Department of Defense
Legacy Resource Management Program

09-431

Historical and Architectural Overview of Aircraft Hangars of the Reserves and National Guard Installations from World War I through the Cold War

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EXECUTIVE SUMMARY

The history of the U.S. armed forces in the twentieth century is inexorably linked with the development of aviation. Aircraft have had a place in military missions and force development since the Wright brothers demonstrated their invention to Army officials at Fort Myer, Virginia, in 1909. Over the next century, military aviation grew from a fledgling experiment to a multifaceted, technologically advanced program of unquestioned importance. This trend is well represented in the evolution of hangar design. Early hangars were simple, small, and impermanent, while hangars in the latter decades of the century were comparatively massive and designed to serve the complex needs of modern aircraft and military missions. Indeed, aviation has become an important component of all services of the U.S. military. Moreover, aviators serve in the Active, Guard, and Reserve components of the Army, Air Force, Marines, and Navy. Aircraft hangars are a monumental reflection of this history.

The architectural history of military hangars and airfields has been thoroughly documented for the active branches of the military. This Department of Defense Legacy Program report comprises a historic context that explores the history of aviation and hangar development in the Reserves and National Guard. This historic context provides a framework and apparatus that the National Guard and Reserves can utilize in the National Register of Historic Places eligibility process. Therefore, this document enables compliance with the National Historic Preservation Act.

In many ways the histories of the Active, Guard, and Reserve components of the U.S. military are intertwined. Therefore, this document is intended to complement previously developed historic contexts for military aviation and hangar construction. Two reports are particularly important in this regard: the Kathryn M. Kuranda, *Historic Context for Army Fixed Wing Airfields, 1903–1989*; R. Christopher Goodwin & Associates, Inc., prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD, 2002; and Julie Webster, *Historical and Architectural Overview of Military Aircraft Hangars: A General History, Thematic Typology, and Inventory of Aircraft Hangars Constructed on Department of Defense Installations,* U.S. Air Force Air Combat Command, 1998.

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1.0 INTRODUCTION

The Department of Defense Legacy Resource Management Program (DoD Legacy Program) was created in 1990 to assist the various military services in their cultural and natural resource protection and enhancement efforts with as little impact as possible to the agency's mission of military preparedness. The DoD Legacy Program is guided by the principles of stewardship or protection of irreplaceable resources, leadership of the Department of Defense (DoD) as the leader in resource protection, and partnership with outside DoD entities to access the knowledge and skill sets of others. The DoD Legacy Program's general areas of emphasis are:

- The DoD Legacy Program implements an interdisciplinary approach to resource stewardship that takes advantage of the similarities between DoD's natural and cultural resource plans. Often, the same person is responsible for managing both natural and cultural resource plans on an installation. Legacy strives to take advantage of this by sharing management methodologies and techniques across natural and cultural resource initiatives.
- The DoD Legacy Program promotes understanding and appreciation for natural and cultural resources by encouraging greater awareness and involvement by both the Military Departments of Services and the public.
- The DoD Legacy Program incorporates an ecosystem approach that assists the DoD in maintaining biological diversity and the sustainable use of land and water resources for mission and other uses.
- Additionally, the DoD Legacy Program works to achieve common goals and objectives by applying resource management initiatives in broad regional areas.
- Finally, the DoD Legacy Program pursues the identification of innovative new technologies that enable more efficient and effective management (DoD 2010).

Each year, the DoD Legacy Program develops a more specific list of areas of interest, which is usually derived from ongoing or anticipated natural and cultural resource management challenges within the DoD. These specific areas of emphasis, however, reflect the DoD Legacy Program's broad areas of interest. In order to be funded, a project must produce a product that can be useful across DoD services and/or in a large geographic region. This particular project spans all the DoD services of National Guard and Reserves service and can be used across the nation.

1.1 PROJECT DESCRIPTION

The DoD and its individual military service must comply with the National Historic Preservation Act of 1966, as amended (NHPA), by identifying and managing historic properties on lands managed by the DoD. In an effort to help with this requirement, the U.S. Army Construction Engineering Research Laboratories (USACE-CERL) directed a study in 1998 of DoD aircraft hangers built prior to 1996. The purpose of the study was to establish criteria relevant to the NHPA against which any future hangar assessments could be conducted to help determine their historic or architectural significance. The report, *Historical and Architectural Overview of Military Aircraft Hangars*, provided a context for understanding the history of DoD aviation and hangar construction, but it excluded a look at Reserve and National Guard hangars. The author recommended that a follow-on study be conducted of Reserve and National Guard resources (Webster 1998).

Aviation is a historically significant aspect of the twentieth century evolution of the military and warfare. Hangars are a distinct building type directly associated with aviation. The evolution of hangar types is associated directly associated with the development and use of aircraft within each DoD military service. This project supplements the 1998 Webster report by providing information relevant to the development of aviation within the specific missions of the National Guard and Reserves, which are often linked to the mission of the full-time military service branches.

This study focuses on the history of the National Guard and Reserves, but is intended to be a companion to other, much more extensive contexts that address the history of aviation in the military in a considerably more holistic sense. The most notable context of this type is:

> *Historical and Architectural Overview of Military Aircraft Hangars: A General History, Thematic Typology, and Inventory of Aircraft Hangars Constructed on Department of Defense Installations. United States Air Force Air Combat Command.*
>
> Julie Webster 1998

While the objective of this context is to provide substantially more National Guard- and Reserve-specific information than Webster's 1998 report, it is not as exhaustive. Rather, the intent of the following discussion is to be representative, not definitive.

1.2 METHODOLOGY

Research was conducted to develop a document to aid the evolution of aviation operations within each National Guard and Reserve military service. A component of this research included development of a historic context for hangar construction within each military service. Research of primary and secondary sources took place at Air National Guard (ANG) Headquarters, the National Guard Bureau, and Reserve Headquarters; the National Archives and Records Administration (NARA); the NARA, Archives I (Military Reference Branch); NARA, Archives II (Cartography and Architectural Records Branch); the U.S. Army Corps of Engineers (USACE), Office of History; USACERL Technical Library; University of Colorado libraries, and the Internet.

In order to create an inventory of extant hangars, the National Guard and Reserve headquarters-level cultural resource managers and real property points of contact were contacted for information. A request was sent to installations to confirm the existence of hangars. Other requested information included maps depicting hangar locations, available historic context information for the installations and hangars, and real property records for the hangars, including drawings and pictures. This data was assembled in a Microsoft Access database that is arranged similarly to a database included in the Webster report (see Webster 1998). The database associated with this report incorporates hyperlinks to photographs and drawings provided by installation cultural resource managers. It is not presumed that the database includes all hangars, some installations and headquarters did not provide complete lists, and in some cases, a former hangar may be used in a different capacity today and not be reflected as a hangar on current real property lists.

1.3 HOW TO USE THIS DOCUMENT

This report is intended to provide a basis from which to evaluate DoD National Guard and Reserve military service hangars on a national level. When evaluating a hangar, the information contained within this document should be augmented with specific installation historic contexts in order to make an accurate and justified argument regarding hangar significance. Specific military service aviation histories outlined herein help to provide the context within which each era of hangar construction took place and the types of missions being flown by each military service.

The database in appendix B can be used by installation or military service cultural resource managers to identify hangars that should be evaluated for their National Register of Historic Places (NRHP) eligibility. It also can be used to identify hangars elsewhere within the National Guard or Reserves that are similar to resources they manage. The photographs and drawings found in appendix B provide visual examples of hangar types.

1.4 ACKNOWLEDGEMENTS

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- Kip Troeger, Illinois Army National Guard
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- Rolandria Boyce, Georgia Army National Guard
- Kim Wittorff, Vermont Army National Guard
- Lisa Melnicsak, Connecticut Army National Guard

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2.0 HISTORY OF AVIATION IN THE NATIONAL GUARD

2.1 OVERVIEW HISTORY OF THE NATIONAL GUARD

The history of the National Guard can be traced to 1636 when the Massachusetts Bay General Court ordered the militia units surrounding Boston to form three regiments—North, South, and East. Pre-dating the Declaration of Independence, the National Guard, originally referred to as "the militia," existed over 100 years before any other service of the U.S. military. The colonists formed militias with the knowledge that the relatively few British soldiers in the New World would not be able to protect them against attacks from American Indians or foreign invaders. Therefore, following the English military tradition, the colonists organized their able-bodied males into militias. The militia's use was codified in the U.S. Constitution, which stated it could be used for repelling invasions, suppressing insurrections, and executing the laws of the land. The Founding Fathers allowed Congress to organize and arm the militia while allowing the states to appoint their own officers, thereby codifying the dual state-federal status of the National Guard (The National Guard 2007).

Since the framing of the U.S. Constitution, Congress has passed several laws affecting the National Guard. The first law was the Militia Act of 1792 (actually, two different laws passed less than a week apart) that gave the president the power to call out the militia and provided for federal standards for organization of the militia (Militia Act 1792). Of course, the militia was instrumental in the American victory during the Revolutionary War, and due to the diminished size of the Regular Army, the militia provided the majority of troops for the Mexican-American War, the initial months of the Civil War, and the Spanish-American War.

