue Fire Protection	Lighting	Facilities
Riyadh, Saudi Arabia	3 miles NNE of Riyadh	Joint Use--RSAF/Saudi Airlines	13,287 x 148 11,778 x 148	Parallel (2) Link (12)	6,080,820	Yes	Runway, Taxiway, Threshold, VASI	Hangars (9), Maintenance, Weapon Storage, Warehouse, Dining, Billeting, Hospital, Administrative
Seeb, Oman	14 miles W of Muscat	Joint Use--Omani Air Force/Civil Aviation	11,762 x 148 2,461 x 98	Parallel (2) Link (28)	4,367,432	Yes	Runway, Taxiway, Threshold, VASI	Hangars (13), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Dining, Billeting, Administrative
Shaikh Isa, Bahrain	Island of Bahrain	Bahraini Air Force	12,541 x 148	Parallel (1) Link (11)	1,116,511	Yes	Approach	Hangars (3), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Billeting, Dining, Administrative

Sharjah, United Arab Emirates	12 miles ENE of Dubai	Joint Use--UAE Air Force/Civil Aviation	12,336 x 148	Parallel (1) Link (11)	3,527,064	Yes	Runway, Taxiway, Approach, Threshold, VASI	Hangars (6), Maintenance, Ordnance Storage, Warehouse, Billeting, Dining, Administrative
Cairo West, Egypt	16 miles WNW of Cairo	Egyptian Air Force	9,730 x 196 9,125 x 147 9,915 x 130	Parallel (2) Link (15) Dispersal (67) Perimeter (1)	2,445,964	Yes	Runway, Taxiway, Threshold. Approach, VASI	Hangars (96), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Dining, Billeting, Administrative
Dhahran, Saudi Arabia	2 miles SE of Dhahran	Joint Use--RSAF/Saudi Airlines	12,008 x 148 11,811 x 148 8,268 x 98	Parallel (4) Link (34) Loop (5) Dispersal (3)	11,547,32 0	Yes	Runway, Taxiway, Threshold, Approach, VASI	Hangars (19), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Dining, Billeting, Hospital, Administrative
Diego Garcia	Chagos Archipelago, Indian Ocean	US Navy/Royal Navy	12,000 x 200	Parallel (1) Link (10)	4,023,750	Yes	Runway, Taxiway, Threshold, Approach, VASI	Hangars (3), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Dining, Billeting, Hospital, Administrative

Gulf War Air Base Characteristics (Continued)

Base	Location	Primary Use	Runways (Feet)	TaxiWays	Ramp Space (Sq Feet)	Host Nation Crash/Rescue Fire Protection	Lighting	Facilities
Doha, Qatar	3.5 miles SE of Doha	Joint Use--Commercial/ Qatari Air Force	15,000 x 151	Parallel (1) Link (17) Dispersal (1)	2,636,049	Yes	Runway, Taxiway, Threshold, Approach, VASI	Hangars (13), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Administrative
Jeddah, Saudi Arabia	12 miles N of Jeddah	Joint Use--RSAF/Saudi Airlines	12,467 x 197 12,106 x 148 10,827 x 197	Parallel (4) Link (45)	17,349,71 6	Yes	Runway, Taxiway, Threshold, Approach, VASI	Hangars (6), Terminal Complex, Maintenance, Fuel Storage, Hospital, Billeting, Dining, Administrative
Khamis Mushait, Saudi Arabia	5 miles E of Khamis Mushait	RSAF	12,467 x 148 12,467 x 148	Parallel (3) Link (23)	3,053,701	Yes	Runway, Taxiway, Threshold, Approach, VASI	Hangars (16), Maintenance, Ordnance Storage, Fuel Storage, Billeting, Dining, Hospital, Administrative

King Fahd, Saudi Arabia	25 miles NW of Dhahran	Saudi Airlines--Under Construction	13,790 x 197 13,790 x 197	Parallel (2) Link (1)	2,846,935	No	Runway (1)	Terminal Complex (2) Fuel Storage, Administrative
Tabuk, Saudi Arabia	4 miles SE of Tabuk. 60 miles SE of Jordan	Joint Use--RSAF/Saudi Airlines	10,991 x 148 10,007 x 148	Parallel (2) Link (15) Dispersal (3)	1,094,248	Yes	Runway, Taxiway, Approach, Threshold, VASI	Hangars (21), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Billeting, Dining, Administrative
Taif, Saudi Arabia	14 miles NE of At Taif	Joint Use--RSAF/Saudi Airlines	12,254 x 148 10,991 x 148	Parallel (3) Link (14) Dispersal (30)	3,599,300	Yes	Runway, Taxiway, Approach, Threshold, VASI	Hangars (4), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Billeting, Dining, Administrative
Thumrait, Oman	44 miles N of Salalah	Omani Air Force	13,123 x 148 19,176 x 164 2,050 x 130	Parallel (2) Link (16) Dispersal (2)	3,284,914	Yes	Runway, Taxiway, Approach, Threshold, VASI	Hangars (4), Maintenance, Ordnance Storage, Fuel Storage, Warehouse, Billeting, Dining, Administrative



Appendix C

Engineering Data as of 19 January 1991[1]

Base	Generators 750 KW	Barriers	Water Purification Units (On Hand/ in Use)	Shower/ Shaves	Latrines	Water Storage (,000 Gals)
Al Ayn	5		1/0	6	9	160
Al Dhafra	8	(2)BAK-12	1/0	10	7	210
Al Kharj	17	(2)MAAS	2/2	26	21	500
Al Minhad	5	(1)MAAS	2/0	3	6	320
Bateen	4		0/0	1	4	120
Cairo	4	(2)BAK-12	1/0	4	4	140
Dhahran	3	(2)BAK-14	2/1	9	5	420

[1]CENTAF/DE "Weekly Status Report," 19 Jan 1991.

Engineering Data as of 19 January 1991 (Continued)

Base	Generators 750 KW	Barriers	Water Purification Units (On Hand/ In Use)	Shower/ Shaves	Latrines	Water Storage (,000 Gals)
Doha	3	(1)BAK-12	1/0	2	2	180
Jeddah	0		1/0	1	2	200
Khamis Mushait	0	(2)BAK-12/14	0/0	0	0	20
King Fahd	11	(1)MAAS (1)BAK-12	5/0	11	12	500
King Khalid	0		0/0	3	3	200
KKMC	3	(1)BAK-12	1/0	3	3	80
Masirah	2		3/0	0	0	0
Riyadh	4	(1)MAAS	2/1	5	4	0
Seeb	2		0/0	8	7	0
Shaikh Isa	5	(2)BAK-14 (1)BAK-13	4/3	6	6	280
Sharjah	2		1/1	1	9	80
Tabuk	0	(2)BAK-14 (2)BAK-12	2/1	0	0	100
Taif	8	(4)BAK-14 (1)BAK-12	2/0	12	12	120
Thumrait	7	(1)BAK-13	1/0	7	9	80

Appendix D

Services Data as of 19 January 1991[1]

Base	Feeding Source	9-1 Kitchen	MREs	Billeting (Tent/Hard Wall)	Laundry	TFLs on Hand/ in Use)
Al Ayn	P. RIBS	1	10,200	1350/250	Contract	3/0
Al Dhafra	P. RIBS	2	70,800	2650/200	P. RIBS	8/6
Al Kharj	P. RIBS/Contract	4	175,900	4400/0	Contract	7/0
Al Minhad	P. RIBS/Contract	0	98,748	2000/500	P. RIBS/ Contract	1/1
Bateen	P. RIBS	1	74,600	550/550	Contract	1/0
Cairo	P. RIBS	1	26,200	850/0	Contract	2/0
Dhahran	P. RIBS/Contract	2	37,300	1300/2200	Contract	3/0
Doha	P. RIBS	1	101,196	900/50	P. RIBS	7/6

MREs: Meals Ready to Eat; TFL: Tactical Field Laundry; P. RIBS: Prime Readiness in Base Services

[1]CENTAF/DE, "Weekly Status Report," 19 Jan 91.

