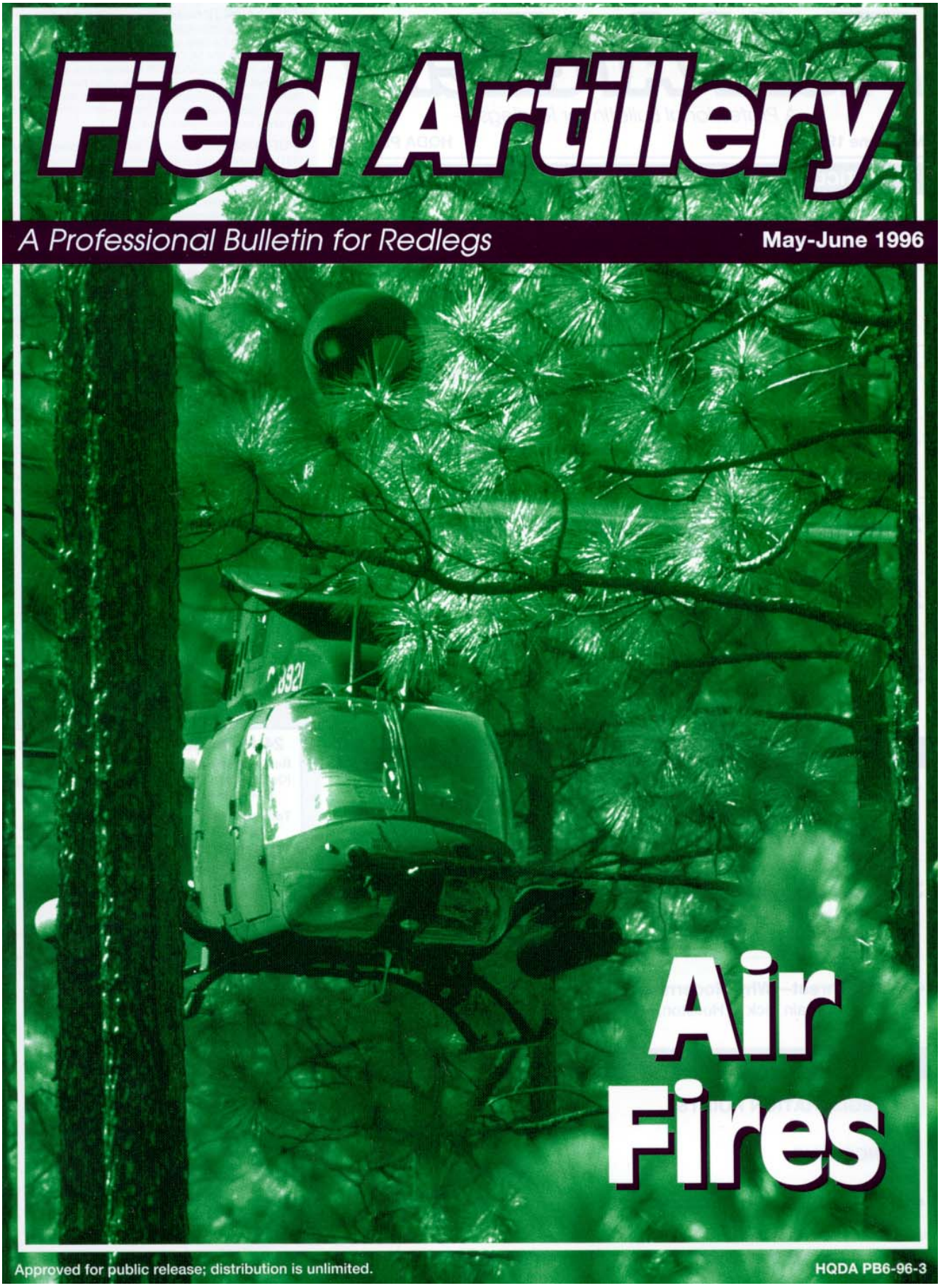
Field Artillery

A Professional Bulletin for Redlegs

May-June 1996



Air Fires

HQDA PB6-96-3

Field Artillery

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ARTICLES—The Fire Support-Aviation Team

ARTICLES

DEPARTMENTS

Front Cover: *OH-58D Kiowa Warrior; Photo Courtesy of Bell Helicopter Textron*

PURPOSE (as stated in the first ***Field Artillery Journal*** in 1911): *To publish a journal for disseminating professional knowledge and furnishing information as to the Field Artilley's progress, development and best use in campaign; to cultivate, with the other arms, a common understanding of the power and limitations of each; to foster a feeling of interdependence among the different arms and of hearty cooperation by all; and to promote understanding between the regular and militia forces by a closer bond; all of which objects are worthy and contribute to the good of our country.*

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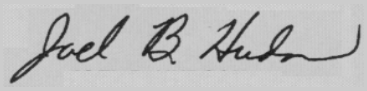

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The FA and Air Attack Team

No battle is strictly a branch or even a service fight. Every fight is a joint and combined arms effort, and integrating fire support is a condition for success. Force XXI experimentation has shown we get the most lethal, responsive fires when we link FA and air attacks—both Army and Air Force.

Critical Fire Support Tasks. Integrating the fires of close air support (CAS) fixed- and rotary-wing aircraft with the fires of cannon, rocket and missile artillery (and direct fire systems, where appropriate) ensures the land component commander (LCC) has overwhelming fire support throughout his battlespace. Using Army aviation for CAS increases the tempo and lethality of the combined arms fight.

Traditionally, CAS has come from fixed-wing assets (Air Force), but now joint doctrine recognizes rotary-wing (Army attack helicopters) for CAS as well. The situation dictates the balance of fixed- and rotary-wing CAS required for the close operation. Commanders consider the threat, weather, terrain and operational requirements for close support and attacks at depth to decide where best to mass the effects of attack aviation assets.

For the deep fight, the LCC employs FA and aviation to attack simultaneously throughout the battlespace with precision fires at depth, bewildering and overwhelming the enemy. Army rocket and missile fires operating in concert with attack aviation create a seamless battlespace, offering the enemy no sanctuary.

As the LCC conducts simultaneous attacks at depth, he can employ Army and joint assets to create the opportunity to maneuver combinations of aviation, light infantry and light artillery at depth, radically altering the tempo of battle. Fire support for the joint suppression of enemy air defenses (JSEAD) becomes increasingly important to support attack aviation as our forces conduct these raids and ambushes.

Theater missile defense (TMD) is another critical fire support task. TMD operations are inherently joint and require fully integrated national, theater and joint reconnaissance, surveillance and target acquisition (RSTA) assets to defeat ballistic missile threats before they fire on friendly forces. Operating in close coordination with the joint force air component commander (JFACC), Army fire support systems are principle mechanisms for planning, coordinating and attacking missile targets in TMD.

Coordinating Joint Fires. Our tool for planning, coordinating and controlling fires, the advanced FA tactical data system (AFATDS), links command and control nodes from the battalion through echelons-above-corps. It interfaces with components of the Army battle command system (ABCS) to integrate fire support planning and execution with the LCC's operational concept.

Recently the Chief of Staff of the Army directed the FA expedite the development of the interface between AFATDS and the Air Force's contingency theater automated planning system (CTAPS). This interface will provide fire supporters direct access to the air tasking order (ATO) and the airspace control order (ACO), simplifying the synchronization of air and ground operations.

AFATDS will be an important tool for the battlefield coordination detachment, or BCD. (Until recently, the BCD was called the battlefield coordination element, or BCE.) *FM 100-13 Battlefield Coordination Detachment,* the field manual that spells out BCD doctrine, organization, responsibilities and interservice relationships, is scheduled for distribution in the fourth quarter of FY 96.

The BCD establishes Army forces (ARFOR) liaison with the JFACC. It helps synchronize ground and air operations by coordinating air support and exchanging operations and intelligence data. The BCD interprets the land battle for the JFACC and the air operations situation for the ARFOR commander.

With the proposed CTAPS-AFATDS interface, the BCD will be able to extract information from the ATO and distribute it, as relevant, throughout the fire support system. The AFATDS-CTAPS interface should improve the timeliness of requests for air support and JSEAD and the deconfliction of Army tactical missile system (ATACMS) firings.

The BCD is a doctrinal unit with a standard organization. But the deep operations coordination cell (DOCC), an equally important fire support coordination agency, is formally resourced at the corps but not at the division-level.

To orchestrate the attack of uncommitted enemy forces or functions, the DOCC links components of the ARFOR staff involved in planning, coordinating and controlling operations at depth. It fully integrates fire support into deep attack operations.

The DOCC is not a stand-alone organization; it functionally integrates key processes in division and above command posts that support and control attacks at depth. The DOCC takes advantage of staff organizations and automated support linkages, serving as a common interface for all components of the joint force and simplifying the attack of planned and time-critical targets.

Talk of deep attack is bound to raise the issue of the fire support coordination line (FSCL). There should be no issue. Past problems between the Army and the Air Force over the FSCL have been problems with coordination—not problems with the nature of the FSCL itself. The FSCL remains a permissive measure. If fire supporters coordinate properly, the FSCL will facilitate, not restrict, the attack of targets by the full range of fires.

A Lethal Team. Fire support for any operation requires a team effort. The FA and air attack team, including fixed-and rotary-wing aircraft, combine to form a lethal team with complementary capabilities.

We must integrate and coordinate fires to provide the critical capabilities that guarantee the success of the joint and combined arms team.

TA Success and Challenges in Bosnia

Editor's Note: *Our direct support (DS) FA battalions in Bosnia each is organized as a "mini-division artillery" with assets for independent operations, including its own target acquisition (TA) battery.*

We read your recent targeting/counterfire [January-February] issue with great interest. We are the Counterfire Officer and Targeting NCO of C Battery, 333d FA (TA), which is attached to 2-3 FA Battalion DS to the Ready First Combat Team, 1st Armored Division. Our battery is deployed to Kime Base near Dubrave, Bosnia-Herzegovina. We would like to pass on some lessons learned from our experience in stability operations. First, some things that have worked.

We are attached to a DS FA battalion, which obviously is not standard practice. We first linked up with 2-3 FA in October 1995 at Grafenwoehr [Germany]. It was as if we had always worked together. We had the advantage of having a specially modified HMMWV [high-mobility multipurpose wheeled vehicle] ambulance equipped with an IFSAS [initial fire support automation system], SINCGARS [single-channel ground and airborne radio system], generator and lighting equipment. It was a matter of hooking up tentage and running WD-1 to the battalion fire direction center's [FDC's] IFSAS. We were in business as "Gunner Radar" in a matter of 20 minutes.

The IFSAS/SINCGARS combination has proven effective. Our digital communications are almost flawless. We do almost all operations digitally; we receive and process targets, control the radar by receiving FM:OBCOs and sending searches and zones. We have set up our MOI [message of interest] files to automatically send radar data and targets to the brigade fire support element [FSE]. IFSAS is everything manual operation is not: fast, accurate and automatic.

Our command, control and communications procedures worked as trained. C/333 FA and the 1st Armored Div Arty [division artillery] have been preparing for a deployment such as Bosnia for three years. The procedures developed during successive Grafenwoehr/CMTC [Combat Maneuver Training Center, Hohenfels] rotations have proven valid. Our current clearing procedures were developed during the October-November 1995 pre-deployment train-up and are valid. CMTC was an invaluable training tool. A majority of the lessons learned have proven useful with few exceptions.

The S3, S2, target production section [TPS] and the radar warrant officers (WOs) have separate but equally important jobs in counterfire. The S3 and S2 determine what's to be covered and in what priority. The TPS determines, in general terms, the scheme of coverage. The radar WO converts the tactical requirements into a specific technical solution for his position or notifies the TPS that the site is not suitable.

Here are a few of the challenges we encountered:

• *Stability operations place restrictions on positioning radars*. Force protection and land availability place severe limitations on radar coverage. Radars must be in a secure position; there are a limited number of secure bases, which are in high demand. The amount of clutter (buildings, tents, guard towers, motor parks, etc.) severely limit which way we can orient each radar. Each radar's coverage capability must be closely tracked to allow the maximum flexibility in radar coverage. Additionally, base camp construction must be closely monitored to see what effects new construction will have on the radars. It is critical that the radar WO be consulted. He should lead or accompany reconnaissance to ensure the area is suitable for the planned radar primary azimuth. Failure to do this may lead to a radar position with limited coverage.

At the CMTC, one of the WOs was bumped from the leaders' reconnaissance and the radar section ended up with a +/- 300-mil search sector. Had he gone on the reconnaissance, we could have adjusted our plans. This also has proved to be the case in Bosnia.

• *False acquisitions have been a problem*. These are radar-generated targets that are not mortar, artillery or rockets. We pick up many helicopters. We understand "a fix" is in the works for this. Because we do not have good screening crests, we also pick up cars on the MSR [main supply routes] that are tracked by side/gain lobes.

When we arrived in Croatia around New Year's Eve, we picked up more than 300 acquisitions of "celebratory fire." (Many locals are armed and enjoy firing their AK-47s into the air to celebrate.) A workaround for this is to extend the minimum range of the Q-36 out to 2,000 meters.

The problem is deciding what is a valid target. We are in the reverse position of where we should be—we have to prove or disprove each target. Each target has to be analyzed to see if it can be ruled out as an aircraft, ground clutter or small arms. We soon learned that "IFR" does not mean "instrument flight rules" but rather "I Fly Roads." Targets along MSRs and power lines are probably helicopters.

Battle tracking is important. The brigade FSE can confirm where air operations are being conducted—close coordination with the FSE is essential. Targets within one to two kilometers of a Q-36 are probably vehicles. Our concern is that we'll miss a real target by ruling it out as something else. None of the field manuals or technical manuals warned us about these problems.

• *Only the ATI:CDR acquisition message has the impact predict feature—unlike FM:CFF which does not*. In our environment, each target must be distinct and have an impact predict. For instance, the Croatians shooting at each other would not elicit much interest from us. On the other hand, Croats shooting at Serbs across the ZOS [zone of security] is a treaty violation and would get a lot of people very interested. The only way we can see this is from an ATI:CDR that has the weapons location and impact predict. We use ATI Mode 1 in the IFSAS and turn off "location averaging" in the radar. This keeps the systems from combining targets. Each target must be distinctive and as accurate as possible.

• *Target numbers need close management*. We have to zero the target block frequently. Task Force Eagle gave us 500 target numbers. Radars must be checked periodically, especially after initialization, to ensure targets are not lost. We have developed a form containing all the data a radar needs to re-initialize, including primary azimuth, target block and zone data.

• *Zones have not proved useful in stability operations*. Censor zones [CZ] do not

work as described in *FM 6-121 Tactics, Techniques and Procedures for Field Artillery Target Acquisition*. Low-angle artillery fire may be fired from under a CZ and still be tracked. We decided to track friendly and hostile fires because the clearing process is very thorough and lengthy.

We no longer are using critical friendly zones. CFZs generate a FM:CFF, which does not have an impact predict field. This would cause us to get the impact predict from the radar by voice. This extensive workaround does not merit the priority FM:CFF message.

An acknowledgment of a primary azimuth (SPRT:SEARCH) or of zones (SPRT:FILTER) does not mean the radar received the message in a useable form. Voice or digital verification of the radar entering the data is necessary.

• *IFSAS drops leading zeros from data*. This is merely an inconvenience with target grids. The zeros dropped by the meteorological (TA) message makes the message unusable to the Firefinder radars. The IFSAS ATMS field [Met station pressure] needs to be changed to 999 mb [millibars] if the value is 1,000 mb or greater. IFSAS sends the ATMS as _5 instead of 005. Adding zeros doesn't work.

• *IFSAS [Version 1.15] works well but is optimized for neither stability operations nor counterfire*. It was designed to be a battalion FDC and does that well. Hopefully the AFATDS [advanced Field Artillery tactical data system] will be optimized to handle Firefinder radars. [The brigade, corps and division (BCD) Version of IFSAS currently handles Firefinder.] Using the IFSAS [1.15] for counterfire requires extensive workarounds.

• *Continuous operations is a challenge*. One problem with CMTC rotations is their short duration. We have been in theater more than 90 days, and the strain of continuous operations has begun to show in shortcomings in our maintenance and logistics plans in a way that never could have at the CMTC.

Even with high-priority call-ins, repair parts are slow to arrive in theater. We were forced to develop a maintenance program to support the 24-hour cueing of radars. The radars were not designed to be cued for such long durations. Three maintenance schedules were developed. Schedule "A" allows the radars to go off-line in sequence for two hours of maintenance daily. Schedule "B" allows for one-half hour of maintenance for each radar before a mission and one-half hour of maintenance after the mission is complete. From time to time, all radars are required to be on-line; Schedule B is used for these cases. Schedule "C" is used once a week to allow one radar 12 hours of maintenance. During Schedule C, the radar can run all the radar tests and conduct monthly PMCS [preventive maintenance checks and services].

• *Logistics is a challenge for our TA battery [TAB]*. Each TAB should have a battery operations center (BOC) to handle the logistics needs of the battery. The battery should use both the TAB command net and A/L [administrative/logistics] net. The TAB command net needs to be reserved for operational traffic. The TPS is staffed by 13Fs who are not trained to process logistics requests. The radar platoon sergeant is uniquely capable of handling the radar-specific logistics and should run the radar logistics program with the maintenance NCO.

In our theater, we are fortunate to have several TABs supporting one division. There has been considerable cross-leveling of needed parts. The 1st Armored Division Artillery has coordinated our sharing parts. Each TAB must have 100 percent of its mandatory parts list before being deployed. Failure to do so will lead to excessive radar down-time while waiting for the parts to arrive.

Fuel for the radar systems was a problem before the logistics system in theater matured. TABs do not have their own POL [petroleum, oils and lubricants] support and must rely on the unit they support for fuel. Radars must be refueled every other day (at least) because their generators use a lot of fuel in 24-hour operations. Our Q-37 uses more than 200 gallons a day when cueing continuously. It is important that the radar can carry three days' of fuel in case the tanker can-not make the every-other-day delivery.

Firefinder is a powerful tool for both the artillery and maneuver commander. We hope these lessons learned will help others make the most out of the radar.

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Responses to “TTP for Winning the Counterfire Fight”

Rather than being "TTP for Winning the Counterfire Fight." [by Chief Warrant Officer Two Keith A. Derrick and Captain Davis L. Butler, which appeared in the January-February edition] the article might more accurately be titled "TTP for the Counterfire Fight at the NTC" [National Training Center, Fort Irwin, California]. No training environment can perfectly replicate a real battlefield; therefore, we must carefully discern between "NTCisms," or gamesmanship, and usable tactics, techniques or procedures [TTP]. I discuss a few important are as the authors may have failed to discern in this article.

Doctrinal Placement of the FA Targeting Technician. The doctrinal place for the FA targeting technician (formerly called the radar technician) to fight is at the radar site. The authors had the targeting technician fight from the DS battalion TOC. During their rotation, the authors did not bring a Q-36 Firefinder radar to the NTC. We replicated a notional radar in order to support the unit. In this scenario, the targeting technician only had to select the radar's site, provide survey, move, track and report active radar zones. Therefore, the unit used the targeting technician as a targeting officer in the TOC and stated in the article this was his place of duty.

During a subsequent rotation, this misuse of the targeting technician was corrected. The unit used the targeting technician with the radar and used an FA brigade liaison officer at the DS battalion TOC in the role they had used the targeting technician. The targeting technician's place of duty is with the radar, and the targeting officer works in the brigade FSE.

Brigade Radar Authority. Next, the brigade does not tell the Div Arty [division artillery] how and when to fight the DAG [Soviet divisional army group] counterfire duel. The authors seem to imply that is their role in the statement "the S2 gives the Div Arty a specific time for the coverage (AN/TPQ-37, NLT _____)."

Cueing Time. Lastly, we plan radar cue time to support the concept of fires that supports the scheme of maneuver. We answer the questions: When do I need to fire counterfire? When will the enemy open up with his Phase I fires? What effect can I expect them to have on my forces? What volume of acquisitions can the system (radar TOC) effectively manage?

What is my threat when I radiate? Who can be used as real-time cueing agents? The answers to these sorts of questions drive cueing patterns to facilitate the entire counterfire plan.

In light of the above, two statements by the authors need to be clarified. First, "the radar section should ask the *cueing agent* how much time is needed to avoid wasting cueing time" (emphasis added). This statement is an attempt to initiate real-time cueing as described in *FM 6-121 Tactics, Techniques and Procedures for Field Artillery Target Acquisition*. As a result of visual observation or incoming artillery, an observer can act as a real-time cueing agent. However, the S2 and targeting technician must plan cue time as a countermeasure to ELINT/SIGINT [electronic intelligence/signal intelligence] or to ensure the volume of acquisitions does not overload the fire direction center (FDC).

There is no way a *cueing agent* other than the S2 or targeting technician can track cumulative cue time and assess the vulnerability of the radar. The unit can use a standardized time period it will radiate on a command cue, such as one minute, 30 seconds, or until six targets are generated.

The second statement says, "during the enemy's most important phase of fire, the cueing time should increase to 30 to 45 seconds on and five to 15 seconds off." The assertion that cue time must be increased during the enemy's most important phase of fire may be misleading. This phase contains high volumes of massed fires, and increased radiation time may acquire a volume of acquisitions that will quickly overload the FDC and negate a responsive counterfire plan.

The article contained several valuable lessons to win the counterfire fight, but each mission has its own METT-T [mission, enemy, terrain, troops and time available] considerations. The CTCs [Combat Training Centers] are working hard to replicate division functions and pass on TTP for the next battlefield. The trick is to discern between CTCisms and usable TTP.

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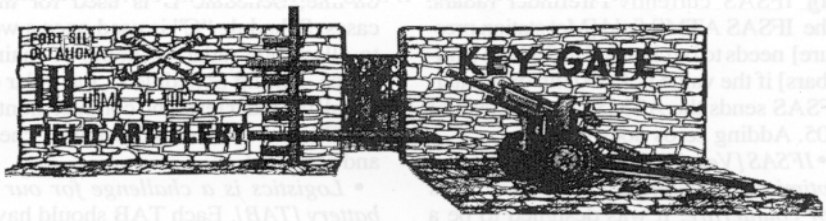
On the Worldwide Web…http://sill-www.army.mil/index.htm



Welcome to Fort Sill, Oklahoma

Home of the Field Artillery

FEATURES

- The Legend of Saint Barbara and Molly Pitcher
- History of Fort Sill and the Field Artillery
- Community Information
- The Complete Fort Sill Welcome Packet
- Field Artillery Doctrine and Publications
- Links to Fort Sill Agencies, including:
  - III Corps Artillery
  - Field Artillery Training Command (Schools and Combat Developments)
  - Depth and Simultaneous Attack Battle Lab
  - US Marine Corps Artillery
  - TEXCOM—Fire Support Testing Directorate
  - CECOM—New Equipment Training Team

In April, Fort Sill opened the door to its home page for all Redlegs surfing the Internet. By entering the uniform resource locator (URL) http://sill-www.army.mil/index.htm in their browsers, Redlegs worldwide can keep up with developments at the home of Field Artillery. In addition, this web page has E-mail for readers to forward comments to the agencies linked to it.

The home page begins as the viewer passes through Key Gate to meet the Commanding General, learn the history of Fort Sill, and legend of Saint Barbara, view the Half-Section and visit Lawton, Oklahoma. From there, the viewer may access the 120-page Welcome Packet before moving on to read about post organizations.

Among the organizations featured are III Corps Artillery, "Phantom Firepower;" the Marine Corps Artillery Detachment, the trainers and doctrine and materiel developers for Marine Redlegs; the Army's Depth and Simultaneous Attack Battle Lab, researching and testing better ways and means for the Army to conduct deep attacks; Army Test and Experimentation Command's (TEXCOM's) Fire Support Testing Directorate; and Army Communications and Electronics Command (CECOM) New Equipment Training Team.

The Army's Field Artillery Training Command—Field Artillery School, Field Artillery Training Center and NCO Academy—divided its home-page information among the Training and Doctrine Command (TRADOC) functional domains: doctrine, training, leadership development, organization and materiel. This provides a resilient structure open to growth. Course descriptions and schedules, a list of Field Artillery pub-lications, descriptions of Field Artillery systems and plans for combat developments are among items of interest.

Other agencies plan to join the Fort Sill Home Page in the near future, including the US Field Artillery Association for Army and Marine Redlegs stationed worldwide and *Field Artillery*, the professional magazine for those Redlegs.

Visit the Fort Sill Home Page often and see what's new at the home of the Field Artillery—King of Battle.

Captain Earl D. Noble, FA
TSM-Fire Support C^3
Fort Sill, OK

F-16 with KC-10 Refueling

Today's Air Tasking Process

by Lieutenant Colonel H. Alleyne Carter, USAF

In an effort to develop a more responsive air targeting architecture, several agencies have proposed significant changes to the theater air tasking process. These agencies often point to coordination problems (both real and perceived) that occurred during Operation Desert Storm as evidence that changes are needed in the air tasking system.

Those who advocate these changes generally have a valid point—the air tasking process used for most of the Gulf War would be hard pressed to provide the responsiveness and flexibility needed to efficiently synchronize and deconflict operations on today's battlefield. However, just as technology has greatly improved the capabilities and responsiveness of surface forces, similar developments also have enhanced the air tasking process. In fact, today's theater air control system (TACS) represents a quantum improvement over the system that existed during Desert Storm, thanks to the integration of computers and digitization.

This article describes the generic air tasking process and then shows how recent updates have made the process faster and more efficient. Some procedures and terminology may differ from theater to theater as each command tailors its operations for its requirements.

The Role of the Joint Air Operations Center (JAOC). As early as World War I, military leaders recognized that centralized control of theater air operations is the best way to apply limited air assets in support of a theater campaign. Today, *Joint Publication 3-56.1 Command and Control for Joint Air Operations* establishes the joint force air component commander (JFACC) as the single commander responsible for the theater air effort. The JFACC derives his authority from the joint force commander (JFC) who is designated by the theater commander-in-chief (CINC)—the JFC may be the CINC himself. Typically, the JFACC is designated the supporting commander for some missions (such as close air support, or CAS) and the supported commander for others (such as counterair).

The JFACC's command center, the JAOC, exercises centralized control via the air tasking order (ATO). Essentially a daily operations order for theater air forces, the ATO tasks each air unit with missions commensurate with the unit's capabilities. Each ATO includes a tasking section containing many (possibly hundreds) of mission assignments similar to the two-line tasking depicted in Figure 1 on Page 6. (For simplicity, unit-specific remarks and coordinating instructions are not shown in the figure.)

Essential elements of the mission (number of aircraft, target, weapons and timing) are assigned by the JAOC; each unit plans and executes its missions in accordance with the ATO. The ATO normally covers 24 hours from 0600L on the day of execution until 0600L the next morning. This sunrise-to-sunrise time frame allows units more time to plan the complex, high-intensity night missions.

The ATO is the most important document issued by the JAOC; roughly half the JAOC is dedicated to building the ATO with the other half dedicated to orchestrating its execution. Figure 2 depicts the major elements of the JAOC. The Combat Plans Division assembles and distributes the ATO, along with the planning staffs in the intelligence sections and the liaison elements. Once the ATO is transmitted, the Combat Operations Division and its elements supervise its execution, including dealing with any deviations and making any necessary changes to the sortie flow.

Several organizations make up the JAOC, but almost all work with and support either Combat Plans, Combat Operations or both. The actual size of the JAOC may vary—the manning and rank structure is tailored to the specific contingency.

The ATO Process Today. To understand the ATO process, it's helpful to follow the development of a single ATO for Day X (referred to as ATO X). The typical ATO cycle includes several days of planning with the first significant decision point approximately 30 hours before execution. At that point, air planners in the JAOC have reviewed the JFC's guidance and theater air objectives.[1] The Guidance, Apportionment and Targeting (GAT) Branch of the Combat Plans Division has formulated and recommended to the JFACC a 24-hour air strategy of what the *air apportionment* should be for Day X.

The JFACC and other component commanders (or their representatives) normally review and adjust the apportionment recommendation. Other component commander may present their views of the JFACC's recommendation, but the JFC makes the final decision. This process allows the JFC to guide the air effort with the benefit of the expertise provided by the JFACC and his staff and input from the other components.