Following the Spanish-American War at the end of the nineteenth century, the Militia Act of 1903 (also known as the Dick Act) gave federal status to the militia and required that they organize according to Regular Army standards. The law resulted in the elevated role of the militia as a reserve force for the U.S. Army. The National Defense Act of 1916 was the most comprehensive legislation dealing with the military to that date. Specifically, the law provided for a modest increase in the strength of the Regular Army to 175,000 for peacetime and 300,000 for wartime, as well as an increase in funds for the National Guard, an increase in the level of National Guard personnel to over 400,000, and required federally stipulated training and organization while specifying that the National Guard answer the call of the president when asked to do so. The Act also created the Signal Corps Reserves, which required all states to designate their militias as "National Guard," and allowed the Secretary of War to establish qualifications for officers (Stewart 2005).

When the United States entered World War I in 1917, 40% of U.S. forces were National Guard. Sixty percent of the first divisions to enter combat in Europe were National Guard. Guardsmen from Tennessee and the Carolinas represented the bulk of Medal of Honor recipients from the war (Powers 2010).

The 1920s and 1930s were somewhat uneventful, but in the autumn of 1940, the National Guard was activated in anticipation of the U.S. entry into World War II. Upon entry into the war, all National Guard divisions saw combat in both the Pacific and European theaters. Significant episodes in which the National Guard participated included action in Bataan, Guadalcanal, North Africa, and Italy.

The Cold War began immediately following World War II. In 1945, the major Allied powers (United States, Great Britain, France, and the Soviet Union) convened at the Yalta Conference, and redrew the

boundaries of post-war Europe, which included dividing Berlin into four sections to be governed by each of the four countries. Decisions made at Yalta, when combined with the Soviet Union's failure to withdraw from some of the Eastern European countries, led Winston Churchill, in 1946, to declare that an "iron curtain" had fallen across Europe. This speech is largely considered to mark the beginning of the Cold War era.

FIGURE 2-1. WINSTON CHURCHILL, FRANKLIN ROOSEVELT, AND JOSEPH STALIN ("THE BIG THREE") IN ATTENDANCE AT THE YALTA CONFERENCE (ON THE PATIO OF LIVADIA PALACE, CRIMEA, UKRAINE)

In 1948, tensions mounted over the reunification of Berlin among the United States, Great Britain, and France on one side and the Soviet Union on the other. After a failed Czechoslovakian uprising, the Soviet Union began pressuring the terrestrial routes between Eastern and Western Berlin, finally imposing a full blockade in the summer of 1948. With access to all road routes eliminated, the only option left to the North Atlantic Treaty Organization (NATO) countries was to airlift food and other necessities to Western Berlin. The U.S. performed the majority of the operations that delivered over 2.3 million tons of cargo from June 1948 until September 1949 (Miller 1998).

Under a pre-arranged agreement with the United States at the end of World War II, the Soviet Union received the surrender of the Japanese troops north of the 38th Parallel in Korea and the United States received the Japanese surrender south of the 38th Parallel. Although Korea was to be reunited through elections, those elections were never held. Tensions in the area rose after Mao Zedong's Communist Party defeated the Chinese Nationalist government. With the support of the Chinese government, and with Soviet-supplied weapons, North Korea invaded South Korea in June 1950. Although the United Nations (UN) voted for a military response to the aggression, the UN forces were composed largely of U.S. forces. The United States was engaged in Korea until 1953, when a ceasefire was executed while an armistice agreement was drafted. A demilitarized zone was established at the 38th Parallel, which still exists today. Nearly 140,000 Army National Guardsmen were mobilized for the Korean Conflict, as were 45,000 Air National Guardsmen (Listman and Cathcart 2001).

Under President John F. Kennedy, the United States began its involvement in Vietnam with the goal to stop the spread of communism in Southeast Asia. U.S. involvement began in 1961 when U.S. advisors arrived to assist the South Vietnamese government resist invasion by the North Vietnamese and their communist allies. The U.S. left Vietnam in 1973, and shortly thereafter the North Vietnamese united the country under a single communist government. The National Guard was not mobilized for military service in Vietnam until after the 1968 Tet Offensive, and then only on a limited scale.

President Richard M. Nixon withdrew U.S. troops from Vietnam in 1973 and began an era of decreased political tensions with the Soviet Union. After the Vietnam War, the U.S. military increased its appeal to

volunteers through improved housing and increased educational benefits. The military also began actively recruiting minorities, including women.

The Reagan administration commenced in 1980 under a cloud of mistrust between the United States and the Soviet Union, which was accompanied by increased military spending. President Ronald Reagan focused on developing the "Star Wars" program, an extensive missile defense system officially called the Strategic Defense Initiative (Lafeber 2002).

Soviet Premier Mikhail Gorbachev and President Reagan held several summits around the world with the hopes of containing the threat of nuclear war. Premier Gorbachev initiated "Glasnost," a policy of openness and transparency, which relaxed the Soviet Union's control over the Warsaw Pact countries. In 1989, the Eastern European Soviet Bloc countries renounced their association with the Soviet Union. The Berlin Wall was erected by the German Democratic Republic (East Germany) in 1961 during the Berlin Crisis; the wall was brought down during 1989–1990, marking the end of the Cold War. The National Guard era was dominated by participation in NATO and UN peacekeeping and humanitarian missions, the first Gulf War in 1991, and the Global War on Terror during the post-Cold War era.

2.1.1 History of Aviation in the National Guard

2.1.1.1 The Early Years: 1900–World War I

Military aviation history began in 1907 when President Theodore Roosevelt ordered the U.S. Army to purchase its first aircraft. Wilbur and Orville Wright delivered the aircraft in 1909; the U.S. Army's newly created Aeronautical Division (within the Signal Corps) began experimenting with bomb dropping, strafing, and photography. In 1910, the first army air installation was established at Fort Sam Houston, Texas (Miller 2003). The first Aeronautical Division unit was created in December 1912, and was dubbed the 1st Aero Squadron (Mcfarland 1997). By 1917, with the threat of war and increased congressional appropriations for the military, the Signal Corps created flight schools in San Diego, California; Mineola, New York; Chicago, Illinois; Memphis, Tennessee; and Essington, Pennsylvania (Hennessy 1958).

The National Guard's interest in aviation can be traced to the New York National Guard's 1st Signal Company's experiments with balloons in 1908. In 1915, the New York National Guard, under the leadership of Raynal C. Bolling, created the 1st Aero Company, and in 1916 created a second aviation company (2nd Aero Company) in Buffalo, New York. In June 1916, the New York 1st Aero Company was mustered into federal military service for anticipated duty on the Mexican border, with Captain Bolling as commander. After weeks of training under Signal Corps officers, however, the company was mustered out of military service without having been deployed (Hennessy 1958).

Although the New York 1st Aero Company did not see military service on the Mexican border, the Signal Corps' 1st Aero Squadron did (figure 2-2). As part of General John J. Pershing's expedition, the squadron performed observation and reconnaissance missions, proving their value to ground commanders by providing timely information regarding troop movement. The squadron's use of experimental equipment, combined with their reconnaissance missions, paved the way for new technological advances and provided the United States with experienced aviators, which would be needed as the U.S. entered World War I (Miller 2003).

The first National Guard aviation units, including the ones in New York, California, and Missouri, were either self-supporting or were supported with private funds from individuals or groups like the Aero Club of America that raised funds to train aviators and purchase planes for the National Guard and the Navy

Militia, as well as for mail courier services. Initially, National Guard aviators were not allowed to attend the Signal Corps Aviation School in San Diego because their attendance at the school could not be funded until they had organized themselves (according to the Secretary of War's standards for the organization of a squadron) and were classified as an organized militia under the Militia Law of 1903. In 1915, the New York National Guard was the first to send aviators to school in San Diego (Hennessy 1958). It was not until 1917 that federal funds were approved for the training of 18 National Guard pilots at the Air Corps aviation schools (Cantwell 1997).

(Source: National Guard Education Foundation)

FIGURE 2-2. MEMBERS OF THE NEW YORK AERO SQUADRON MOBILIZED FOR SERVICE IN MEXICO

National Guard aviators distinguished themselves early. In November 1916, they made their first cross-country formation flight from Mineola, New York, to Princeton, New Jersey, led by Captain Bolling. A second cross-country flight by a group of National Guard aviators took place in December 1916, and was flown in conjunction with Army aviators from Mineola to Philadelphia (Hennessy 1958).

2.1.1.2 World War I

Upon entry into World War I in 1917, the National Guard represented 40% of U.S. ground forces. The National Guard aviators were forced to join the Signal Corps Reserves (created by the National Defense Act of 1916), rather than enter the war with their own units. With too few pilots, lack of experience, and lack of modern equipment, the Army's own aviation program was not sophisticated enough to engage in an air war at the beginning of World War I. Approximately 100 National Guard pilots joined the Signal Corps Reserves, making a significant impact on the Army's ability to engage the German forces (Gross 1995, McKinley 2001).