Services Data as of 19 January 1991 (Continued)

Base	Feeding Source	9-1 Kitchen	MREs	Billeting (Tent/Hard Wall)	Laundry	TFLs on Hand/ in Use)
Jeddah	Contract	0	115,044	0/3200	Self-Service	0/0
Khamis Mushait	Contract	0	92,868	300/1000	Contract	1/1
King Fahd	P. RIBS/Contract	4	148,800	4700/500	Contract	0/0
King Khalid	P. RIBS/Contract	0	80,400	300/1250	Contract	0/0
KKMC	P. RIBS	1	76,600	1000/0	US Army	6/0
Masirah	P. RIBS	0	63,912	950/0	P. RIBS	5/3
Riyadh	P. RIBS/Contract	4	98,256	400/5150	Contract	2/0
Seeb	P. RIBS	2	124,000	800/0	P. RIBS	5/3
Shaikh isa	P. RIBS	0	134,436	2050/350	Contract	0/0
Sharjah	P. RIBS	1	59,008	650/100	Contract	0/0
Tabuk	Contract	0	55,956	0/850	Contract	0/0
Taif	P. RIBS/Contract	3	146,760	1700/900	P. RIBS	6/6
Thumrait	P. RIBS	2	40,848	1300/0	P. RIBS	5/5 UNIMAC

Appendix E

MWR Program/Facility By Location

PROGRAM/ FACILITY	Saudi Arabia										United Arab Emirates							Oman			Ba hr ain	Egypt	Qtar	UK
	DAHRAIN	JEDDAH	K. MUSHAIT	K* ING FAHD	AL KHARJ	R* IYADH	TABUK	TAIF	KING IA	KHALID MC	AL AIN	AL DHAFRA	ABU DHABI	AL MINHAD	DUBAI	BATEEN	SHARJAH	MASIRAH	SEEB	THUMRAIT	SHAIK ISA	CAIRO WEST	DOHA	D** IEGO GARCIA
Rec Center/Tent	A		A	H	A	H	A	A	H	A	A	A	A	H	H		A	A					A	A
Taped Movies/TV	A	A	A	A	A	A	A	A	H	A	HA	A	A	A	A	A	A	A	A	A	A	A	A	A
Resale/Snack Bar	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A

MWR Program/Facility By Location (Continued)

PROGRAM/ FACILITY	Saudi Arabia										United Arab Emirates							Oman			Bahrain	Egypt	Qtar	UK
	DAHRAIN	JEDDAH	K. MUSHAIT	K* ING FAHD	AL KHARJ	R* IYADH	TABUK	TAIF	KING IA	KHALID MC	AL AIN	AL DHAFRA	ABU DHABI	AL MINHAD	DUBAI	BATEEN	SHARJAH	MASIRAH	SEEB	THUMRAIT	SHAIK ISA	CAIRO WEST	DOHA	D** IEGO GARCIA
Rec Center/Tent	A		A	H	A	H	A	A	H	A	A	A	A	H	H		A	A					A	A
Rec Equip Checkout	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A
Library/Paperbacks	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Tours	A		A	A		A	A	A	A		A	A	A			A		A	A	A	A	HA	A	A
Morale/Pay Phone				A	A			A		A		A	A							A	A			A
Better Than Letter	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Rec Lounge/Club	A		A	A	A		A	A		A	A	A	A	A**	A**	H	H	A	A	A**	A	A		A
Fitness Center	H		A	A			H					HA	HA			H							H	A

PROGRAM/ FACILITY	Saudi Arabia										United Arab Emirates							Oman			Bahrain	Egypt	Qtar	UK
	DAHRAIN	JEDDAH	K. MUSHAIT	K* KING FAHD	AL KHARJ	R* RIYADH	TABUK	TAIF	KING IA	KHALID MC	AL AIN	AL DHAFRA	ABU DHABI	AL MINHAD	DUBAI	BATEEN	SHARJAH	MASIRAH	SEEB	THUMRAIT	SHAIK ISA	CAIRO WEST	DOHA	D** IEGO GARCIA
Rec Center/Tent	A		A	H	A	H	A	A	H	A	A	A	A	H	H		A	A					A	A
Organized Sports	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Weight Room/Tent	H	A	A	A	A	A	H	A	H	A	A	HA	HA	A	A	A		A	A		A	A	H	A
Running Track																				H			H	A
Basketball Court	H	A	A	H	A	A	H		A									A	A	A	A	A	H	A
Volleyball Court	H	H A	A		A	A	H	A	A		A	A	A	A	A	A		A		A	A	A	H	A
Softball Field	A	H						A				A	A	A	A			A					A	A
Soccer/Football											A	H	H					A	A					A
Tennis Court		H	A	H			H					H	H											A
Squash/Racquetball	H						H					H	H											
Sauna												H	H											A

MWR Program/Facility By Location (Continued)

PROGRAM/ FACILITY	Saudi Arabia										United Arab Emirates							Oman			Bahrain	Egypt	Qtar	UK
	DAHRAIN	JEDDAH	K. MUSHAIT	K* ING FAHD	AL KHARJ	R* IYADH	TABUK	TAIF	KING IA	KHALID MC	AL AIN	AL DHAFRA	ABU DHABI	AL MINHAD	DUBAI	BATEEN	SHARJAH	MASIRAH	SEEB	THUMRAIT	SHAIK ISA	CAIRO WEST	DOHA	D** IEGO GARCIA
Rec Center/Tent	A		A	H	A	H	A	A	H	A	A	A	A	H	H		A	A					A	A
Swimming Pool	H	H	A	H					H			H	H							H				A
Beach		H		H														H	H		H			A
Golf				H				H												H				
Bowling	H																							A

A - American Facility/Tent
H - Host Nation Facility

* - AF Facilities Available to Other Service
** - Other Service Facilities Available to AF

Appendix F

The Weather Information System

Weather support for contingency operations calls for full duplex (i.e., send and receive) teletype and receive-only facsimile circuits for all air bases and Army divisional size units. However, during Operations Desert Shield/Desert Storm, various factors such as airlift constraints, communications engineering limitations, communications saturation, and the size of deployment led to deviations from this doctrinal concept of operations.[1] Moreover, the distinction between long-range and tactical communications systems became blurred during the Gulf War. Long-range circuits became tactical circuits in many cases. For example, the Standard Base Level Computer system and the Automated Digital Network were used by both the Air Force and the Army to pass weather information between units and headquarters elements within the theater.

Long-Range Communications Systems

The Automated Weather Network (AWN) and the Air Force Digital Graphics System (AFDIGS) were the primary systems used to transmit weather information to and from the Gulf region. To some extent, Automated Digital Network and the Navy's Naval Oceanographic Data Dissemination System (NODDS) were also used.[2]

Weather data were transmitted by way of landlines and satellite links. However, the multiple conversions of the data from analog to digital format resulted in serious signal degradation. Frequent bridging of equipment, the use of different types of circuits, and multiple satellite hops were the principal causes of the degradation. Incompatible modems complicated interfaces between landlines and satellite links and between the automated digital weather switches in the United States and western Europe

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[1](S) Dr. William E. Nawyn, AWS Historian, Operations Desert Shield/Desert Storm, Chapter III, The Weather Information System, 12 Mar 1992, p 13.

[2]*Ibid.*

and the terminal equipment in the theater. In addition there was a shortage of terminal equipment within the theater to send and receive data.[3]

A short-term solution implemented by the Air Force was to use the Standard Base Level Computer (SBLC) network connection. This system was a standard Air Force network used primarily by TAC for supply purposes. It had intratheater circuits as well as a long-range circuit to Langley AFB, Virginia. This system was largely operative in mid-January.[4] The Automated Digital Network system was used by CENTAF as well as ARCENT. In addition, it supported secure communications up to SECRET and was a reliable back-up hard-wired communications system. But, the system was slow and became saturated very quickly with weather data in its demand to support many customers.[5]

CENTAF began receiving weather bulletins over the Automated Digital Network on 11 August and received a dedicated send and receive terminal on 28 September. ARCENT received their dedicated terminal on 18 October. Weather teletype circuits to CENTCOM and CENTAF were established by means of a landline from Air Force Global Weather Center through the Carswell weather switch to Forts Meade and Detrick, Maryland, and then by satellite relay to the theater. The CENTCOM Joint Operations Center had a receive only teletype transmission capability by 28 August and full duplex capabilities by 26 September; CENTAF had full duplex teletype capabilities by the end of August. ARCENT weather stations, although able to receive teletype data, never acquired full duplex capabilities by means of the Automated Weather Network. ARCENT received its teletype data from Croughton through an Army communications site at Landstuhl, Germany.[6]

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[3]*Ibid*, p 12.

[4]Intvw, Col William S. Koenemann, Cmdr, 5th Weather Wind and Dr. William E. Nawyn, AWS Historian, 4 Jan 1991, p 14.

[5]Intvw, Lt Col Gerald F. Riley, Staff Weather Officer to CENTCOM and Dr. William E. Nawyn, AWS Historian, 29 May 1991, p 5; (S) Dr. William E. Nawyn, AWS Historian, Operation Desert Shield/Desert Storm, Chapter III, The Weather Information System, 12 Mar 1992, p 20.

[6](S) Dr. William E. Nawyn, AWS Historian, Operations Desert Shield/Desert Storm, Chapter III, The Weather Information System, 12 Mar 1992, p 15.