At any time, at least three ATOs are being worked by the JAOC staff: execution of today's ATO, assembly and distribution of tomorrow's ATO and the initial planning of the ATO for the day after tomorrow. Figure 3 depicts the timing of significant actions and information exchanges between agencies in the development of an ATO.

Air apportionment is usually expressed as a priority ("Air superiority is my first priority for friendly air forces during Phase I of the campaign") or by percentage ("30 percent of my air assets should be directed to the CAS mission against [a geographical area]").[2] Not later than 30 hours before executing the ATO, the JFC issues his daily guidance that includes the air apportionment decision and targeting priorities.

Another product that results from the GAT meeting is the joint integrated prioritized target list, or JIPTL. Daily GAT meetings provide a forum where intelligence and operations representatives of all service components present the priorities of their respective commanders and submit requests for air support for the 24-hour period covered by ATO X. Those requirements and requests are then prioritized, based on the JFC's guidance.

The Army's liaison and representative at GAT meetings comes from the battlefield coordination detachment, or BCD. (BCD until recently was known as BCE or battlefield coordination element.) The Army forces (ARFOR) commander's staff provides a consolidated list of target nominations to the BCD each day before the meeting.

JFCs can employ the optional joint targeting coordination board (JTCB), which may produce the JIPTL. In this case, the GAT cell may perform weaponeering and assign air assets against the JTCB's list. Use of a JTCB allows component coordination similar to the GAT but may add a layer of command structure for air missions, requiring additional staff personnel and more processing time.

Following apportionment, the JFACC must *allocate* air assets in a manner that accurately reflects the JFC's guidance. Allocation refers to assigning sorties by aircraft type to each of the JFC's stated mission priorities in a way that optimizes aircraft usage and meets the JFC-approved apportionment.

Each air-capable component headquarters submits a daily sortie allocation and request message (ALLOREQ) to detail the sorties available for common-use JFACC tasking. Components use the

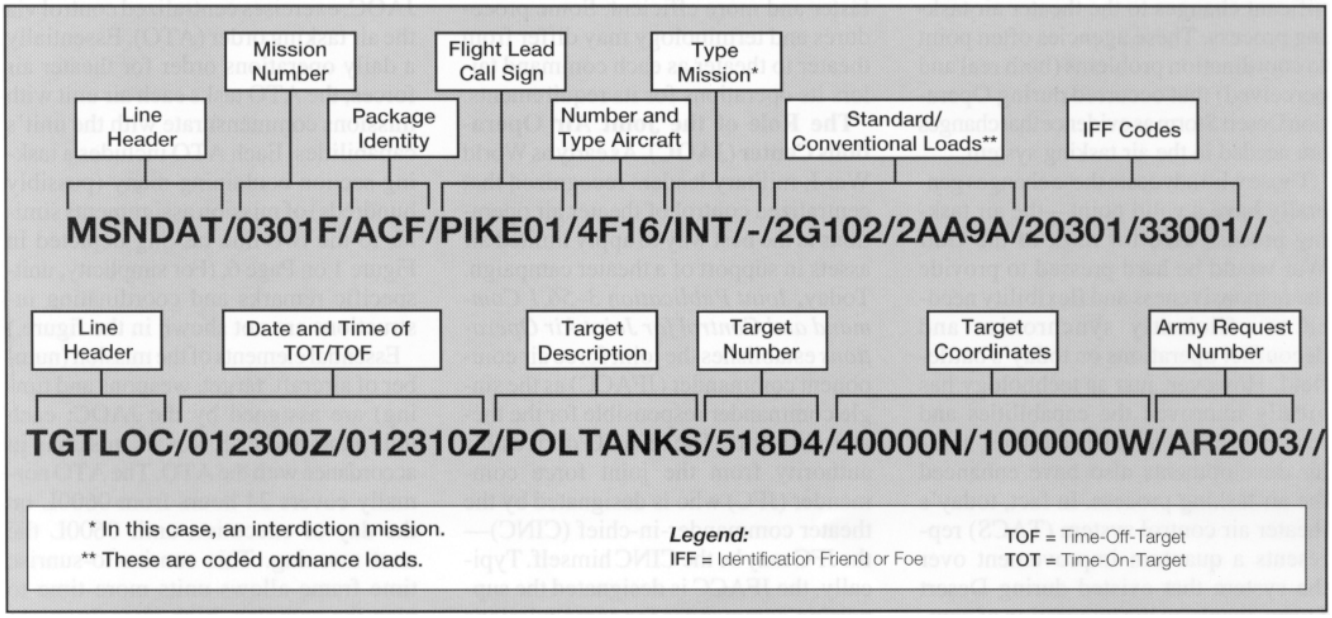


Figure 1: Typical ATO Mission Tasking

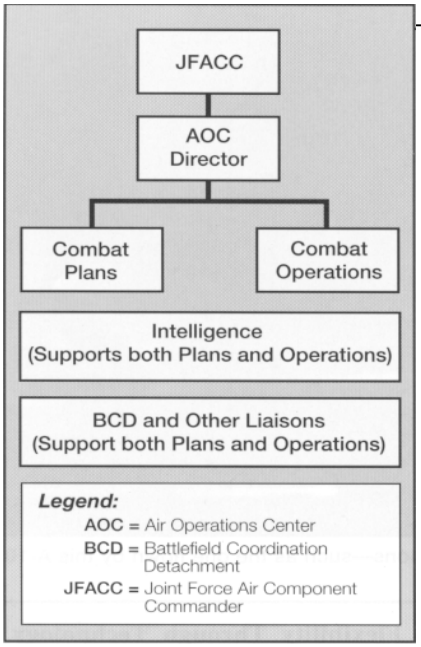


Figure 2: Key Organizations in the AOC

AIRSUPREQ message to request air support for missions that can't be filled with organic assets.

Based on the JFACC's allocation, the ATO Development Branch of the Combat Plans Division develops the master air attack plan (MAAP) for Day X by combining the JIPTL targets and the sortie allocation. When completed, the MAAP matches as many JIPTL targets as possible with appropriate combinations of aircraft and munitions. As such, the MAAP becomes the foundation for the air tasking section of the ATO, which is assembled by the ATO Production Branch of Combat Plans.[3]

After the allocation process, the JFLCC *distributes* the CAS sorties to his corps (or subordinate units) based on his priorities. This decision allows the JFLCC to direct the weight of the CAS effort where he wants it. Air Force F-16 and A-10 units, or Navy F/A-18 squadrons usually will be tasked to support CAS missions. Marine F/A-18s and AV-8s may be apportioned and allocated to CAS if the theater Marine air ground task force (MAGTF) commander makes them available for JFACC tasking.

At this point, enough information is available for tasked units to begin planning their missions, including tanker and other support missions (i.e., electronic combat. Wild Weasel, etc.). This information may be transmitted to the tasked air units in the form of an ATO "shell" or a SORTIEALOT message several hours before the ATO is executed. This provides air unit commanders and staffs, maintenance crews and aircrews as much advance notice as possible.[4]

Finally, the air tasking section of the ATO usually is combined with the airspace control order (ACO) listing the current airspace control measures—restricted operating zones and orbits for airborne warning and control system (AWACS), joint surveillance and target attack radar system (JSTARS), Compass Call, Rivet Joint, etc. The ATO also includes the special information section (SPINS) with the rules of engagement (ROE), communications plans, authenticators and other data that's pertinent.

After assembly, the complete ATO is proofed and transmitted, usually NLT 1800 the evening before Day X—approximately 12 hours before execution or the first time-on-target (TOT). The ATO is sent to each tasked unit, air liaisons officers (ALOs) at component headquarters, control and reporting centers (CRCs), air support operations centers (ASOCs) and other agencies.

Flexibility through Procedures. The lead time needed for this ATO process may seem excessive to commanders faced with a rapidly changing battlefield. However, the apportionment, allocation and distribution decisions can be modified as needed to meet changing conditions.

For example, if intelligence reveals an unexpected but viable chemical threat, the JFC can redirect the air effort to meet this new priority. The JFLCC may redirect the weight of CAS to a different subordinate unit if developments dictate. Even if changes occur too late to be included in ATO X, they can rapidly be disseminated as a formal change to the ATO. The same flexibility applies to each step of the ATO process.

Combat Plans builds flexibility into each ATO during the planning phase. For example, due to the relatively long lead times for preplanned CAS requests (up to 48 hours) and the inherent difficulties in forecasting specific CAS requirements, it may not be possible to assign specific times and targets to all apportioned CAS sorties when the ATO is developed. CAS planners, however, can task these "untargeted" sorties in the ATO for ground or airborne alert missions with the aircraft ready to respond to requests for immediate CAS. A corps ASOC may launch the corps' sorties if the JAOC has delegated scramble authority to the ASOC.

Emerging threats, such as mobile missile launchers, can be targeted by establishing airborne alert orbits for aircraft configured to deal with the threat. Based

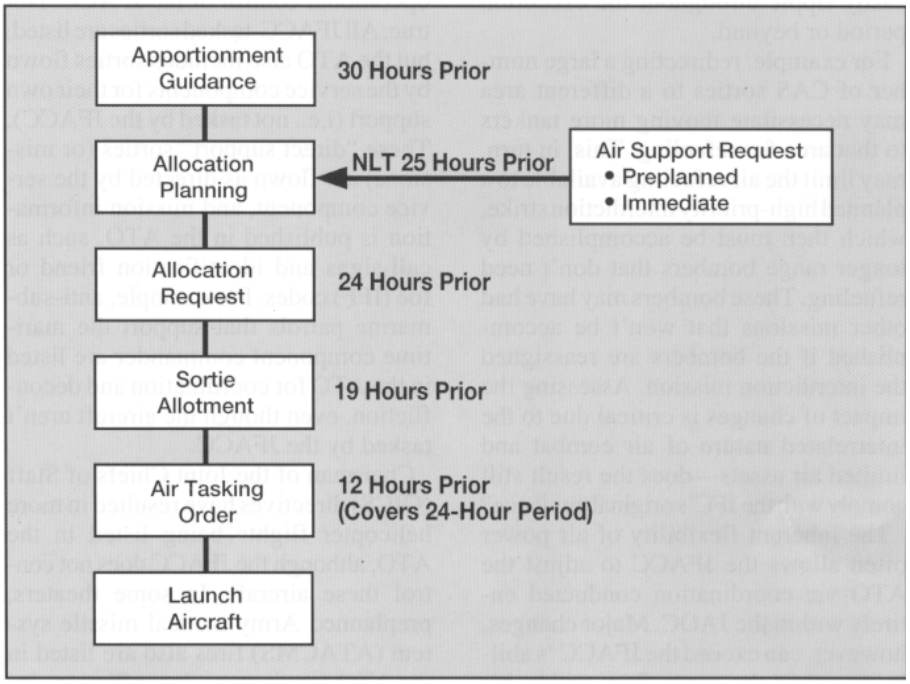


Figure 3: Significant Actions During ATO Development (Source: *Joint Pub 3-56.24 Tactical Command and Control Planning Guidance and Procedures for Joint Operations: Joint Interface Operational Procedures and Message Text Formats*, Page III-79)

on the intelligence estimates of the most probable areas for these targets to appear, aircraft may be assigned to patrol nearby orbits during specific times. As JSTARS, unmanned aerial vehicles (UAVs) or other sources acquire targets, the orbiting aircraft can be directed immediately onto the target.

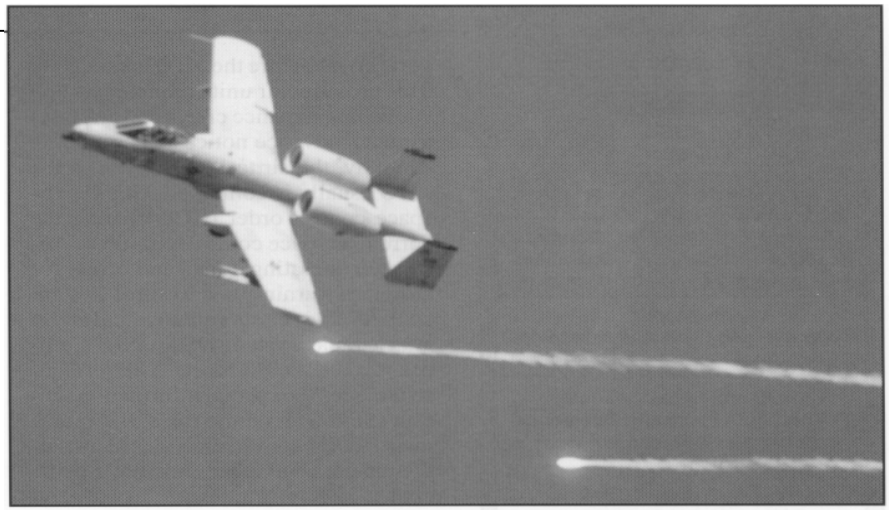
A major disadvantage of this practice is that limited strike assets are tied up for a mission that may be unproductive if no targets appear. However, if the JFC has established the threat system as a priority target, the JFACC can employ these procedures as an option. Sometimes orbiting strike aircraft can be assigned alternate targets after their station time has ended.

Once the ATO has been transmitted, responsibility for it transfers to the Combat Operations Division, which supervises the *execution* phase. Combat Operations coordinates and executes frequent changes to the ATO in response to a rapidly developing battle situation. Because the JAOC oversees all air operations in the theater, it must deal with changes occurring in the strategic environment as well as interdiction and the battlefield arenas.

Any adjustments to the planned flow of missions must be made carefully as each ATO is designed to maximize the use of limited resources. Changes can easily ripple throughout the execution period or beyond.

For example, redirecting a large number of CAS sorties to a different area may necessitate moving more tankers to that area for refueling. This, in turn, may limit the air refueling available to a planned high-priority interdiction strike, which then must be accomplished by longer range bombers that don't need refueling. These bombers may have had other missions that won't be accomplished if the bombers are reassigned the interdiction mission. Assessing the impact of changes is critical due to the interrelated nature of air combat and limited air assets—does the result still comply with the JFC's original guidance?

The inherent flexibility of air power often allows the JFACC to adjust the ATO via coordination conducted entirely within the JAOC. Major changes, however, can exceed the JFACC 's ability to adjust the sortie flow within his internal organization. When this happens, external coordination is required, such as redistribution of CAS sorties by the JFLCC or modification to the apportionment by the JFC.



The JFLCC directs the weight of his CAS missions—such as the one flown by this A-10 Warthog.

The JAOC serves as the single coordinating agency for all air activity in the theater. Various command and control elements of the theater air defense system and airspace management agencies rely on the ATO as a single-source, daily reference to coordinate and deconflict friendly air movements or actions across the theater.

A common misconception is that any sortie listed in the ATO is under the operational control of the JFACC. Not true. All JFACC-tasked sorties are listed, but the ATO also includes sorties flown by the service components for their own support (i.e., not tasked by the JFACC). These "direct support" sorties (or missions) are flown as directed by the service component, and mission information is published in the ATO, such as call-signs and identification friend or foe (IFF) codes. For example, anti-submarine patrols that support the maritime component commander are listed in the ATO for coordination and deconfliction, even though the aircraft aren't tasked by the JFACC.

Chairman of the Joint Chiefs of Staff (CJCS) directives have resulted in more helicopter flights being listed in the ATO, although the JFACC does not control these aircraft. In some theaters, preplanned Army tactical missile system (ATACMS) fires also are listed in the ATO for airspace deconfliction. Including these "direct support" missions means a more complicated ATO, but it potentially reduces chances of fratricide.

Flexibility Through Technology. Fortunately, new tools introduced since the Gulf War have made the entire ATO process faster, easier and much more efficient. The combat air forces' primary command and control system, known as the contingency theater automated planning system (CTAPS), has greatly enhanced the JAOC's ability to deal with rapid changes in the ATO process.

The latest versions of CTAPS offer vast improvements over the earlier systems, and future developments will include interfaces with the Air Mobility Command's command and control information processing system (C^2IPS), the Army's advanced Field Artillery tactical data system (AFATDS) and the global command and control system (GCCS).

CTAPS hardware consists of a theater-wide network of Unix-based computer workstations linked together with servers located in the JAOC and interconnected through secure data links. These links may be achieved through several means, including satellite communications or conventional land lines. CTAPS connectivity has been established through multiple media to link wing operations centers (WOCs) at deep inland locations with JAOCs afloat on command ships. CTAPS expedites distribution of the ATO and allows twoway communications between units and the JAOC. This gives the JAOC timely feedback on the status of missions, including takeoff times, aborts, combat losses and postmission estimated battle damage

assessment (BDA). An E-mail module plus a similar "talk" function allows all CTAPS users to exchange information over secure means. The greatest advantage of CTAPS, however, is that the ATO and subsequent changes can be quickly disseminated to all remote CTAPS locations using a common software and format.

Since Desert Storm, the increasing automation of the ATO process has been evident through constant updates in CTAPS software. CTAPS updates include the—

Advanced Planning System (APS). This module consists of an air battle planning system that interfaces with various preloaded data bases. Using APS, planners build the ATO mission directly on the computer instead of using hard-copy work sheets and manual data entries.

Today, APS missions can be automatically cross-checked for logistical feasibility, route analysis and mission support, such as air refueling, electronic combat (EC) support, etc. Thus, APS reduces the need for telephonic or face-to-face coordination. APS contains an interactive digital mapping capability with worldwide coverage.

Rapid Application of Air Power (RAAP). This module automates the analysis of targets and target sets. It interfaces with other data bases, including the joint munitions effectiveness module (JMEM) to match the weapons available with individual targets in the theater target list. This analysis is input to the GAT meeting and forms the basis for the MAAP. RAAP is used primarily by intelligence personnel in the JAOC when producing the JIPTL.

Airspace Deconfliction System (ADS). In addition to its primary function of allowing faster construction of the ACO, this module is used during ATO execution to rapidly establish or revise airspace control measures. This information can be rapidly disseminated via CTAPS.

Computer-Aided Force Management System (CAFMS). This operating system manages the data needed to build, transmit and execute the ATO. An early version of CAFMS was the only module available during Desert Storm. This system allows mission data to be sorted in a variety of useful formats, such as by chronological list, by unit, etc.

Future CTAPS improvements include the—

Force-Level Execution (FLEX). FLEX will provide automated tools to import the entire battle plan from APS and execute the ATO. FLEX is projected for fielding FY 96 or 97.

TISD/JMI. The acronym stands for theater integrated situation display (TISD)/"J" for JTIDS (joint tactical information distribution system), "M" for MAOC (modular air operations center) and "I" for integration. This system will provide an integrated display of aircraft track data (the "air picture"), using tactical data information links (TADILs) that interface with some joint systems. Eventually, this module will be upgraded to interface with future joint systems.

Except for CAFMS, these advances have occurred since Desert Storm. The result is a more efficient, responsive and flexibility air tasking process, greatly improving the JAOC's ability to direct air support where it's needed.

New technologies across the US armed services have created new challenges. Cruise missiles, the multiple-launch rocket system (MLRS), UAVs, attack helicopters and ATACMS can range targets previously unreachable except by manned, fixed-wing aircraft. These systems enhance our warfighting potential, but coordinating and deconflicting their operations have become more complicated.

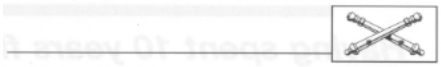
A promising combination of technology, procedures and doctrine may facilitate joint operations. Current joint efforts to develop an interface between AFATDS and CTAPS are expected to pay big dividends in coordinating and deconflicting fires. Several proposals are now under study to solve the problem of rapidly deconflicting fires on time-critical targets with air or special forces that may be in the area. Procedural solutions have also proven effective—for example, deconflicting cruise missile and UAV missions by listing the missions in the ATO. This practice has worked well in recent joint exercises.

Tomorrow's ATO Process. The Air Combat Command is continuously improving the air tasking process. Development, testing and fielding new versions of CTAPS is a coordinated, ongoing effort. Future CTAPS versions will significantly improve today's capabilities. New modules are being designed to interface with existing modules and allow the system to operate more smoothly.

These improvements, when coupled with joint efforts—developing a common target numbering system and integrating digitized joint information links into the existing command and control architecture—will allow joint forces to achieve new levels of interoperability.

Continued technical progress may eventually shorten the cycle for ATO production, although the services will have to address operational problems before this can occur. With the command and control system interfaces now on the horizon, and the development of applicable joint doctrine and training, a seamless fire support architecture may be well on its way to reality.

Meanwhile, today's air tasking process delivers more responsive, flexible air support and delivers it with far greater efficiency than ever before.

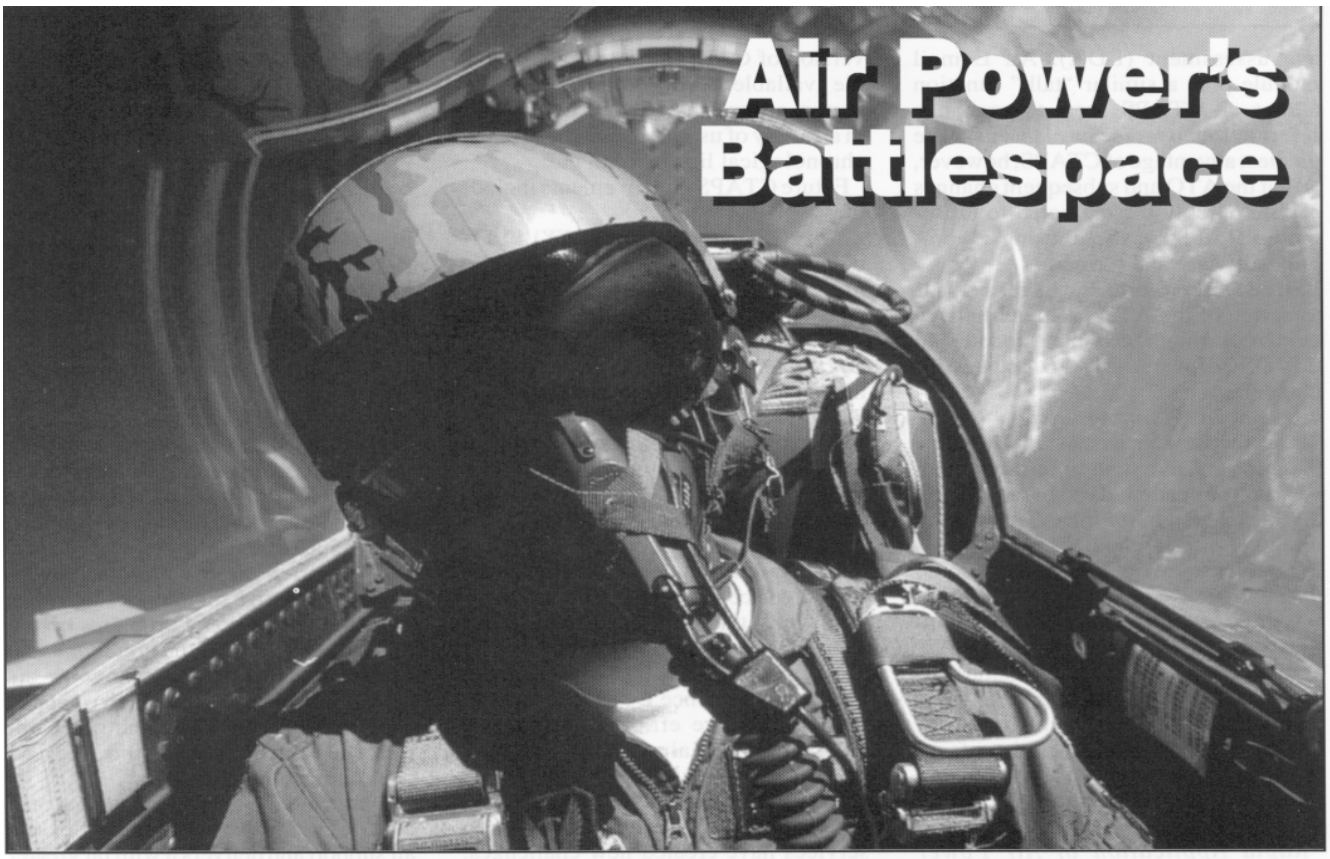


Lieutenant Colonel H. Alleyne (Al) Carter, US Air Force, is Chief of Academics of the Air Ground Operations School at Operating Location C, Fort Sill, Oklahoma; he teaches the air tasking process, among other subjects, to students at the Field Artillery School. His previous assignments include serving as Chief of Air Tasking Order (ATO) Development and Exercises at Eighth Air Force Headquarters, Barksdale AFB, Louisiana, and Operations Officer for the US Comander-in-Chief Pacific Command (USCINCPAC) Airborne Command Post based at Hickam AFB, Hawaii. Lieutenant Colonel Carter is a Command Pilot with more than 3,400 hours in B-52 and T-37 aircraft. He's a 1989 graduate of the US Army Command and General Staff College, Fort Leavenworth, Kansas.

Notes:

1. *Joint Publication 3-56.1 Command and Control of Joint Air Operations* (14 November 1994), IV-6.
2. Ibid.
3. *JFACC Primer* (Washington, DC: Headquarter, US Air Force), 43.
4. *Joint Publication 3-56.24 Tactical Command and Control of Planning Guidance and Procedures for Joint Operations Joint Interface Operational Procedures Message Text Format* (October 1991), III-61.

Air Power's Battlespace



by Lieutenant Colonel Ricky R. Ales, USAF

Having spent 10 years flying close air support (CAS) missions in the A-10 Warthog and two years as an air support operations center (ASOC) commander, I've had plenty of experience supporting the Army. Through this experience, I've learned how differently soldiers and airmen view the employment of air power.

On many occasions, Army leaders have asked me to influence the air tasking order (ATO) for dramatic change or coordinate retasking or redirection of sorties—changes requested to ensure their commands or units received specific support. In most cases, time constraints and the planning factors required for retasking and redirecting sorties would not allow the Air Force to satisfy those Army requests.

The Air Force would like to be able to satisfy all Army requests for air—given enough air assets. But employing air power is our job; we must use it to realize mutual supporting requirements between our components while ensuring a ground commander's air requests are conveyed accurately and expeditiously for consideration in the apportionment process.

Because air power is a limited resource, it must be used effectively to maximize its contribution to the joint force. This becomes especially important to the ground commander when air power is critical to achieving his objectives. Therefore, to use air power most effectively, fire support planners, as well as combat planners from other services, need to understand where and how best to employ air power. This article discusses what air power's battlespace is, how best to exploit it and how its employment requirements impact fire support planning.

Air Power—What It is and Isn't

Air power can't be a replacement for artillery because it can't lay down responsive barrages of fire or counterfire like artillery can. By the same token, artillery can't replace air, which can strike the enemy anywhere in the joint force commander's area of responsibility (AOR) with a flexible precision not provided by artillery. Put another way, aircraft, unlike artillery, can be called back or adjusted/redirected while in flight to a moving or different target.

Also, fixed-wing strike aircraft can't replace attack helicopters and vice versa. The advantages of fixed-wing aircraft (range, speed and ordnance load) is quite distinct from the helicopter's advantage of excellent responsiveness.

Because air power can strike the enemy anywhere with a wide variety of

munitions, its effects can have an impact at all levels of war. Air Force fighter and bomber assets, therefore, aren't tied to a particular level of war. One day a squadron's mission may be strategic attack, and the next the same squadron's mission may be CAS. Also, theater air is not constrained by boundaries as are surface forces, so ultimately air power's battlespace is the entire joint and combined AOR.

Air Power Effectiveness

We didn't learn how to employ air power overnight; it took two world wars and wars in Korea, Vietnam and the Gulf. We discovered that aircraft historically used for strategic purposes, such as B-52 bombers, also could be effective at the operational or tactical levels of war. B-52s were employed tactically in Vietnam within 1,000 yards of the Marines at Khe Sahn and operationally in the Gulf War at A1-Khafji and against the Iraqi Republican Guard.

The following highlights some of the most prominent lessons we've learned and how each may relate to the responsibilities of fire support elements (FSEs) at the Army echelons.

• *Air power should be controlled by an airman who maintains a broad strategic and (or) theater perspective*. While command and control of air power should be centralized, execution of air missions should be decentralized to promote effective span of control and allow for responsive tactical flexibility.[1] Experiences from World War II highlight the reasons for current doctrine on centralized command and control of air power.