Colonel Bolling and Major Reuben Fleet occupied senior level positions within the Air Service after leaving the National Guard to volunteer for the war. Bolling led a 1917 mission to obtain information on

Allied aircraft industries. He was killed by enemy fire in 1918 (Gross 1995:2). The first air combat mission ordered by a U.S. commander included Tennessee Guardsman Reed Chambers. At least four former National Guardsmen became "aces" during World War I including Chambers, Field Kendley, Reed Landis, and Martinus Stenseth. One former Guardsman, Second Lieutenant Erwin R. Bleckley of Kansas (figure 2-3), received the Medal of Honor posthumously for his heroism as an aerial observer attached to the 50th Aero Squadron.

(Source: U.S. Air Force http://www.af.mil/news/story.asp?id=123020444)

FIGURE 2-3. ERWIN R. BLECKLEY

2.1.1.3 Interwar Period

Following World War I, the National Guard was given the authority to form one aero unit per division, and the U.S. government agreed to provide funds for equipment (including planes), personnel training, and to provide one regular Army officer to train each squadron. These provisions were made with the stipulation that the states would provide airfield and hanger accommodations. Each aero unit was given authorization for a balloon company, a photo section, an observation squadron, and one unit to serve under the Military Intelligence Division. The Minnesota National Guard 109th Observation Squadron was the first National Guard unit to receive federal recognition in 1921; quickly followed by the 104th Observation Squadron in Maryland. By 1930, there were 29 observation squadrons, 19 with National Guard divisions and 10 other independent air squadrons. These 29 squadrons' federal missions were to provide ground service support, while their state missions were to provide transportation during natural disasters and times of civil unrest (ANG n.d.a).

(Source: Public Domain)

FIGURE 2-4. CHARLES A. LINDBERGH

Charles A. Lindbergh (figure 2-4) is the most famous National Guard aviator from the Interwar period. In 1925, he joined the 110th Observation Squadron of the Missouri National Guard. By 1926, he had been promoted to captain and became the chief pilot for the airmail route between St. Louis and Chicago. In 1927, Lindbergh became the first person to complete a transatlantic flight; soon after, he left the Missouri National Guard.

The growth of military aviation stagnated for a time after World War I, mostly due to a lack of resources. The National Guard units used World War I aircraft to train throughout most of the 1920s (Gross 1995). However, the Air Corps Act of 1926 began a period of modernization for military aviation. Falling short of the goal of some Air Service officers to create a separate Air branch of the military, the Air Corps Act changed the name of the Air Service to the Air Corps, provided an Assistant Secretary of War for Air Affairs, and elucidated a five-year expansion plan to grow and modernize the military (U.S. Army Air Corps Act of 1926).

The National Guard benefitted from the Air Corps Act as well. States, however, failed to consistently provide adequate airfield and storage facilities until the early 1930s. In 1936, the National Guard finally received its first modern pre-jet airplane (Gross 1995). Other improvements to the National Guard aviation program included photographic and radio equipment and additional training in all aspects of aviation from maneuvers and tactics to maintenance and armament. There were still shortcomings in the training facilities, which lacked artillery ranges, aviation-gunnery ranges, and infantry combat ranges. The Army Air Corps deemed that ground attack and observation missions were marginal and shifted toward bombardment. The National Guard stepped in and overtook the observation missions (National Guard, n.d.c, Connecticut ANG 2010).

2.1.1.4 World War II

In 1940, all 29 National Guard observation squadrons were mobilized, including approximately 4,800 aviation Guardsmen, 613 of whom were pilots. These Guardsmen were a great addition to the Army Air Corps, quickly serving to expand its resources immediately prior to the U.S. entry into World War II (Gross 1995). Directly following the attack on Pearl Harbor, the National Guard flew antisubmarine coastal watches along both oceanic coasts (Doubler 2001).

Most National Guard aviation units, however, were disbanded during World War II. The Guard personnel were reassigned throughout the Army Air Force (formerly the Army Air Corps) and performed reconnaissance, fighter, liaison, and bombardment missions. There were exceptions to this policy. Eight National Guard squadrons were assigned to U.S. training where they trained Army Air Force pilots (Connecticut ANG 2010). Three National Guard observation squadrons, one each from Texas, Louisiana, and Arkansas, took part during the invasion of North Africa with the 68th Observation Company. The 107th Observation Squadron from Michigan and another unit from Minnesota performed photo-reconnaissance for the Normandy invasion; the 107th was the first U.S. air unit to operate from French territory in 1944 (Doubler 2001). The first use of a helicopter in combat came in 1944 when an Army helicopter rescued four downed airmen in Burma (figure 2-5) (Kreisher 2007).

2.1.1.5 Cold War

When the Army began contemplating post-World War II plans for an independent air force, they did not initially include the National Guard or any reserve component (Gross 1995). By 1944, however, the Army Air Force approved a post-war plan that included the National Guard, but in a diminished capacity. The plan did not provide for adequate resources for the National Guard, and National Guard personnel felt that they had been used as a scapegoat for poor pre-war Army planning. Leaders also feared that Army post-war policies would lead to the replacement of senior Guard officers with younger regular Army officers (Gross 1995). These fears drove the National Guard to team with its powerful lobby group, the National Guard Association of the United States, for support. The result was a plan developed by the War Department Special Planning Division's Committee on National Guard Policy that created a dual component National Guard Reserve, one for the Army and one for the Army Air Force, with a total strength of 450,000, which would be the first line of the Army's reserve force (Connecticut ANG 2010, Doubler 1999).

The Army Air Force accepted this plan in November 1945 (Gross 1995). As the first line of air defense, the federal government agreed to provide the National Guard with aircraft (mostly fighters), supplies, and instructors, and agreed to pay National Guardsmen to train. The states were required to provide bases and storage facilities. A total of 58,000 Air National Guardsmen were projected to be split among the states

(Source: National Archives and Records Administration)

FIGURE 2-5. CREW AND HELICOPTER USED BY U.S. ARMY IN 1944

based on the male population in each state (Gross 1995). The first unit to be federally recognized under this plan was the 120th Fighter Squadron of Colorado, which formed in April 1946 (Global Security n.d.b).

The post-World War II period amplified the struggle to create an independent air branch of military service. The conflict was between those in the Army who wanted to retain control of the air units and those in the Army Air Force who wanted a stand-alone military service. At the core of the issue was the role of aviation within the military. The Army Air Force argued that strategic bombing would be the key to future military engagements, which would be brief, highly destructive, and decided by superior air power. Early in the Cold War, the U.S. deemed it would likely be threatened by an air or missile attack. This perceived threat and the campaign promoting strategic bombing warfare as the wave of the future, resulted in a decrease in military budgets for conventional ground forces. Aviation units that were given the task of air defense received an increased military budget and were provided with strategic bombers and nuclear weapons (Gross 1995).

Between 1947 and 1951 there were three congressional initiatives that resulted in the creation of an independent Air Force, Air National Guard, and Air Reserves. The National Security Act of 1947 established the National Security Council, merged the War and Navy departments into the National Military Establishment, and created an independent Air Force. The result was three independent military services—Army, Navy, and Air Force—under the National Military Establishment. The act also allowed for the transfer of former Army Air Force units and property to the newly formed U.S. Air Force (USAF).

Through agreements between the Army and the Air Force during the transfer of resources, the Army chief of engineers maintained construction contracting duties and retained real property oversight for the USAF (Kuranda 2002). Amendments to the National Security Act in 1949 changed the name of the National Military Establishment to the Department of Defense.

The Army and Air Force Authorization Act of 1949 was designed to address the deficiencies of the National Security Act of 1947. Among other things, the act stipulated that the USAF included the regular Air Force, the U.S. Air Force Reserve, and the Air National Guard, while in the service of the U.S. government. The law also set the size of both the U.S. Air Force Reserves and the Air National Guard (Kuranda 2002). The Air Force Organization Act of 1951 established the internal organizational framework for the USAF, defined who was "regular" Air Force, and created three major air commands—the Air Defense Command, the Strategic Air Command, and the Tactical Air Command. The law placed federal responsibility of the Air National Guard units and personnel under the Secretary of the Air Force (Kuranda 2002).

The ANG became an independent reserve to the USAF after its creation by the National Security Act of 1947. Early on, however, there were conflicts between the USAF and the ANG over federal and state financial obligations for bases, aircraft, training, and infrastructure. Both organizations were using obsolete World War II equipment. These challenges were the result of the lack of delineation of air defense responsibilities between the USAF and the ANG (Connecticut ANG 2007, ACC 1999:4). The conflicts were resolved in 1950 when the ANG and the ARNG were allowed division chiefs who could run their respective entities according to the directives of the USAF or Army. Also, in order to promote more effective deployment of the ANG in times of emergency, the ANG reorganized in 1950 to be more in line with the UASF Wing Base Plan. The ANG organization allowed for each ANG squadron to meet all of its logistical, communication, maintenance, and supply needs from within the squadron, which the USAF Wing Base Plan squadrons were unable to do (Connecticut ANG 2010).