Both the Air Force and ARCENT had problems with facsimile transmitted weather data. The Air Force turned to the U.S. Navy for help in receiving facsimile data during the four-month period when long-range lines were not available. This was accomplished by means of the Naval Oceanographic Data Dissemination System, which transmitted from the Navy Fleet Numerical Weather Center at Monterey, California to the Air Force Desert Storm Forecast Unit. On the other hand, in early October, ARCENT sought to acquire facsimile data by means of a dedicated European Digital Graphics System circuit originating at RAF Croughton. The circuit routed through Pirmasens, Germany, but the quality of the data was not very good.[7]

Tactical Communications Systems

Tactical communications systems included Quick Reaction Communications Terminal (QRCT) for the Air Force and the Goldwing high-frequency radio system for the U.S. Army. Also, the Tactical Imagery Dissemination System (TIDS) was used for in-theater distribution of satellite imagery and a hard-wire tactical facsimile (TACFAX) circuit was acquired. The quick-reaction terminal, a slightly modified version of the Goldwing (officially the AN/GRC-27) was in the process of distribution to weather teams when the Gulf War started.[8]

By mid-September, CENTAF communications and weather support personnel had coordinated a communications package. The configuration reduced the number of hard-wired teletype send/receive locations to four and required the use of high-frequency radio communications. The full duplex capabilities were installed between Carswell and weather sites located at Riyadh, Dhahran, Al Dhafra, and Taif. The plan called for the further dissemination of the weather data to in-country locations by means of high-frequency radio. This method gave them a receive-only teletype data capability at most in-country weather sites. Dhahran and Taif sites became operational in mid-January, and Al Dhafra did not become operational until early February.[9]

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[7] *Ibid*, p 19.

[8] *Ibid*, p 13

[9] *Ibid*, p 16.

After the VII Corps arrived in Saudi Arabia in November 1990, ARCENT subdivided its network into XVIII Corps, VII Corps, and SOCCENT nets. The VII Corps high-frequency network became operational on 21 December. They had brought with them the U.S. Army, Europe Automated Weather System, thus introducing a second high-frequency tactical communications system into the theater. However, the modems were not compatible with the Goldwings or the quick-reaction terminals used by other Army and Air Force units. They found it necessary to exchange floppy disks between the two for retransmission to weather teams.[10]

Maintenance of Meteorological Equipment

There were six pieces of tactical meteorological equipment deployed to the Persian Gulf region. Three of the systems had been recently procured, and many weather units had not received all the equipment nor had any significant training for them been accomplished. Table 20 lists the meteorological equipment deployed and the number of failures experienced with the equipment.

The maintenance concept employed for the tactical meteorological equipment was a two-level maintenance concept. Equipment not repairable at the unit level was to be returned to the United States for repairs. The turnaround time for the equipment was inadequate to meet customer needs. By January 1991, the Air Weather Service was working towards establishing an in-country maintenance capability for the equipment.[11]

Maintenance-related problems were primarily due to moisture, heat, dust, and sand. Moisture was the prevalent factor early in the deployment, while heat-related problems as well as difficulties with dust and sand surfaced later. Thirteen GMQ-33s were returned to the United States for repairs with seven being returned to the theater before the end of the war. Eighteen TMQ-34s were returned, fifteen because of failed components and three because of wiring problems. Only one MARWIN system had maintenance problems and the TQM-36, BOS, and TPS-68 had

[10] *Ibid*, pp 24-26.

[11] Intvw, Col William S. Koenemann, Cmdr, 5th Weather Wing and Dr. William E. Nawyn, AWS Historian, 4 Jul 1991, pp 15-17.

Table 20
Meteorological Tactical Equipment[12]

Equipment	Number Deployed	Number of Failures
GMQ-33 Transportable Cloud Height Detection Set	60	13
TMQ-34 Tactical Meteorological Observing System	87	51
TMQ-36 Tactical Wind Measuring System	13	0
Back-Up Observing System	Components	NA
Marwin Tactical Upper Air Measuring System	8	1
TPS-68 Tactical Radar Set	2	0

none. However, the MARWIN and TPS-68 systems were not deployed until January 1991 and the BOS was used as back-up equipment.[13]

The maintenance concept for UAWS required broken systems to be returned to Germany for repairs. The system had few maintenance problems and sufficient spares were brought to support the system. QRCT and

[12](S) Dr. William, E. Nawyn, AWS Historian, AWS Role in Operation Desert Storm/Desert Shield, 27 Feb 1992, Chp 3, pp 3-11.

[13](S) Dr. William E. Nawyn, AWS Historian, Operations Desert Shield/Desert Storm, The Weather Information System, 12 Mar 1992, pp 4-10.

Goldwing on the other hand experienced many hard disk failures.[14] Both the Air Force and the Army purchased additional cartridges, but the new hard drives did not arrive in country before the war ended. In addition, software defects caused the systems to reject garbled message traffic and to prevent polling of the nodes by the network control station. Other problems included the slowness of the system in handling data transfer, insufficient power (12 watts), and difficulty in finding usable frequencies.[15]

The Air Force had no in-country maintenance capability, but the Army deployed two communications maintenance detachments to support their Goldwings. The Air Force obtained an agreement with the Army to repair their QRCTs also. However, maintenance procedures required both Army and Air Force customers to bring their equipment to the maintenance shops for repairs. While this procedure worked well for the Army, CENTAF units found it difficult because the shops were located near Army units while they themselves were spread across the theater. As the Army began to move its forces closer to the Iraqi border in January 1991, the maintenance detachment moved with them, thus making it even more difficult for Air Force weather teams to locate them.[16]

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[14](S) Intvw, Lt Col William H. Campbell, ARCENT Staff Weather Officer, 7th Weather Squadron and Dr. William E. Hawyn, AWS Historian, 1 Jul 1991, p 23.

[15]Intvw, Col William S. Koenemann, Cmdr, 5th Weather Wing and Dr. William E. Nawyn, AWS Historian, 4 Jun 1991, p 13.

[16]*Ibid*, p 14.

Appendix G

Operations Desert Shield/ Desert Storm Ground Rules

The following information should not be reported because its publication or broadcast could jeopardize operations and endanger lives:

(1) For U.S. or Coalition units, specific numerical information on troop strength, aircraft, weapons systems, on-hand equipment, or supplies (e.g., artillery, tanks, radars, missiles, trucks, water), including amounts of ammunition or fuel moved by or on hand in support and combat units. Unit size may be described in general terms such as "company-size," "multibattalion," "multidivision," "naval task force," and "carrier battle group." Number or amount of equipment and supplies may be described in general terms such as "large," "small," or "many."

(2) Any information that reveals details of future plans, operations, or strikes, including postponed or cancelled operations.

(3) Information, photography, and imagery that would reveal the specific location of military forces or show the level of security at military installations or encampments. Locations may be described as follows: all Navy embark stories may identify the ship upon which embarked as a dateline and will state that the report is coming from the "Persian Gulf," "Red Sea," or "North Arabian Sea." Stories written in Saudi Arabia may be datelined "Eastern Saudi Arabia," "Near the Kuwaiti border," etc. For specific countries outside Saudi Arabia, stories will state that the report is coming from the Persian Gulf region unless that country has acknowledged its participation.

(4) Rules of engagement details.

(5) Information on intelligence-collection activities, including targets, methods, and results.

(6) During an operation, specific information on friendly force troop movements, tactical deployment, and disposition that would jeopardize operational security or lives. This would include unit designations, names of operations, and size of friendly forces involved, until released by CENTCOM.

(7) Identification of mission aircraft points of origin, other than as land- or carrier-based.

(8) Information on the effectiveness or ineffectiveness of enemy camouflage, cover, deception, targeting, direct and indirect fire, intelligence- collection, or security measures.

(9) Specific identifying information on missing or downed aircraft or ships while search and rescue operations are planned or underway.

(10) Special operations forces' methods, unique equipment, or tactics.