The United States military began the North African campaign with command of its air power divided between the Army Air Corps and organic air power assigned to each surface unit. The decentralized air forces focused on providing an "umbrella" cover over ground troops and were not used where they were needed most—gaining air superiority and interdicting German ground forces and their resupply and reinforcement capabilities. As a result, the Germans gained military strength, and the United States suffered a serious defeat at Kaserine Pass in February 1943.

This defeat forced a reexamination of how air power was controlled and employed. As a consequence, General Carl Spaatz centralized control of American air power in North Africa, and his immediate success emphasized the importance of a single air commander. The concept of centralized control of air power basically parallels the Army division's having a division artillery for centralized control of its Field Artillery—the structure allows one to make the most effective use of the assets available.

This concept of centralized control of air power was incorporated into Army doctrine in *FM 100-20 Command and Employment of Air Power* published on 21 July 1943. The same basic doctrine is in today's *Air Force Manual (AFM) 1-1 Basic Aerospace Doctrine of the United States Air Force*.[2]

General Douglas MacArthur also saw the importance of centralized control of air power when he appointed General George Kenney as Air Commander in the Pacific. General Kenney streamlined logistics, accelerated weapons development and devised an air campaign that would support the overall joint theater objectives. Kenney's air campaign was the critical element in MacArthur's island-hopping strategy.[3]

These examples are "big picture stuff," but the principles they illustrate is the doctrinal foundation for the joint force air component commander (JFACC) to control air power at the joint level. The concept of central control led to the development of the theater air control system (TACS), a subject beyond the scope of this article, but an important system for fire supporters to understand.

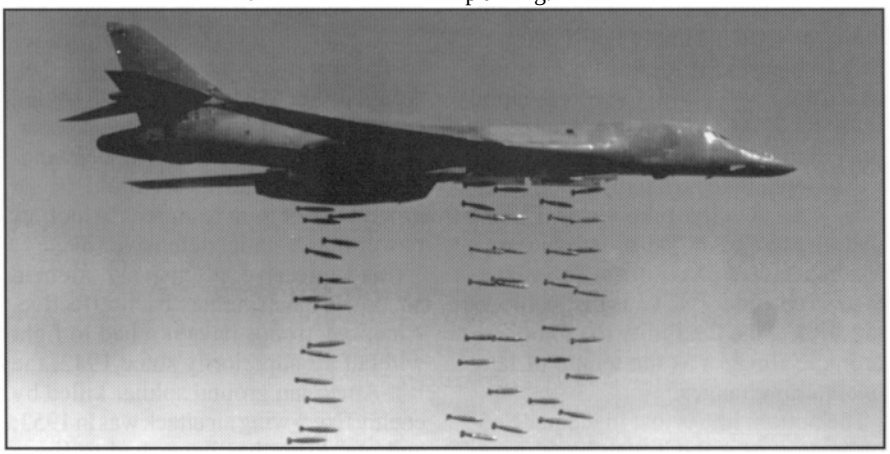
The knowledge and professional expertise air liaison officers (ALOs) bring to the ground commanders and their FSEs is key to making the system work. ALOs are trained to assist in fire support planning and provide the expertise necessary to make smart decisions on employing air power. ALOs should be fully involved in integrating air with the ground commander's fire and maneuver plan and assisting commanders and their staffs in requesting immediate air support to accommodate changing battle requirements.

• *Air power is capable of decisive, simultaneous employment at all levels of war*. The decisiveness of air power gradually became apparent in World War II after the strategic bombing of Germany virtually destroyed its industrial war-making capability and economy before Allied ground forces breached German borders.

Also, conventional bombing nearly assured Japan's unconditional surrender before the atomic bombs were dropped.

"One of the important factors inducing Japan's leaders to accept unconditional surrender was a realization that the Japanese armed forces had lost their ability to protect the people and that under the impact of direct air attack and lowered livelihood their confidence in victory and determination to continue the war were rapidly declining."[4]

Although these are examples of air power's effectiveness at the strategic level, air power can have effects at all levels of war. Unlike ground forces, air power is not bound by terrain, tactics or doctrine to a specific type or level of employment; it uses its foremost inherent characteristic—flexibility—to meet the needs of the entire joint effort.[5] What this means to FSOs is that air power (with its speed, range and, more importantly, flexibility) can strike targets unreachable by organic fire support and provide reconnaissance and surveillance—e.g., satellites, joint surveillance and target attack radar system (JSTARS) and unmanned aerial vehicles (UAVs)—critical to maneuver and fire support coordination and planning.



B-1 bomber employing conventional weapons. Air power is, essentially, a strategic force.

To the maximum extent possible, air power should be permitted to exercise its inherent characteristics. Flexibility, speed, and range are nullified if fire support coordinating measures (FSCM) are used without consideration for their impact on the theater-wide employment of limited air power resources.

For example, care must be taken when establishing the fire support coordination line (FSCL) because there are significant tradeoffs between close-in and deep FSCLs. A close-in FSCL allows for supporting components, such as air, to execute attacks in a wider area without time-consuming coordination. Deep placement of the FSCL provides maneuver area for ground forces in rapidly advancing, offensive situations. This deep placement of the FSCL may impose unacceptable limitations on the air component's ability to support operations short of the FSCL due to the requirement for increased coordination and tighter, positive control.

The joint force land component commander (JFLCC) should optimize placement of the FSCL so it doesn't inhibit the ground force operational tempo and reduces the possibility of fratricide while making the most of all organic and supporting component assets. Fundamentally, FSCL placement is situational and may be changed as required to maximize the success of the campaign.[6]

The JFACC must be notified of pending FSCL changes as soon as possible. Anticipated changes should be communicated from the JFLCC's staff through the battlefield coordination detachment (BCD) to the joint air operations center (JAOC). (Until recently, the BCD was called the battlefield coordination element, or BCE.) Timely notification of FSCL changes (six to eight hours before execution) will allow for coordination with the JFACC for uninterrupted air operations.

One technique to facilitate notification is to develop preplanned FSCLs that are established "on-order" and work like movement phase lines. The advantage of on-order FSCLs is that it allows the JFLCC the flexibility to rapidly coordinate changes as the tempo of land operations changes.[7]

The bottom line is that inadequate coordination of a FSCL can have disastrous results. One could be fratricide and another sanctuary for the enemy—neither is acceptable. FSOs and ALOs must understand the importance of proper FSCL placement to help ground commanders make critical FSCL decisions.

A-10 Warthog Providing CAS. CAS is an effective offensive tool; it can be a force multiplier for the ground commander.

• *Whoever controls the air generally enables ground operations.* More commonly called air superiority, this is the first priority of any joint force commander (JFC). Achieving control of the air will enable our surface forces—land or sea—to operate unhindered while protecting our centers of gravity and military forces from air attack. The concept of air superiority parallels the ground commander's emphasis on counterfire as a priority.

This emphasis on gaining air superiority troubles some ground commanders who equate dedicated air support with added security. Rather than have aircraft attack airfields or aircraft factories in the quest for air superiority, they would prefer to have them close by and on-call in case enemy planes appear. Although this preference is understandable, it's unfounded. It would be an unwise use of joint resources to lock air power into a static, defensive role.

This aggressive, offensively oriented air power doctrine has been effective. American troops have not had to fight without air superiority since 1942; the last American ground soldier killed by enemy fixed-wing air attack was in 1953; and our Army has never had to fire a surface-to-air missile at an enemy fixed-wing aircraft—the aircraft have never been allowed to get that close.[8]

Consequently, when the JFC needs to gain and maintain air superiority, fewer aircraft may be available for CAS and interdiction missions because counterair is first priority. But aircraft performing counterair aren't "lost" assets; they help shape the battlefield and enable friendly operations, both current and future.

Therefore, FSOs should carefully examine organic capabilities to meet fire support needs before submitting pre-planned requests up the Army chain to the BCD at the JAOC. By the same token, the fact that all requests for CAS or interdiction missions may not be filled shouldn't prevent ground commanders and fire supporters from requesting preplanned air support. But they must be aware that the majority of CAS sorties and air interdiction assets supporting maneuver forces will go to the corps or surface unit the JFC designates as the main effort.

• *Air power is best used as an offensive weapon*. This is an enduring principle of employing air power. The combat situation may dictate defensive use of air for close support of surface forces, but success in war is usually gained while on the offensive.

The offense in air warfare is different than in ground warfare because countering attacks in the defense takes more air assets than seizing the initiative and attacking. In air warfare, for any air power to delay an air attack is to risk defeat. An overwhelming initial air strike offers the potential for great impact. This was proven by the devastating effects of air attacks at Pearl Harbor, the Arab-Israeli War of 1967 and Desert Storm.

The minimum requirement for attaining the initiative demands an air force capable of immediate and decisive action at the outbreak of any hostilities. Air warfare won't allow for weeks or months of mobilization; a conflict may be lost before friendly forces can be employed.

Air power can be compared to the Army's operational ground reserve. It can be a shock weapon when concentrated in space and time. But unlike ground reserves, air power can be redirected in a matter of hours to close with the enemy. Thus, more options exist for employing air assets than a ground reserve that may take days to build and commit.

Commanders historically have used air support as a shock weapon to break through enemy lines, cover a flank or prevent an enemy breakthrough.

The Germans used CAS to spearhead breakthroughs throughout World War II.[9]

"On 23 August 1941, the Luftwaffe's VIII Corps (its dedicated close support unit) flew 1,600 sorties to open a way for a 60-kilometer advance by Wietersheim's Panzer Corps. During this massive attack, the Luftwaffe lost only three aircraft, while destroying more than 90 Russian machines."[10]

This is just one of many examples where both Axis and Allied forces massed air power to ensure the success of offensive operations. Consequently, once air superiority is achieved, air power, along with Army CAS assets, would likely be at the forefront of offensive operations.

A ground commander, therefore, may desire to mass CAS assets to rapidly degrade the enemy physically and psychologically, saturate enemy defenses and reduce danger for air assets, as opposed to employing CAS assets in a more risky piecemeal manner. If Army organic CAS assets are exhausted and tasked fixed-wing CAS sorties are insufficient, other sources must be considered. In this process, communication among planners in the corps FSE, BCD and the JAOC, as well as the involvement of ALOs, is essential at all Army echelons.

The timetables set up for air requests give JAOC combat planners time to determine if requests can be filled. Once the JFC has identified the main effort, other components (Navy and Marines) may be tasked to augment the Air Force in satisfying CAS and interdiction requests of priority units.

• *Air power is essentially a strategic force*. Even though air power can have effects at all levels of war, generally speaking, the most efficient use of air power is at the strategic level.

In the past, armies were tactical tools to throw against the enemy in hopes that if enough battles were won, a decisive position of strategic advantage would develop. The history of military air power gradually changed things by compressing the time between the strategic and tactical levels of war. Air power's ability to have strategic effects eliminates the need to confront terrain or the environment because aircraft can fly over armies, fleets and geographic obstacles and strike an enemy's key centers.

Although not every situation calls for strategic attack, such an attack offers alternatives to bloody, prolonged ground battles. Therefore, the airman's ultimate goal is to prevent force-on-force ground operations from ever occurring by striking the enemy's heartland and hindering his ability to wage war or convincing enemy leaders further conflict is futile.

As a principle, strategic attack is one of the most effective uses of air power while CAS is the least effective because it has the briefest effects of any air power force application mission. Now, having said that, CAS may be the most critical mission to ensure the success or survival of surface forces.[11] But the general principle is the basis for the 1943 Army Field Manual 100-20 placement of tactical air support as a third priority behind air superiority and interdiction. Ground commanders and their staffs need to understand that limits placed on the amount of CAS available are not because the JFACC wants to deny tactical support, but rather because of the need to accomplish the JFC's operational and strategic objectives.

Conclusion

The airman's battlespace is the same as the joint force commander's—it encompasses the entire JFC's AOR. Air power has no boundaries other than the limits of the AOR.

Air power's speed, range and ordnance load allows the JFC great flexibility to destroy the enemy's war-making capabilities or will to fight. The key is for the JFC to use his air power—all his assets—most effectively to speed the end of war and save US lives.

One World War II leader's perspective of air power provides a unique summation of air warfare and its contribution to the joint effort:

"Whereas to shift the weight of effort on the ground from one point to another takes time, the flexibility inherent in air forces permits them without change of base to be switched from one objective to another in the theater of operations. So long as this is realized, then the whole weight of the available air power can be used in selected areas in turn. This concentrated use of the air striking force is a battle-winning factor of the first importance. It follows that control of the available air power must be centralized and command must be exercised through Air Force channels."[12]

The leader's name was Field Marshal Bernard Montgomery, and he commanded the British Eighth Army in North Africa and the Allied Land Forces at Normandy.

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Notes:

1. *Air Force Manual (AFM) 1-1 Basic Aerospace of the United States Air Force*, Volume I, (Washington, DC: USAF, March 1992), 8.
2. Ibid, 3.
3. Ibid, 3.
4. *The United States Strategic Bombing Surveys* (Maxwell AFB, AL: Air University Press, October 1987), 92.
5. AFM 1-1, 8.
6. *Targeting: Procedures for Coordinating, Deconflicting and Synchronizing Attacks Against Time-Critical Targets* (Second Draft), which is a manual of targeting tactics, techniques and procedures (TTP) being published by the Army, Marines, Navy and selected Air Force commands (Langley AFB, VA: Air Land Sea Application Center, October 1995), III-18.
7. Ibid, III-19, III-20.
8. Meilinger, Colonel Phillip S., *Propositions Regarding Air Power*, (Maxwell AFB, AL: School for Advanced Aerospace Studies, 1995), 4-5.
9. Warden, John A., III, T*he Air Campaign, Planning for Combat* (Washington, DC: National Defense University Press, 1988), 105-106.
10. Murry, Williamson, *Strategy for Defeat: The Luftwaffe 1933-1945* (Maxwell AFB, AL: Air University Press, 1983), 121.
11. AFM 1-1, 13.
12. Westenhoff, Lieutenant Colonel Charles M., *Military Air Power* (Maxwell AFB, AL: Air Power Research Institute, Air University Press, October 1990), 121.

Integrating Army Aviation into the Brigade Targeting Process

by Captain Gregory P. Fenton and
Major Frank R. Baum, Jr., AV

Courtesy of Bell Helicopter Textron Inc.

Scenario I. The brigade executive officer (XO) directs the S2 begin the targeting meeting by updating the current enemy situation. The S3 states the commander's intent, updates the current friendly situation and briefs the operations planned for the next 48 hours.

The fire support officer (FSO) follows with a review of the high-payoff target list (HPTL) and attack guidance matrix (AGM). He then leads a discussion geared toward determining which of the enemy's high-value targets now are most critical to attack, in order of priority, and what assets will be tasked to detect and attack targets and then assess their damage. The FSO uses a target synchronization matrix and enters the appropriate information into the decide, detect, deliver and assess (D^3A) portions of the matrix.

During the targeting meeting, an enemy battalion supply point (BSP) is identified as an HPT. Attack helicopters, OH-58D(I) Kiowa Warriors, are designated as the weapon system tasked under the deliver column of the target synchronization matrix.

The aviation liaison officer (LNO), who observed the targeting meeting, calls his S3 over the radio and informs him that the aviation task force is to destroy the BSP at grid WQ055343. The aviation battalion S3 briefs an attack team to go to that location, identify any movement of supplies that might pinpoint the location of the BSP and, if possible, destroy the BSP.

The team leader gets the current enemy situation from the aviation battalion S2. He then briefs the aircrews, and in 30 minutes, they are en route. Upon arrival, the team begins an orbit at treetop level looking through the trees at a slant distance of 200 meters. After 20 minutes without contact, the team leader decides to return to his holding area to await another mission from the aviation battalion tactical operations center (TOC).

During egress, his wingman is hit by an enemy rocket-propelled grenade (RPG), destroying the aircraft and killing both crew members. The team leader suppresses the area with his .50-caliber weapon system and calls for help on the battalion command net.

This scenario—where valuable aviation resources are squandered—occurs often during rotations at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana. It illustrates problems that Field Artillery and Aviation units frequently experience at the JRTC. Targeting, in reality, is the brigade staff's method of synchronizing current operations and planning contingencies (branches), and all players must be integrated into that process. This article examines how to integrate Army aviation into the brigade's D^3A functions.

Decide Function. To ensure the targeting process is successful, the following questions must be answered during the decide function: What targets should be acquired and attacked? When and where are the targets likely to be found and who can locate them? How should the targets be attacked? Is target damage assessment (TDA) required?

Continuous intelligence preparation of the battlefield (IPB) is the first step the brigade staff performs in the decide function. By updating the facts and assumptions about the battlefield environment and the threat, the IPB enables the staff to begin developing courses of action (COAs). The IPB also determines the allocation and synchronization of intelligence collection assets to support the commander's chosen COA. Finally the IPB, specifically the enemy's most probable COA, is the key to war-gaming combat functions and completing several other staff processes.

The initial IPB effort produces a doctrinal template. This template converts the enemy order of battle into graphics and aids in the initial identification of potential high-value targets (HVTs). HVTs are those assets the enemy commander requires for the successful completion of his mission. The situation template further refines HVTs for a specific area of operation and enemy COA. Concurrently, these HVTs are analyzed for the threat's most probable COA and any possible branches.

War-gaming identifies critical threat functions associated with each COA. Not only must the staff war-game the decide function, but it also must continue to war-game throughout the detect, deliver and assess functions. At a minimum, the staff must war-game the critical actions or events to synchronize assets across the battlefield operating systems (BOS).

From this war game, the decision support template (DST) is developed. It identifies

critical threat activities, named areas of interest (NAIs), targeted areas of interest (TAIs), decision points (DPs) or phase lines (PLs) and HPTs. HPTs are those HVTs that must be acquired and attacked for the friendly brigade's mission to succeed. At this point, the staff can answer the first question—What targets should be acquired and attacked?—and begin developing taskings for subordinate units.

Using the event template and DST, the S2 develops the reconnaissance and surveillance (R&S) plan. This plan identifies where and when targets should be found and who's tasked to find them. The aviation LNO plays a key role by ensuring the staff understands the reconnaissance capabilities and limitations of the aircraft available (discussed in the "detect function" section) before R&S tasks are assigned. This precludes false expectations and gaps in the R&S plan. After the commander approves the R&S plan, the plan answers the second question—When and where are the targets likely to be found and who can locate them?

The next step is to develop the AGM. The staff recommends how a target should be engaged. The attack guidance specifies the HPT to be attacked, when, how and any restrictions. The "how" column refers to the target effects desired. The effects can be specified by a subjective term, for example, suppress (S), neutralize (N) or destroy (D).

Again, it's important that the aviation LNO participate in developing the AGM. While "destroy" means 30 percent casualties or materiel damage to an artilleryman (*FM 6-20-1 Tactics, Techniques and Procedures for the Field Artillery Cannon Battalion*), an attack helicopter pilot understands "destroy" to mean that he must kill greater than 70 percent of the enemy force (*FM 1-112 Tactics, Techniques and Procedures for the Attack Helicopter Battalion*). Attack helicopter doctrine doesn't define "suppress" and "neutralize"; it uses the terms "attrit" and "disrupt" instead. Understanding the differences in terminology is critical when assigning tasks to the aviation task force.

The aviation LNO also must address any restrictions, such as the use of dud-producing munitions. If TDA is required, attack helicopters have certain capabilities and limitations, and the aviation LNO must ensure the staff accounts for them during the assess function. Once completed, the AGM answers the last two questions—How should the target be attacked? and Is TDA required?

Detect Function. The detect function focuses on the HPTs designated during the decide function. The key is the R&S plan, which integrates all collection assets. Collectors available to the brigade include intelligence and electronic warfare (EW) systems, Field Artillery target acquisition assets and assets provided by division and maneuver units, including aviation. Before the S2 can assign aviation as a collector, he must understand how these assets can best be directed to collect, process and disseminate the essential targeting information.

For example, the brigade S2 must understand that if continuous observation is required, aviation is probably not the right choice. First, periods of adverse weather ground the aircraft leaving the NAI uncovered. Additionally, remaining in one location for an extended time places the aircraft at risk to SA-14, rocket-propelled grenades (RPGs) and small-arms fire.

An effective technique is to combine aviation with other assets to provide continuous coverage. For example, attaching an infantry scout platoon to the aviation task force enables a single battalion headquarters to cover NAIs with a human intelligence (HUMINT) asset to find the specific target that aircraft alone may not be able to find. The aviation task force can insert, protect and extract this ground force.

If less than continuous observation on a NAI is acceptable, then the S2 must provide the critical times to observe. Too often units allow the aviators to choose the times the NAIs are observed and the critical times are overlooked. For example, if the targeted BSP is resupplied by rotary wing aircraft at end (of) evening nautical twilight (EENT), then EENT is the critical time for observation. The aviation task force must know these details.

Finally, the S2 must not over task the aviation unit by assigning too many NAIs; a good rule of thumb is to assign no more than six NAIs per task force. The aviation LNO can advise the S2 on the times the aircraft can observe the NAIs, based on aircraft availability and fighter management cycles.

In collecting essential targeting information, the OH-58D(I) and the AH-64 Apache are equipped with thermal systems. These systems appear to be infallible. However, it requires little sophistication for the threat to defeat the OH-58D(I) thermal image system (TIS) and the AH-64 forward-looking infrared (FLIR). For example, the enemy can simply shut down vehicles and let them cool to the ambient temperature, making the vehicle invisible to thermal systems. Inexpensive infrared (IR) camouflage nets and IR paint also reduce the visibility of enemy systems. The S2 also must be aware of how weather, moon illumination and IR crossover periods impact aircraft employment techniques.

Both the OH-58D(I) and AH-64 can video tape essential targeting information. These tapes allow the aviation task force S2 to view the information first-hand. Coupled with a good mission debriefing checklist, these tapes are an invaluable tool when processing and disseminating intelligence. If the brigade wants to view the tapes, the S2 should ensure a knowledgeable individual is available to interpret them.

It's essential that target acquisition (TA) assets be used most effectively and efficiently to detect HPTs in a timely, accurate manner. Therefore, clear and concise taskings must be given to the TA systems. The end state of the detect function is a revised R&S plan. If the brigade S2 works with the aviation LNO, then aviation assets will be integrated into the R&S plan.

Deliver Function. After the HPTs have been located and identified, this function executes the attack guidance and supports the commander's battle plan. Attacking these HPTs requires several tactical and technical decisions.

Aircraft	Weapon System	Range
OH-58D(I)	.50 Cal Rounds	2,000 Meters
OH-58D(I)	Stinger Missiles	Excess of 5,000 Meters
AH-64	30-mm Rounds	4,000 Meters
OH-58D(I)/AH-64	Hellfire Missiles	8,000 Meters
OH-58D(I)/AH-64	70-mm Rockets	8,800 Meters

Maximum Effective Ranges of Army Aviation Weapon Systems

Tactically, the brigade staff must determine the time of attack, the desired effects on target and the type of attack system to be used. Considering those tactical decisions, the staff must technically decide the precise delivery means, the number and type of munitions, the unit capable of conducting the attack and the response time.

The staff must understand the attack capabilities of the various aircraft before tasking them as delivery assets. For example, the OH-58D(I) has two wing store stations. On each station, the crew may install one of the following four weapons: .50-caliber machinegun with 500 rounds (left pylon only), seven 70-mm rockets, two Hellfire missiles or two Stinger missiles. In comparison, the AH-64 has four wing store stations. On each of these stations, the crew may install one of the following three systems: 19 70-mm rockets; four Hellfire missiles or an external fuel tank; and, located under the front of the AH-64, a 30-mm machinegun with 1,200 rounds. The three basic types of 70-mm rockets are high-explosive, flechettes and multipurpose submunitions.

The brigade staff should note the limited ammunition capacity of the OH-58D(I) as compared to the AH-64 and plan accordingly. It should task the aircraft, state the desired target effects and allow the aviation task force to determine the weapons load. The table highlights the maximum effective ranges of the two helicopters.

Although both aircraft can range targets in excess of 8,000 meters, most engagements at the JRTC are within 500 meters. At these ranges, the aircraft lose their stand-off capability and are more vulnerable to many threat weapons. The brigade staff needs to factor in risk to the aviation asset based on the range of the engagement.

All aviation task force commanders want indirect fires to suppress the enemy forces they're attacking. This is particularly true of OH-58D(I) units because of the limited amount of ammunition the helicopter carries. However in most situations, aviation units are last in priority for indirect fire support. The staff needs to consider aviation assets for support by indirect fire.

On those targets chosen for engagement by indirect fire, the brigade staff should consider aviation assets as possible observers. JRTC rotations have demonstrated that unobserved fires have had little or no effects on the enemy. The acquisition systems on board both the OH-58D(I) and AH-64, coupled with each aircraft's lasing capability, allow for first-round fire-for-effect missions. The brigade FSO should consider these factors while war-gaming.

Assess Function. Assessing the effects of an attack is always desirable. But the staff must weigh the value of the information gained against the risk involved for the system used to assess the target damage. Because the targeting process focuses on HPTs, future decisions will depend upon TDA. If the risk analysis requires the TDA to be conducted, the same level of detailed planning during the detect function must be accomplished again at this point.

Considerations for using aviation as TDA assets are similar to those already discussed in the detect function. Again, adverse weather may make it impossible for aviation to collect TDA in a timely manner. The same thermal image systems limitations apply, and environmental conditions may not allow for accurate TDA.

When aviation assets are tasked to conduct TDA, the video recorders are good tools. They allow more than one set of eyes to scrutinize the assessment. But using the video recorder isn't a substitution for good pilot debriefings. Pilots often have valuable information that is not captured on the tape.

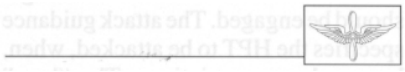
Scenario II. The brigade staff conducted a targeting meeting integrating all players. The brigade task and purpose is to locate and destroy the BSP. Fragmentary Order (FRAGO) 96-08-19 task organized an infantry platoon to the aviation task force and tasked the aviation task force to conduct area reconnaissance and focus on NAIs 4, 5, 9 and 32. The brigade S2 and the aviation LNO worked closely to determine the critical times for the aircraft to be on station.

The aviation task force concept was to insert six ground observation posts to provide continuous observation on the four NAIs and tasked the OH-58D(I)s to observe NAIs 9 and 32 during the critical times. This combined arms team led to the identification of a helicopter landing zone (LZ) and three infiltration routes leading to the BSP.

The brigade S2 viewed the video tape of the LZ and one infiltration route with the pilot who flew the mission debriefing. At the next targeting meeting, the brigade staff revised the plan to task an infantry battalion to attack the target, integrating artillery and attack helicopters. FRAGO 96-08-21 clearly tasked each of the maneuver units. The aviation task force was tasked to occupy an attack-by-fire position, adjust the artillery preparatory fires and overwatch the infantry's assault.

The brigade's revised R&S plan was properly disseminated, and each FSO received the target synchronization matrix. The infantry and aviation task forces received the necessary information early enough to plan, coordinate and rehearse the mission.

At H-hour, the Kiowa Warriors were on station in their attack-by-fire position observing the prep. Once in their assault positions, priority-of-fires shifted to the infantry task force. Using fires and communicating directly with the overwatching aircraft, the infantry attacked the objective. The result was a coordinated attack, destroying the BSP. Mission accomplished.



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MOA Between the US Air Force and US Army for Liaison Support

Editor's Note: *This memorandum was signed by the Chief of Staff of the Air Force (CSAF) General Ronald R. Fogleman and Chief of Staff of the Army (CSA) General Dennis J. Reimer on 1 November 1995.*

1. This document is a Service Memorandum of Agreement between the CSAF and CSA for peacetime and wartime liaison support and supersedes "Concept for Improved Joint Air-Ground Operations," 28 April 1965. References to close air support [CAS] have been deleted from this document and incorporated into *Joint Publication 3-09.3 Joint Tactics, Techniques and Procedures for Close Air Support*. The policies set forth in this Agreement extend provisions for:

a. Exchange of USAF and USA liaison personnel to support training and combat operations of USA maneuver units and USAF operational units and headquarters; and

b. Logistical and administrative support for USAF and USA liaison personnel assigned to sister service installations.