Early in the Cold War, the ANG and the Air Defense Command of the USAF were responsible for the air defense of the United States. Eventually, however, air defense became the sole responsibility of the ANG as the USAF was tasked with other mission priorities (Connecticut ANG 2007, ACC 1999:4). As the ANG assumed this responsibility, the two organizations developed a more integrated relationship and the ANG became a more sophisticated service unit. The ANG gave up some of its independence to achieve the more efficient integration with the USAF (Connecticut ANG 2007). One result of this closer relationship was the ANG acquisition of jet aircraft from the USAF in the 1950s.

ARNG aviation history splits from ANG aviation history in 1947, after the creation of the Air Force and Air National Guard. After the formation of the ANG, helicopters dominated ARNG aviation. The helicopter was first used in World War II, but not considered central to ARNG missions until after the Korean Conflict.

2.1.2 Korean Conflict

2.1.2.1 Air National Guard

The Korean Conflict was the first test of the newly established ANG. Sixty-six of the 92 extant ANG flying squadrons were mobilized during the Korean Conflict. Six of those squadrons were sent to Korea, 11 were sent to Europe to support U.S. NATO allies acting as a deterrent to Soviet aggression, while the rest remained on U.S. soil. Two ANG fighter-bomber wings saw action in Korea. The 136th Wing was made up of the 154th Fighter-Bomber Squadron from Arkansas and the 111th and 182nd squadrons from

Texas. The 116th Fighter Bomber Wing was made up of the 158th Fighter Bomber Squadron from Georgia, the 159th Fighter Bomber Squadron from Florida, and the 196th Fighter Bomber Squadron from California. These two wings flew escort missions for heavy bombers using the F-84E "Thunderjet" (figure 2-6) turbojet fighter-bomber. They also flew bombing and strafing runs for close ground support (Listman and Cathcart 2001). The 116th was stationed in Japan and began experimenting with in-air refueling operations to extend their sorties (Listman 2002).

(Source: U.S. Air Force)

FIGURE 2-6. F-84E THUNDERJET FLOWN BY THE NEW MEXICO AIR NATIONAL GUARD

A 1951 Air Force study found that 80% of personnel in the Korean theater were mobilized Air Guardsmen or Reservists that had been "levied" from their home units to backfill individual slots within units (Listman 2002). Air Guardsmen distinguished themselves during their service in Korea. The National Guard Bureau recorded 39 downed enemy aircraft by Guard pilots with 29.5 of those brought down by just four "aces": Major James Hagerstrom from Texas, Captain Clifford Jolley (figure 2-7) and Captain Robert Love from California, and Captain James Robison Risner from Oklahoma (who later was shot down twice in Vietnam and became a prisoner of war for eight years) (Listman 2002). Unlike ARNG units, whole ANG units were rotated out of Korea with much of their equipment remaining behind in-theater (Listman 2002).

2.1.2.2 Army National Guard

Forty-three ARNG units served in Korea. None of these units, however, were aviation units (Berebitsky 1996).

2.1.3 Between Korea and Vietnam (1953–1961)

2.1.3.1 Air National Guard

The Korean Conflict resulted in personnel issues, equipment problems, and other challenges that affected the performance of the ANG while in-theater (Gross 1995:67, 68). As a result, policies were instituted to include the air reserve forces into war plans, develop a selective reserve force program, and enhance command knowledge of reserve forces management (Gross 1995).

After Korea, the ANG's primary responsibility was the air defense of the United States; the fighter-interceptor squadrons were developed for this mission. The Air Defense Command of the USAF was charged with developing a nationwide radar system, and weapons to intercept attack bombers. However, the Air Defense Command was underfunded and was forced to look to other agencies for assistance with air defense. The USAF began talking to the ANG in 1952 about their ability to supplement USAF manpower to accomplish these tasks. The result was the Runway Alert Program that was created by the ANG in 1953, and accepted by the USAF in 1954 (Buterbaugh 2001). In the latter half of the 1950s, the USAF sought to break air defense mission ties with the ANG; however, the ANG completed its mission, oftentimes to higher standards than the USAF. and was able to retain the mission (Brayton 1972, Buterbaugh 2001).

(Source: U.S. Air Force)

FIGURE 2-7. CAPTAIN CLIFFORD JOLLEY

The Gaining Command Concept was adopted by the Air Force in 1960. It advocated a policy, pushed by ANG leaders since the 1950s, which required the command under which an ANG unit fell during war, be responsible for the ANG's peacetime training. This concept was the precursor to the Total Force Policy, which integrated the USAF and the ANG.

A total of 45,000 Guardsmen, including ANG personnel, were mobilized for a year in 1961 (figure 2-8) as part of the U.S. response to the Berlin Wall constructed by the Soviet Union. After the 1961 Berlin crises, which exemplified ANG challenges with outdated aircraft, the lack of funding, and poor planning, the UASF created Air Force Regulation 45-60 in 1963. This regulation required that the Reserve programs must become operationally ready units, which meant they must be ready to enhance the active duty units at a moment's notice (Global Security n.d.a).

Major General Reid Doster, Commanding General of the Alabama National Guard, recruited pilots to train the Cuban exile aviators who took part in the 1961 Bay of Pigs invasion. Some of these pilots were current or former members of the Alabama ANG. The pilots trained the Cuban counter-revolutionaries initially in Florida, then in Guatemala. Four Alabama ANG airmen took part in the last desperate throes of the Bay of Pigs invasion. All four died in Cuba. It should be noted, however, that this was not an Alabama ANG operation. The Alabama ANG pilots were serving with the U.S. Central Intelligence Agency and were undercover as commercial pilots (Jones 2008).

2.1.3.2 Army National Guard

The early 1950s mark the ARNG's concerted re-entry into aviation. In 1951, the Army started training helicopter pilots and began organizing five helicopter transportation companies. The rivalry for resources between the Army and Air Force, however, limited the number of Army transportation companies mobilized to Korea to two (Trowbridge 2004).

(Source: National Guard Educational Foundation)

FIGURE 2-8. MOBILIZED AIR NATIONAL GUARD JETS ON THE TARMAC AT CHAMBLEY AIR BASE, FRANCE

After proving its worth in Korea in 1953, the Alabama ARNG was the first state ARNG to receive an Army-issued helicopter. While the number of helicopters issued to the ARNG increased, the growth of ARNG aviation units were hampered by lack of trained pilots and mechanics (Doubler 2001).

As the call for helicopter pilots increased, the pilot school moved from Fort Sill, Oklahoma, to Camp Rucker, Alabama, giving the camp permanent status; making it Fort Rucker in 1955. In 1956, the Army was given oversight over Army pilot training (formerly provided by the Air Force) and Air Force bases Gary and Wolters in Texas were given to the Army for fixed-wing and rotary wing training, respectively (Trowbridge 2004).

The mid-1950s also found the Army Aviation Center beginning to test weapons systems on helicopters; however, it was not until 1962 that the first armed helicopter division was established in Okinawa. The unit was then deployed to Vietnam where it performed escort missions. It was not until 1966 that the Army officially authorized an armed helicopter (Trowbridge 2004).

2.1.4 Vietnam War and the 1970s

2.1.4.1 Air National Guard

President Lyndon B. Johnson initially refused to mobilize the National Guard for the war in Vietnam. As early as 1965, some ANG units were mobilized for supply missions. The seizure of the USS *Pueblo* by North Korea in 1968 changed this policy. There was concern that the United States would become engaged in Korea again, while remaining engaged in Vietnam. Executive Order 11329 gave President Johnson the authority to mobilize National Guard members for up to 24 months. Almost 10,000 ANG members were mobilized to serve under the Tactical Air Command, Military Aircraft Command, and Air Force Communications Service, including units from Maryland, New Jersey, New York, Colorado, Kansas, Iowa, New Mexico, Kentucky, Arkansas, and Nevada. Air Guardsmen were mobilized (11 Air Guard Wings) and assigned to USAF assets around the world. In 1968, the ANG made up 60% of the USAF presence in Korea (ANG n.d.b, Listman n.d.).

Mobilizations to serve in Vietnam comprised four ANG tactical fighter squadrons and approximately 2,000 Air Guardsmen deployed to Vietnam for a one-year tour of duty. They flew F-100Cs, or Super Sabre fighter-bombers, which were designed for close air support (e.g., bombing enemy targets from lower altitudes). The units deployed included the Colorado 120th and the Iowa 174th tactical fighter squadron (which was accompanied by the 185th Consolidated Aircraft Maintenance Squadron), the New Mexico 188th, and the New York 136th tactical fighter squadrons (figure 2-9). Eighty-five percent of the 355th USAF tactical fighter squadron was composed of South Carolina Air Guardsmen and is sometimes considered a fifth ANG unit deployed to Vietnam (Listman n.d.).