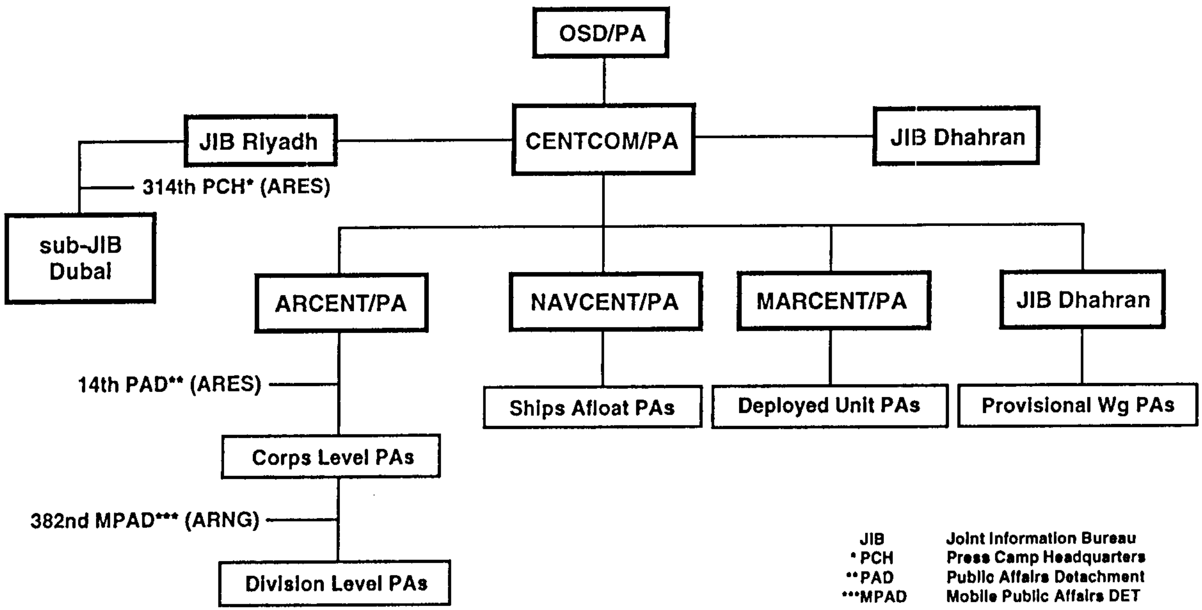
(11) Specific operating methods and tactics (e.g., air angles of attack or speeds, or naval tactics and evasive maneuvers). General terms such as "low" or "fast" may be used.

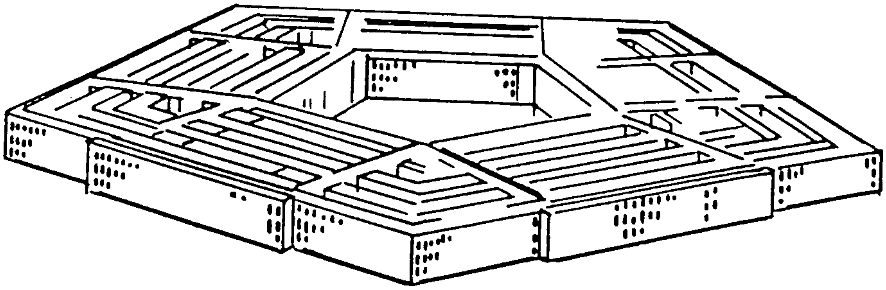
(12) Information on operational or support vulnerabilities that could be used against U.S. forces, such as details of major battle damage or major personnel losses of specific U.S. or Coalition units, until that information no longer provides tactical advantage to the enemy and is, therefore, released by CENTCOM. Damage and casualties may be described as "light," "moderate," or "heavy."

Appendix H

Public Affairs Chain of Command

Operations Desert Shield/Desert Storm





Appendix I

Guidelines for News Media

14 Jan 91

News media personnel must carry and support any personal and professional gear they take with them, including protective cases for professional equipment, batteries, cables, converters, etc.

Night Operations–Restrictions in exposing light will be followed. The only approved source of light is a flashlight with a red lens. No visible light source, including flash or television lights, will be used when operating with forces at night unless specifically approved by the on-scene commander.

Because of host-nation requirements, you must stay with your public affairs escort while on Saudi bases. At other U.S. tactical or field locations and encampments, a public affairs escort may be required because of security, safety, and mission requirements as determined by the host commander.

Casualty information, because of concern of the notification of the next of kin, is extremely sensitive. By executive directive, next of kin of all military fatalities must be notified in person by a uniformed member of the appropriate service. There have been instances in which the next of kin have first learned of the death or wounding of a loved one through the news media. The problem is particularly difficult for visual media. Casualty photographs showing a recognizable face, name tag, or other identifying feature or item should not be used before the next of kin have been notified. The anguish that sudden recognition at home can cause far outweighs the news value of the photograph, film, or videotape. News coverage of casualties in medical centers will be in strict compliance with the instructions of doctors and medical officials.

To the extent that individuals in the news media seek access to the U.S. area of operation, the following rule applies: Prior to or upon commencement of hostilities, media pools will be established to provide initial combat coverage of U.S. forces. U.S. news media personnel present in Saudi Arabia will be given the opportunity to join CENTCOM media pools, providing they agree to pool their products. News media personnel who are not members of the official CENTCOM media pools will not be permitted into forward areas. Reporters are strongly discouraged from attempting to link up on their own with combat units. U.S. commanders will maintain extremely tight security throughout the operational area and will exclude from the area of operations all unauthorized individuals.

For news media personnel participating in designated CENTCOM Media Pools:

(1) Upon registering with the JIB, news media should contact their respective pool coordinator for an explanation of pool operations.

(2) In the event of hostilities, pool products will be the subject to review before release to determine if they contain sensitive information about military plans, capabilities, operations, or vulnerabilities (see attached ground rules) that would jeopardize the outcome of an operation or the safety of U.S. or coalition forces. Material will be examined solely for its conformance to the attached ground rules, not for its potential to express criticism or cause embarrassment. The public affairs escort officer on scene will review pool reports, discuss ground rule problems with the reporter, and in the limited circumstances when no agreement can be reached with a reporter about disputed materials, immediately send the disputed materials to JIB Dhahran for review by the JIB Director and the appropriate news media representative. If no agreement can be reached, the issue will be immediately forwarded to OASD(PA) for review with the appropriate bureau chief. The ultimate decision on publication will be made by the originating reporter's news organization.

(3) Correspondents may not carry a personal weapon.

Appendix J

Historical Comparison of War Correspondence

War	Comments	Reporters
Civil War	• Initially no attempt to censor.	Five hundred reporters covered the War in the North.
	☞ McClellan's attempt to rely on "Gentleman's agreement" with press didn't work.	A smaller number covered the Confederacy.
	• Censorship of telegraph imposed 2 February 1862.	No accurate accounting of reporters because no accreditation system and documentation exists.
	☞ No "prepublication" control of mails or private couriers.	
	• Historians concluded that government lacked an "incisive and intelligible news policy."	

Historical Comparison of War Correspondence (Continued)

War	Comments	Reporters
WW 1	• British and French banned correspondents from the front for an entire year.	British accredited six journalists initially to its headquarters.
	☞ Only under pressure from the press and American entry into the war did they relent and accredit reporters to headquarters and the field.	Thirty-eight reporters were accredited to General Pershing's American Expeditionary Force in 1917-1918.
	☞ The British practice was to assign quarters, a car, driver, and "escort/censor" to each accredited journalist.	Hundreds of unaccredited journalists, freelancers, "visitors" were to follow.
WW II	• Office of Censorship created by President in 1941.	Four hundred sixty-one reporters and photographers from Allied press and radio accredited to SHAEF for D-Day (including 180 Americans).

Historical Comparison of War Correspondence (Continued)

War	Comments	Reporters
	☛ Published a "Code of Wartime Practices" with full cooperation of the press that codified kinds of information could *not* be published without official authorization.	Walter Cronkite of UP assigned to Supreme HQ-Air, along with eight other U.S. news persons.
	☛ Established a clearance procedure in U.S. for official authorization of information for domestic publication.	Only 27 U.S. newsmen went ashore with elements of all Allied armies, others came later (only six on Omaha Beach where pivotal battle of invasion took place).
	• Military retained full authority to censor all dispatches from overseas theaters of war.	Estimates that throughout the war a total of some 2,250 American journalists covered the conflict all over the world.
	☛ Censorship in the field *and* again at the headquarters where dispatches were cleared.	
	• First photos of U.S. war dead killed in battle weren't published at home until 1943.	

Historical Comparison of War Correspondence (Continued)

War	Comments	Reporters
	• By Normandy, U.S. two years of experience with press covering military operations in North Africa and Sicily. • Newsmen were accedited to HQ (Supreme HQ or various echelons of land, air, or naval contingents). • Newsmen wore uniforms, assimilated rank of Captain in U.S. Army, were subject to the Articles of War. • First news of Normandy invasion came from London, not from the beaches...communication system set up for correspondents broke down, was out for 28-hours.	
Korean War	• MacArthur experimented first with "voluntary censorship."	Five newsmen accompanied first U.S. troops sent to reinforce South Korea (later joined by 70 others after three days).