2. The services will implement this agreement upon signature of the CSAF and the CSA and will review it every two years. Review will be initiated alternately between HQ USAF and the Department of the Army on the anniversary date of the current agreement. Offices of primary responsibility: HQ USAF/XO [Executive Officer] and Department of the Army/DCSOPS [Deputy Chief of Staff for Operations and Plans].

I PURPOSE. The purpose of this Agreement is to provide Service guidance to USAF and USA major commands for liaison duties during peacetime training and combat operations.

IIBACKGROUND. The current Air-to-Ground support structure is based upon the precepts of the CSAF/CSA 1965 Agreement, "Concept for Improved Air-Ground Coordination." The USAF provides tactical air control parties (TACPs) to US Army maneuver units, corps through battalion, and the US Army provides ground liaison officers (GLOs) to USAF units, from major command headquarters through squadron level.

The Air-to-Ground support structure set forth by the 1965 Agreement has stood the test of time and several conflicts. However, recent studies and updates in joint doctrine have revealed necessary improvements to the existing structure and prompted a review of service and command guidance, to include the 1965 Agreement.

III SCOPE. The basic provisions of this Agreement apply to all USAF and USA major commands and remain in effect following partial or full mobilization.

IV OBJECTIVE. The objective of this Agreement is to increase the joint capabilities of the USA and USAF and to standardize USA/USAF joint training and combat operations.

V BASIC PROVISIONS.

A. The USAF will provide a TACP to each US Army maneuver unit, corps through battalion, for liaison and terminal control of CAS missions. TACPs will be composed of aeronautically rated USAF officers (air liaison officers and theater airlift liaison officers) and enlisted specialists representing areas of expertise necessary for integrating air support into ground combat operations.

B. The USAF will provide an ASOC [air support operations center] at the corps level as the focal point for air operations to the corps. The ASOC may be an active duty USAF or Air National Guard unit. The ASOC provides Army or allied corps commanders, or their equivalents, with the capability to receive and process requests for immediate air support from subordinate TACPs. They commit allocated sorties to satisfy requests for immediate air support, and they integrate those missions with the supported unit's fire support plan and scheme of maneuver. The ASOC has operational control of subordinate TACPs.

C. The USAF will delineate TACP manpower composition and rank structure, tailored to the Army unit and echelon supported.

D. USAF MAJCOMs [major commands] will align battalion air liaison officers (BALOs) to Army units to enhance BALO support for training and exercises. BALOs will normally be byname aligned to each maneuver battalion for a period of 12 months. Army units and their associated USAF BALOs should actively seek opportunities to train together as frequently as possible.

E. The US Army will field a robust battlefield coordination element (BCE) (or theater equivalent) to USAF air operations centers (or theater equivalent). The BCE [recently renamed battlefield coordination detachment, or BCD] will effectively integrate US Army operational requirements into the ATO [air tasking order] development process. BCEs should participate as often as possible in exercises with appropriate USAF organizations to maintain combat mission readiness.

F. The US Army will assign GLOs to USAF major command headquarters, numbered Air Force headquarters, operational wings and specific squadrons to provide liaison and special staff assistance to the air unit commander. The USAF and USA major commands will determine specific GLO requirements. Department of the Army will provide manpower positions and funding for GLO programs to US Army major commands.

G. The supported unit will provide operational, logistical and administrative support for ASOCs, TACPs and GLOs in accordance with Department of Defense and service directives. Interservice support of those organizations is specified in AR 525-25/AFJM 11-226 [*Army Regulation 525-25/Air Force Joint Manual 11-226 Responsibilities for Tactical Air Control Parties*].

VI IMPLEMENTATION. HQ USAF and Department of the Army will publish policy and guidance to major commands for implementing this Agreement. Major command commanders are authorized to publish command-level joint agreements and regulations to further define operational, logistical and administrative support requirements and responsibilities. Unresolved issues will be elevated to the offices of primary responsibility of this Agreement for resolution.

Report Out:

1996 Senior Fire Support Conference—

Focusing Fires for Force XXI

by Major General Randall L. Rigby

The theme of the 1996 Senior Fire Support Conference was "Joint Fires for Force XXI." Joint fires—mixing the capabilities of Army, Navy, Air Force and Marine Corps assets—enables the commander to accomplish his mission and protect his force. Fires are a prerequisite for successful joint warfare.

The conference, held from 11 to 14 March at the Field Artillery School, Fort Sill, Oklahoma, assembled senior joint leaders to address the challenges of providing fires to the joint force (see the figure). The conference was a keystone event in building the fires of Force XXI, relevant to all warfighters—from the team commander and his fire support team (FIST) lieutenant to a joint force commander (JFC) employing operational fires.

The 1996 conference was the largest in the history of the FA School with 300 official representatives, including 76 general officers; the conference had 49 contractor displays. Participants included senior Marine and Army field commanders. Air Force and Navy representatives, commandants of the branch schools, distinguished retired senior officers, Marine artillery regimental commanders and active and National Guard corps artillery, division artillery and Field Artillery brigade commanders and their command sergeants major. The speakers and discussions highlighted the critical concerns of the joint force, helping to establish a baseline for the Army's approach to joint fires in the 21st century.

At the conference, the Field Artillery School identified seven key issues related to Force XXI fires. We linked each issue to corresponding initiatives here at the school. The initiatives focus our efforts on the critical developments that will make the Army a full partner on America's joint fires team.

1. Fires for Decisive Operations. Decisive operations are just that—the military actions that force the enemy to bend to our will. Fires contribute by supporting maneuver and by achieving decisive effects. The objective of the fire support system is to reduce the enemy's capability to the point that when maneuver forces are committed, they're in the exploitation phase. The issue is how do we ensure overwhelming fire support for the future close fight?

Initiative—Modernization. While many factors contribute to enhancing the commander's ability to fight with fires, only the continued modernization of the Field Artillery will provide overmatching combat power. We must maintain the momentum of modernization.

Organizational design is a critical aspect of modernization, and we've already begun some significant changes. Through our work with the Army Science Board, we revalidated a lesson learned from Desert Storm—one Field Artillery brigade is insufficient to support a committed division. The new allocation is two Field Artillery brigades per division (each with two multiple-launch rocket system, or MLRS, battalions and one cannon battalion).

In addition, the Army recently decided to restructure the cannon battalion from a 3x8 (3 batteries of 8 guns each) to a 3x6 organization. This change will significantly speed our ability to modernize the cannon artillery in the Field Artillery brigades—allowing us to outfit 10 additional Paladin battalions. As part of this restructure initiative, the current MLRS battery in each division will be replaced by an MLRS battalion with two firing batteries, each equipped with nine launchers.

General John H. Tilelli
CG, US Army Forces Command: "Progress Toward Force XXI"

Lieutenant General Ralph E. Eberhart
Deputy Chief of Staff for Plans and Operations (DCSOPS), Headquarters, US Air Force: "An Airman 's Perspective"

Lieutenant General Anthony C. Zinni
CG, I Marine Expeditionary Force: "USMC Fire Support"

Captain James W. Phillips
Head of the Surface Strike Warfare Department, US Navy: "Naval Surface Fire Programs"

Lieutenant General John E. Miller
Deputy CG, US Army Training and Doctrine Command: "Force XXI—The Process to Army XXI"

Lieutenant General Paul E. Blackwell
DCSOPS, US Army: "Warfighting in the 21st Century"

Major General Douglas D. Buchholz
CG, US Army Signal Center: "Future Communications and Information Innovations"

Major General Joseph E. DeFrancisco
CG, 24th Infantry Division (Mechanized): "Fires for the Division Fight"

Major General Leon J. LePorte
CG, 1st Cavalry Division: "First Team Fire and Maneuver in III Corps' Warfighter"

Major General Lon E. Maggart
CG, US Army Armor Center: "Future Mounted Warfare"

Major General James E. Miller
The Adjutant General, Utah Army National Guard: "I Corps Exercise Deep Look"

Major General Charles W. Thomas
CG, US Army Intelligence Center: "Information Dominance and Fires"

Selected Guest Speakers at the Senior Fire Support Conference

These changes will dramatically increase the division's firepower. Where a committed division today could expect to be supported by 96 cannons and 53 MLRS launchers, by the year 2000, that division will have 90 Paladins and 126 launchers. The result will be a more flexible artillery force with a greatly expanded capability to mass fires in support of the division fight.

While organizational initiatives will give us a more modernized, adaptive force, only future materiel developments will provide overwhelming combat power. In the next decade, we'll field Force XXI's "Fires Close Battle Team"—the Crusader howitzer, the sense and destroy armor munition (SADARM), the Bradley fire support team (BFIST) vehicle and the improved Firefinder radar.

Initiative—Develop the How-to-Fight Concept for the Heavy Force. The Field Artillery's main effort must be to bring these new systems into the force and develop concepts for it to deliver the most responsive, precise and decisive fires. Our goal is to lay out a comprehensive concept of how this team will fight and what it will look like at the next Senior Fire Support Conference.

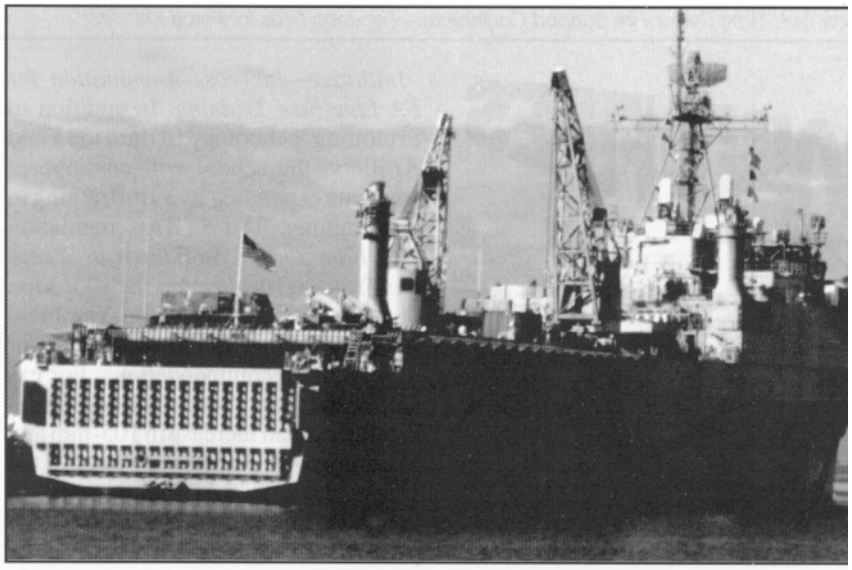
We'll examine additional requirements for the team, particularly in the areas of long-range communications and improved command and control vehicles. We'll test our concepts and link them to a few key organizational and materiel enhancements. If we do it right, we will give the commander the moving "hornet's nest of combat power" envisioned only two years ago in the artillery's vision of the future—Vision 2020 (see the article "Field Artillery Vision 2020" by Brigadier General Leo J. Baxter, December 1994).

2. Shaping Battlespace with Fires. Shaping battlespace means setting the conditions for decisive action. Fires help shape battlespace by limiting the enemy's ability to bring combat power into battle at a time and place of his choosing. Commanders look to the Field Artillery to provide land-based, day or night, all-weather fire support to attack the enemy at depth, to begin shaping the battlespace long before close battle is joined. What can we do to continue to expand our deep strike capability?

Initiative—Develop the Capabilities of the Light Artillery Force. With the expanding capabilities of our light and aviation forces, our growing capacity to exploit joint fire support and suppress enemy air defenses, we can "own" the third dimension. In turn, air supremacy will provide unprecedented opportunities to maneuver light forces at depth where light artillery systems can extend the commander's reach across the battlespace.

The Field Artillery School is participating in an experiment called the Rapid Force Projection Initiative (RFPI) to demonstrate the power of these capabilities. RFPI will outfit a division-ready brigade from the 101st Airborne Division, Fort Campbell, Kentucky, with a suite of advanced hunter-killer systems for a two-year user test beginning in 1998. This force will include a platoon of the high-mobility artillery rocket system (HIMARS) launchers and a battery of surrogates for the Army and Marine Corps future 155-mm advanced towed cannon system (ATCAS).

Complementing the RFPI effort, the Field Artillery is conducting a study to determine the best direct support (DS) and general support (GS) systems for future light forces. After the study is completed this summer, we'll form an integrated concept team, including combat developers and representatives of the light community, to chart a strategy for the development of light Field Artillery systems and fire support equipment. Our goal is to field a family of light Field Artillery systems that can deploy quickly to any theater and support theater-wide air assault operations, providing commanders an unprecedented capability to shape battlespace with fires.



Courtesy of Loral Vought Systems

Conference Speaker Captain Phillips, US Navy, discussed firing an Army tactical missile (ATACMS) successfully from the deck of the *USS Mount Vernon* on 12 February 1995. (Note the launcher on deck under the US flag.)

3. Training a Force Projection Army. The Army of the 21st century will be a power projection force. Our ability to deploy Army fires in support of the joint force is significantly enhanced with the fielding of the C-17 aircraft and prepositioned cannon and MLRS assets. But, projecting the force is more than deployment—it means deploying directly into combat operations without pause.

Our critical task in force projection is having a trained force—a force ready to exploit rapid deploy ability. For the Field Artillery, with two-thirds of our firepower in the National Guard, it's crucial our force is trained to one standard—that's the artillery's critical path to force projection. What should we do to enhance our ability to train the entire artillery force?

Initiative—Use New Technology to Train. We need a significant change in our mindset of how to train reinforcing (R) and GS artillery. All Field Artillery units fight in the maneuver brigade's band of battle. All have to know how to fight and maneuver under the same conditions as replicated at the National Training Center (NTC), Fort Irwin,

"...the Army recently decided to restructure the cannon battalion from a 3x8...to a 3x6 organization."

California; the Combat Maneuver Training Center (CMTC). Hohenfels, Germany; and the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana. The challenge is that there isn't enough room or resources to bring all units to the CTCs. Therefore, we must bring "CTC-like experiences" to the artillery—both for the cannon and the rocket force in the active component and National Guard.

New technologies offer the only feasible means for expanding training opportunities for the total Field Artillery. At the Field Artillery School, we'll continue to maintain quality resident instruction, but our "center of gravity" must be to support the field. We must give both the active Army and National Guard better unit training tools that cover the range of tasks from leader and individual skills to combined arms operations.

One essential tool we're working on is the synthetic theater of war (STOW) that blends live and simulated training environments to expand the CTC training experience. Our goal, within the next year, is to demonstrate how we can expand fire support training without distracting from the "dirt" CTC's emphasis on maneuver brigade combined arms operations. This proof-of-principle experiment will show how an artillery unit at home station provides supporting fires to units at the NTC. These linkages are being expanded to the Marine Corps Air Ground Combat Center (MCAGCC) at Twentynine Palms, California, and the Air Force's Air Warrior Close Air Support Training Center at Nellis Air Force Base, Nevada. Through this experiment and the Field Artillery School's other training initiatives, we'll develop the training tools the field will need in the 21st century.

Initiative—Increase Ammunition for FA Live-Fire Training. In addition to exploiting technology to train the Field Artillery, the school will continue to advocate expanding live-fire training in unit training. The STRAC regulation (*DA Pam 350-38 Standards in Weapons Training*) determines the allocation of ammunition for training. The Field Artillery School is the proponent for developing recommendations. For example, the school recently lobbied successfully for an increase in 105-mm and MLRS training ammunition (see the article "New STRAC Allocations" in the "View From the Blockhouse" department on Page 40).

As the pressure to reduce the cost of live-fire training increases, it is absolutely critical the Field Artillery community articulate its live-fire training requirements. We'll work closely with units in the field to update justifications and develop the most efficient and effective live-fire unit training strategies.

4. Protection Fires. Protecting the force incorporates measures from threat avoidance to preventive attack, guarding the force against the range of threats on the modern battlefield. The joint fires contribution will be in attack operations—destroying threats before they threaten the force. How do we expand fires to most effectively protect the future force?

Initiative—Build the Systems/Munitions to Find and Strike Theater Missiles. Field Artillery has traditionally focused on counterfire operations, integrating intelligence, artillery and fixed-and rotary-wing attack aviation into a powerful counterfire team. In the future, we must expand our expertise to other target sets that will threaten the force. In particular, we must focus on attack operations for theater missile defense (TMD). Tactical missiles are probably the toughest target set a commander will face. If a force can successfully take out the theater missile target set, it's ready for any threat on the battlefield.

We are developing the munitions and systems to find and strike theater missiles. The munitions include the extended-range Army tactical missile system (ATACMS) and the BAT brilliant anti-armor submunition. But, we need fire support command and control at the upper echelons to speed the commander's ability to apply fires, particularly at echelons-above-corps (EAC). We're working on the essential enhancements needed to quickly fuse joint capabilities for the attack of deep targets, such as tactical ballistic missile launchers.

The advanced Field Artillery tactical data system (AFATDS) will be the back-bone of this joint fire support architecture. By this summer, we're committed to having a version of AFATDS that is interoperable with the Air Force's contingency theater automated planning system (CTAPS). The link will allow joint fire supporters to extract relevant information from air tasking orders (ATOs), increase ground situational awareness for the joint force air component commander (JFACC) and speed airspace coordination and clearance of fires. The AFATDS-CTAPS link will provide a leap-ahead capability in coordinating TMD and other deep attack operations that protect the force.

Initiative—Facilitate Sensor-to-Shooter Links and Fire Support Coordination at EAC. In addition, the Army is putting fire support officers (FSOs) and aviation liaison officers (ALOs) on the joint surveillance and target attack radar system (JSTARS) airborne platform as part of the crew. They will facilitate sensor-to-shooter links, improve responsiveness of reconnaissance and target acquisition and help the JFACC interpret the ground situation.

Continued development of the organization of the EAC fire support element (FSE), deep operations coordination cell (DOCC) and battlefield coordination detachment (BCD—formerly called the battlefield coordination element, or BCE) must be a priority for the Army of the 21st century. EAC commanders require an FSE to plan and allocate fire support resources for major campaigns and operations, represent the commander's interests in the joint targeting process and act as a proponent for joint fire issues with the joint staff.

The DOCC coordinates the execution of operational fires. The BCD establishes liaison and is the interface between Army forces and the JFACC to synchronize air-ground operations. Together these key organizations help the land component commander (LCC) reduce duplication in target attack and preclude fratricide. We're developing the doctrinal, materiel and personnel requirements to support each of these organizations.

5. Exploiting Information Dominance. Establishing a dominant advantage over the enemy in critical combat information is a key tenet of Force XXI operations. How do we manage and exploit superior information to more effectively fight with fires?

Initiative—Train with Simulations to Manage Fires in an Information Dominant Force. Developing the expertise to exploit information operations requires simulations that can accurately recreate the "shotgun blast" of combat data we'll see on the future battlefield. We must have a family of simulations and simulators that accurately recreate the challenge of managing fires in an information dominant force. We are improving fire support modeling and creating realtime links between simulations and our digital command and control.

In the last year, we've made significant progress. For example, in the 1995 Advanced Warfighting Experiment (AWE) held during Prairie Warrior, the capstone exercise at the Command and General Staff College, Fort Leavenworth, Kansas, we demonstrated a realtime interface between AFATDS and the Corps Battle Simulation (CBS) used in division and corps Battle Command Training Program (BCTP) Warfighter exercises. The interface eliminates the need for "sim center warriors," soldiers who have to retype every fire mission into a CBS terminal. By linking the computer directly into the command and control system, commanders see more realistic volume and speed of information and in the format that it will appear in their command posts. In the 1996 Prairie Warrior AWE, we'll employ an enhanced version of the interface device.

To help guide our simulation efforts, we've built a simulations test bed at the Depth and Simultaneous Attack Battle Lab, Fort Sill, Oklahoma. Through the battle lab, we'll continue to develop a flexible, robust family of simulations that realistically represent fires.

6. Sustaining the Artillery Force. Force XXI operations seek not only to seize and set the tempo of operations, but also to maintain that tempo over time. We can realize this capability only by sustaining the force.

Operation Desert Storm demonstrated we need to enhance support for the Field Artillery brigades. Because the allocation of the number of Field Artillery brigades per division has doubled, addressing the issue of FA brigade sustainment is even more imperative.

> ***"...we've begun work on a Field Artillery Road Map, an advanced decision management tool that charts our critical path to Force XXI."***

The issue, then, is how do we sustain the artillery force of the future?

Initiative—Work with CASCOM to Develop the Support Structure Required for the Future Force. The Field Artillery School is working closely with the Combined Arms Support Command (CASCOM), Fort Lee, Virginia, on future sustainment concepts to ensure they match the needs of future fire support. This includes a system or structure to sustain the FA brigade.

Initiative—Develop Munitions that Demand Less of the Logistical System. In addition, the Field Artillery is helping overcome the logistics challenge by developing advanced smart and brilliant munitions. Advanced munitions offer the potential to reduce the logistic burden by destroying more targets with fewer rounds. Within three years, we'll field SADARM, the Army's first smart munition, pioneering the way for other smart and brilliant weapons.

The Field Artillery's goal is to match SADARM's success and develop a spectrum of lethality that gives the joint commander the means to attack a wide array of targets in every corner of the battlespace with smart and brilliant munitions. There are many promising technologies; our task is to focus combat developments and experimentation on the most promising.

7. Building a Plan. The Field Artillery School's challenge is to build and maintain a comprehensive plan to see these initiatives through and guide artillery developments well into the 21st century. We must focus our efforts on the most essential doctrinal, organization, materiel, leader and soldier developments to improve the future Field Artillery force.

Initiative—Chart the FA's Course with a Road Map. At the conference, we announced we've begun work on a Field Artillery Road Map, an advanced decision management tool that charts our critical path to Force XXI. It will keep us focused on the key initiatives.

The Road Map will include a comprehensive data base of threat analysis, system overviews and doctrinal, organizational, personnel and other information. It also will be the foundation for the Field Artillery's input into the Army Modernization Plan. The initial version of the Road Map will be distributed to the Field Artillery community this fall.

More to Follow.... In the months ahead, we'll use Field Artillery and our new Fort Sill Home Page on the Internet (see Page 4) to keep you updated on progress with the Road Map and other initiatives discussed at the Senior Fire Support Conference. The home page is on the World Wide Web; the address is hpt://sill-www.army.mil. Through our Internet connection, we'll provide periodic updates on our Force XXI efforts, keeping the joint fire support community informed as we move toward a more lethal, deployable and versatile Field Artillery for the 21st century.

Major General Randall L. Rigby, Chief of Field Artillery, is the Commandant of the Field Artillery School and Commanding General of the Field Artillery Center and Fort Sill, Oklahoma. Other assignments include serving as Deputy Commandant of the Command and General Staff College at Fort Leavenworth, Kansas; Deputy Director for Assessment, J8 of the Joint Staff at the Pentagon; and Executive Officer to the Vice Chief of Staff of the Army, also at the Pentagon. He commanded the 6th Infantry Division (Light) Artillery in Alaska; the 4th Battalion, 4th Field Artillery (now 5th Battalion, 18th Field Artillery), 75th Field Artillery Brigade of III Corps Artillery at Fort Sill; and two batteries: one in the 172d Infantry Brigade (Mechanized), also in Alaska, and one in the 1st Cavalry Division (Airmobile) in Vietnam. Among other positions, Major General Rigby has served in the continental US, Germany and Korea as a G3 for a corps artillery, S3 of a battalion and Executive Officer for both a brigade and battalion.

RAH-66 Comanche—

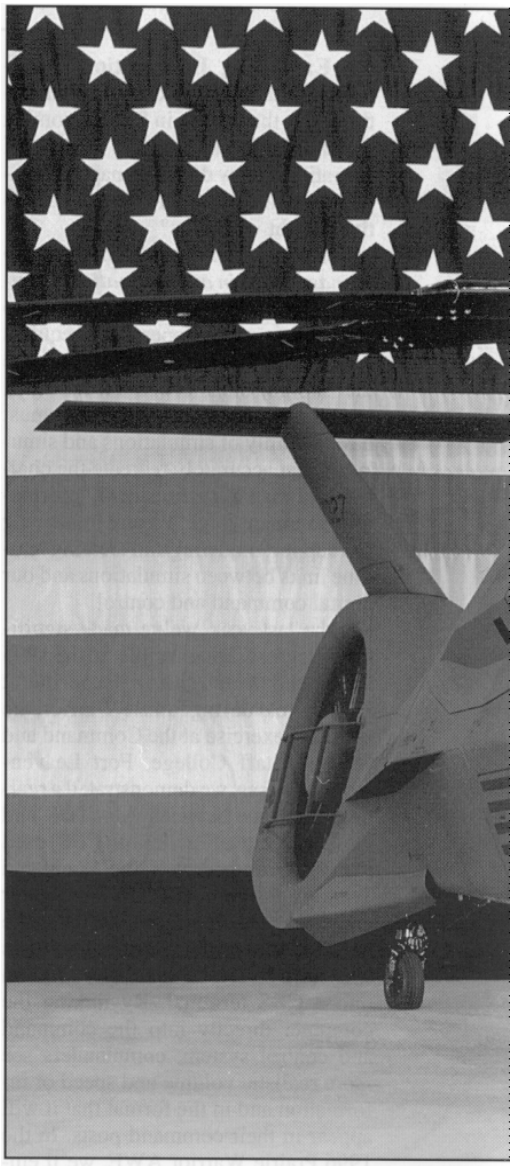
Eyes and Ears for the 21st Century

by Major Eric S. Johnson, AV

The most significant deficiency in Army aviation today is armed reconnaissance....Comanche will be the eyes and ears of the commander on the lethal future battlefield. It must deploy rapidly, see without being seen and inform commanders at many levels. If necessary, the Comanche must influence the battle with organic weapons—precision strike—and at times, the Comanche crew must control the maneuver battle....

Comanche's integrated mission equipment system will share critical information digitally with other members of the Army combined arms team and sister services....and will dramatically compress engagement times in the deep as well as close battles....The most accurate, current, though perishable data [allows the commander] to control battlespace and the environment he is in.

General Gordon R. Sullivan
Chief of Staff of the Army, 15 March 1994



The new RAH-66 Comanche helicopter is designed to maximize the fire support and aviation team as an effective integrated combat force. When fielded after the turn of the century, the Comanche's capabilities will extend the "eyes" of the fire support system, shorten the sensor-to-shooter time line, present a near realtime picture of the battlefield and help synchronize the fight.

As demonstrated in testing, the helicopter's advanced sensors detect and identify threat forces at greater ranges than current aerial platforms. The RAH-66 can detect a target and pinpoint its location to within 15 meters. Its integrated digital architecture allows the crew to format and transmit the information in less than three seconds. The RAH-66 can conduct six fire missions simultaneously with an additional 20 preplanned missions in the system, waiting for execution.