(Source: National Guard Educational Foundation)

FIGURE 2-9. AIRCRAFT OF IOWA'S 174TH TACTICAL FIGHTER SQUADRON AT PHU CAT AIR BASE, VIETNAM

After Vietnam, ANG personnel levels remained consistent through the inclusion of USAF pilots into the Guard while Army personnel levels suffered losses after the elimination of the draft (Doubler 2001). The ANG was increasingly used for air defense. By the mid-1970s, the majority of air defense missions were completed by the ANG. By this time, the ANG was truly integrated with the USAF, to the point where some ANG personnel completed short tours of duty with the active USAF, and many ANG personnel were former active USAF. This integration and reliance on the ANG for air defense allowed the USAF to concentrate on what it viewed as its primary mission—missile defense and strategic bombing (Connecticut ANG 2007).

The Nixon Administration introduced the Total Force Policy in 1973, which integrated the reserve and active units of the U.S. military. The policy grew from the unpopularity of the Vietnam War and associated draft. The objective was to decrease military expenses by using the reserves to supplement the active components. In order to be effective, the National Guard and Reserves had to be included in all planning, manning, and resource models (Doubler 2001). The objectives of Total Force were to elevate the dependability, readiness, and responsiveness of the Guard and Reserves as units and individuals; develop and execute a 10-year construction plan for the Guard and Reserves; and acquire modern equipment for the Guard and Reserves (Iowa National Guard 2004). Ultimately, Total Force allowed the ANG to be fully integrated into the USAF because it equipped the ANG with the same resources as the active forces (Iowa National Guard 2004).

2.1.4.2 Army National Guard

The full potential of helicopter use as a tactical vehicle was not realized until Vietnam War. In 1962, the Howze Board, also known as the Tactical Mobility Requirements Board, was established to assess air mobility. In 1966, the board recommended that the Army commit to what would become known as air assault, which included troop and supply transport and live fire support for ground troops. From 1963 to 1965, the 1st Air Assault Division tested the proposed air assault and in 1965 the 1st Calvary Division (figure 2-10) was formed and sent to Vietnam (Trowbridge 2004).

(Source: U.S. Army)

FIGURE 2-10. ARMY 1ST CALVARY DIVISION HELICOPTERS IN VIETNAM

The deactivation of active Army aviation units in the wake of Vietnam resulted in the expansion of ARNG aviation forces. In 1971, the ARNG acquired 320 helicopters, bringing its total to over 1,200. By 1972, the total number of aircraft in the ARNG included 1,542 helicopters and 166 fixed-wing planes. Army officers and warrant officers seeking to retain their status as pilots joined the ARNG, resulting in an increase of almost 800 ARNG pilots in 1972. The dramatic increase caused the National Guard Bureau to form an aviation branch in 1974 to handle personnel, aircraft, maintenance, and training. By 1980, the ARNG provided almost 30% of the Army's aviation force (Doubler 2001).

2.1.5 1980s and Post Cold War

2.1.5.1 Air National Guard

In 1983, Operation Urgent Fury was the U.S. reaction to the Cuban government's storage of arms on the island of Grenada. ANG units were the first to land on the island and were responsible for the removal of U.S. citizens. The ANG maintained communications during the operation via airborne radio stations. That same year, the ANG participated in the invasion of Panama (Operation Just Cause), providing both airlift support and fighter units.

In 1975, the Air Defense Command became the Aerospace Defense Command. Ultimately, the Aerospace Defense Command functions were transferred to the North American Air Defense Command or NORAD, leaving the ANG to perform all air defense missions by the 1990s (Buterbaugh 2001). These changes led to ANG support of the Strategic Air Command and Tactical Air Command. Having acquired KC-135 tankers from the USAF, the ANG provided air re-fueling support (figure 2-11) for the Strategic Air Command. The ANG completed air refueling operations worldwide for U.S. forces as well as personnel airlifts and equipment drops in support of ground forces (Connecticut ANG 2007).

Post-Cold War, the ANG played significant roles in Operation Desert Storm/Desert Shield in 1990; operations in Haiti, Somalia, Bosnia, and Kosovo; the Global War on Terror; air defense missions at home; Hurricane Katrina; and other numerous natural disaster relief missions.

(Source: National Guard Bureau)

FIGURE 2-11. KC 135 OF ARIZONA'S 161ST AIR REFUELING WING DURING OPERATION DESERT STORM / SHIELD

2.1.5.2 Army National Guard

Throughout the early 1980s, debates within the Army raged regarding the establishment of a separate Army aviation branch. The winning argument was that as aviation technology became increasingly more sophisticated, it required ever more complicated logistical support, which would be better served via a separate military branch. The Army Aviation Branch was created in 1983. The rest of the 1980s saw the development of various Army aviation training programs. At the same time, financial resources to support the armed forces was beginning to wane and the Army Aviation Modernization Plan included reducing the number of helicopters and pilots by maintaining mission effectiveness through new and/or modified aircraft. The support provided by the Army Aviation Branch has been unquestionable since the Vietnam era and has repeatedly proven that it is indispensible (Trowbridge 2004:33).

Since the end of the Cold War, ARNG aviation brigades have served in Operation Desert Storm/Desert Shield in 1990 and, more recently, Iraq and Afghanistan, and have conducted relief missions throughout the United States and overseas.

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3.0 RESERVES

3.1 OVERVIEW HISTORY OF THE RESERVES

[Note: The Air Force Reserves will be discussed below under "Aviation in the Army and Air Force Reserves" (section 3.2.1)].

3.1.1 Overview History of the Army Reserves

Throughout U.S. history, beginning with the American Revolution, the country has relied on a small "Regular" military that has been increased in times of need by its militia (later known as the National Guard) and civilian volunteers. In 1908, Senate Bill 1424 created an Army Reserve Corps of medical officers that the Secretary of War could activate during emergencies. The beginning of the twentieth century saw tensions in Europe rapidly escalate, and although the United States hoped to remain isolated from European affairs, began to increase the size and organization of its military. Just four years after the Medical Reserve Corps was created, the Army Appropriations Act of 1912 created the Army Reserve.

In 1916, after Francisco "Pancho" Villa's raid into the U.S, approximately 3,000 Army Reserve soldiers were mobilized for military service on the border of Mexico. This was 70% of the Army Reserves and was the first mobilization of the Army Reserves (Global Security n.d.). As a result of this action, the National Defense Act of 1916 created an Officer's Reserve Corps and an Enlisted Reserve Corps as well as the Reserve Officers Training Corps (ROTC) program in U.S. universities. In 1917, the Medical Reserve Corps merged with the Officers Reserve Corps.

The Army and the Army Reserves expanded to meet the challenges of World War I in 1917. Approximately 80,000 served in the Enlisted Reserve Corps and nearly 90,000 served in the Officers Reserve Corps during the war, and were found in every division of the American Expeditionary Force.

Between World War I and World War II, the Organized Reserves, as they were referred to until 1952, suffered from lack of pay for drill and no retirement plan, which helped contribute to lack of participation in annual training and decreased numbers. From 1933 until 1939, however, some 30,000 officers served as commanders and officers at the 2,700 Civilian Conservation Corps camps that were created by President Franklin D. Roosevelt's New Deal (Global Security n.d.a, USAR 2008).

The Army Reserves were mobilized prior to World War II to build the Army and fill junior officer slots. In 1941, 90% of the Army's company-grade officers were activated Reservist officers. The Organized Reservists were called up in February 1942 by President Roosevelt and served throughout the war. Some of the Reservists were too old, held high ranks that were not needed, or filled positions that were considered too essential for them to leave; these individuals were not activated. During World War II, 200,000 of the 900,000 Army officers that served during World War II were Reservists (USAR n.d.).

The significance of the contribution of the Reserves to World War II is undeniable, with one Army survey showing that over 52% of the officers killed in action between September 1943 and May 1944 were Reservists (Global Security n.d.a). In 1948, Congress acknowledged the Reserves importance by authorizing drill pay and providing retirement. Women were also authorized to join the Organized Reserves in 1948.

The invasion of South Korea by North Korea in 1950 sparked the first post-World War II mobilization of the Organized Reserves (see section 2.1 of this document for a detailed discussion of U.S. Cold War policy for National Guard and Reserve forces). Initially, 25,000 Army Reservists were activated in the early weeks of the conflict, many of whom were junior officers and noncommissioned officers whose recent World War II combat experience was desperately needed. In all, 240,000 Reservists were called up, with some 400 Reserve units serving in Korea. Seven Reservists received the Medal of Honor for heroism in the Korean Conflict.

The Armed Forces Reserve Act, which was passed in 1952, was designed to consolidate the laws governing the Reserves and National Guard and to better define the roles and responsibilities of the two organizations. The Organized Reserves were renamed the U.S. Army Reserve (USAR); three levels of Reserves were established: Ready, Standby, and Retired. Ready Reserves were subject to being called up by the president in case of emergency while the other two could only be called up by Congress. Additional legislation in 1955, the Reserve Forces Act, required National Guardsmen and Reservists to attend basic training on active army installations, provided for 24 days of training and 17 days of annual training, and gave the president the authority to mobilize up to one million Reservists (Doubler 2001, Reserve Forces Act of 1955).

After the Korean Conflict, the Reservists were not called on again until 69,000 were activated in response to the 1961 Berlin Crisis. Due to the challenges encountered during the 1961 mobilization, which included outdated equipment, problems locating individuals, and shortage of soldiers, the Army Reserves were reorganized in 1968 to be primarily combat support and combat service support units with the combat units being concentrated in the National Guard (Global Security n.d.a).