Historical Comparison of War Correspondence (Continued)

War	Comments	Reporters
	☛ Under "voluntary" rules, there were almost daily security/rules violations.	Eventually 270 reporters (American and foreign, accredited to Tokyo HQ to cover Korea).
	☛ Rate of disclosures alarmed members of Congress who called on press and radio to stop disclosures, to no avail.	Fewer than one-quarter were ever at the front at any given time.
	• At request of reporters, MacArthur imposed WW II-like field and headquarters censorship in December 1950.	
Dominican Republic		Twenty-two journalists accompanied the April 1965 deployment of U.S. forces.
Vietnam War	• No censorship imposed (political reasons, practicality cited).	Number of correspondents accredited increased as U.S. troops commitments increased.
	• U.S. Mission in Saigon provided "dedicated spaces" for newsmen on in-country transport.	In 1960, fewer than half a dozen fulltime correspondents.

Historical Comparison of War Correspondence (Continued)

War	Comments	Reporters
	• Set up major "press camps" in each of Vietnam's three outlying regions with direct telephone communication and daily flights to/from Saigon.	In 1964, 40 U.S. and foreign correspondents.
	• Helicopters occasionally assigned exclusively to transport reporters to units in the field.	In 1965, 400 plus (MACV's daily briefings regularly attended by 130 correspondents).
	☛ Newsmen often "hitchhiked" on helicopters and aircraft.	In 1966, 419 news media accredited from 22 nations (179 American including support).
	• Action unpredictable, never any assurance of contact with enemy.	In 1968, 637 (at height of Tet); 1969 - 467; 1970 - 392; 1971 - 355; 1972 - 295; 1974 - 35.
Grenada	• No censorship.	At $D^{+}48$ hours, one pool of 15 reporters taken to island.
	• No ground rules.	At $D^{+}72$ hours, pool of 24 reporters.
	• No regular briefings.	At D+96 hours, pool of 47 reporters.

Historical Comparison of War Correspondence (Continued)

War	Comments	Reporters
	• As one journalist described the situation there: "no briefings, no press releases, no nothing."	At D+120 hours, day five of operation, 182 transported and pool restrictions lifted.
	• No media plan in place with deployment of troops.	Total of 370 journalists on Barbados waiting to cover the war (estimates have gone as high as 700).
	• Public Affairs Officers deployed to Barbados after war well under way (press already there).	
Panama		Fifty to 100 resident journalists in country at time of invasion.
		DOD Media (14 plus two technicians, three escorts).
		Day Two, 300 media.
		Total of 855 media accredited/processed through SOUTHCOM Media Center.

Historical Comparison of War Correspondence (Continued)

War	Comments	Reporters
Persian Gulf War	• Pool coverage of combat.	No Western press in Saudi Arabia.
	• Security Review of pool reports "at the source."	At start of air campaign, 1,200 reporters (130 reporters in pools with units).
	☞ Ground rule violations only.	A start of ground campaign, 1,500 reporters (192 reporters in pools with units).
	☞ No "editorial" changes.	Pools dissolve when events outpace pools.
	☞ Final decision to print story up to editor or bureau chief.	
	• Military escort required.	

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Glossary

AAA	Antiaircraft Artillery
AAAM	Advanced Air-to-Air Missile
AADC	Area Air Defense Commander
AAI	Air-to-Air Interrogator Set
AAV	Amphibious Assault Vehicle
AAR	After Action Report
AASLT Div	Air Assault Division (US)
AB	Air Base
ABCCC	Airborne Battlefield Command and Control Center
ABDR	Aircraft Battle Damage Repair
ABF	Advanced Bomb Family
ABFDS	Aerial Bulk Fuel Delivery System
Abn Corps	Airborne Corps (US)
AC	Active Component
ACA	Airspace Control Authority or Airlift Clearance Authorities
ACAS	Air Combat Assessment Summary
ACC	Air Component Commander or Airspace Coordination Center or Arab Cooperation Council
ACCS	Airborne Command and Control Squadron
ACE	Airborne Command Element (USAF) or Aviation Combat Element (USMC) or Air Combat Element (NATO) or Armored Combat Earthmover (US Army)
ACM	Air Combat Maneuvers

ACO	Airspace Coordination Order or Airspace Control Order
ACR	Armored Cavalry Regiment
ACV	Armored Combat Vehicle (US Army) or Air Cushion Vehicle (USN)
AD	Air Division
ADA	Air Defense Artillery
A/DACG	Arrival/Departure Airfield Control Group
ADOC	Air Defense Operations Center
ADX	Air Defense Exercise
AECC	Aeromedical Evacuation Control Center
Aegis	Ship based long-range air defense system.
AELT	Aeromedical Evacuation Liaison Team
AES	Aeromedical Evacuation Squadron
AEW	Airborne Early Warning
AFB	Air Force Base
AFCOMAC	Air Force Combat Ammunition Center
AFDIGS	Air Force Digital Graphics System
AFEWC	Air Force Electronic Warfare Center
AFGWC	Air Force Global Weather Center
AFHRA	Air Force Historical Research Agency
AFLC	Air Force Logistics Command
AFLIF	Air Force Logistics Information File
AFLMC	Air Force Logistics Management Center
AFMSS	Air Force Mission Support System
AFR	Air Force Reserve

AFSC	Air Force Systems Command or Air Force Specialty Code
AFSOC	Air Force Special Operations Command
AFSOUTH	Allied Forces, South (NATO)
AFWMPRT	Air Force Wartime Manpower and Personnel Readiness Team
AGE	Aerospace Ground Equipment
AGL	Above Ground Level
AI	Air Interdiction
AIF	Automated Installation File
AIR	Air Inflatable Retarder
AIWS	Advanced Interdiction Weapons System
ALARM	Air-Launched Anti-Radiation Missile
ALC	Air Logistics Center
ALCC	Airlift Control Center
ALCE	Airlift Control Element
ALCM	Air-Launched Cruise Missile
ALMSNSCD	Airlift Mission Schedule
ALO	Air Liaison Officer
AMI	Aeronautical Militare Italiana
AMRAAM	Advanced Medium-Range Air-to-Air Missile
AMU	Aircraft Maintenance Unit
ANG	Air National Guard
ANGLCO	Air and Naval Gunfire Liaison Company (USMC)
AO	Area of Operation
AOB	Air Order of Battle
AOR	Area of Responsibility
APC	Armored Personnel Carrier

APCC	Aerial Port Control Center
APOD	Aerial Port of Debarkation
APS	Afloat Prepositioning Ship
ARBS	Angle Rate Bombing Set (USMC)
ARC	Air Reserve Components
ARCENT	U.S. Army Forces, Central Command
AREFS	Air Refueling Squadron
ARM	Antiradiation Missiles
ARNG	U.S. Army National Guard
ARS	Air Rescue Service
ARW	Air Rescue Wing
ASARS	Advanced Synthetic Aperture Radar System
ASD(PA)	Assistant Secretary of Defense (Public Affairs)
ASD(SO-LIC)	Assistant Secretary of Defense (Special Operations and Low Intensity Conflict)
ASM	Air-to-Surface Missile
ASMA	Air Staff Management Aide (UK and Iraq)
ASOC	Air Support Operations Center (Army/USAF)
ASUWC	Anti-to-Surface Unit Warfare Commander (USN)
ATACMS	Army Tactical Missile System
ATAF	Allied Tactical Air Force (NATO)
ATC	Air Training Command (USAF)
ATGM	Anti-Tank Guided Munition
ATO	Air Tasking Order
ATTG	Automated Tactical Target Graphic

AUTODIN	Automatic Digital Network
AVCAL	Aviation Coordinated Allowance List (USN)
AVLB	Armored Vehicle-Launched Bridge
Avn Bde	Aviation Brigade (US)
AWACS	Airborne Warning and Control System
AWN	Automated Weather Network
AWS	Airborne Warning System
BAAF	Bahrain Amiri Air Force
BAI	Battlefield Air Interdiction
BARCAP	Barrier Combat Air Patrol
BAS	Basic Allowance for Subsistence
BBBG	Battleship Battle Group
BCE	Battlefield Coordination Element
BDA	Bomb Damage Assessment
Bde	Brigade (US)
BDU	Battle Dress Uniform
BE or BEN	Basic Encyclopedia (number)
BEEF	Base Engineer Emergency Force
BLT	Battalion Landing Team (USMC)
BMP	Soviet armored personnel carrier
BMS	Bombardment Squadron
BMW	Bombardment Wing
B/N	Bombardier/Navigator
BND	German Federal Intelligence Service
BTG	Basic Target Graphic
BVR	Beyond Visual Range
BW	Biological Warfare