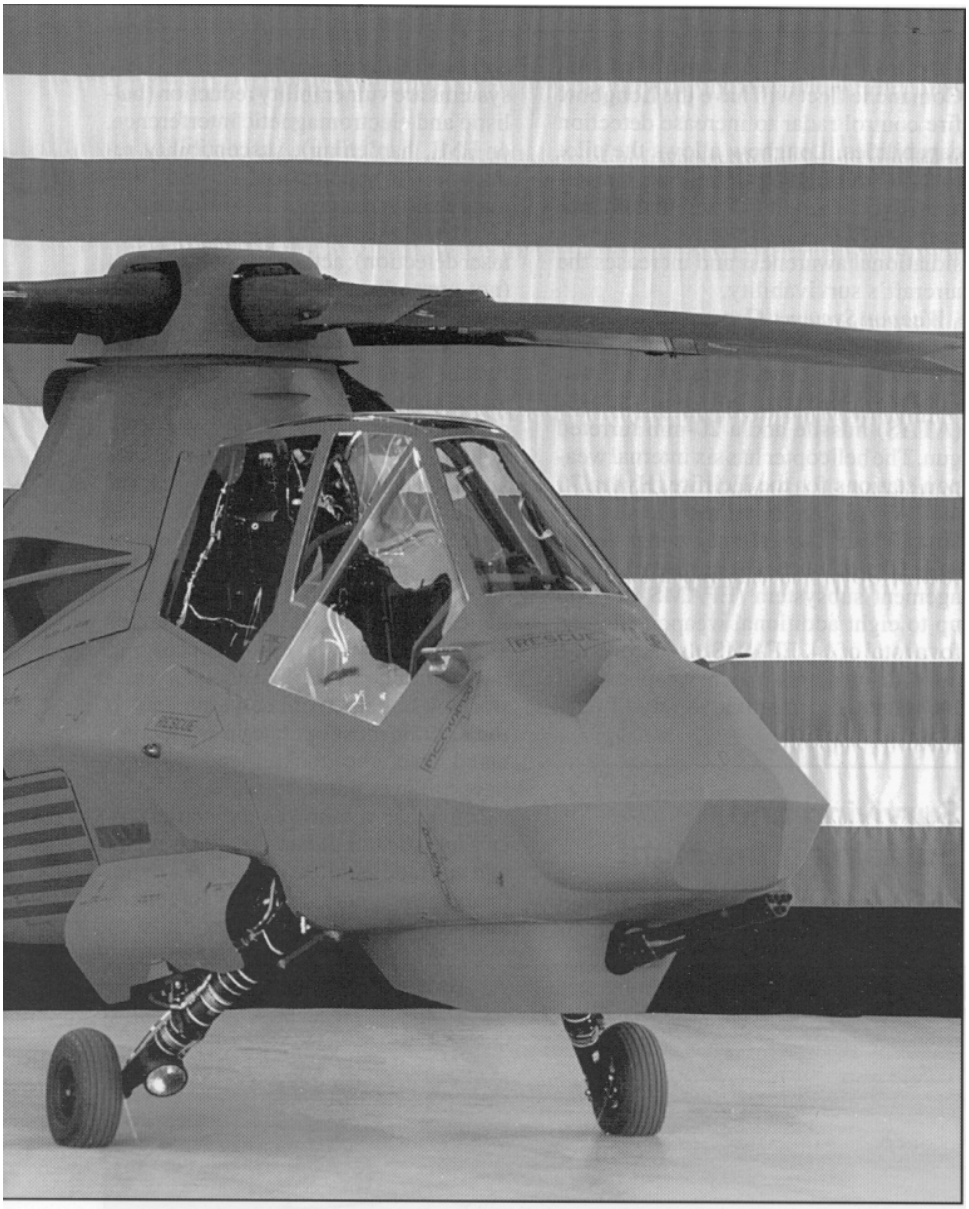
Comanche's integrated communications suite enhances the situational awareness of all forces to help commanders synchronize operations and rapidly engage high-payoff targets (HPTs). These sensors also provide accurate, timely battle damage assessment (BDA) for planning future operations.

Comanche will perform the full spectrum of cavalry, attack and air combat operations. It is a weapon system that can get to the battle, fight, survive and sustain itself to fight again.

Getting to the Battle and Fighting

The RAH-66 is air-transportable by all Air Force transport aircraft. For example, the Comanche can off-load from a C-130 and be ready to fight in less than 22 minutes with minimal personnel and no special equipment. (See Figure 1.)

In addition, using external fuel tanks, the Comanche has an unrefueled self-deployment range of 1,260 nautical miles. This range provides a rapid force projection capability while freeing strategic transport aircraft to carry other high-priority assets.



RAH-66 Aircraft Number 1 rolls out at a ceremony on 25 May 1995 at Stratford, Connecticut.

The Comanche is an extremely maneuverable aircraft with dash speeds of up to 175 knots (325 kilometers per hour), maximum speeds of 210 knots (390 kilometers per hour) and low fuel consumption allowing more than two hours of endurance, plus reserve, for long-range tactical employment. With the addition of external tactical fuel tanks, the Comanche can operate up to three and one-half hours without refueling.

The Comanche receives tactical information on friendly and enemy units via on-board sensors and digital communications; the information is displayed on a full-color digital map so the crew can make tactical decisions rapidly based on the commander's intent, situation and rules of engagement (ROE).

Per Sortie	C-5	C-17	C-141	C-130
Number of RAH-66	8	4	3	1
All Ready to Fight	75 Min	45 Min	35 Min	22 Min

Figure 1: Rapid Deployability. As shown in this figure, the Comanche—RAH-66—is air-transportable. This reconnaissance and attack helicopter also is self-transportable with an unrefueled range of 1,260 nautical miles and can operate off ships.

Mission Processing. Two sets of very high-speed integrated circuit (VHSIC) computers enhance the speed and power of the Comanche's mission processing. Each processor consists of replaceable modules, many common with the Air Force and Navy. If a module fails, the mission processors can reconfigure themselves, allowing the Comanche to remain in the battle and continue its mission despite hardware malfunctions or battle damage.

Communications. The helicopter has the Air Force integrated communications navigation identification avionics (ICNIA) for interoperability and commonality. It also has inter- and intra-service communications in both secure and non-secure voice and digital modes in a variety of different radio functions. The Comanche has two VHF-FM single-channel ground and airborne radio system (SINCGARS) radios, a VHF-AM radio, a UHF-AM radio and a high-frequency (HF) radio for non-line-of-sight communications.

To transmit digital information, the Comanche uses the improved data modem (IDM) that incorporates digital protocols and receives data from the combined arms, joint and combined forces. These protocols include, but are not limited to, the variable message format (VMF), advanced Field Artillery tactical data system (AFATDS), tactical fire direction system (TACFIRE) and Marine tactical system (MTS). The enhanced position location and reporting system (EPLRS) and joint tactical information distributions system (JTIDS) also can be easily incorporated.

Navigation. An embedded global positioning/inertial navigation system (EGI) provides accurate and fail-safe navigation worldwide—even in the absence of terrain features. The system is integrated with other navigational systems and continuously displays the position of its own aircraft on a color digital map to 300 x 300 kilometers of a 1:50,000 scale map. The 1:250,000, 1:1,000,000 and 1:2,000,000 scale maps also are options.

Sensors. The Comanche has a suite of integrated sensors from different spectrums to provide a detailed, near realtime picture of the battlefield. The sensors include the electro-optical target acquisition system (EOTAS), the pilotage system and the Longbow fire control radar.

The EOTAS consists of a day TV, second-generation forward-looking infrared

(FLIR) and laser rangefinder/designator. The FLIR provides at least a 40 percent range increase in target detection and more than a 100 percent increase in target identification when compared to the first-generation FLIR on the AH-64 Apache and OH-58D Kiowa Warrior. EOTAS increases the crew's stand-off range from threat weapons, enhances the precision of target locations for target hand-overs and improves situational awareness.

Using aided target detection/classification (ATD/C), the crew can scan the battlefield using automation and store the imagery to review later from behind masking terrain. Within seconds, this scan can detect, classify and prioritize air or ground targets. ATD/C is integrated with EGI, providing precise target locations and the ability of the crew to select and prioritize threats for attack by precision weapons.

The night-vision pilotage system (NVPS) features pilot selection of second-generation FLIR or image intensification (I^2) to use the best night-vision system for his environmental conditions. Using his helmet-mounted display, the pilot can see flight, navigation and weapon symbology for all operations while looking out of the cockpit.

Approximately one-third of the Comanche fleet will have the Longbow fire control radar to increase detection capabilities. Longbow allows the pilot to "see" through battlefield obscurants and adverse weather. Used in conjunction with EOTAS, it improves the pilot's situational awareness and increases the aircraft's survivability.

Weapon Systems. Comanche weapons include the Hellfire missile (both laser-guided and RF), the Hydra 70 2.75-inch family of rockets, air-to-air Stinger (ATAS) missile and a 20-mm turreted gun. The helicopter has six internal weapon stations for the Hellfire, Hydra 70 and ATAS. As missions dictate, the aircraft can use external wing stores, called the enhanced fuel armament management subsystem (EFAMS), to add up to eight additional weapon stations for a total of 14. EFAMS also allows the pilot to mix and match weapons and fuel tanks to perform a variety of missions.

Surviving and Sustaining the Fight

Increased survivability of the aircraft is the result of an integrated systems approach in designing the aircraft. These systems are vulnerability reduction (ballistic and electromagnetic interference, or EMI, hardening); susceptibility reduction (IR suppression, acoustic signature and radar cross section); passive countermeasures (radar, chemical and laser detection); active countermeasures (not currently required) and self-defense armaments.

Comanche's composite airframe is a further development of the "stealth" technology used on the F-117 and B-2 as well as other low-observable technologies to reduce the signature of the aircraft. (See Figure 2.) However, if the aircraft is detected, it can sustain a hit of up to a 23-mm round and still be operational.

Extensive measures for nuclear, biological and chemical (NBC) protection are provided for the crew. The aircraft has point chemical detectors for early warning to help avoid contaminants. If the aircraft must operate in a contaminated area, the cockpit and avionics bays are over pressurized.

Comanche minimizes the commander's logistic tail. It has a modular repair and upgrade architecture to allow maintenance personnel flexibility for repairs and system developers flexibility as

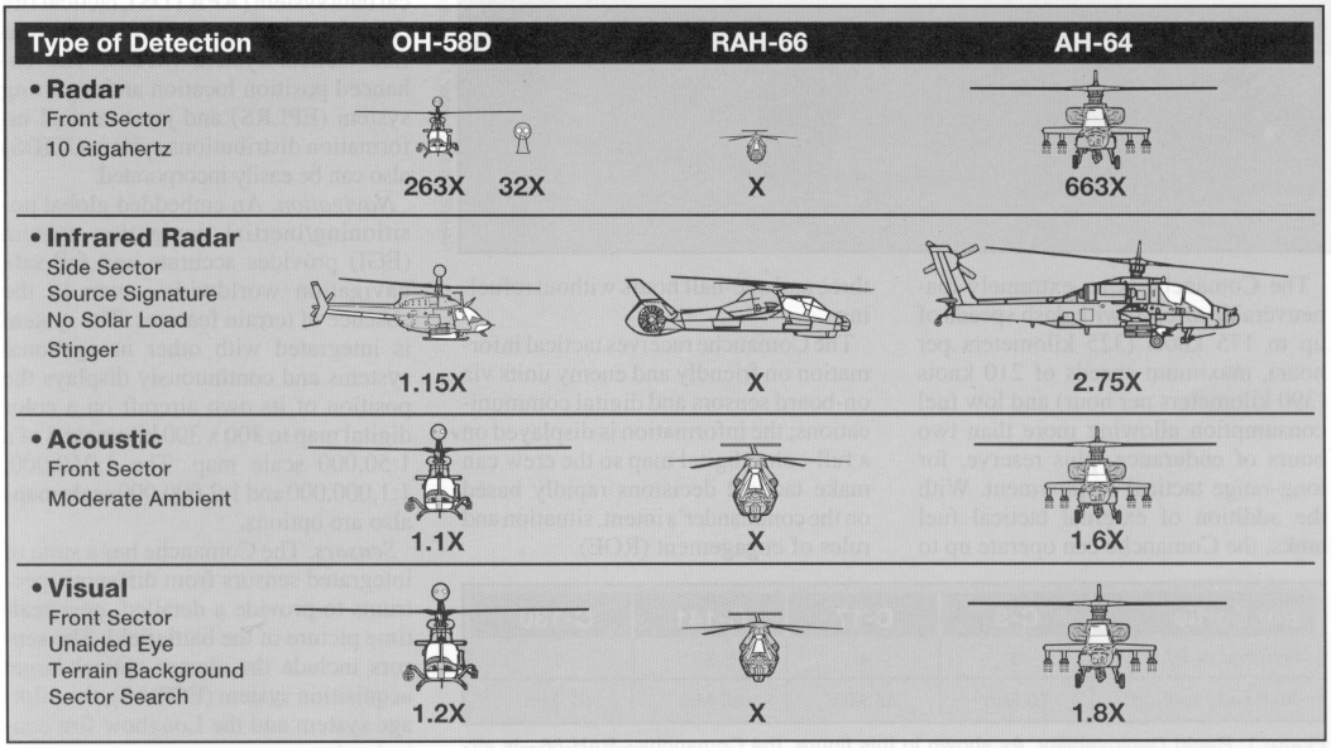


Figure 2: Detectability Comparison. Using the detectability quotient of "X" for the RAH-66 Comanche, the OH-58D Kiowa Warrior and AH-64 Apache are easier to detect—as indicated by the multiples of "X."

technology advances. The two-level maintenance support structure results in simpler remove-and-replace maintenance tasks in the field, requiring only 23 common tools. The Comanche needs significantly fewer maintenance man-hours per flight hour—2.6 hours—than our other helicopters.

Testing the Fleet

Performing the armed reconnaissance and light attack missions, the Comanche ultimately will replace the AH-1 Cobra and OH-58 Kiowa helicopters in the cavalry and attack helicopter battalions in the light/airborne and heavy/air assault divisions. (See Figure 3.) Additionally, the Comanche will be fielded in the target acquisition and reconnaissance platoons and companies of the armored cavalry regiments and special operations forces.

In November 1995, the Training and Doctrine Command (TRADOC) Force XXI "Rock Drill" conducted at Fort Monroe, Virginia, explored tactics, techniques and procedures (TTP) for employing this versatile weapon as a division asset. In the exercise, two 12-aircraft Comanche air cavalry troops conducted continuous armed reconnaissance, security, attack and air assault security operations. The experimental air cav troops were employed with unmanned aerial vehicles (UAVs) to extend their range and coverage and were cued digitally by joint surveillance and target attack radar system (JSTARS), the Army aviation command and control system (A^2C^2S) UH-60 and ground-based command posts. This gave commanders real-time intelligence and situational awareness, culminating in the delivery of lethal precision fires at the decisive time and place. The exercise results indicated that the increased capabilities of the Comanche in the air cavalry troops equated to an additional attack helicopter battalion's worth of combat power for the division.

In the Rock Drill, the Comanche triggered the division's decisive attack on an enemy tank regiment. Using its unique survivability, stealth and advanced target acquisition systems, Comanche penetrated into the enemy's depth, detected and tracked enemy forces, employed other joint and combined arms assets to shape an engagement area and digitally handed-off targets to both extended-range artillery and AH-64D Longbow Apaches. The Apaches fired their radar-guided Hellfire missiles from masked positions at stand-off ranges without being exposed to enemy fires. Remaining on station, the Comanches were able to assess the damage to the enemy and digitally transmit that assessment, which became the decision point to unleash the division's main attack. Comanche was, in effect, the "battlefield quarterback" for the decide, detect, deliver, and assess (D^3A) targeting process.

Air Cavalry Troop 6 OH-58A/C 4 AH-1	8 OH-58D	12 RAH-66
Attack Bn (Light/Airborne Division) 13 OH-58A/C 21 AH-1	24 OH-58D	24 RAH-66
*Attack Bn (Heavy and Air Assault Division/Corps)*13 OH-58A/C 18 AH-64	24 AH-64	9 RAH-66 15 AH-64D

Figure 3: Active Component Aviation Modernization Plan. The objective is to replace OH-58A/C Kiowa scout and AH-1 Cobra attack helicopters with RAH-66 Comanche reconnaissance and attack helicopters in our force structure, except for the AH-64D Longbow Apache helicopters in heavy and air assault divisions and corps.

Another benefit reinforced by the Rock Drill was the effectiveness of Comanche in conducting security operations in an economy-of-force role. Because of its survivability, digital connectivity with other battlefield systems, long-range acquisition capability and lethal weapons, the Comanche can be force-oriented and cued to counter the enemy where he is or is most likely to be. During the Rock Drill, one Force XXI Comanche troop demonstrated its potential to perform security missions that requires an air cavalry squadron today.

The 1996 Prairie Warrior, an annual division-level exercise at the Command and General Staff College at Fort Leavenworth, Kansas, will test Comanche as an advanced system for the mobile strike force. In addition, a series of advanced concept technology demonstrations (ACTD) during a three-year period will experiment with the Comanche survivable armed reconnaissance on the digital battlefield (SARDB) in conjunction with various battle labs and other agencies. These and other exercises and experiments will continue to provide more definitive analyses of potential Comanche operations.

As a result of program restructuring, the Army is getting Comanche into the hands of users as early as possible. The early operational capabilities strategy is providing six prototype aircraft and two test-flight aircraft for evaluations in some 3,800 flight hours. Concurrent with developmental tests and evaluations, we're developing and refining Comanche TTP. The goal is to start fielding the Comanche in the objective force configuration of the Aviation Modernization Plan (Figure 3) in 2006.

The Comanche, with its multi-mission versatility, meets the Army's needs for worldwide armed reconnaissance. Although the aircraft is still in the testing phases, it's already clear the Comanche will be a catalyst for exciting innovations in combined arms doctrine and TTP as the commander's eyes and ears on the 21st century battlefield.

Major Eric S. Johnson, Aviation, has been the Assistant Training and Doctrine Command (TRADOC) System Manager for Communications, Navigation and Identification (CNI) Avionics on the Comanche at Fort Rucker, Alabama, since 1993. Previous assignments include command of two air cavalry troops, one in the 11th Armored Cavalry Regiment in Germany and the other in the 4th Squadron, 17th Cavalry at Fort Bragg, North Carolina. Other assignments include serving as Aide-de-Camp to the Deputy Commander of V Corps in Germany; Detachment Commander in Task Force 118 at Fort Bragg supporting Operation Prime Chance in the Persian Gulf from 1988 to 1990; and Assistant Brigade Adjutant of the 18th Aviation Brigade and Aeroscout Platoon Leader for the 18th Aviation Company, both also at Fort Bragg.

Fires for Attack Helicopter Operations

by Captain Michael J. Forsyth

The challenge for fire supporters is to understand the subtle differences between fire support tactics, techniques and procedures (TTP) for an attack helicopter battalion and those for an infantry or armor battalion. Fire support field manuals are written from the perspective of ground maneuver operations. No manual addresses fire support TTP for the newest maneuver element, the attack helicopter battalion.

Although the principles of fire support are the same, the tactics are often different. This article discusses the differences discovered by aviation fire supporters in the 101st Airborne Division (Air Assault), Fort Campbell, Kentucky, and offers TTP to meet some of the unique challenges of providing fire support for the attack helicopter battalion.

Organization and Mission

An AH 64 Apache attack helicopter battalion is arguably the most powerful battalion in the United States Army today. A battalion that can synchronize and employ fire support assets as well as employ its organic firepower is an effective combination on the modern battlefield. The job of the fire support officer (FSO) in the attack helicopter battalion is to plan, prepare and execute a fire support plan to capitalize on the capabilities of all available systems.

The attack helicopter battalion is organized as shown in Figure 1. Each line company has two platoons: one scout platoon equipped with four OH-58 Kiowas and one gun platoon with six AH-64 Apaches. Each Apache carries an ordnance load tailored for the mission, including Hellfire missiles, 2.75-inch rockets and 30-mm rounds.

Under the Aviation Restructuring Initiative (AR1), the line companies are in the process of converting into the structure shown in Figure 2. Each company has two platoons: a scout platoon with three Apaches and an attack platoon with five Apaches. This structure is an interim organization until the RAH-66 Comanche helicopter is fielded after the turn of the century. The objective attack helicopter company in the heavy and air assault divisions and the corps will include a scout platoon with three Comanches and an attack platoon with five Apache Longbow helicopters.

The fire support element (FSE) is attached to the attack helicopter battalion from the division artillery. The current modified table of organization and equipment

Courtesy of McDonnell Douglas Helicopter Company

Soldiers conduct pre-flight checks of Apaches fully uploaded with Hellfire missiles for a deep attack mission.

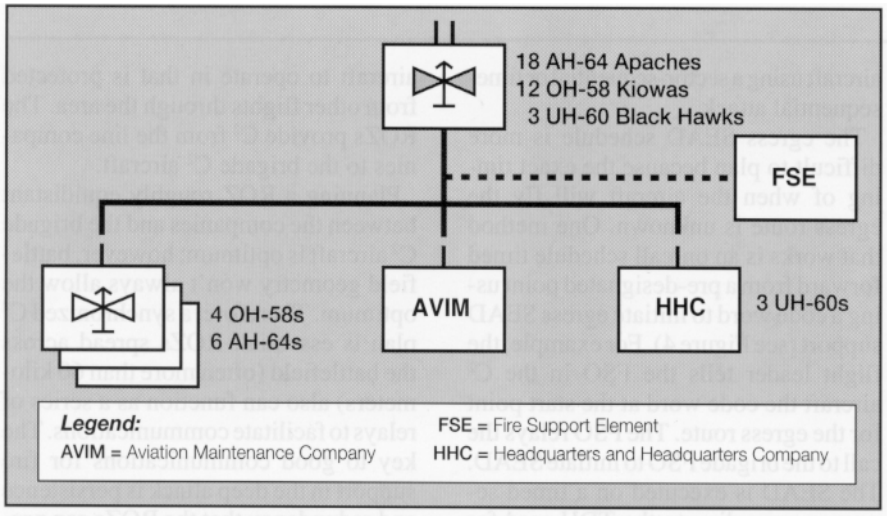


Figure 1: Attack Helicopter Battalion Organization. This organization is found in the heavy and air assault divisions and in the corps. Each line company has a scout platoon of four OH-58 Kiowas and an attack platoon of six AH-64s Apaches.

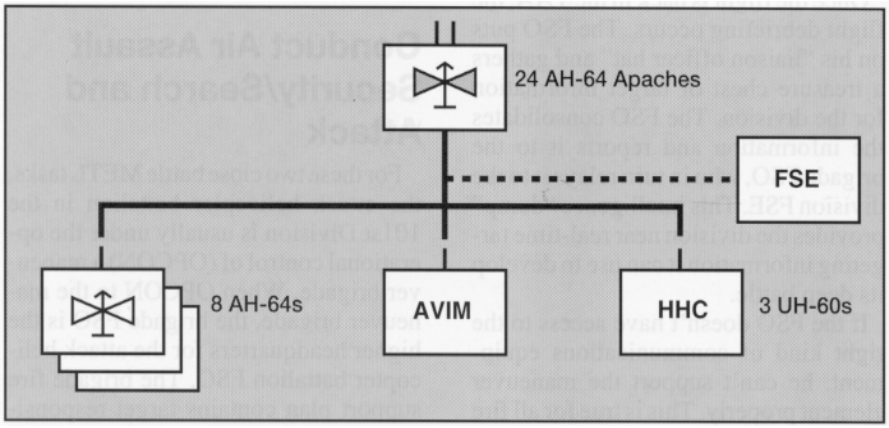


Figure 2: Attack Helicopter Battalion ARI Organization. The Aviation Restructure Initiative (ARI) is moving attack helicopter battalion organization in the heavy and air assault divisions and the corps toward this structure. The battalion includes three line companies as shown, each with a scout platoon of three AH-64 Apaches and an attack platoon of five Apaches.

(MTOE) in the 101st Division authorizes one captain FSO and one sergeant first class fire support NCO (FSNCO). A recent request to change the MTOE would add two fire support specialists, enhancing the FSE's ability to conduct 24-hour operations.

The FSE has a high-mobility multipurpose wheeled vehicle (HMMWV), one VRC 92 single-channel ground and airborne radio system (SINCGARS), a VRC 90 SINCGARS and a forward entry device (FED). Changes proposed to the MTOE would add one UHF radio set, increasing the communications range. The 101st Div Arty has the initial fire support automation system (1FSAS), which allows the FSE to plan fires, battle track and execute fire support digitally.

The attack helicopter battalion fights deep and close. Its FSO must understand how the battalion fights and what the scheme of maneuver is for each mission. In any operation, there are unique considerations and opportunities for the FSE to influence the battle.

Conduct a Deep Attack

This mission-essential task list (METL) task is always against division high-payoff targets (HPTs). Normally, the battalion receives the mission from 48 to 72 hours before time-on-target. The battalion begins the orders process by planning, preparing and executing according to a time line.

A generic mission entails an attack using multiple flight routes for ingress and egress into the target area. The range from the tactical assembly area (TAA) to the engagement area (EA) varies; however, typical deep missions range from 100 to 300 kilometers. In a recent exercise conducted by the 101st Aviation Brigade, the range was 148 nautical miles one way. This demonstrates the tremendous range of the AH-64 with auxiliary fuel tanks.

Looking at this mission, a fire supporter asks what are the considerations and assets available to support the mission. The priority-of-fires in this mission is force protection through suppression of enemy air defenses (SEAD).

SEAD comes in many forms for a deep attack. If lethal SEAD is used, FA fires are the first choice, but the limited range of cannon artillery won't support missions of such long distances. This means the division will have to allocate other assets to provide SEAD along the entire route from crossing the forward line of own troops (FLOT) to the EA. These assets include Air Force aircraft for air interdiction, electronic warfare (EW) and close air support (CAS) in the EA, creating a joint air attack team (JAAT). Additionally, naval gunfire can provide force protection for the flight. If there aren't enough SEAD assets already available to the attack helicopter battalion, the FSO requests additional assets to support the mission.

The key to successfully synchronizing fire support with maneuver and fires of the attack helicopter battalion is the FSO's integration into the battle staff. As in any maneuver battalion, the FSO must be intimately familiar with the enemy situation and the friendly scheme of maneuver.

Knowledge of enemy air defense artillery (ADA) assets along the flight route with the range fans for each system is essential in planning suppressive fires. Ideally, the FSO nominates ADA targets for destruction by air interdiction before the mission so the ADA threat is minimal. If this isn't possible, then the FSO plans suppressive fires.

As important as it is for the FSO to know the enemy situation, he also must know the speed of the flight through the threat range fans. The FSO gets that information from the attack planners (aviators trained in Apache flight planning) in the S3 shop in the form of the time-distance heading (TDH) card.

The TDH card has the air speed between checkpoints and the precise times the flight will hit each checkpoint—to the second. With this card and the enemy ADA range fans plotted on his map, the FSO schedules SEAD fires to cover the flight route. To convert air

speed in knots to kilometers per hour and precisely schedule ADA target suppression along the route, the FSO uses the chart in Figure 3.

The ingress schedule is a time-driven event schedule and is planned backward from H-Hour (the time the first Hellfire missile impacts). It's the ideal way to provide SEAD fires for ingress. Air Force CAS is preplanned to be on station at a specific time when the Apaches are working the EA. When the aviators are in their battle positions, they call the air liaison officer (ALO) in the command and control (C^2) aircraft or the FSO who contacts the pilots and pushes them down to pre-designated communications net. The Apaches then have terminal control

Ground Speed	KMPM
1 Knot/01.85 KMPH	0.03
2 Knot/03.70 KMPH	0.06
3 Knot/05.56 KMPH	0.09
4 Knot/07.41 KMPH	0.12
5 Knot/09.26 KMPH	0.15
6 Knot/11.10 KMPH	0.19
7 Knot/12.96 KMPH	0.22
8 Knot/14.82 KMPH	0.25
9 Knot/16.57 KMPH	0.28
10 Knot/18.52 KMPH	0.31
20 Knot/37.04 KMPH	0.62
30 Knot/55.56 KMPH	0.93
40 Knot/74.08 KMPH	1.24
50 Knot/92.60 KMPH	1.54
60 Knot/111.12 KMPH	1.85
70 Knot/129.64 KMPH	2.16
80 Knot/148.16 KMPH	2.47
90 Knot/166.68 KMPH	2.78
100 Knot/185.20 KMPH	3.09
110 Knot/203.72 KMPH	3.40
120 Knot/222.24 KMPH	3.70
130 Knot/240.76 KMPH	4.02
140 Knot/259.28 KMPH	4.32
150 Knot/277.80 KMPH	4.63

Figure 3: Chart for Converting Air Speed in Knots to Kilometers per Hour (KMPH) and Kilometers per Minute (KMPM). An aircraft flying, for example, 100 knots ground speed will travel 185.20 KMPH and 3.09 KMPM.

of the Air Force aircraft using a sector-sequential or time-sequential attack.

The egress SEAD schedule is more difficult to plan because the exact timing of when the aircraft will fly the egress route is unknown. One method that works is an on-call schedule timed forward from a pre-designated point using a code word to initiate egress SEAD support (see Figure 4). For example, the flight leader tells the FSO in the C^2 aircraft the code word at the start point for the egress route. The FSO relays the call to the brigade FSO to initiate SEAD. The SEAD is executed on a timed sequence according to the TDH card for the route and the ADA threat along that route.

Once the flight is back in the TAA, the flight debriefing occurs. The FSO puts on his "liaison officer hat" and gathers a treasure chest of target information for the division. The FSO consolidates the information and reports it to the brigade FSO, who in turn relays it to the division FSE. This intelligence "dump" provides the division near real-time targeting information it can use to develop its deep battle.