USAR personnel were not called up for service in Vietnam en masse until after the 1968 Tet Offensive, and even then relatively few Reservists were mobilized. Approximately 5,900 USAR troops in 42 units were activated and only 3,500 of those in 35 units served in Vietnam (Global Security n.d.a).

In 1973, President Nixon's Total Force Policy was developed with the goal of keeping an active duty military to maintain the peace that would be supplemented by a well-trained and equipped Reserve force. It shifted some resources and duties to the USAR and resulted in downsizing the manpower of the Reserves while improving its readiness (USAR History n.d.).

The 1980s saw USAR civil affairs units deployed to Grenada during the 1983 Operation Urgent Fury to help the island rebuild its infrastructure. In 1989, police and civil affairs units were sent to Panama during Operation Just Cause to help reestablish peace. During these operations, the Regular Army did not have enough qualified individuals to perform the missions and the USAR was given the responsibilities. The trend to use USAR units to supplement Regular Army units abroad in the conflicts that have ensued since 1990 has continued (Global Security n.d.a, USAR 2008). In the 1990s, Reservists provided support for NATO and UN operations in Europe, Africa, and the Caribbean. Since 2001, Reservists have proven to be pivotal in the execution of the Global War on Terror.

3.1.2 Overview History of the U.S. Navy and Marine Corps Reserves

After Europe erupted in war in 1914, the U.S. Secretary of the Navy and one of his assistants, Franklin D. Roosevelt, prompted Congress to pass legislation that provided federal funding for a federal Navy Reserve, which was established in 1915. The first task of the Navy Reserve came in 1916 when they began to hunt German U-boats from biplanes (Global Security n.d.a, Goodspeed 2008).

The Marine Corps Reserve was created one year later by the Naval Appropriations Act; however, Marine Reservists already had been participating in state Navy militias that bordered water. As a result of World War I, the Maine Corps Reserve grew from 35 in 1917 to 6,440 in 1918. These Reservists included women, who were allowed to enroll by the Secretary of the Navy in August 1918 (USMC History Division 2006).

The period between World War I and World War II was a time of major fluctuations in the Marine Corps Reserves, largely caused by congressional actions and variations in funding. The Marine Corps Reserves were reorganized after Congress passed the Reserve Act of 1925, which succeeded the 1916 Act that created the Reserves. Part of the 1925 Act established aviation units with the Marine Corps Reserves, and another provided for pay to members and financed training programs. These actions resulted in an increase in Reservist numbers; however, numbers dropped again during the Great Depression when units trained and drilled without pay (USMC History Division 2006).

The Naval Aviation Cadet program and the Naval Reserve Officer Training Corps were established in the Interwar period. In the 1920s and 1930s, Navy Reservists began training on a more regular basis, and in some cases, became the crew for noncommissioned ships or served to augment active Navy ship crews (Chambers 2000a). These advances made possible the development of a well-trained Navy Reserve force.

The Naval Reserve Act of 1938 took precedence over the 1925 law and created a Fleet Marine Corps Reserve, an Organized Marine Corps Reserve, and a Volunteer Marine Corps (USMC History Division 2006). The Fleet Marine Corps Reserves and the Volunteer Reserves had no obligations until they were activated in war or national emergency. The Organized Marine Corps Reserves were organized in battalion-sized units and were required to attend training. The Naval Reserve Act also created four major divisions of the Naval Reserve. These included the Fleet Reserve, the Organized Reserve, the Merchant Marine Reserve, and the Volunteer Reserve. Finally, the law expanded training for the Merchant Marine and Volunteer Reserve.

The Marine Corps and Naval Reservists were mobilized in 1940. Marine Corps Reserve units were dissolved and the Reservists were used to replace individuals within the active Marine battalions, which served to integrate the Reserve and Regular Marines and created cohesion between the two. Navy Reservists were usually called up as individuals and served alongside active-duty Navy personnel. This procedure provided a more seamless integration of active duty and Reserve personnel (Chambers 2000b).

During World War II, the ranks of the Navy grew exponentially from 383,150 personnel to 3,405,525. The majority of the growth was from Reservists (Goodspeed 2008). Almost 600,000 Marines served during World War II, and of those, approximately two-thirds were classified as Reservists including retirees, war volunteers, college students, and women (Chambers 2000b, USMC 2006). These Marine Reservists served with distinction and in 1943, 45 of the 82 Marine Medal of Honor winners were Reservists (U.S. Marine Corps 2006).

The Cold War followed immediately on the heels of World War II and caused the government to create programs to provide for Reserve troop readiness (see section 2.1 of this document for a detailed discussion of U.S. Cold War policy for National Guard and Reserve forces). The Navy embarked on a nationwide recruiting campaign, Operation Naval Reserve, in the first years of the Cold War. As a result, by December 1947, Naval Reserve enlistment exceeded 630,000 men and women (McManes 1953). The Reserve Forces Act of 1948 provided for drill and retirement pay and training for Reservists (Chambers 2000a). In 1950, the active Marine Corps numbered 74,279 members, which was just over half of its estimated required peace time strength of 114,200. The Organized Marine Corps Reserves numbered almost 40,000, while the Volunteer Reservists numbered almost 90,000. Ninety-eight percent of the

Reserve officers and 25% of enlisted Reservists had combat experience; the majority of the combat-tried Reservists were Organized Aviation Reserve pilots or Volunteer Reserves.

Over 95% of Marine Corps Reservists were called to active duty during the Korean Conflict (Chambers 2000b). As with World War II, with the exception of aviation units, Marine Reserve units were disbanded and the individuals were assigned to active duty units (Chambers 2000a). Marine Reservists earned 13 Medals of Honor during the Korea Conflict, and a third of all aviation combat missions were undertaken by Marine or Navy Reservists (USMC History Division 2006). Navy Reservists served in Korea and recommissioned aircraft carriers housed air squadrons wholly composed of Navy Reservists.

Naval Reservists were called to active duty during the 1961–1962 Berlin Crisis and the Vietnam War. Very few Marine Reservists were activated during Vietnam; however, thousands volunteered as individuals for active duty (Chambers 2000b).

The Marine Reserves were deployed to the Persian Gulf in 1990 and 1991. This was their largest mobilization since the Korean War, comprising 15% of Marines in the Gulf War. Also deployed to the Persian Gulf were 21,000 Navy Reservists. Ten years later, Marine and Navy Reservists returned to the Persian Gulf and participated in the Global War on Terror. They also were deployed to Southeast Asia, Afghanistan, and Okinawa.

3.2 HISTORY OF AVIATION IN THE RESERVES

3.2.1 Army and Air Force Reserves

3.2.1.1 The Early Years: 1900 to World War I

After General Pershing's use of the 1st Aero Squadron during his excursion into Mexico chasing "Pancho" Villa, the Army realized the utility of aircraft to provide up-to-date information on troop movement. In 1917, seven active-duty squadrons were organized and a Reserve Air Corps was established under the National Defense Act of 1916. In March 1917, a plan was devised to acquire thousands of planes for the Army (and Navy), and a call was issued for 1,850 aviators. The U.S. declared war on Germany less than two weeks after the plan was conceived (Hennessey 1958).

3.2.1.2 World War I

The Signal Corps Reserves were home to the Organized Reserve aviators immediately before and during World War I. With only 250 aircraft and less than 30 qualified aviators, the Signal Corps Reserves had failed to develop the personnel structure, technology, or advanced equipment for an air war.

3.2.1.3 Interwar Period

Due to the lack of pay for Organized Reservist annual training, less than 30% of the Reservists attended annual training, and the Interwar period saw few, if any, developments in aviation for the Reservists. However, the Army aviation program saw changes beginning with the Air Corps Act of 1926, which began a five-year-long period of modernization for the Army Air Corps, providing money for new

equipment, aviator training (figure 3-1), and an Assistant Secretary of War for air affairs (Air Corps Act of 1926).

3.2.1.4 World War II

Many Reservists were called to duty in 1940 prior to U.S. entry into World War II, with the remainder called up in 1942. Like World War I, Reservists were integrated into the Regular Army. One of the most famous reservists, James H. Doolittle (figure 3-2), began his aviation career in 1917 when he entered the Army Signal Corps Reserve. He trained Army Signal Corps pilots during World War I, and afterward, Doolittle remained in the Signal Corps until 1930, when he left the Regular Army remaining a Reserve Officer. In 1940, Doolittle returned to active service with the Air Corps, and in 1942 he planned and executed the famous "Doolittle Raid" on Japan (Department of the Navy, Naval Historical Center 2002).

(Source: Pearson Air Museum)

FIGURE 3-1. 321ST OBSERVATION SQUADRON, U.S. ARMY RESERVES, 1920S

(Source: Travis Air Museum)

FIGURE 3-2. JAMES H. DOOLITTLE

As the Army Air Corps grew and reorganized, Army artillery officers saw their needs were not being met by the Air Corps arm, which began to focus on aerial bombardment. In response to these concerns, the Secretary of War created the Organic Air Observation for Field Artillery in June 1942. The Secretary ordered the Army Air Force to supply the ground forces with one-engine planes (two per artillery battalion), maintenance, and pilot training and ratings. The first Organic Army Aviation unit saw combat in North Africa in November 1942; units that included reservist aviators were used in all theaters of combat during World War II (U.S. Army Aviation Museum Foundation, Inc. 2003a).