C-Day	Deployment Day
C3	Command, Control, and Communications
C3CM	Command, Control, Communications Countermeasures
C3I	Command, Control, Communications, and Intelligence
C3IC	Coordination, Control, Communications, and Intelligence Center
C4	Command, Control, Communications, and Computers
CA	Civil Affairs
CADOB	Consolidated Air Defense Order of Battle
CAF	Canadian Air Force
CAFMS	Computer Aided Force Management System
CAFT	Center for Anti-Fratricide Technology
CALCM	Conventional Air Launched Cruise Missile
CAMS	Core Automated Maintenance System
CAP	Combat Air Patrol
CAS	Close Air Support or Combat Ammunition System
CASSUM	Close Air Support Summary
CAT	Crisis Action Team
CB	Chemical/Biological
CBU	Cluster Bomb Unit
CBW	Chemical/Biological Weapons
CCD	Camouflage, Concealment and Deception

CCIP	Continuously Computed Impact Point
CCRC	Combined Control and Reporting Center
CEM	Combined Effects Munition
CEMIRT	Civil Engineering Maintenance, Inspection, Repair, and Training
CENTAF	U.S. Air Force, Central Command
CENTCOM	U.S. Central Command
CEP	Circular Error Probable
CES	Civil Engineering Squadron
CEV	Combat Engineer Vehicle
CFT	Conformal Fuel Tank
CI	Civilian Internees
CIA	Central Intelligence Agency
CIFS	Close-In Fire Support (USMC)
CINC	Commander-in-Chief
CINCCENT	Commander-in-Chief U.S. Central Command
CINCMAC	Commander-in-Chief, Military Airlift Command
CINCSPACE	Commander-in-Chief U.S. Space Command
CINCTRANS	Commander-in-Chief, U.S. Transportation
CINCTRANSCOM	Commander-in-Chief U.S. Transportation Command
CJCS	Chairman, Joint Chiefs of Staff
CMMS	Congressionally Mandated Mobility Study
CNN	Cable News Network

COCOM	Combatant Command (Command Authority)
COMALF	Commander, Airlift Forces
COMAO	Composite Air Operation
COMMZ	Communications Zone
COMPES	Contingency Operations Mobility Planning and Execution System
COMSEC	Communications Security
COMTAC	Commander of Tactical Air Command
COMUSCENTAF	Commander, U.S. Air Force, Central Command
COMUSCENTCOM	Commander, U.S. Central Command
CNA	Center for Naval Analysis
CNO	Chief of Naval Operations
COMINT	Communications Intelligence
COMSAT	Communications Satellite
CONUS	Continental United States
COSCOM	Corps Support Command (US Army)
CPX	Command Post Exercise
CRAF	Civil Reserve Air Fleet
CRC	Control and Reporting Center
CS	Combat Support
CSAR	Combat Search and Rescue
CSG	Contingency Support Graphic
CSS	Combat Service Support
CSSA	CENTAF Supply Support Agency or Combat Service Support Area
CT	Counterterrorism
CTJTF	Counterterrorism Joint Task Force
CVBG	Aircraft Carrier Battle Group (USN)

CW	Chemical Warfare
CWEP	Conventional Weapons Enhanced Penetration
CWP	Contingency Weather Package
D&D	Decoy and Deception
DACT	Dissimilar Aerial Combat Tactics
DARPA	Defense Advanced Research Projects Agency
DAS	Deep Air Support (USMC)
DASC	Direct Air Support Center (USMC)
DCA	Defense Communications Agency
DCI	Director of Central Intelligence
D-Day	Unnamed day on which an operations begins
DDN	Defense Data Network
DF	Direction Fired or Direction Finding
DFR/ME	Defense Fuel Region, Middle East
DFSC	Defense Fuel Supply Center
DFSP	Defense Fuel Supply Point
DIA	Defense Intelligence Agency
DIS	Daily Intelligence Summary
DISA	Defense Information Systems Agency
Div	Division
DLA	Defense Logistics Agency
DLIR	Downward Looking Infrared
DMA	Defense Mapping Agency
DMDC	Defense Manpower Data Center
DMI	Directorate of Military Intelligence (Israel, Iraq, Egypt)

DMSP	Defense Meteorological Satellite Program
DMPI	Desired Mean Point of Impact
DNA	Defense Nuclear Agency
DOC	Designed Operational Capability
DOD	Department of Defense
DOE	Department of Energy
DOPMA	Defense Officer Personnel Management Act
DOS	Department of State
DOT	Department of Transportation
DOWSR	Directorate of Weather for Strategic Reconnaissance
DPA	Defense Production Act
DPG	Defense Planning Guidance
DSB	Defense Science Board
DSCS	Defense Satellite Communication System
DSFU	Desert Storm Forecast Unit
DSMAC	Digitized Scene Mapping and Correlation
DSP	Defense Support Program
EAC	Echelon Above Corps or Eastern Area Command
ECM	Electronic Countermeasures
ECS	Electronic Combat Squadron
EDS	European Distribution System
EDT	Eastern Daylight Time
ELINT	Electronic Intelligence
EMIS	Electro-Magnetic Isotope Separation

EOB	Electronic Order of Battle
EOD	Explosive Ordnance Disposal
EOGB	Electro-Optically Guided Bomb
EOTDAS	Electro-Optical Tactical Decision Aid Software
EPW	Enemy Prisoner of War
ESA	European Space Agency
EST	Eastern Standard Time
ETTF	European Tanker Task Force
EUCOM	European Command
EW	Electronic Warfare
EWO	Electronic Warfare Officer
EWWS	Electronic Warfare Warning System or Set
FAC	Forward Air Control
FAE	Fuel Air Explosive
FAF	French Air Force
FAPES	Force Augmentation Planning and Execution System
FEBA	Forward Edge of the Battle Area
FEWS	Follow-on Early Warning System
FHTV	Family of Heavy Tactical Vehicles
FID	Foreign Internal Defense
FLIR	Forward-Looking Infrared
FLOGEN	Flow Generation computer model
FLOT	Forward Line of Own Troops
FMC	Fully Mission Capable
FMF	Fleet Marine Force
FMS	Foreign Military Sales

FMSE	Fuels Management Support Equipment
FMTV	Family of Medium Tactical Vehicles
FNOC	Fleet Numerical Oceanography Center (USN)
FOL	Forward Operating Location
FORSCOM	U.S. Army Forces Command
FOSK	Follow-on Spares Kits
FOV	Field of View
FROG	Free Rocket Over Ground
FSCL	Fire Support Coordination Line
FSS	Fast Sealift Support
FTX	Field Training Exercise
G-Day	Day the ground war began
GAO	General Accounting Office
GC	Geneva Convention
GCC	Gulf Cooperation Committee
GCI	Ground Control Intercept
GCU	Guidance and Control Unit
GDSS	Global Decision Support System
GENA	Ground Air Navigation Aids radar (U.K./Saudi)
GHQ	General Headquarters (usually theater level)
GLO	Ground Liaison Officer
GMT	Greenwich Mean Time
GNA	Goldwater-Nichols DOD Reorganization Act
GOB	Ground Order of Battle
GOK	Government of Kuwait
GOSC	General Officer Steering Committee

GP	General Purpose bomb
GPS	Global Positioning System or Satellite
H-Hour	Specific time at which operations commence
HA	Heavy Armor
HARM	High Speed Antiradiation Missile
HAB	Hardened Aircraft Bunker
HAS	Hardened Aircraft Shelter
HEMTT	Heavy Expanded Mobility Tactical Truck
HET	Heavy Equipment Transporter
HF	High Frequency
HIDACZ	High Density Airspace Control Zone
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HNS	Host-nation Support
HTPM	Hard Target Penetrator Munitions
HUD	Heads-Up Display
HUMINT	Human Resources Intelligence
HVAA	High Value Airborne Assets
I&W	Indications and Warnings
IAADF	Iraqi Air and Air Defense Forces
IADF	Iraqi Air Defense Forces
IADS	Integrated Air Defense System
IAEC	International Atomic Energy Commission
IAF	Italian Air Force
ICAO	International Commercial Aviation Organization

ICRC	International Committee of the Red Cross
IDF	Israel Defense Force
IFF	Identification Friend or Foe
IFR	Instrument Flight Reference
IFV	Infantry Fighting Vehicle
IIR	Intelligence Information Report or Imaging Infrared
ILM	Intermediate-Level Maintenance
ILMC	Intermediate-Level Maintenance Center
IMA	Individual Mobilization Augmentee
IMET	International Military Education and Training
IMINT	Imagery Intelligence
IMQT	Initial Mission Qualification Training
INS	Inertial Navigation System
IOC	Intercept Operations Center or Integrated Operations Center
IOT&E	Initial Operational Test and Evaluation
IP	Initial Point
IPDS	Inland Petroleum Distribution System (US Army)
IR	Infrared
IRR	Individual Ready Reserve
ISW	Integrated Strike Warfare
ITAC	Intelligence and Threat Analysis Center (US Army)
ITF	Intelligence Task Force (DIA)
IZAF	Iraqi Air Force
J-1	Manpower & Personnel Directorate (Joint)