If the FSO doesn't have access to the right kind of communications equipment, he can't support the maneuver element properly. This is true for all fire supporters, but it has some different connotations in an attack helicopter battalion. The FM radio, the fire support community's radio of choice, doesn't have adequate range for the battalion's deep attack mission.

The FSO flies in the C^2 aircraft with the battalion S3, S2, ALO and a recorder. From that location, he facilitates fires from the line companies to the brigade FSE. Although the primary communications link is FM, the FSO should use the additional radios in the C^2 aircraft. These include HF, VHF and UHF nets from the line companies to the FSO and then to the brigade FSO. These assets not only provide net redundancy, but they also increase the communications range for a deep attack. The radio frequencies and nets are stated in the operations order and rehearsed at the maneuver and fire support rehearsals to ensure constant communications.

When the S3 plans the battalion's C^2, the FSO must be involved in this process. The aviation battalion C^2 plan uses a system of restricted operating zones, called ROZs. Each ROZ is a zone for aircraft to operate in that is protected from other flights through the area. The ROZs provide C^2 from the line companies to the brigade C^2 aircraft.

Planning a ROZ roughly equidistant between the companies and the brigade C^2 aircraft is optimum; however, battlefield geometry won't always allow the optimum. Therefore, a synchronized C^2 plan is essential. ROZs spread across the battlefield (often more than 60 kilometers) also can function as a series of relays to facilitate communications. The key to good communications for fire support in the deep attack is persistence and redundancy that the ROZs can provide. The FSO must be part of the planning process for the ROZs.

Conduct Air Assault Security/Search and Attack

For these two close battle METL tasks, the attack helicopter battalion in the 101st Division is usually under the operational control of (OPCON) a maneuver brigade. When OPCON to the maneuver brigade, the brigade FSO is the higher headquarters for the attack helicopter battalion FSO. The brigade fire support plan contains target responsibilities, any allocations, assets available, priorities of fire and restrictions.

A generic air assault is divided into three phases. The first is the condition-setting phase. This is the phase in which the attack helicopter battalion FSO can have the most influence on the operation. By definition, "setting the conditions" is bringing about the specific conditions required by the brigade commander to commit his brigade to active operations in the vicinity of the landing zone (LZ). For example, the conditions might be "all enemy ADA assets in the vicinity of the LZs are destroyed, no maneuver units above squad level are able to operate in the vicinity of the LZs and no indirect fire weapon systems can fire on the LZs."

The second phase is the air assault. The possibility of fratricide by indirect fires increases significantly once boots hit the LZ. Correspondingly, the availability of indirect fires to support the attack helicopter operations greatly diminishes as indirect fire assets shift priority-of-fire to committed ground elements. The Apaches' role during this

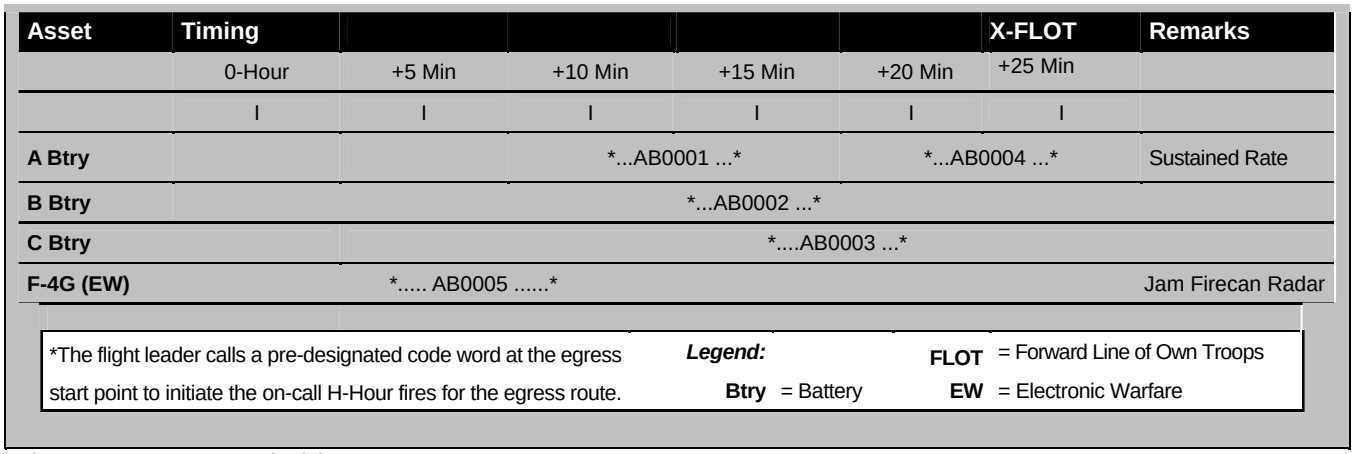


Figure 4: Egress SEAD Schedule

phase is to provide close support to the ground elements and maintain a protective ring around the ground areas of operation.

Phase three is search, attack and expansion of the lodgement area. The attack helicopters still cover the ground elements. The opportunity to use fire support in this phase is to employ planned fires with the Apaches to destroy enemy counterattack elements.

Planning. The attack helicopter battalion generally has priority-of-fires of indirect systems during the first phase of the operation—the condition-setting phase. The attack helicopter battalion's mission is reconnaissance and hasty attacks in the zone to achieve the brigade commander's conditions.

The key to the companies using fire support is keeping the plan simple. The brigade usually does a thorough job of targeting, so there's no need for a lot of additional targeting. The fewer the targets, the easier it will be for a pilot to execute them. The pilots have many tasks to perform in the cockpit and very little room for overlays or fire support plans.

One planning technique is to synchronize the named areas of interest (NAIs) the pilots must observe with the planned targets. The brigade FSO's targets and the S2's reconnaissance and surveillance (R&S) plan both are based on the S2's enemy situation template. The pilots always are responsible for part of the R&S plan. By associating NAIs and planned targets, the FSO makes the fire plan easy for the pilots to use. The FSO simply writes in the target list work sheet "Remarks" column the NAI associated with that target. The FSO reduces the work sheet on a copy machine so it fits on the pilot's knee board for cockpit use. The pilot then easily can refer to the targets as he checks his NAIs and can execute the planned target, as necessary.

After the operations order is issued, thorough products are a must to ensure the companies know all fire support coordinating measures (FSCM), friendly unit locations, targets, priorities-of-fire and the assets available. Each company needs a detailed overlay with the FSCM, targets and unit locations. Each company command post uses this overlay for its pilot briefings before a mission.

A technique to make sure companies update their situation maps with current fire support information is to disseminate the plan to the company pilots and ask each company commander to appoint a warrant or commissioned officer to be the fire support point-of-contact, who also updates the map. The commander usually doesn't have time to update fire support information himself, but having an officer in charge of fires allows him to give it the emphasis it requires.

Preparation. Because the attack helicopter battalion has limited assets, a deliberate targeting meeting, as such, is unnecessary, especially in an already tight orders process. But an informal targeting meeting to walk through the targeting process helps the battalion prepare for the air assault security/search and attack mission. It helps the battalion focus on what to attack, when to attack it and with what asset.

Some targets are best attacked immediately with the Apache's organic direct fire assets—an 82-mm mortar is one example because it shoots and scoots. The Apache may want to attack other targets using direct fire in combination with indirect fire; for example, the pounding capabilities of indirect fire enhances the helicopter's direct fire on a dug-in air defense weapon site. Going through the targeting process during war-gaming focuses the battalion on the HPTs. The HPT list should mirror the brigade list with specific attack criteria for the attack helicopter battalion.

A good fire support rehearsal is a must, but it is extremely difficult to execute. The companies don't have FSOs, so there are no fire supporters for the rehearsal. Company commanders are very busy—asking them to do a separate fire support rehearsal is something that is not on their agenda.

The first solution is for the FSO to integrate fire support into the battalion maneuver rehearsal. Second, a separate, concise fire support rehearsal is needed to reinforce understanding of the fire plan. The FSO should ask the company commanders to stick around for 10 minutes after the maneuver rehearsal for a quick fire support rehearsal.

Preparation is the key to making the rehearsal go smoothly and fast and also for demonstrating its utility to the commanders who have to execute the plan. A tool that will make it concise and reinforce understanding is target cards summarizing what the pilots need to know to execute the targets. Each card has the target number, associated NAI, grid, purpose, trigger and the asset planned to attack the target.

The FSO walks the commanders through the plan from start to finish, using the cards to cue the commanders on the pertinent information concerning each target. The FSO should copy the cards for them so the commanders can use them while he talks to them.

Before a mission is executed, a thorough pilot briefing is the FSO's final opportunity to reinforce the fire support plan. After verbally briefing the pilots,

the FSO provides them a knee board-sized copy of the briefing (see Figure 5).

Execution. One of the unique capabilities of the Apache is its laser that achieves first-round fire-for-effect in indirect fire missions. When an Apache engages a target, the laser gives the pilot an eight-digit grid to the target. The pilot then can send this grid to the FSE and put indirect fires on the target along with direct fires, significantly increasing the effects on the target.

Call-for-Fire

FM Net Primary:_____
Alternate: _____
FSE C/S: _____
FSCM_____
_____

Friendly Artillery Positions

DS Arty _____ Bn Mortars _____
DS Arty _____ Bn Mortars _____
DS Arty _____ Bn Mortars _____
GS Arty _____ NGF _____

CAS Available

Type_____
Time_____
Call Sign _____
Frequency _____
IP _____ Abort Code_____
Laser Code _____

Legend:	=	
CAS	=	Close Air Support
C/S	=	Call Sign
DS	=	Direct Support
FSCM	=	Fire Support Coordinating Measures
FSE	=	Fire Support Element
GS	=	General Support
IP	=	Initial Point
NGF	=	Naval Gunfire

Figure 5: Fire Support Pilot Briefing. Before a pilot executes a mission, the FSO briefs him on the information in this figure and then reduces the information to a "knee-sized" board for the pilot.

Though the Apache has this lasing capability, the FSO must realize the aircraft is not an observed-fire platform exclusively. Its mission is to destroy enemy vehicles, built-up positions and personnel. If an Apache hovers in one place to observe indirect fire, the aircraft becomes a target for the enemy. Therefore, the aircraft must move around continuously. To maintain eyes on the target, the pilot can hand-off the target to his wingman or store the target in the aircraft computer. This enables the aircraft to move continuously for survivability.

Fire mission processing is conducted either in a centralized or decentralized manner. In the decentralized mode, the pilots may contact the firing unit directly with fire missions. This is a speedy process; however, there are pitfalls.

First, clearing fires is more difficult. In the close battle, clearance is usually obtained through the FSO on the ground; the aircraft normally operate in a ground maneuver unit's zone. After a mission is sent directly to the firing unit, the attack helicopter battalion FSO must step in to obtain clearance from his ground counterpart.

The second pitfall could be the training level of the pilot observing the fire. Although it might be faster for the pilot to call the firing element directly, a poorly transmitted fire mission will slow the process down as the fire direction officer (FDO) deciphers the information. The battalion FSO must ensure proper missions are sent to the fire direction center (FDC) and that his pilot/observers are trained to perform this task.

Centralized fire mission processing, although slower, positively clears the fires for every mission because each mission is routed through the FSO. The pilot sends the fire mission to the attack helicopter battalion FSO who immediately checks for clearance. He then sends the mission to the FDC via voice or digital means.

With pilots whose observed fire skills are rusty, the battalion FSO can ensure the information from the pilots is in the proper format before it's sent to the FDC. If pilot observed fire skills need work, centralized clearance of fires is the best option and will save time in the long run.

Future Challenges

By far the biggest challenge for the attack helicopter battalion FSE is communications. As mentioned, maintaining communications at ranges of 150 kilometers with the AH-64 is difficult for the FSE with its FM radios. The UHF or VHF radio, with its utility and redundancy, would make an excellent addition to the TOE. In the interim, the FSE can leverage the attached ALO's ability to communicate with the aircraft using his high-frequency radios.

Another big challenge for attack helicopter battalion FSOs is educating their aviation counterparts. The FSO in an attack helicopter battalion is still a relatively new concept. Not all aviators have "grown up" with a fire supporter in their units. Our maneuver counterparts in the infantry and armor know how to work with fire supporters and what fires can do for them. But many aviators are still unsure of what fires can do to enhance their operations.

It's imperative for the attack helicopter battalion FSO to build a team and win the confidence of his aviation unit. The result will be increased lethality for the attack helicopter battalion and the aviators' strong trust in their FSO.

The last challenge is the lack of written doctrine. Although the principles of fire support are the same, application can be quite different. Solid standing operating procedures (SOPs) and continuity files from FSO to FSO are interim fixes.

The FSO in the attack helicopter battalion can play a huge role in shaping and influencing the battlefield. We, in the fire support community, must use all assets available to bring the lethality of indirect fires to bear along with the destructive direct fires of the attack helicopter.

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Planning Fire Support for Attack Helicopters

Text and Photographs by Captain Richard S. Richardson

Combined arms warfare produces effects that are greater than the sum of the individual parts... The application of combined arms in this manner is complex and demanding. It requires detailed planning and violent execution by highly trained soldiers and units who have been thoroughly rehearsed.

FM 100-5 Operations

"To survive and succeed on the battlefield, the attack helicopter battalion must fight as an integrated member of the combined arms team"—as stated in *FM 1-112 Attack Helicopter Battalion.* Also as members of the combined arms team, fire supporters can help our aviation brethren "survive and succeed."

Fire support in the attack helicopter battalion is much more than suppression of enemy air defenses (SEAD). Fire support can play a broader role in helping the attack helicopter battalion execute its missions. This article focuses on techniques to integrate fire support as an effective combat multiplier during the attack helicopter battalion planning process.

Aviation Fire Support

Fire support for the attack helicopter battalion is fundamentally the same as fire support for any ground maneuver battalion. However there are some key differences.

Supporting Artillery. The attack helicopter battalion and aviation brigade have no habitually related artillery in direct support (DS). Normally, the attack helicopter battalion receives its artillery fire support from the organization it is attached to or operationally controlled (OPCON) by. This support usually comes from division or corps general support (GS) artillery.

Fire Support Element (FSE). The attack helicopter battalion FSE is not as robust as its ground maneuver counterparts. In addition, unlike its ground counterparts, the attack helicopter company has no fire support team (FIST). The battalion fire support officer (FSO) must rely on scout and attack helicopter aircrews to execute the commander's scheme of fires.

Planning. The aviation brigade FSE does much of the fire support planning for the attack helicopter battalion. The key role of the attack helicopter battalion FSO is to plan and execute fire support for the battalion fight.

Fire Support Planning

The attack helicopter battalion commander's greatest challenge is to synchronize and concentrate all of his combat power at the critical time and place. The goal of fire support planning is to integrate fire support into battle plans to optimize this combat power. The FSO works with the battalion staff to translate mission, enemy, terrain, troops, and time available (METT-T), weather and guidance from higher headquarters and the commander's guidance into the final scheme of fire support. Figure 1 lists typical attack helicopter fire support considerations.

The fire support planning process can be summarized in three steps: mission analysis, course of action (COA) development and war-gaming (including targeting and the development of the decision support template and the fire support and observation plans).

1. **Mission Analysis.** In this first step in the planning process, the FSO analyzes the mission using the following information; fire support asset allocation and status, brigade commander's intent and concept of fires, fires planned by higher headquarters in zone and limitations and constraints.

> • FSO Technique: Train your battalion fire support NCO (FSNCO) to conduct the mission analysis in your absence during high-tempo operations.

To analyze the mission, the FSO first must clearly understand the commander's guidance for fire support. Too often, this guidance reads something like, "suppress enemy air defenses, mass indirect fires to destroy the enemy and execute targets of opportunity, as required." This vague guidance rarely produces a coordinated plan that supports the scheme of maneuver and focuses observers and supporting artillery.

FM 6-20-20 Fire Support at Battalion Task Force and Below, dated 27 December, 1991, states, "The commander's intent serves to prioritize fire support on the battlefield and focus fire support execution at the critical time

Phase: Ingress/Egress

Consider planning—

- Fires on enemy ADA weapons that are a threat along ingress and (or) egress routes.
- Fires on enemy ADA C^3, acquisition and tracking radars.
- Fires to suppress enemy direct-fire weapons that could be used in an air defense role along the routes.
- Smoke to restrict enemy observation and optical ADA acquisition and tracking systems.

Consider preparation fires on BPs and in the EA if the advantages outweigh the disadvantages—

- Will the enemy be forewarned of an attack?
- Will the loss of surprise significantly affect the chance of success?
- Are there enough significant targets to justify a preparation?
- Is there enough fire support ammunition to fire an effective preparation?
- Can the enemy recover before the effects can be exploited?
- Will smoke and dust from the preparation degrade attack helicopter observation and gun/missile engagements?

Determine when and how you will shift fires based on one or more of the following—

- Time: At what predetermined time will fires shift?
- Location: When friendly forces reach what location will fires shift (i.e., when the maneuver unit reaches a certain location, such as a phase line)?
- On Call: Shift fires when the maneuver commander directs.
- Event: By what predetermined event will fires shift?

Phase: EA

Consider planning—

- Fires to suppress ADA weapons or direct-fire weapons capable of use in an ADA role.
- Fires to suppress, neutralize or destroy in order to delay, disrupt, limit or attrit enemy forces to help accomplish the mission.
- Fires to suppress enemy forces as friendly elements maneuver.
- Smoke to obscure the enemy force's vision.
- Fires to isolate enemy formations.
- Fires to support disengagement.
- The allocation of priority targets.
- Trigger points for possible moving targets.
- CFZs around battle positions.
- FASCAM to slow or canalize the enemy.

On obstacles, plan—

- Fires behind obstacles to hinder enemy breaching operations.
- FASCAM (if available) to re-seed minefields the enemy has breached.
- Fires to close gaps and lanes in barrier or obstacle plans.
- To integrate obstacle indirect fires to complement direct fires.

Phase: Beyond the EA

Consider planning fires to—

- Suppress or destroy overwatching ADA weapons.
- Impede enemy reinforcements.
- Block avenues of approach for counterattacking enemy forces or repositioning ADA weapons.
- Slow or block the enemy's retreat.
- Interdict enemy follow-on formations.

Legend:

ADA	=	Air Defense Artillery	**CFZs**	=	Critical Friendly Zones
BPs	=	Battle Positions	**EA**	=	Engagement area
C^3	=	Command, Control and Communications	**FASCAM**	=	Family of Scatterable Mines

Figure 1: Attack Helicopter Fire Support Considerations

and place. To be useful, the commander's intent for fire support must be both understood and feasible. This requires a mutual effort by FSOs and supported commanders to articulate and understand exactly what fire support can and is expected to accomplish during an operation. The commander's requirements of the fire support system must be within the capabilities of the resources available—adjusted as necessary for METT-T factors. The FSO must know and communicate fire support capabilities, limitations and risks during the process of developing the commander's intent for fire support."

- Who will indirect fires affect? Answer: The enemy formation or other HPTs.
- What are the desired effects? Answer: To destroy, neutralize, suppress (with assigned numbers and types of vehicles) in order to delay, disrupt, limit, etc.
- How will this be accomplished? Answer: Field Artillery, mortars, CAS, EW, etc.
- Where will it be accomplished? Sample Answers: At EA Red, at TRP1, at target AV2001.
- When will it occur? Sample Answer: When the forward security element is identified, as the 1st MRC crosses DP1.
- How will the task contribute to our success? Sample Answer: Allow B Company to maneuver to BP21.

Legend:

BP =	Battle Position	**EW** =	Electronic Warfare
CAS =	Close Air Support	**HPTs** =	High-Payoff Targets
DP =	Decision Point	**MRC** =	Motorized Rifle Regiment
EA =	Engagement Area	**TRP** =	Target Reference Point

igure 2: Quick Decision-Making Checklist. When planning time is limited, the ommander must give specific guidance in the quick decision-making process. The uestions listed in this figure help the FSO keep the commander's responses specific and es focused to accomplish the mission.

- FSO Technique: The commander's guidance should address the following: enemy formation to be attacked, enemy function that is unacceptable, desired effects and purpose (the maneuver reason for effects).

- FSO Technique: Artillery effects desired can be addressed as those listed in *FM 6-20-10 The Targeting Process*, using the terms: disrupt, delay and limit. These terms apply to the effect that the damage has on the target as it pursues a COA:

"Disrupt" prevents the enemy from carrying out his function in the method he intends. Example: "Disrupt the advance guard's ability to fix our screening force."

"Delay" causes that function or action to happen later than the enemy desires. Example: "Delay 2d Motorized Rifle Company (MRC) until A & B Companies destroy the 1st MRC."

"Limit" prevents that action or function from happening where the enemy wants it to happen. Example: "Limit the advance guard's use of the ridge to position its air defense weapons."

An example of clear commander's guidance is "Disrupt the combined arms reserve 2d Motorized Rifle Company's ability to fix B & C Companies until B & C Companies destroy the 1st MRC with direct fire."

- FSO Technique: When planning time is limited, you can help the commander give specific guidance in the decision-making process to help prioritize fire support and focus it at the critical time and place by asking specific questions (see Figure 2).

2. COA Development. During this phase, the FSO and staff should translate the commander's guidance into a concept of fires for each COA.

- FSO Technique: Determine three things. First, the concept of fires in terms of task, purpose, method and end state that achieves the effects required (see the example in Figure 3). Second, determine the tentative triggers and fire support coordinating measures (FSCM); and third, determine the tentative observer focus and positioning.

3. War-Gaming. The war game is the process where the FSO turns the concept of fires into a detailed scheme of fires. The result of the war game is a clear sequence of fire support events with detailed triggers, FSCM and an observer plan. In addition, the staff clearly identifies attack systems, the volume of fires required and high-payoff targets (HPTs).

During the war-gaming process of thinking through the action-reaction-counteraction of each COA, the FSO recommends the concept of fire support that best supports each COA. As the friendly and enemy COA are "fought" in the war-game, the FSO and staff determine how to integrate fire support with the scheme of maneuver. The FSO recommends fire support employment options and determines how fire support will be used with direct fire weapons and maneuver in time and space.

Targeting. This process is an integral part of the detailed war-game of the chosen COA. Targeting is identifying enemy targets for possible engagement and determining the appropriate attack system to achieve the desired target effects. The emphasis of targeting is on identifying the enemy function or formation he can least afford to lose to accomplish the friendly mission.

To be effective, targeting must be an integral part of engagement area (EA) development and direct fire planning. And most important, targeting decisions must support the commander's intent to affect the target in the way the commander desires.

Targeting in the attack helicopter battalion is not as formal as targeting in the brigade. However, the concept of the process, which identifies HPTs and eventually evolves into attack guidance, is still

- **Task:** Disrupt the 2d MRC.
- **Purpose:** Prevent the 2d MRC from engaging B & C Companies while they destroy the 1st MRC.
- **Method:** A Company eyes on 2d MRC deep with MLRS triggered to fire on the 2d MRC as it enters EA Gold.
- **End State:** 2 BMPs destroyed, flank 2S6s suppressed and 2d MRC unable to engage attack companies.

Legend:

BMPs	:	Soviet-Made Infantry Combat Vehicle
EA	:	Engagement Area
MLRS	:	Multiple-Launch Rocket System
MRC	:	Motorized Rifle Regiment

igure 3: Sample Concept of Fires. For each ourse of action (COA), the FSO determines ie concept of fires that will achieve the esired effects.

valid and useful at the battalion level. The HPT list (HPTL) and the attack guidance matrix (AGM) specify what targets are to be acquired and attacked, when they are to be acquired and attacked and what is required to achieve the commander's effects.

The battalion may not develop its own formal HPTL and the AGM or it may use or modify the HPTL and attack guidance developed by brigade and higher FSEs. No matter which products are developed, the focus at the battalion level is to determine the critical information required to detect, prioritize and engage appropriate targets. The bottom line is attack battalion targeting must be time-sensitive and practical.

Targets should be developed by the targeting team: S3 (operations), S2 (intelligence), electronic warfare officer (EWO) and FSO. Targeting as a team ensures the targets are synchronized with and supported by the enemy situation and scheme of maneuver. The FSO advises the targeting team on the fire support system's ability to defeat high-payoff or other designated targets, the best means of attack and the best type of munitions to achieve the commander's desired results.

Targeting during the war game might go something like this: Armed with the S2's situation and event templates, high-value targets and commander's guidance, the targeting team interacts during war-gaming to develop targeting products. As the staff fights the different options during the war game, the S2 identifies specific high-value targets and the collection means available to acquire these targets (including the FSO's observation plan).

- FSO Technique: With the S3, use your knowledge of friendly weapons systems to determine if a capability exists to attack the high-value targets with lethal and non-lethal assets.

Using this knowledge of friendly attack capabilities and the knowledge of enemy vulnerabilities, the S2 then analyzes and predicts the enemy's response to each attack method. This analysis determines if the attack of the high-value target is necessary to ensure the success of the friendly mission. The high-value targets that meet the criteria of being acquirable, attackable and necessary to ensure friendly force success are designated HPTs and recorded on the decision support template (DST) for that phase of the battle.

As part of the battlefield calculus during EA development, the FSO should consider—

- How many vehicles will enter the EA?
- How long will the enemy be in the EA?
- How many rounds can I fire during that time?
- How many vehicles will these rounds kill or suppress?
- Can we kill him in the numbers required?

Before a target number is assigned and the target placed on the map, the targeting team should ask—

- What is the purpose of the target?
- Does this target reflect the commander's intent?
- Is this target in synch with the intelligence preparation of the battlefield (IPB)?
- Can this target be observed and triggered?

Figure 4: FSO's Targeting Team Checklist for Engagement Area (EA) Development

In addition, as part of HPT development, the targeting team determines when to acquire and attack targets while also deciding the best means of attack. Knowing target vulnerabilities and the effect a method of attack has on an enemy operation allows the staff to propose the most efficient acquisition and attack means available and the time to attack.

- FSO Technique: With the targeting team, use the aviation mission planning system (AMPS) or terrabase and tactical sensor planner software as tools to identify enemy weapons and radars that can affect friendly operations.

- FSO Technique: Figure out what fire support assets can actually accomplish to meet the commander's guidance. Consider the questions listed in Figure 4 as part of your battlefield calculus during EA development.

Decision Support Template. The DST is developed as the commander and staff form the operations plan during the war-gaming process. War-gaming identifies the decision points (DPs) for the commander while the DST graphically portrays those DPs and the options available to the commander if an action occurs.

The DST identifies the critical fire support triggers on the battlefield and is an aid to the commander and staff in synchronizing the battlefield operating systems. It provides the FSO the information he needs to plan fire support that's synchronized with direct fire and maneuver.

Fire Support Plan. The plan is based on the detailed scheme of fires developed during war-gaming. (See Figure 5.) The fire support execution matrix

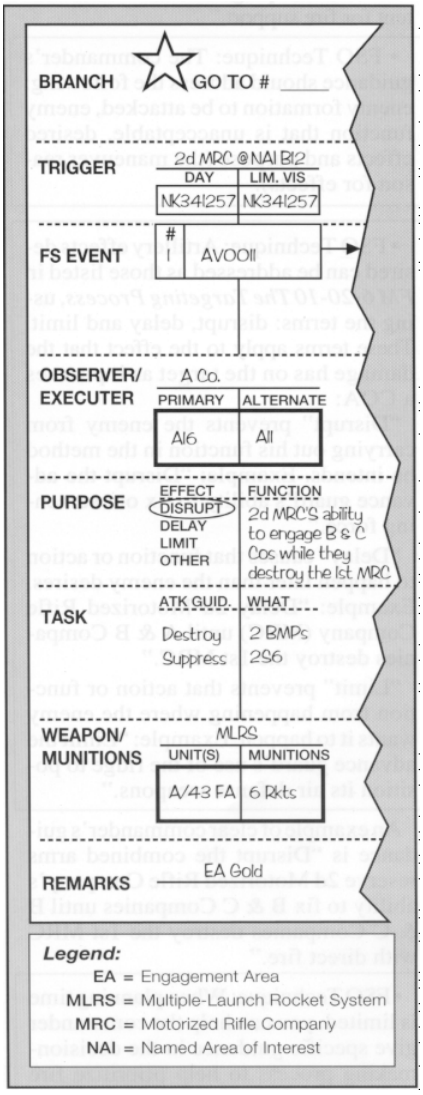

Figure 5: Scheme of Fires. The fire support plan is based on the detailed scheme of fires developed during war-gaming.