During World War II, Organic Army Aviation's main purpose was to adjust artillery fire via aerial observation. Organic Army pilots included Reserve pilots. It also provided aerial photography, medical evacuation services, and limited low level bombing of close-range ground targets. The use of Organic Army Aviation was strongly protested by the Air Corps and later the USAF, especially as the number and diversity of Army Aviation missions expanded.

3.2.1.5 Cold War

The end of World War II saw the rapid draw down of active U.S. military forces, which were then reinforced by a large reserve component. The biggest change to affect the post-World War II Reservists was the passage of the 1947 National Security Act, which established a separate Air Force (USAF) from the Army (Kuranda 2002), and the 1949 Army and Air Force Authorization Act, which dictated that the Air Force include the Regular Air Force, the Air Force Reserve (formerly the Reserves of the Army Air Force), and the ANG. The act also dictated the size of the USAF Reserve and the ANG. In 1948, congressional action approving drill pay and retirement pay for Reservists was passed.

The Key West Agreement of 1948, which outlined the air assets of the Army, Navy, and Air Force, and the Joint Army Air Force Adjustment Regulation 5-1001 of 1949 limited Army Aviation missions to messenger, reconnaissance, observation, evacuation, and emergency wire laying. Other air missions were reserved for the USAF (U.S. Army Aviation Museum Foundation, Inc. 2003b).

3.2.1.6 Korean Conflict

Army Reserves

Just before the Korean Conflict, the Army acquired 13 H-13 Sioux helicopters, bringing its total helicopter inventory to 56, and acquired the new 0-1 Bird Dog fixed-wing aircraft. During the conflict, Army helicopters proved their worth. In 1951, the Army tried to organize five helicopter transportation units, but the rivalry with the USAF over control of resources and missions and a shortage of helicopters only permitted two units of H-19 Chickasaws to be formed before the war ended (U.S. Army Aviation Museum Foundation, Inc. 2003c). Also during the conflict, the Army's Department of Air Training at Fort Sill expanded and was renamed the Army Aviation School, which moved to Camp Rucker in 1953.

Although the Army Reserves comprised a large part of the ground forces deployed in Korea, the Army Aviation missions were undertaken by Regular Army personnel.

(Source: AFRC)

FIGURE 3-3. MOBILIZED RESERVISTS BOARDING AN AIR FORCE RESERVE TRANSPORT AIRCRAFT

Air Force Reserves

The first test of the Air Force Reserve Command came when North Korea invaded South Korea. Just prior to the Korean Conflict there were over 315,000 nondrilling Air Force Reservists and over 58,000 drilling Reservists in combat-sustainable units with aircraft (AFRC n.d.). Twenty-five Air Force Reserve Command flying wings with 30,000 personnel were activated, with an additional 119,000 individual Air Reservists mobilized (figure 3-3). The Air Force Reserve Command performed poorly in Korea, living up to their reputation of being "flyable storage" (Meilinger 2003).

3.2.1.7 Between Korea and Vietnam (1953–1961)

Army Reserves

Between the Korean Conflict and the Vietnam War, the Army Aviation School at Camp Rucker became the Army Aviation Center, making the camp a full-time Army asset that was renamed Fort Rucker. In 1956, the Army was given full control of its aviation training program, which was originally conducted by the USAF, and took over Gary and Wolters Air Force bases in Texas, where it continued fixed-wing and rotary wing training, respectively. That same year, the Army began testing weapon systems on helicopters. In 1962, the first armed helicopter unit was created on Okinawa and shipped to Vietnam (U.S. Army Aviation Museum Foundation, Inc. 2003c).

The 1961–1962 Berlin Crisis and Cuban Missile Crisis resulted in the call-up of thousands of Army Reserve soldiers. However, no Army Reserve Aviation units were activated (Wilson 1998).

Air Force Reserves

After the Korean War, the Air Reserve Personnel Center and an Air Reserve Technician program were created, which resulted in a staff of civil servants who were also Air Force Reservists. Five Air Force Reserve units with approximately 5,600 personnel were mobilized for military service during the 1961–1962 Berlin Crisis (figure 3-4).

During the Cuban Missile Crisis in 1962, Air Force Reserve units flying C-119s were assembled at Key West NAS and Homestead Air Force Base in Florida. A total of 14,220 Reserve personnel and 422 planes remained on active duty until late October 1962 (AFRC n.d.).

(Source: AFRC)

FIGURE 3-4. 512TH AIR FORCE RESERVISTS DEMOBILIZING AFTER THE CUBAN MISSILE CRISIS

3.2.1.8 Vietnam War and the 1970s

Army Reserves

The Army Reserve played only a minor role in the Vietnam War. The 42 Army Reserve units called up for military service in Vietnam after the 1968 Tet Offensive were composed of transportation, medical, infantry, military intelligence, adjutant general, composite service, finance, ordnance, and quartermaster units and totaled 5,869 individuals. A total of 35 units were ultimately deployed to Vietnam. These included the 11th Aviation Group, which provided air mobility support for the 1st Cavalry.

After the 1973 Total Force Policy was implemented, all Reserve forces became more symbiotic with the Regular forces. As a result of this policy, the Reserve forces experienced an influx of new equipment and better training. The goal was to be able to seamlessly integrate regular and Reserve forces in the country's military defense plans (Meilinger 2003).

Air Force Reserves

The Air Force Reserves mostly provided direct and indirect voluntary support in Vietnam. Air Force Reservists flew C-124 airlift missions during their annual two-week training and an additional 36-day inactive duty training every year until the United States left Vietnam in 1973. The units also provided intelligence and medical personnel, aerial porters, lawyers, chaplains, maintainers, and performed rescue and recovery missions such as Operation Homecoming: the return of American POWs from North Vietnam (figure 3-5). In 1968, the Air Force Reservists assisted active duty units by helping to maintain the new C-141 and C-9 aircraft (AFRC n.d.). This program to acquaint Regular and Reserve Air Force units was a precursor to the 1973 Total Force Policy (Meilinger 2003).

(Source: U.S. Air Force Reserve Command)

FIGURE 3-5. AIR FORCE RESERVE SUPPORTS OPERATION HOMECOMING FROM VIETNAM, 1973

There were limited mobilizations for the Air Force Reserves during the Vietnam War. In May 1968, after the USS *Pueblo* incident, an airlift group, a medical service squadron, and an aero medical evacuation squadron were activated. The 72nd Tactical Airlift Squadron was the first Air Reserve unit to see combat since Korea. Other Air Reserve units called up were the 305th Aerospace Rescue and Recovery Squadron from Selfridge Air Force Base (AFB), Michigan; the 938th Military Airlift Group and its collocated 349th Military Airlift Wing from Hamilton AFB, California; the 921st Military Airlift Group from Kelly AFB, Texas; the 941st Military Airlift Group from McChord AFB, Washington; the 918th Military Airlift Group and its collocated 435th Military Airlift Wing from Dobbins AFB, Georgia; the 904th Military

Airlift Group from Stewart AFB, New York; portions of the 930th Tactical Airlift Group; the 34th Aeromedical Evacuation Squadron; the 52d Medical Service Squadron; and the 82d, 86th, and 88th Aerial Port Squadrons (DeVries 2009).

The Total Force Policy adopted in 1973 served to integrate the Air Force Reserves with the USAF bringing the Reserves up to active duty operational readiness standards. As a result, Air Force Reserves received new aircraft. This policy ensured that all future engagements would see the Reserves as a major source of reinforcements for the Regular forces.

3.2.1.9 1980s and Post Cold War

Army and Air Force Reserves

Since implementation of the Total Force Policy, Army and Air Force Reservists have maintained a close relationship with active duty Army and USAF. The 1980s were relatively quiet for the Reserves. They participated in training and humanitarian missions in Latin America. In 1990, Reservists operating from Saudi Arabia and Europe, including aviators, were deployed to provide support during the first Gulf War. In 1992, Air Force Reservists also were activated to provide support in the maintenance of the UN-mandated no-fly zone over Iraq. Air Force and Army Reservists also served in post-Cold War multi-national operations supporting UN and NATO relief and peacekeeping missions in Africa (figure 3-6) and the Balkans. Since 2001, Reservists have participated in Iraq and Afghanistan during the Global War on Terror. Finally, Reservists have provided disaster relief and wildfire suppression support in the United States (Doubler 2008).

3.2.2 History of Aviation in the Navy and Marine Corps Reserve

3.2.2.1 The Early Years: 1900–World War I

(Source: AFRC)

FIGURE 3-6. AIR FORCE RESERVE HC-130 IN DJIBOUTI, AFRICA

Navy aviation began in July 1911 when Lieutenant T. G. Ellyson became the first U.S. Naval aviator to qualify for his pilot's license. Two months later, Ellyson and lieutenants John H. Tower and John Rodgers were ordered to the Navy's new Engineering Experiment Station at Greenbury Point, Annapolis, Maryland, where they continued to train (Webster 1998).