J-2	Intelligence Directorate (Joint)
J-3	Operations Directorate (Joint)
J-4	Logistics Directorate (Joint)
J-5	Strategic Plans & Policy Directorate (Joint)
J-6	Command, Control & Communications Systems Directorate (Joint)
J-7	Operational Plans & Interoperability Directorate (Joint)
J-8	Force Structure Resource & Assessment Directorate (Joint)
JAAT	Joint Air Attack Team
JAG	Judge Advocate General
JAIC	Joint Atomic Intelligence Committee
Jaguar	Land-based ground attack aircraft
JAMPS	Joint Automated Message Program
JCEOI	Joint Communications Electronics Operations Instructions
JCMEC	Joint Captured Material Exploitation Center
JCS	Joint Chiefs of Staff
JCSE	Joint Communications Support Element
JDOP	Joint U.S./Saudi Directorate of Planning
JDS	Joint Deployment System
JFACC	Joint Force Air Component Commander.
JFC	Joint Forces Commander
JFC-E	Joint Forces Command East
JFC-N	Joint Forces Command North

JFLCC	Joint Forces Land Component Commander
JFMCC	Joint Forces Maritime Component Commander
JFSOCC	Joint Forces Special Operations Component Commander
JIB	Joint Information Bureau
JIC	Joint Intelligence Center
JIPC	Joint Imagery Production Center
JIST	Joint Intelligence Survey Team
JMCC	Joint Movement Control Center
JMEM	Joint Munitions Effectiveness Manual
JOPES	Joint Operations Planning and Execution System
JPEC	Joint Planning and Execution Community
JPTS	Jet Propellant Thermally Stable
JRC	Joint Reconnaissance Center
JRCC	Joint Rescue Coordination Center
JS	Joint Staff
JSCP	Joint Strategic Capabilities Plan
JSEAD	Joint Suppression of Enemy Air Defenses
JSIPS	Joint Service Imagery Processing System
JSOTF	Joint Special Operations Task Force
JSPS	Joint Strategic Planning System
JSTARS	Joint Surveillance Target Attack Radar System (E-8)
JTACMS	Joint Tactical Missile System
JTCB	Joint Target Coordination Board

JTF	Joint Task Force
JTFME	Joint Task Force Middle East
JTIDS	Joint Tactical Information Distribution System
JTTP	Joint Tactics, Techniques and Procedures
JULL	Joint Uniform Lessons Learned
KAF	Kuwaiti Air Force
KCATF	Kuwait Civil Affairs Task Force
KHZ	Kilohertz
KKMC	King Khalid Military City
KIA	Killed In Action
KTO	Kuwait Theater of Operations
LAMPS	Light Airborne Multi-Purpose System (USN)
LANDSAT	Land Satellite, NASA/NOAA Satellite Program
LANTCOM	Atlantic Command
LANTIRN	Low Altitude Navigation and Targeting Infrared System for Night
LAV	Light Armored Vehicle
LCAC	Air Cushioned Landing Craft
LCC	Land Component Commander
LDGP	Low Drag General Purpose bomb
LENSCE	Limited Enemy Situation/Correlation Equipment
LG	Logistics
LGB	Laser Guided Bomb
LGGAIR	Logistics Airlift
LIATE	LANTIRIN Intermediate Automatic Test Equipment

LOC	Lines of Communication
LOS	Line of Sight
LOTS	Logistics Over the Shore
LRC	Logistics Readiness Center (USAF)
LRI	Long Range International
LVS	Logistics Vehicle System
MAC	Military Airlift Command
MACCS	Marine Air Command and Control System
MACG	Marine Air Control Group
MAG	Marine Airlift Group
MAGTF	Marine Air Ground Task Force
MAIRS	Military Airlift Integrated Reporting System
MAJCOMS	Major Commands
MAP	Master Attack Plan
MARCENT	U.S. Marine Corps, Central Command
MARDIV	Marine Division
MASF	Mobile Aeromedical Staging Facility
MASS	MICAP Asset Sourcing System
MAW	Marine Aircraft Wing
MCI	Ministry of Culture and Information (Iraq)
MCM	Mine Countermeasures or Multi-Command Manual
MEB	Marine Expeditionary Brigade
Mech Div	Mechanized Infantry Division
MEF	Marine Expeditionary Force
MEL	Mobile Erector-Launcher used for mobile missiles

METS	Mobile Electronic Test Set
METSAT	Meteorological Satellite
MEU	Marine Expeditionary Unit
MHE	Materiel Handling Equipment
MIA	Missing In Action
MIF	Maritime Interdiction Force
MICAP	Mission Critical Parts or Mission Capable or Mission Capability Limiting
MILCON	Military Construction
MILSATCOM	Military Satellite Communications
MILSTAR	Military Strategic and Tactical Relay System
MIO	Maritime Intercept Operations
MIPE	Mobile Intelligence Processing Element
MIS	Military Intelligence Study
MISREP	Mission Report
MLRS	Multiple Launch Rocket System
MLV	Memory Loader Verifier
MOBREP	Manpower Mobilization and Accession Status Report
MOD	Ministry of Defense
MODA	Ministry of Defense and Aviation (Saudi Arabia)
MOPP	Mission Oriented Protective Posture
MPES	Medical Planning and Execution System
MPF	Maritime Prepositioning Force
MPS	Maritime Prepositioning Ships
MRE	Meals Ready to Eat

MRR	Minimum Risk Route
MRS	Mobility Requirements Study
MSC	Military Sealift Command
MSE	Mobile Subscriber Equipment
MSI	Multi-Spectral Imagery
MSK	Mission Support Kits
MTACC	Marine Tactical Air Command Center
MTI	Moving Target Indicator
MTL	Master Target List
MTMC	Military Traffic Management Command
NAC	Northern Area Command
NALE	Naval Amphibious Liaison Element
NATO	North Atlantic Treaty Organization
NAVCENT	U.S. Navy, Central Command
NAVEUR	Naval Forces, Europe
NAVSTAR	Navigational Satellite Timing and Ranging
NBC	Nuclear, Biological, and Chemical
NCA	National Command Authorities
NCTR	Noncooperative Target Recognition
NDRF	National Defense Reserve Fleet
NDS	NPIC Data Systems
NF or NOFORN	Not Releasable to Foreign Nationals
NGB	National Guard Bureau
NGFS	Naval Gunfire Support
NIE	National Intelligence Estimate
NMAC	Near Mid-Air Collision
NMCS	Not Mission Capable Supplies

NMCM	Not Mission Capable Maintenance
NMIC	National Military Intelligence Center
NMIST	National Military Intelligence Support Teams
NOAA	National Oceanographic and Atmospheric Administration
NOB	Naval Order of Battle
NODDS	Naval Oceanographic Data Dissemination System
NPIC	National Photo Interpretation Center
NSA	National Security Agency
NSC	National Security Council
NTC	Night Targeting Cell (in GAT)
NVG	Night Vision Goggles
O&M	Operations and Maintenance
OAS	Offensive Avionics System
OASD/(DR&E)	Office of the Assistant Secretary of Defense (Defense Research & Engineering)
OASD/(SO/LIC)	Office of the Assistant Secretary of Defense (Special Operations/Low Intensity Conflict)
OB	Order of Battle
OCA	Offensive Counter Air
OCP	Observation Command Post
OICC	Operational Intelligence Crisis Center
OP	Observation Post
OPAIR	Opposing Air
OPCON	Operational Control
OPDS	Offshore Petroleum Distribution System (USN)

OPEC	Organization of Petroleum Exporting Countries
OPLAN	Operation Plan
OPORD	Operation Order
OPSEC	Operational Security
OSD	Office of the Secretary of Defense
OSI	Office of Special Investigations (USAF)
OSP	Operational Support Package
PACOM	Pacific Command
PA	Public Affairs
PAO	Public Affairs Officer
PCITF	Positive Combat Identification Task Force
PGM	Precision Guided Munitions
PIN	Primary Identification Number
PLO	Palestine Liberation Organization
PLS	Palletized Loading System
PLV	Program Loader Verifier
PMC	Partially Mission Capable
PMEL	Precision Measurement Equipment Laboratory
PMT	Pastoral Ministry Team
PNVS	Pilot Night Vision System
POG	Psychological Operations Group
POL	Petroleum, Oils and Lubricants
POMCUS	Pre-positioning of Material Configured to Unit Sets
POW	Prisoner of War
PREPO	Pre-positioned