- Commander's Guidance for Fire Support
- Availability of Fire Support Assets and their Status
- Fire Support Execution Matrix (with a clear sequence of fire support events)
- Target List
- Priority of Targets and Engagement Criteria (listing the type of target to attack first and how to attack—high-payoff target list, or HPTL, and attack guidance matrix, or AGM)
- Observation Plan (who observes/fires each target and where each primary and secondary observer is positioned to see the trigger/target)
- Priority of Fires (which element receives fire support in case of competing demands)

Figure 6: Fire Support Plan Checklist

(FSEM) and detailed observer plans are the fire support products developed during the war game. (See Figure 6 for the fire support plan checklist.)

The fire support plan must articulate the critical time and place to focus fires, who will trigger and control the fires, where the observer will position himself to see triggers and targets, which targets to shoot (number and type of vehicle, formation, etc.), when and where to shoot them, what target effects are desired, which type of indirect weapon and munition will achieve the commander's desired results and the purpose of shooting the target.

Observation and Execution. If a target is important enough to target, it's important enough to assign an observer to control fires. Because attack helicopter companies don't have assigned FISTs, the battalion FSO normally assigns observer responsibilities to the companies. However, the FSO must receive bottom-up refinement from the companies on the details of their observation plan to validate their ability to execute the battalion fire support plan. All targets should have alternate observers assigned in case the primary observer is unable to fire the target.

- FSO Technique: Use the AMPS or terrabase to analyze terrain to determine observer line-of-sight and help select observation posts.

With no FISTs in the companies, the FSO carefully decides where he and his FSNCO should locate for mission execution. He normally has four options: locate with the battalion commander, S3, battalion command post or tactical command post. He positions himself and his FSNCO to best support the commander's concept of fires. But the type of aircraft used by the commander and S3 and the radio capabilities of any airborne command and control post affect the FSO's decision.

The FSO and S3 also decide how the observer will send fire missions and spot reports to the fire direction center (FDC). The FSO usually requires observers to send all fire missions through him or the FSNCO. This way, the FSO can clear fires and ensure the missions support the scheme of fires and commander's concept.

In addition, the attack helicopter battalion may require an aerial or ground radio retransmission team to talk over long distances to the supporting artillery. The FSO also may request quick-fire channels to facilitate rapid communications with the supporting artillery. This is usually most effective when supported by division or corps GS assets.

The attack helicopter battalion FSO and company commander rehearse the fire support plan.

Attack helicopter battalions typically receive missions to attack second-echelon and reserve forces, stop enemy penetrations and to conduct screens forward or to the flanks of the ground maneuver forces. For these missions, the attack helicopter battalion often needs to fire into the ground maneuver zone of action, requiring careful clearance of fires. FSOs develop and coordinate maneuver and fire support control measures to safeguard friendly elements and ease rapid clearance of fires outside the battalion's zone. In addition, the FSO develops plans to control and coordinate indirect fires within the attack helicopter battalion's subordinate units.

- FSO Technique: To clear fires, the FSO establishes and practices positive controls (maneuver control measures and FSCM); establishes simple procedures for external (adjacent and higher) and internal (company) clearance of fires and includes them in standing operating procedures (SOPs); and uses aviation brigade liaison teams for detailed coordination with external units.

The combat power of the attack helicopter battalion is most effective when synchronized with massed indirect fires. The FSO plays a crucial role during the planning process to integrate these fires. As a combat multiplier available to the attack helicopter battalion commander, fire support plays a key part in the application of firepower and maneuver.

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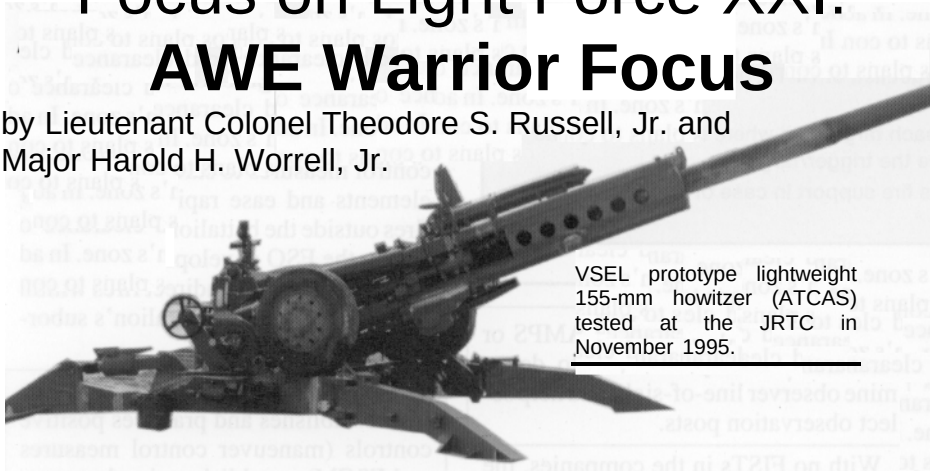
Focus on Light Force XXI: **AWE Warrior Focus**

by Lieutenant Colonel Theodore S. Russell, Jr. and Major Harold H. Worrell, Jr.



VSEL prototype lightweight 155-mm howitzer (ATCAS) tested at the JRTC in November 1995.

Evolving information technologies are shaping the development of weapons systems and the way we fight. These changes challenge us to consider the way we think about our staff and units and the information flow between them. Integrating these technologies, we'll one day link commanders and battle staffs into a seamless, automated architecture.

Soldiers of the 2d Brigade Combat Team, 10th Mountain Division (Light Infantry), Fort Drum, New York, recently participated in Warrior Focus, an advanced warfighting experiment (AWE). Sponsored by the Dismounted Battlespace Battle Lab from Fort Benning, Georgia, the experiment culminated in a rotation at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana. The AWE tested a number of advanced technologies, digital communications and information systems integrated across the battlefield operating systems (BOS) of a light force.

The JRTC rotation provided a rigorous opportunity to test these systems during two weeks of intense, almost non-stop, force-on-force battles against the highly trained opposing force (OPFOR). This experiment provided Army leaders insights into the future of the digitized battlefield and will influence the requirements for doctrine, organizations, training, leadership, materiel and soldiers of tomorrow's light forces.

The Bottom Line. During the AWE execution, some of the equipment issued to individual soldiers provided exceptional warfighting capabilities. Fire supporters deployed with digitized units could see and engage targets at greater distances with improved accuracy. They had better information as to the location of friendly and enemy forces on the battlefield and could mass combat power at the decisive point faster than the enemy. They also could disseminate precise information across the battlefield in near-real time. All these capabilities were combat multipliers. Some systems designed to digitize the individual soldier were promising but not ready for the AWE because they weren't rugged enough, degraded fighting at their point of development or lacked reliability.

Battalion and brigade battle staffs integrated into the digitized command, control, communications, computers and intelligence (C^4I) architecture could observe, orient, direct and act faster than the enemy's ability to react. Precise intelligence received within near-real time helped focus the decide-detect-track-deliver-assess targeting methodology by assisting in the collection, dissemination and analysis of target information. Targets were attacked within established target selection standards (TSS). Improved situational awareness contributed to more effective battle tracking, counterfire operations and clearance of fires.

Real-time, shared situational awareness also provided some insights on how to fight from split-based command and control nodes where a smaller set of C^4I systems deployed forward while the main command post (CP)—the brigade tactical operations center (TOC)—remained at the lodgment or an intermediate staging base (ISB).

System Review. Of the more than 60 systems introduced into the experiment, 10 systems were tested by fire supporters. The training and orientation plan that prepared units for the JRTC was a multi-echeloned and iterative process that began with new equipment training (NET) in April of 1995 and culminated in November with the rotation. The following is a brief summary of the AWE systems used by fire supporters.

• *Advanced Field Artillery Tactical Data System (AFATDS).* The Warrior Focus AWE was the first time AFATDS was fielded to a light unit. The AWE's primary objective was to test the interoperability that might result from integrating AFATDS with other digitized systems. AFATDS terminals were fielded to the direct support (DS) FA battalion and the division, brigade and battalion fire support elements (FSEs).

Although some modifications in its software are needed, AFATDS improved command and control, fire planning and fire direction. The user-friendly data base and speed of computation resulted in faster fire planning and tactical fire direction.

AFATDS' ability to continually display and update automated situational maps made shared situational awareness possible among fire support nodes. This real-time situational awareness significantly enhanced battle tracking and clearance of fires. Advanced decision aides embedded in the software helped develop target attack criteria and integrate a wider range of attack assets, including mortars, close air support (CAS) and naval gunfire.

• *Advanced Towed Cannon System (ATCAS).* The ATCAS lightweight 155-mm howitzer will provide the joint force commander a lethal early entry system that requires fewer airlift assets. A four-gun "ATCAS" firing platoon from C Battery, 3d Battalion, 8th Field Artillery, part of the 18th Field Artillery Brigade at Fort Bragg, North Carolina, consisted of two fire control test-bed M198 howitzers and two ATCAS prototypes—one from Vickers Shipbuilding and Engineering Limited (VSEL) and one from Royal Ordnance, both companies from England. The firing element was employed as a reinforcing unit to the organic 105-mm battalion supporting the 2d Brigade Combat Team during the JRTC rotation.

The two ATCAS prototypes weighed approximately 9,000 pounds and could fire high-and low-angle missions within 6,400-mils. Both howitzers provided responsive

fires and increased lethality to the level of current systems that have a 30-kilometer range using assisted projectiles.

The ATCAS howitzer is equipped with a system of digitized components similar to the Paladin howitzer design, which enables the light howitzers to mass fires from greater dispersed locations, enhances firing accuracy and increases responsiveness. Both prototypes demonstrated their mobility in occupations and displacements during the high tempo of the force-on-force exercise. Their responsiveness was excellent in providing a 6400-mil firing capability. They also could deliver all special munitions designed for the 155-mm howitzer.

•*Gun Laying and Positioning System (GLPS).* A reliable and durable system, the GLPS was the solution to the age-old dilemma of waiting for the position area survey needed to deliver accurate, predicted fire. The tripod-mounted positioning and orienting device consists of a gyroscope, electronic theodolite, precision lightweight global positioning system (GPS) receiver (PLGR) and a short-range eye-safe laser rangefinder.

GLPS can orient and provide position area survey for each howitzer with universal transverse mercator (UTM) coordinates to 10 meters circular error probable (CEP), 10 meters in altitude probable error (PE) and 0.4 mils in azimuth PE from an established orienting station. Firing battery advance parties could easily carry the tripod and carrying case and provide their own survey control upon entry into an area of operations. This system provided a much needed capability for light force firing units.

•*Lightweight Laser Designator and Rangefinder (LLDR) Surrogates.* Several devices were issued to fire support team (FIST) personnel for testing. The forward observer's (FO's) ranging and marking system (FORMS) is a hand-held, multipurpose night binocular that allows the user to view targets at night and select the bearing, range and time to target out to five kilometers. FORMS was the only LLDR surrogate tested that could designate targets with a laser once acquired.

The mini-eye-safe laser infrared observation set, AN/PVS-6 (MELIOS), provides a laser rangefinder weighing only four pounds (6.5 pounds with tripod) with an effective range out to 9,555 meters. Because of its capabilities, the MELIOS eventually replaced the FO and FIST binoculars. MELIOS was permanently issued to the FIST as part of a force modernization initiative.

The man-portable target location device (MTLD) will integrate the MELIOS with a compass, GPS receiver and forward entry device (FED). This system will send observer and target data digitally. Although it was used during training at Fort Drum, it was not ready for final testing at the JRTC.

• *Mortar Fire Control System (MFCS).* Issued to the digitized light infantry battalion, the MFCS provided digital position navigation, fire control and situational awareness. Position navigation was accomplished with a PLGR and dynamic reference unit (DRU).

Digital fire control was accomplished through a lightweight computer unit (LCU), and digital communications occurred through the use of the AN/PSG-2D digital message device (DMD) interfaced with the single-channel ground and airborne radio system (SINCGARS). Individual mortar sections also were issued the PLGR and M1A1 collimator (infinity aiming reference). The MFCS could interface with AFATDS to track mortar firing locations and attack priority targets in the close fight.

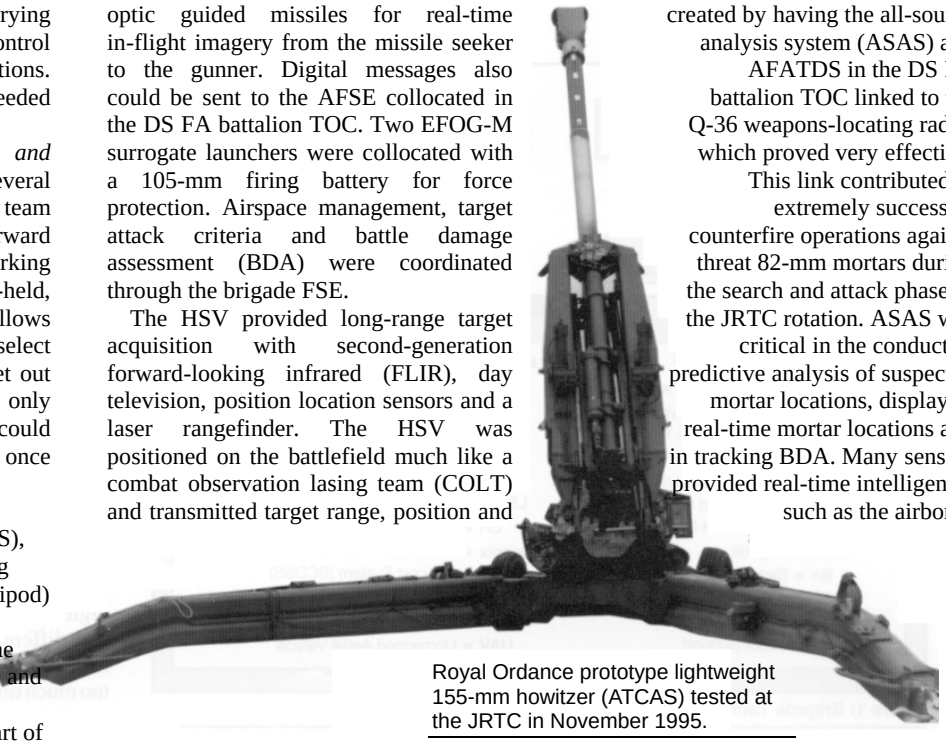
• *Rapid Force Projection Initiative (RFPI).* The RFPI involves three separate but interrelated systems employed in a fire support role: the enhanced fiber optic guided missile (EFOG-M), Hunter surrogate vehicle (HSV) and automated FSE (AFSE). The EFOG-M used fiber optic guided missiles for real-time in-flight imagery from the missile seeker to the gunner. Digital messages also could be sent to the AFSE collocated in the DS FA battalion TOC. Two EFOG-M surrogate launchers were collocated with a 105-mm firing battery for force protection. Airspace management, target attack criteria and battle damage assessment (BDA) were coordinated through the brigade FSE.

The HSV provided long-range target acquisition with second-generation forward-looking infrared (FLIR), day television, position location sensors and a laser rangefinder. The HSV was positioned on the battlefield much like a combat observation lasing team (COLT) and transmitted target range, position and visual imagery to the brigade TOC through the AFSE. Together these three systems were a potent sensor-to-shooter link in the attack of high-payoff targets (HPTs).

Experimental Insights. The Warrior Focus AWE focused not only on testing new systems in a realistic tactical environment, but also on gaining insights into possible changes in organizations and doctrine driven by these new capabilities. The experiment demonstrated that improvements in lethality, survivability and tempo can be achieved with the application of digital information systems and advanced technologies to light combat forces. The Warrior Focus AWE provided a snapshot of Force XXI.

• *Situational Awareness*. One of the main objectives of the digitized battlefield is situational awareness. The AWE's increased situational awareness enabled commanders and battle staffs to plan, direct, make decisions and mass combat power at the decisive point more quickly.

During the experiment, some aspects of situational awareness worked well. Digitally linked intelligence collection assets provided assured knowledge of enemy unit locations and disposition, enhancing our ability to attack targets throughout the brigade's battlespace. Synergy was created by having the all-source analysis system (ASAS) and AFATDS in the DS FA battalion TOC linked to the Q-36 weapons-locating radar, which proved very effective. This link contributed to extremely successful counterfire operations against threat 82-mm mortars during the search and attack phase of the JRTC rotation. ASAS was critical in the conduct of predictive analysis of suspected mortar locations, display of real-time mortar locations and in tracking BDA. Many sensors provided real-time intelligence, such as the airborne



Royal Ordance prototype lightweight 155-mm howitzer (ATCAS) tested at the JRTC in November 1995.

reconnaissance low (ARL) and HSV. These systems provided accurate target location and BDA useful for predictive analysis and focused future collection efforts on HPTs.

Situational awareness supports two critical processes—battle tracking and the clearance of fires. Throughout the experiment, situational awareness was achieved with those units or systems that could communicate in the digital network. Non-digitized elements in the brigade combat team's battlespace necessitated a manual battle tracking system. Firing battery advance party operations, for example, had to be tracked and input manually because the forward entry device (FED) could not transmit data through the brigade-and-below command and control (B^2C^2) system. Air defense systems, communications nodes and some intelligence sensors faced similar dilemmas.

The result was a hybrid system of battle tracking. Information that could not be sent automatically across the digital network was entered into the system manually or tracked with the use of a map and voice radio transmissions. Although these work-arounds were cumbersome and time-consuming, the combination of digital and manual battle tracking techniques were essential in dealing with the risks of fratricide.

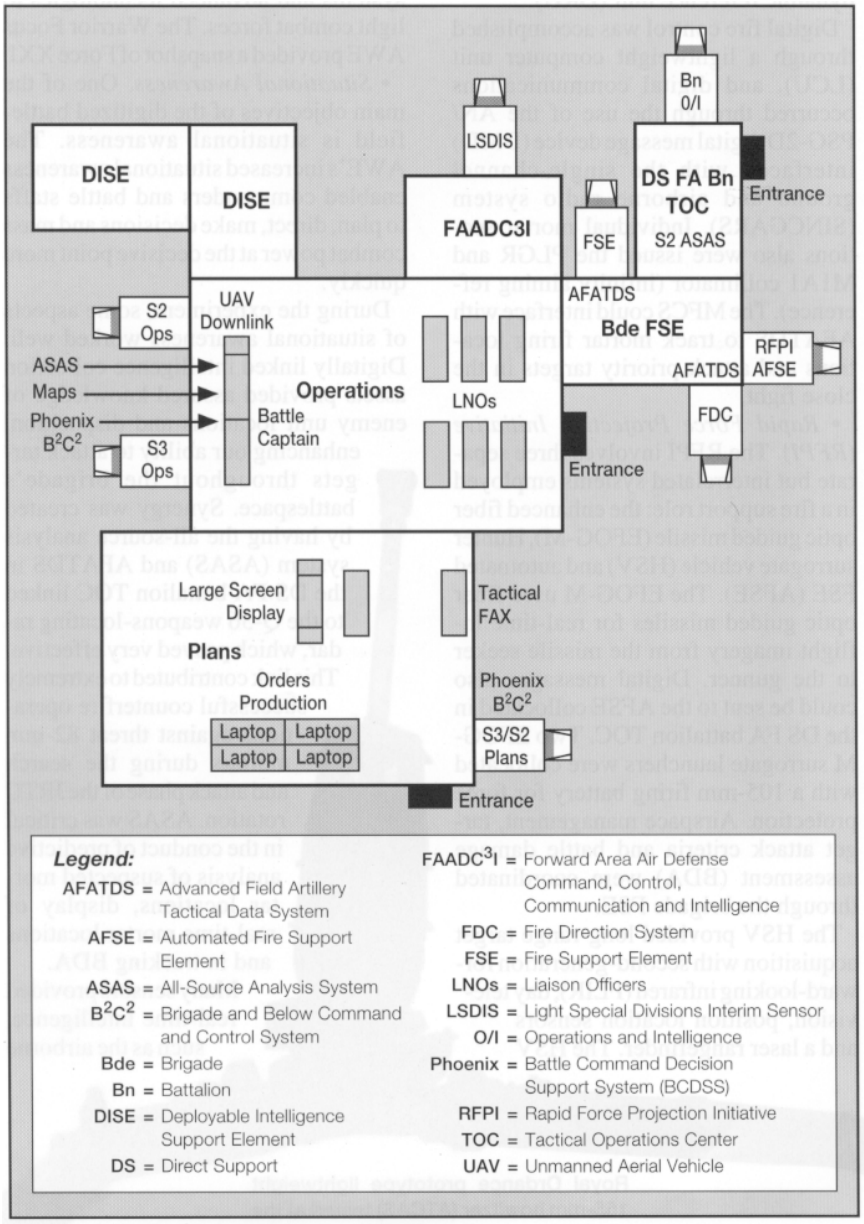


Figure 1: Brigade Tactical Operations Center

Clearance of fires is only as good as our situational awareness. Until we can link all elements together by a single integrated C^4I network, we'll have to rely on hybrid means of battle tracking to clear and coordinate fires.

• *Battle Command.* Digitized systems provided some interesting insights into the deliberate decision-making and battle-command processes. During the experiment, commanders and their brigade and battalion battle staffs used a battle command decision support system, called Phoenix, to help plan, direct and fight. In the planning phase, digital systems received and analyzed the mission and developed courses of action (COAs). The digital exchange of information saved the brigade staff time and networked staffs in the parallel planning process. Because we lacked a user-friendly matrix or spreadsheet that could be communicated digitally, war-gaming and synchronization had to be accomplished using off-the-shelf graphic software or paper charts.

During the directing phase, orders were prepared and passed digitally to subordinate headquarters. Digitization increased the efficiency of parallel planning and reduced the need for couriers, orders briefings or messages sent on limited tactical facsimile devices. It also gave the commander flexibility in choosing where and how to conduct back briefs with digital products.

Unfortunately, there were a few problems in the digital network. Bandwidth problems affected the speed at which the system could carry digital information to connected devices. Also, the digital network lacked the ability to link all units on a single display to effectively track the battle. At one point in the experiment, the battle captain at the brigade TOC viewed six monitors at his battle station, each providing parts of the relevant common picture created by Phoenix, ASAS and AFATDS. The battle captain was quickly overloaded with unfiltered information.

The difficulty of tracking non-digitized units also slowed down clearing fires. Because there were so many non-digitized units across the battlespace and different systems could not automatically update each other's data bases, too much time was spent manually tracking and retrieving information.

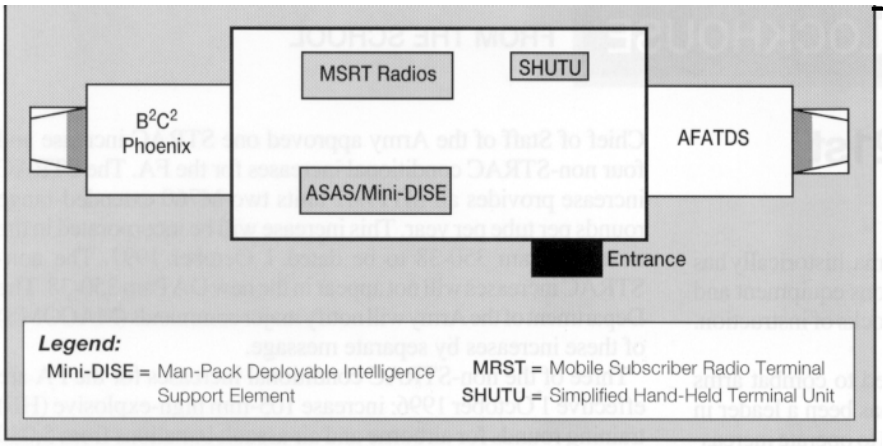


Figure 2: Brigade Assault Command Post

The digitized architecture used in the experiment stimulated some new thinking about command and control nodes. Figure 1 on Page 38 shows the layout of the brigade's main command post, the brigade TOC, used during the JRTC rotation. The larger than normal footprint of this experimental TOC created a lucrative target for the OPFOR and was extremely difficult to displace and set up. Some of this large footprint was the result of artificial requirements (for example, the DS FA battalion TOC was collocated with the brigade TOC due to the limited number of AFATDS terminals available) and the addition of several new digital capabilities mounted in their vehicles or individual shelters. The brigade commander spent much of his time fighting the battle from his assault CP.

This command and control node, shown at Figure 2, had all of the requisite information and digital systems and was easily moved about the battlefield. On two occasions, the brigade assault CP was emplaced in a prepared position within an artillery battery firebase.

Under the split-based concept of command and control nodes, the larger digital brigade TOC can remain at the point of lodgment or at an ISB while a smaller, more agile digital assault CP can be deployed forward. The CP still provides the commander relevant common situational awareness and is survivable. With the advent of longer range digital communications networks, the concept of split-based command and control nodes is worthy of further study.

• *The Human Dimension.* The AWE reminded us all of the impact of digitization on soldiers—from the commander down to the individual system operator. While commanders must be knowledgeable about their digitized systems and the information they provide, they still must rely on their intuition and vision and carefully balance the art and science of command. Although information systems provide a great deal of knowledge, there's no substitute for the face-to-face leadership that occurs when a commander circulates throughout the battlefield.

Staff officers must have a greater breadth of knowledge in the application and synchronization of combined arms operations. Digitized systems will give them access to a much greater amount of disparate information that must be analyzed quickly and effectively to achieve the commander's intent.

The battle captain at the brigade combat team TOC must have more experience than the title and rank of "captain" entails.

The digital architecture requires trained personnel who can not only operate digital devices, but also create and maintain digital networks. In the digitized CPs, computer operators and technicians must maintain and troubleshoot equipment. Stability of assignment will be a consideration in building the trained teams needed to man future digitized CPs. Further, a user-friendly piece of digitized equipment with a trained operator is useless without a redundant, fail-safe communications network.

Conclusion. To the participants in Warrior Focus, the AWE was both an experiment and experience. As an experiment, it proved that information technology will improve lethality and survivability and increase the battle tempo of future light forces. As an experience, it reminded us that we are citizens of an information society. In the future, battlespace will include the electromagnetic spectrum and the availability of information "pipelines."

In the evolution of our digital battlefield, we continue the search for the threshold that divides the age of the paper map sheets and voice radio from the era of information platforms connected by an integrated digital communications network to plan, direct, fight and win.

Lieutenant Colonel Theodore S. Russell, Jr., commands the 2d Battalion, 15th Field Artillery, 10th Mountain Division (Light Infantry) at Fort Drum, New York. Also in the 10th Mountain Division, he served as the Deputy Fire Support Coordinator (DFSCOORD) and Joint Force Fires Coordinator (JFFC) for Operation Uphold Democracy in Haiti. He commanded C Battery, 1st Battalion, 92d Field Artillery, 2d Armored Division, Fort Hood, Texas; C Battery, 1st Battalion, 37th Field Artillery, 172d Light Infantry Brigade, Fort Wainwright, Alaska; and US Army Recruiting Company, Columbia, South Carolina. He also served as the Fire Support Officer (FSO) for the 101st Aviation Brigade and S3 for the 3d Battalion, 320th Field Artillery, both in the 101st Airborne Division (Air Assault) at Fort Campbell, Kentucky, and as Chief of the Command Planning Group at the Combined Arms Command, Fort Leavenworth, Kansas. Lieutenant Colonel Russell holds a Master of Arts in Education from the University of South Carolina.

Major Harold H. Worrell, Jr., has been the Brigade FSO for the 2d Brigade, 10th Mountain Division at Fort Drum since June 1995. His previous experience includes serving as J5 Plans Officer for Joint Task Force Haiti during Operation Uphold Democracy and Chief of G3 Exercises, both in the 10th Mountain Division; Doctrine Staff Officer in the Command Planning Group of Headquarters, Training and Doctrine Command, Fort Monroe, Virginia; Commander of C Battery, 2d Battalion, 92d Field Artillery, 42d Field Artillery Brigade, Germany; Aide-de-Camp for the Deputy Commanding General of V Corps, also in Germany; and FSO for the 1st Battalion, 187th Infantry, 101st Airborne Division (Air Assault), Fort Campbell, Kentucky. Major Worrell is a graduate of the Command and General Staff College and holds a Master of Military Arts and Science degree from the School of Advanced Military Studies at Fort Leavenworth, Kansas.

Commo Training for 21st Century Redlegs

The Field Artillery School, Fort Sill, Oklahoma, historically has taught students how to operate communications equipment and fire support automation devices in separate blocks of instruction. No longer.

With the number of signal soldiers assigned to combat arms units decreasing, the Field Artillery School has been a leader in developing new ways to teach branch soldiers to operate increasingly complex communications systems. In addition, recent reductions in communications instructor authorizations in the school has caused the school to seek even more innovative ways to train. The result is "systems training" for communications instruction.

Systems training requires the student to operate the communications equipment and fire support automation devices as a complete system. It works like this: students operate a light-weight computer unit (LCU) running initial fire support automation system (IFSAS) software to process fire missions and generate digital messages. The LCU is connected to a communications device, such as single-channel ground and airborne radio system (SINCGARS), for the student to transmit the digital messages. When students pass digital traffic to each other or an instructor, they're learning to operate the complete fire direction and communications system.

The first students to receive systems training were Military Occupational Specialty (MOS) 13C Automated Fire Support Systems Specialist soldiers in advanced individual training (AIT) in January 1995. They used SINCGARS and IFSAS as a system, learning to operate them to standard in a shorter time and with fewer instructors. Feedback has shown that systems training results in a better trained soldier.

Officer basic course (OBC) students began receiving systems training on SINCGARS and the battery computer system (BCS) in January 1996. This training gives lieutenants a better understanding of how the BCS functions within the total system. The next step is to start systems training with IFSAS and SINCGARS in the officer advanced course (OAC) and use new communications equipment, such as mobile subscriber equipment (MSE).

The Field Artillery has been the leader in "digitizing" the battlefield. This trend will continue with the advanced Field Artillery tactical data system (AFATDS) now being fielded. MOS 13C AIT and OBC are only the first steps; our goal is to implement systems training for all applicable levels and MOS to help Redlegs focus fires for Force XXI.

CPT Gregory S. Oermann, SC
C, Tactical Communications Br, C^3 Div
Fire Support and Combined Arms Ops Department
FA School, Fort Sill, OK

New STRAC Allocations

The formal review of *DA Pam 350-38 Standards in Weapons Training (STRAC)* was completed on 28 February 1996. The Chief of Staff of the Army approved one STRAC increase and four non-STRAC conditional increases for the FA. The STRAC increase provides all M119A1 units two M760 extended-range rounds per tube per year. This increase will be incorporated in the next DA Pam 350-38 to be dated 1 October 1997. The non-STRAC increases will not appear in the new DA Pam 350-38. The Department of the Army will notify major commands (MACOMS) of these increases by separate message.

Three of the non-STRAC conditional increases for the FA are effective 1 October 1996: increase 105-mm high-explosive (HE) training rounds for airborne and air assault battalions from 5.080 to 9,093 rounds annually; increase multiple-launch rocket system (MLRS) type requisition code (TRC) A units from six to nine training rockets per launcher per year; and increase MLRS TRC C units from three to four training rockets per launcher per year.

The Chief of Staff approved the three non-STRAC increases under the following conditions: non-STRAC increases only will be resourced until completion of the next STRAC review in the first quarter of FY 99; units, the Training and Doctrine Command (TRADOC) and the Department of the Army will analyze the impact of ammunition increases on training readiness; and results of the training analysis will be used during the next STRAC review to determine if the benefit of the ammunition increases warrant formal changes to DA Pam 350-38.

The additional non-STRAC conditional increase currently in effect is the allowance of 162 MLRS annually for joint desert firing exercises at Twentynine Palms, California. This increase will depend on the biannual review of the Marine Corps/Army memorandum of agreement, (MOA) that provides MLRS battalions the opportunity to participate in joint exercises at the Marine Corps Air Ground Combat Center (MCAGCC) at Twentynine Palms. The next STRAC review will determine whether these temporary increases will be included in future DA Pam 350-38s.

It is imperative that units ensure their unit status report (USR) ammunition training readiness comments are included in their division's USR. The Department of the Army uses these comments to determine training ammunition impact on readiness.

If units have questions about the new STRAC allocations, call Larry Isaacs of the Gunnery Department, Field Artillery School, Fort Sill, OKlahoma, at DSN 639-5523 or (405) 442-5523.

Larry D. Isaacs, C, Concepts and Procedures Branch Gunnery Department, FA School, Fort Sill, OK

Field Artillery Special Text Update

The Field Artillery School, Fort Sill, Oklahoma, frequently receives requests for publications from Field Artillery units. Most of these requests cannot be supported by the school's resources. Field manuals (FMs), mission training plans (MTPs), technical manuals (TMs) and other publications printed with Department of the Army printing funds are not stocked at the FA School in sufficient quantities to support unit requests. Units must establish publications accounts to receive required publications.

Establishing Publications Accounts

Accounts are established based on the following guidelines. For the active Army, an account may be established for battalion-sized units with a personnel action center (PAC), detachment-sized and larger units without a PAC or table of distribution and allowance (TDA) activities. Accounts should be established at the commander, director or chief level. The guidelines for US Army Reserve (USAR) units to establish accounts are battery-sized or larger activities and staff sections at the division level. Army National Guard (ARNG) accounts are for battery-sized or larger units and those units designated by the state adjutant general. Marine, Navy and Air Force units also may establish accounts for Army publications in accordance with the appropriate service regulations.

To establish an account, units or activities complete "DA Form 12-R Request for Establishment of a Publications Account." The instructions for completing DA Form 12-R are contained in "AR 25-30 The Army Integrated Publishing and Printing Program."

Active Army units forward the form through the installation's director of information management (DOIM) or designated representative to:

Commander
US Army Publication Distribution Center (USAPDC)
ATTN: New Account Processing
2800 Eastern Boulevard
Baltimore, MD 21220-2896

Units can call USAPDC at DSN 221-6232 or commercial (703) 325-6232.

USAR units forward the form through their continental US Army (CONUSA), ATTN: PCO (or Publications Control Officer for review and approval) to the same address as the active Army.

National Guard units forward the form through the state adjutant general. After approval, the forms are forwarded to:

US Army Publications and Printing Command (USAPPC)
ATTN; ASQZ-CO
2461 Eisenhower Avenue
Alexandria, VA 22331-0302

Units can call USAPPC at DSN 584-3375/2533/2272 or commercial (301) 671-3375.

Ordering FA Special Texts

FA special texts (STs) are available from the Field Artillery School in *limited* quantities. Requests for "one of everything" will not be honored. To obtain the STs listed in this article, send requests to the address after each department's ST listing.

Gunnery Department

ST 6-2-30 FA Survey (BUCS Revision 1) (Nov 89)
ST 6-40-2 Battery Computer System (BUCS) (Version 10.022 [ADA]) Jan 95*
ST 6-40-16 Operation of the M90 Chronograph and Muzzle Velocity Management (Jan 91)
ST 6-40-31 FA Backup Computer System (BUCS) (Dec 90)
ST 6-50-19 FA Cannon Weapon Systems and Ammunition (Dec 93)
ST 6-50-20 Battery Executive Officer's Handbook (Oct 92)
ST 6-50-22 Firing Platoon Workbook (May 88)
ST 6-50-60 Paladin Tactics, Techniques and Procedures (Sep 95)
ST 6-60-40 Multiple Launch Rocket System (MLRS) Platoon Leader's Handbook with Changes 1 and 2 (Dec 93)
* ST 6-40-2 is revised with each new version of software; the date changes with each version.

Commandant
US Army Field Artillery School
ATTN: ATSF-GO
Fort Sill, OK 73503-5600

Fire Support Combined Arms Operations Department

ST 6-1-1 Initial Fire Support Automation System (IFSAS) Supervisor and Staff Guide (Jan 96)
ST 6-1-2 IFSAS (Jan 96)
ST 6-3 Advanced Field Artillery Tactical Data System (AFATDS) Operations (Draft for Test)
ST 6-30-50 Directed Energy Warfare (Mar 91)

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Training and Doctrine Command System Manager-Rocket and Missile Systems (TSM-RAMS)

ST 6-60-30 Tactics, Techniques and Procedures for Employment of ATACMS Block 1 (Mar 95)

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Fort Sill, OK 73503-5600

George L. Fogg, Technical Publications Editor
Warfighting Integration and Development Directorate
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"Call"-for Fire

Force Commander, you can get help anytime—all you need is a touch-tone telephone.

Dial 1-800-Div Arty:

"Welcome to the Joint Observer Kombat Enhancing (JOKE) telephone system:

For an immediate suppression mission, press '1' now.
For immediate smoke, press '2' now.
For fire-for-effect, press '31' for Grid, '32' for Shift from Known Point or '33' for Polar now.

If you would like to speak directly to a Fire Support Officer (FSO), dial '4,' enter your priority-of-fire code and press the pound key. Your call-for-fire is important to us; thank you for calling the greatest killer on the battlefield."

LTC Mark W. Scott, FA
Deputy Fire Support Coordinator
28th IN Div (M), PAARNG
Hershey, PA

The Threat—
Why Modernize FA Cannons?

by Captain Rick L. Hueston, MI

The development and proliferation of technological advancements worldwide will allow potential adversaries to outgun the US in the next century. We must, therefore, field advanced artillery systems to maintain our edge over these adversaries in the first two decades of the next century.

Worldwide trends to modernize and proliferate Field Artillery are increasing the complexity of US cannon artillery support. US forces could easily face a threat with state-of-the-art weapon systems. Consequently, the "why" of a new cannon system is clear—threat capabilities drive fire support modernization.

This article shows the need for better cannon artillery on the basis of threat capabilities being developed or acquired. First is an overview of Crusader and its immediate predecessor, Paladin; next is a discussion of the sophisticated threat; and, finally, this article surveys developments worldwide in self-propelled artillery, munitions and target acquisition (TA) and fire control systems.

Moving Forward with Crusader

Crusader, "the firepower of Force XXI," is being designed to fight and survive on any future battlefields, providing the force commander with unmatched flexibility. Crusader operations will improve the way the Field Artillery moves, shoots, communicates and sustains—by quantum leaps.

Crusader will reduce manpower requirements and exploit technology to improve reliability, responsiveness and survivability significantly. Its design is the result of several factors, foremost of which is the ability to counter potential threats.

Paladin, "the Revolution in Cannon Artillery," is the stepping-stone to Crusader. It features improvements in survivability, delivery of responsive, accurate fires and system availability. As good as the howitzer is, Paladin doesn't provide all the capabilities needed for the Army's fire support in today's close fight and has modernization limits.

By comparison, Crusader will increase our firing rate—rising from the Paladin's four rounds per minute to 10 to 12 rounds per minute—and extend the maximum range from 30 kilometers out to 40 to 50 kilometers. Paladin is at the limits of the M109 howitzer system and won't meet the needs of artillerymen of the future.

Facing the Threat Today and Tomorrow

So why do we need a new cannon system? The threat. In the vision of Force XXI operations, combat power overmatches are essential to providing the edge over potential adversaries. Our indirect fire capabilities in range, accuracy and lethality must overmatch those of the enemy. But the worldwide proliferation of military technology has led to rapid advances in threat artillery capabilities, allowing less-than-friendly nations access to systems that overmatch ours. (See Figure 1.)

Today's threat and its potential are as complicated and diverse as ever. The end of the Cold War signaled the emergence of a "New World Order." Reality, unfortunately, has proven that the New World Order is neither new nor orderly. Without the uneasy stalemate provided by the Soviet Union and the United States, the old problems posed by adventurism, nationalism and separatism have reappeared. To further complicate the issue, a new National Security Strategy validates US military involvement in complex scenarios of operations other than war, such as peacemaking and peacekeeping operations and nation building.

Military size and capabilities are being affected in countries throughout the world by the diminished threat of a large-scale military confrontation. Major military powers, including the US, are progressing toward smaller, better equipped and better trained forces. Although the US armed forces are significantly smaller than they were, even since Desert Storm, we still must be prepared to fight two major regional conflicts nearly simultaneously, including rapidly deploying units anywhere in the world. Most nations focus on projecting forces across borders—not oceans.

The US must strive for a smaller, more capable force at the operational and tactical levels while meeting the logistical requirements of rapid deployment. US forces still will face a target-rich environment

German PzH 2000 155-mm Self-Propelled Gun

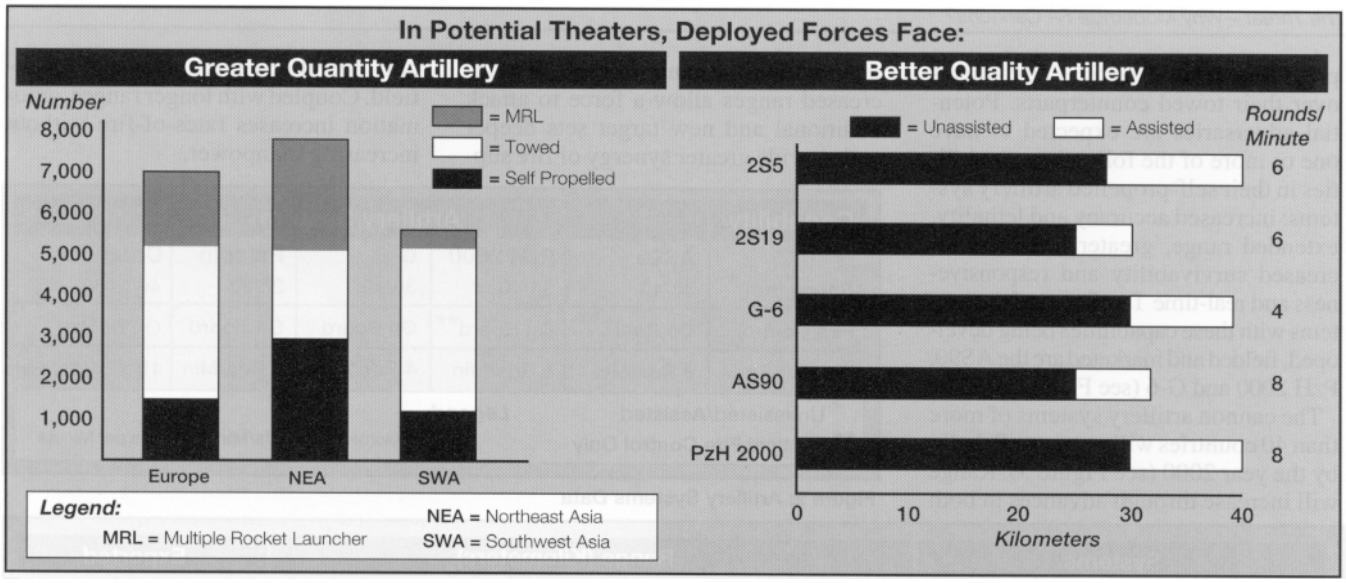


Figure 1: US Artillery must overmatch enemy artillery; threat artillery is still the biggest killer on the battlefield. Modeling shows the enemy artillery accounts for 75 percent of US casualties in early entry scenarios and 90 percent of US casualties in heavy force scenarios.

at the tactical level, calling for massed fires and increased rates of fire. Future threat armies may have a smaller force at the operational level, but their force size at the tactical level probably will remain the same. The US must be able to deploy fewer fire support systems that provide more accurate and lethal combat power than our current systems. Those systems also must be more survivable and not add to our logistical burden.

Less developed nations have improved their military capabilities through greater access to new technologies and increased availability of a wide range of advanced equipment on the international market. Their capacity to integrate advanced weapons' systems and technology into their armed forces is uncertain. However, the global arms market is creating an environment where even less developed countries can acquire advanced weapons systems for a "high technology niche."

Transfers of high technology hardware from major arms exporters and foreign technical assistance and the expansion of indigenous production facilities help nations establish that "niche." Once established, improvements in surveillance, TA, accuracy, lethality and combat power inherent in these modern armaments will make US forces more vulnerable across the operational continuum.

A detailed examination of the current and future threat is complete when balanced against region *and* capability. Current trends in threat analysis recommend we focus more on capabilities than on regions.

Surveying Threat Artillery Systems

Most, if not all, new and emerging technology is exploitable by an adversary's military, depending on the availability of funds and access to technology. Understanding the capabilities available today and tomorrow allows us some foresight as we develop our modernization plan.

While the equipment of potential adversaries is predominantly Soviet- or East European-made, recent events have shown that our forces could face modern Western systems available to the threat through military sales. Many Western countries are selling highly sophisticated military items as a means of preserving their military industrial base during this post-Cold War era.

Self-propelled artillery systems entering production or slated for production feature greater mobility and higher rates-of-fire and use a wider selection of projectiles to greater ranges and accuracy than current systems. In conjunction with advances in weapon platforms, the development of new-generation ammunition is significantly more lethal. Improved TA capabilities, such as countermortar/counterbattery (CM/CB) radars, sound-ranging and unmanned aerial vehicles (UAVs), allow a threat to acquire targets at greater ranges in near real-time. Tying all these capabilities together are advanced artillery fire control systems, enabling artillery to respond faster and more accurately.

Self-propelled Artillery. These systems are in the forefront of artillery improvement programs throughout the world. Prioritized improvements in wide-ranging self-propelled artillery systems being fielded or under development are

Courtesy of Jane's Armour and Artillery 1995-96

This South African G-6155-mm self-propelled gun-howitzer has its stablizers lowered for firing.

providing several tactical advantages over their towed counterparts. Potential adversaries are expected to have one or more of the following capabilities in their self-propelled artillery systems: increased accuracy and lethality, extended range, greater mobility, increased survivability and responsiveness and real-time TA. Some of the systems with these capabilities being developed, fielded and marketed are the AS90, PzH 2000 and G-6 (see Figure 2).

The cannon artillery systems of more than 40 countries will outrange Paladin by the year 2000 (see Figure 3). Range will increase through advances in both ammunition and cannon design. The increased ranges allow a force to attack additional and new target sets deeper and provide greater synergy of fire support operations throughout the battlefield. Coupled with longer ranges, automation increases rates-of-fire without increasing manpower.

Capability	Artillery System				
	AS90	**PzH 2000**	**G-6**	**Paladin**	**Crusader**
Range (Km)*	30/40	30/40	30/40	22/30	40 to 50
Fire Control	On Board**	On Board**	On Board	On Board	On Board
Rate-of-Fire	6 Rds/Min	8 Rds/Min	4 Rds/Min	4 Rds/Min	10-12 Rds/Min

* Unassisted/Assisted

** Tactical Fire Control Only

Legend:

Km = Kilometers **Rds/Min** = Rounds per Minute

Figure 2: Artillery Systems Data

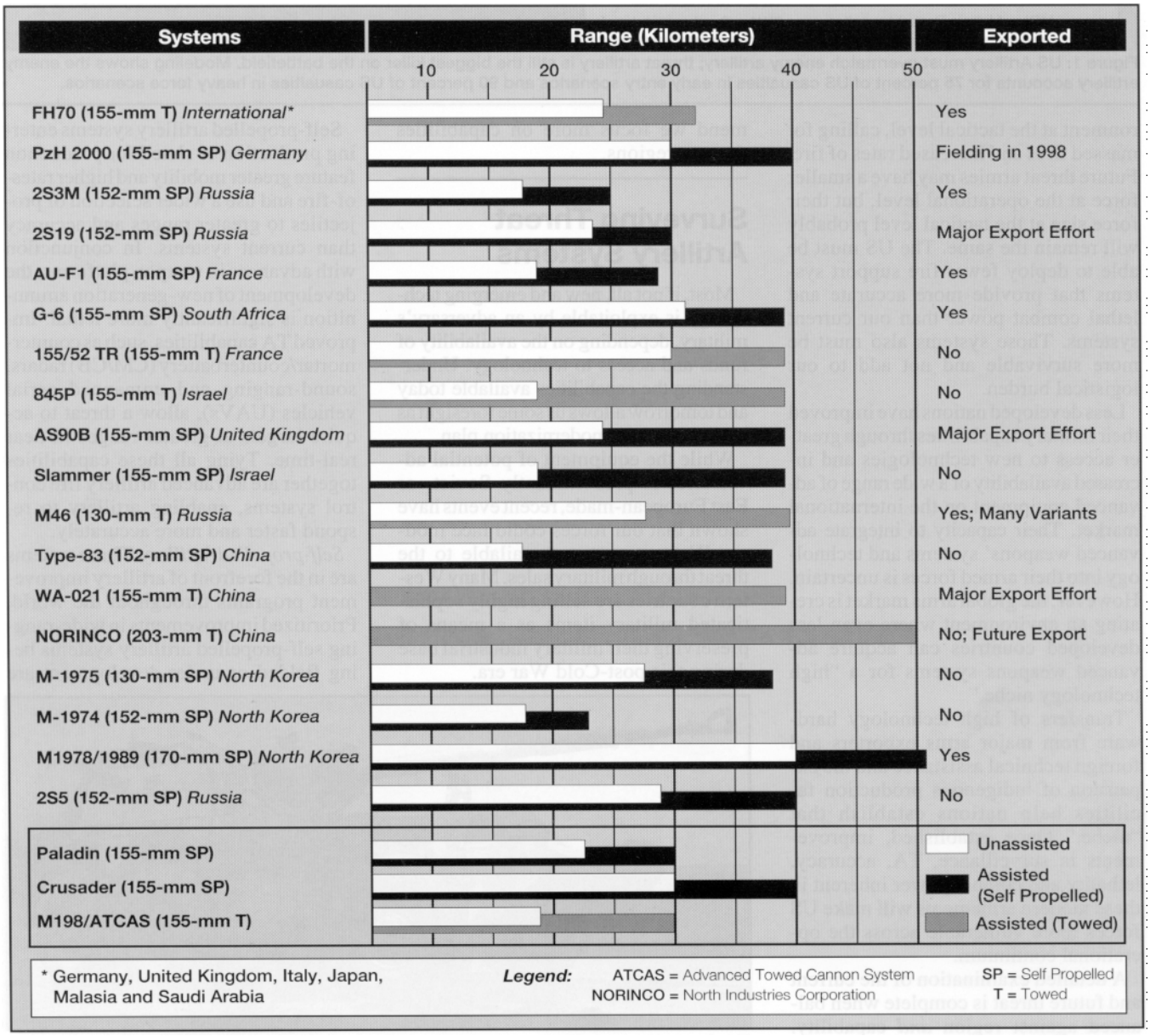
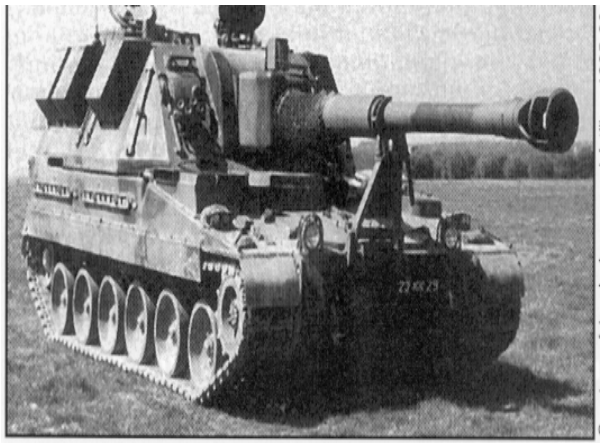


Figure 3: Worldwide Range Comparison of Cannon Systems

Although there are several new systems being developed and entering service under the guise of "artillery modernization," many countries actually are upgrading existing systems. There are many upgrade packages for 105-mm, 130-mm (M-46 specifically) and 155-mm towed and self-propelled artillery systems. Towed systems' upgrade packages concentrate on increasing the rate-of-fire and extending ranges. Installing an automatic fire control system and an on-board survey capability gives a self-propelled artillery system a true shoot-and-scoot capability. These packages are available at a fraction of the cost of new equipment and are an inexpensive, effective means of modernization for many countries.



Courtesy of Jane's Armour and Artillery 1995-96

The United Kingdom Vickers Shipbuilding and Engineering Limited (VSEL) AS90 155-mm self-propelled gun with ordnance in travel lock.

Ammunition Improvements. Munitions development has become an inexpensive way to modernize and extend artillery range. Some new types of ammunition extend the range of a 105-mm howitzer out to 20 kilometers and of 130-mm and 155-mm howitzers out to 40 kilometers.

The quest for increased range was originally met by rocket-assisted projectiles (RAPs), but the emphasis now is on extended-range, full-bore base-bleed (ERFB-BB) or base-bleed (BB) projectiles. High-explosive (HE) projectiles with improved ballistic characteristics, better filling, longer ranges and new and more effective fuzes have been developed and have proliferated worldwide.

Beyond improving high-explosive and other standard projectiles, advanced rounds are on the market. These include cargo rounds that dispense antitank and antipersonnel mines and bomblets to attack the vulnerable lightly armored upper surfaces of armored vehicles.

Even more advanced "smart" projectiles are under development that will increase the lethality of any system. Although few countries can develop and manufacture an artillery-delivered high-precision munition (ADHPM), most can buy them. The survivability of today's close support weapons may become more of an issue, given the development and proliferation of smart munitions.

TA and Fire Control Systems. Threat counterfire response time is one of the most important concerns of Field Artillery. The counterfire response time equation is composed of TA, fire control and artillery system functions. For the counterfire threat to be significant, the enemy must be able to coordinate and synchronize his reconnaissance, surveillance and TA (RSTA) and artillery systems in a timely manner.

The capabilities to see deep, day and night, and communicate in near realtime are growing and becoming available. TA systems now available provide greater ranges and target location accuracy, including near real-time data links effective throughout the operational spectrum. CM/CB radars also are becoming more accurate at greater ranges.

UAVs are providing targeting in excess of 100 kilometers with an endurance of four or more hours and can be fitted with many different types of near real-time data link sensor packages. These packages include real-time TV, forward-looking infrared (FLIR), side-looking airborne radar (SLAR), laser, millimeter wave, optical camera and thermal imaging. Many potential users are seeing the UAV as one of the best means for future TA.

In recent years, artillery modernization efforts have emphasized improving artillery fire control systems (AFCS). This applies equally to the forward observer (FO)—who often is equipped with a day-night thermal observation system, laser rangefinder and data transmission system—and battery, battalion and higher echelon systems. The improved AFCS gives artillery greater operational flexibility and effectiveness.

New fire control systems that combine vehicle and portable observation post systems with a UAV for TA are being developed and marketed. New ballistic software runs on IBM-compatible personal computers and laptops. The emphasis of linking RSTA to artillery via fire control systems is increasing the effectiveness and improving the responsiveness and longer range accuracy of artillery inventories worldwide.

Given these materiel developments, it is virtually certain that US forces will face an enemy with at least some of these modern, lethal, high-tech weaponry and munitions. While today's fire support systems are impressive, the requirement to keep pace in an ever-changing world demands that we modernize continually or face the prospect of being outgunned-in quantity and quality.

The artillerymen of the smaller future force will need Crusader to meet the challenges of the next century's battlefields. They must fight and survive on the future technological battlefield, outgunning potential adversaries in range, accuracy and lethality while limiting collateral damage.

While the future holds many uncertainties, one thing is certain: artillery modernization must consider a realistic vision of the future threat and act today to meet the fire support challenges of tomorrow. With Paladin, we can hold our own for a few more years. With Crusader, we'll maintain the edge for the foreseeable future.

Captain Rick L. Hueston, Military Intelligence, until recently was an Intelligence Research Analyst in the Directorate of Combat Developments, Field Artillery School, Fort Sill, Oklahoma. Currently, he commands Headquarters and Headquarters Battery of the Personnel and Support Battalion, also at Fort Sill. In the 1st Infantry Division (Mechanized), Fort Riley, Kansas, he was the S2 of the 1st Battalion, 34th Armor and Assistant S2 of the 1st Brigade. Among other assignments, he served as Assistant S2 for the 3d Battalion, 35th Armor of the 1st Armored Division, Germany, during Operations Desert Shield and Storm in Southwest Asia. Captain Hueston is a graduate of the Military Intelligence Officer Advanced Course, Fort Huachuca, Arizona.