PSYOP	Psychological Operation
PSYOPS	Psychological Operations
PTAS	Provisional Tactical Airlift Squadron
QEAF	Qatari Emiri Air Force
QRCT	Quick Reaction Communications Terminal
R&D	Research and Development
R&M	Reliability and Maintainability
RADIC	Rapidly Deployable Integrated Command and Control system
RAF	Royal Air Force (U.K.)
RAFVR	Royal Air Force Voluntary Reserve
RAM	Radar Absorptive Material
RC	Reserve Component
RCAF	Royal Canadian Air Force
RCC	Rescue Coordination Center or Revolutionary Command Council (Iraq)
RDAF	Royal Dutch Air Force
RDF	Rapid Deployment Force or Radio Direction Finding
RDIT	Rapid Deployment Imagery Terminal
RDJTF	Rapid Deployment Joint Task Force
Red Horse	Rapid Engineer Deployable, Heavy Operational Repair Squadron, Engineer
REMIS	Reliability and Maintainability Information System
RFI	Request for Information
RFMD	RED FLAG Measurement Debriefing
RGFC	Republican Guard Force Command (Iraq)
RIBS	Readiness in Base Services

RJAF	Royal Jordanian Air Force
RLT	Regimental Landing Team (USMC)
RO/RO	Roll On/Roll Off
ROE	Rules of Engagement
ROTHR	Relocatable Over-The-Horizon Radar
RPV	Remotely Piloted Vehicle
RRF	Ready Reserve Force or Ready Reserve Fleet
RSADF	Royal Saudi Air Defense Force
RSAF	Royal Saudi Air Force
RSLF	Royal Saudi Land Force
RTNEPH	Real-Time Nephanalysis
RW	Reconnaissance Wing
RWR	Radar Warning Receiver
S&TI	Scientific and Technical Intelligence
SA	Selective Availability
SAAF	Saudi Arabian Armed Forces
SAC	Strategic Air Command
SAG	Saudi Arabian Government or Surface Action Group (USN)
SAM	Surface-to-Air Missile
SAMAREC	Saudi Arabian Marketing and Refining Company
SANG	Saudi Arabian National Guard
SAR	Search and Rescue
SAS	Special Air Service (U.K.)
SATCOM	Satellite Communications
SBS	Special Boat Service (U.K.)
SBSS	Standard Base Supply System

SCUD	Soviet surface-to-surface missile
SCI	Sensitive Compartmented Information
SCIF	Sensitive Compartmented Information Facility
SEAD	Suppression of Enemy Air Defenses
SEAL	Sea Air Land
SECDEF	Secretary of Defense
SFG	Special Forces Group
SFW	Sensor Fuzed Weapon
SHAPE	Supreme Headquarters, Allied Powers, Europe
SHF	Super High Frequency
SIDS	Secondary Imagery Dissemination System
SIGINT	Signals Intelligence
SINCGARS	Single Channel Ground/Airborne Radio Subsystem
SIOP	Single Integrated Operations Plan
SITREP	Situation Report
SLAM	Standoff Land Attack Missile
SLAR	Side-Looking Airborne Radar
SLOC	Sea Lines of Communications
SMESA	Special Middle East Shipping Agreement
SNIE	Special National Intelligence Estimate
SOAF	Sultanate of Oman Air Force
SOC	Sector Operations Center (Air Defense) or Special Operations Command
SOCCENT	Special Operations Command, Central Command

SOCOM	Special Operations Command
SOF	Special Operations Forces
SOFA	Status of Forces Agreement
SOG	Special Operations Group
SOS	Special Operations Squadron
SOW	Special Operations Wing
SPACC	U.S. SPACECOM Space Control Center
SPEAR	Strike Projection Evaluation and Anti-Air Warfare Research (USN)
SPINS	Special Instructions
SPOT	French Satellite Probatoire d'Observation de la Terre
SRBM	Short-range Ballistic Missile
SRP	Sealift Readiness Program
SRW	Surveillance and Reconnaissance Wing
SSA	Selective Service Act
SSM	Surface-to-Surface Missile
STAMP	Standard Air Munitions Package
STGP	Special Tactics Group (USAF)
STON	Short Ton (2,000 pounds or 0.9 metric tons)
STPJ	Special Tactic Paramedics (USAF)
STRAPP	Standard Tank, Rack, Adapter, and Pylon Package
STRATFOR	Strategic Forces Advisors
STU	Secure Telephone Unit
SURVIAC	Survivability and Vulnerability Information Analysis Center
SWA	Southwest Asia

SYERS	Senior Year Electro-Optical Reconnaissance System
TAC	Tactical Air Command
TACAIR	Tactical Air
TACC	Tactical Air Control Center
TACON	Tactical Control
TACP	Tactical Air Control Party
TACS	Tactical Air Control System
TACSAT	Tactical Satellite
TADIL	Tactical Digital Information Link or Tactical Data Interface Link
TAF	Tactical Aircraft Forces
TAG	Tactical Airlift Group
TAIRCW	Tactical Air Control Wing
TALD	Tactical Air-Launched Decoy
TALO	Theater Airlift Liaison Officer
TANKREP	Tank Killer Report
TAOC	Tactical Air Operations Center (USMC)
TARCAP	Target Combat Air Patrol
TARPS	Tactical Air Reconnaissance Pod System
TAW	Tactical Airlift Wing
TAWC	Tactical Air Warfare Center
TBM	Tactical Ballistic Missile
TCN	Transportation Control Number
TDA	Tactical Decision Aid
TEL	Transporter-Erector-Launcher
TEMPER	Tent Expendable Modular Personnel
TER	Triple Ejector Rack

TERCOM	Terrain Contour Matching
TFS	Tactical Fighter Squadron
TFW	Tactical Fighter Wing
TIALD	Thermal Imaging and Laser Designating
TIARA	Tactical Intelligence and Related Activities
TIBS	Tactical Information Broadcast System (USAF)
TIROS	Television and Infrared Observation Satellites
TIS	Tactical Intelligence Squadron
TLAM	Tomahawk Land-Attack Missile
TMD	Tactical Ballistic Missile Defense
TO	Technical Order
TO&E	Table of Organization and Equipment
TOAF	Tactical Operations Area Forecast
TOT	Time Over Target
TPFDD	Time-Phased Force Deployment Data
TPFDL	Time-Phased Force Deployment List
TR	Theater Reserves
TRADOC	Training and Doctrine Command (US Army)
TRAM	Target Recognition and Acquisition Multisensor (USN)
TRANSCOM	U.S. Transportation Command
TRAP	Tanks, Racks, Adapters, and Pylons
TRG	Tactical Reconnaissance Group
TTF	Tanker Task Force
TTM	Tactical Target Material

TTP	Tactics, Techniques, and Procedures
UAE	United Arab Emirates
UAEAF	United Arab Emirates Air Force
UAV	Unmanned Aerial Vehicle
UAWS	USAREUR Automated Weather System
UCMJ	Uniform Code of Military Justice
UHF	Ultra High Frequency
UK	United Kingdom
ULN	Unit Line Number
UMMIPS	Uniform Military Management and Movement Indicator System
UN	United Nations
UND	Urgency of Need Designator
UNSC	United Nations Security Council
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USAFE	U.S. Air Force Europe
USAFR	United States Air Force Reserve
USAR	U.S. Army Reserve
USC	United States Code
USCENTCOM	Central Command
USCG	U. S. Coast Guard
USCINCCENT	Commander-in-Chief U.S. Central Command
USCINCCENT	U.S. Commander-in-Chief, Central Command
USDAO	U.S. Defense Attache Office
USEUCOM	U.S. European Command
USG	United States Government

USIA	U.S. Information Agency
USMC	U.S. Marine Corps
USN	U.S. Navy
USNAVCENT	U.S. Navy, U.S. Central Command
USNR	U.S. Navy Reserve
USPACCOM	U.S. Pacific Command
USSOCOM	U.S. Special Operations Command
USSOUTHCOM	U.S. Southern Command
USSPACECOM	U.S. Space Command
USTRANSCOM	U.S. Transportation Command
UTC	Unit Type Code
UTE	Utilization Rate
VA	Department of Veteran's Affairs
VCJCS	Vice Chairman, Joint Chiefs of Staff
VFR	Visual Flight Reference
WAM	Wide Area Mine
WATCHCON	Watch Condition
WCDC	War Crimes Documentation Center
WFOV	Wide Field of View
WHNS	Wartime Host-Nation Support
WIA	Wounded in Action
WIN	Worldwide Military Command and Control System Intercomputer Network
WN or WNINTEL	Warning Notice: Intelligence Sources and Methods Involved
WOC	Wing Operations Center
WRM	War Reserve Material
WRSK	War Readiness Spares Kits
WSO	Weapons System Operator

WWIMS	Worldwide Indicators and Monitoring System
WWMCCS	Worldwide Military Command and Control System
WXG	Weather Group

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