Early Marine aviators trained with Navy aviators. The first Marine Corps pilot, First Lieutenant Alfred A. Cunningham, reported for training in Annapolis in May 1912. The first use of Marine aviation took place,

like the Navy, in maneuvers in the Caribbean. The exercises, conducted in the winter of 1914, consisted of daily reconnaissance flights in support of the ground forces (Webster 1998).

Naval aviation's first deployment occurred in January 1913, which consisted of maneuvers in the Caribbean and was based out of an aviation camp at Guantanamo Bay, Cuba (figure 3-7). Like Army aviation, Navy and Marine Corps pilots were valued for observation, spotting, and reconnaissance.

(Source: U.S. Navy Photo No. NH95636)

FIGURE 3-7. NAVAL AVIATION CAMP AT GUANTANAMO BAY, CUBA, 1913

In 1913, First Lieutenant Cunningham was appointed to the Chambers Board with six other Naval aviators. The board was to develop a comprehensive plan for Naval Aviation and called for the establishment of a permanent Naval Air Station (NAS) at Pensacola, Florida (Webster 1998). The Chambers Board also ensured Marine aviation's integration with Navy aviation (USMC History Division 1962).

When the Naval Militia was created in 1915, it included an aeronautical unit, but there were no associated funds or aircraft. Nonetheless, by 1916 there were 10 state-run Navy air militia groups that made up Naval Reserve Aviation. The Naval Flying Corps and the Naval Reserve Flying Corps were created by the Naval Appropriation Act of 1916. The act limited the total number of naval aviation personnel to 48 officers and 96 enlisted personnel. Civilian interest in Navy aviation was great as represented by a group of students led by Trubee Davison from Yale University. The group acquired their own planes and instructors and joined the Naval Flying Corps Reserve shortly before the United States entered World War I (Mersky1987).

3.2.2.2 World War I

Navy Reserves

In 1917, the Navy aviation arm was negligible. It consisted of 43 officers and 230 enlisted men who based their 54 aircraft out of NAS Pensacola, Florida. In order to remedy this condition, a major recruitment effort was undertaken during World War I in order to expand the ranks of naval aviators. To this end, the Navy established the Naval Reserve Flying Corps, which provided the vast majority of Navy pilot candidates (Webster 1998). Training took place in Squantum and Bay Shore, Massachusetts; Huntington and Newport News, Virginia; Akron and Camp Borden, Ohio; and its primary flying school in Pensacola, Florida.

Naval aviation grew dramatically during the war; 1,100 officers, 18,000 enlisted men, and 570 aircraft took part in the conflict. Aviators spotted 27 enemy submarines, and damaged about half of them, and dropped almost 100,000 pounds of bombs. By war's end, the Navy's air arm had grown to more than 6,700 officers and 30,000 enlisted men. Four thousand trained pilots had a fleet of more than 2,100 airplanes at their disposal (Webster 1998).

Because the Regular Navy aviators were needed to run airfield and command air operations, the bulk of U.S. Navy aviators in Europe were Reservists. Naval Reserve Flying Corps aviators were first to destroy a German submarine from the air, first to get a Navy kill in the air, and first to produce an "ace." At the end of the war, there were over 37,000 naval aviators, 82% of whom were Reservists (Mersky 1987:4).

Marine Corps Reserve

On the eve of World War I, Marine Corps Aviation was nascent. The Marine Corps' first aviation unit, the Marine Corps Aviation Company, was organized in February 1917. Military leadership proposed that the aviation unit consist of 10 officers and 40 enlisted men based out of Philadelphia, Pennsylvania. The unit had begun to receive its own aircraft when the United States entered World War I (Webster 1998).

The Marine Corps Aviation Company was assigned two missions during World War I: seaplane patrols out of the Azores, and observation and bombardment support for the Marine Expeditionary Force in France. For these purposes, two new aviation units were organized in the summer of 1917: the 1st Aeronautic Company and the 1st Marine Aviation Force. By the end of the war, these units had grown to 282 officers and 2,180 enlisted men (Webster 1998). Both units were populated by officers from the Marine Corps Reserve Officers Corps.

Training for Marine aviators initially took place at Navy aviation fields in Mineola, New Jersey, New York, Cape May, Lake Charles, and Coconut Grove. In 1918, the Marines were given Curtiss Flying Field in Miami, which was renamed the Marine Flying Field (USMC History Division 1962). While not as extensive as the other aviation facilities, the establishment of the Marine Corps Air Station at Miami was a direct acknowledgment that the Marines needed their own shore facilities. The base at Miami closed immediately after the Armistice, but new air stations were established at Quantico and Parris Island during the Interwar years (Webster 1998).

3.2.2.3 Interwar Period

Navy Reserve

At the end of World War I, U.S. military forces rapidly dwindled with the return of the Reservists to civilian life. The Naval Reserve Flying Corps lost so many personnel that it was deactivated in 1922. Despite the failure to keep the Naval Reserve Flying Corps active, two Reserve bases were established in Anacostia in Washington, D.C., and Squantum in Boston Harbor. Anacostia was activated in 1919 and was the central feature of Navy Reserve flying until 1961, when its activities were moved to Andrews AFB. In 1924, Squantum became a Naval Reserve Air Base and remained so until 1953 (Mersky1987:5).

The expansion of aircraft inventories in the 1920s exacerbated the already pressing shortage of qualified Navy pilots. Navy aviation was forced to rely increasingly on Reserve pilots. It became clear, however, that these aviators were under-qualified. They only trained intermittently—funds were not available to provide regular training sessions. Even with the help of the Reserve aviators, the Navy's air arm suffered from a chronic lack of pilots (Webster 1998).

A Naval Aviation Reserve policy was issued in 1923 which allowed for one unit each in the naval districts that desired them, and each unit was to recruit 10 new members every year. The policy also called for each unit to be issued two training planes. Thirty-three pilots received training in 1923 under this program. Two years later, the Naval Reserve Aviation Base of Sand Point, Washington, was created as a two-unit installation to train new and already qualified pilots. In 1926, the Navy issued a policy that it would maintain a minimum level of Reservists and would provide training (figure 3-8) for enlisted Reservists. Throughout the rest of the 1920s, greater attention was paid to Naval Reserve Aviation training and units. Additional training facilities were set up in Oakland and Long Beach, California; Detroit, Michigan; and Minneapolis, Minnesota (Mersky 1986:6-7).

The 1930s saw a continued trend for Naval Aviation Reservists. Naval Reserve flight fields were enlarged, equipment was overhauled or replaced, and the units were called on to participate in extra training events as well as rescue and recovery flights and photographic expeditions (Mersky1987:10).

Navy aircraft inventories expanded in the 1930s, but there was still a shortage of pilots. In the past, Navy Reservists were called on to bolster the number of trained aviators, but Reserve funding limitations and the lack of viable career prospects led to a decline in qualified Reserve pilots. Congress established an Aviation Cadet program in 1935 in an attempt to reverse these declines. The program drew candidates from college graduates, most of whom had been members of ROTC units. Selectees underwent one year of flight training at Pensacola, followed by three years of active duty. After active duty, they were discharged to the Naval Reserve at the rank of ensign (S Rep No. 402, 1935). The Aviation Cadet program was intended to be temporary, but evolved into a permanent source of pilots.

The Naval Reserve Act was passed in 1938, and dictated that the Fleet Reserves be made up of former Regular Navy, while the drilling components of the then Fleet Reserves were to be called Organized Reserves. One purpose of the act was to expand the Navy Reserves. The number of Navy Reserve Aviators was particularly low in the mid-1930s. Some thought the Aviation Cadet Program would increase the ranks of the Reserves, and therefore, few resources were diverted to train new Reserve aviators or volunteer reservists (formerly trained aviators who lived too far away from Naval Reserve Air Bases to attend weekend training events) (Mersky1987:12–15).

(Source: U.S. Navy, Photo No. NH84424)

FIGURE 3-8. GROUP OF PILOT TRAINEES AT NAS PENSACOLA, 1927

Marine Corps Reserve

When the Marine aviation units returned from Europe after World War I, they were disbanded; it became difficult for the Marines to retain aviation units. In 1920, Marine Corps Commandant Lejeune approved four aviation squadrons. Marine Corps aviation was officially recognized when Congress passed enabling legislation establishing the Marine Corps aviation component of Navy aviation at approximately one-fifth the strength of the Navy. In 1924, two air groups were established, with the First Air Group on the East Coast, and the Second Air Group on the West Coast, each attached to the Marine Expeditionary Force based on its respective coast (Webster 1998).

Like the Navy, the Marine Corps had difficulty maintaining a qualified cadre of pilots and relied heavily on the Marine Aviation Reserve Officer Corps to ensure that it would have the necessary number of pilots in the event of war. The Marine Reservists received their primary flight training at Pensacola and then went on to other Navy and Army flight schools for advanced training. Upon completion of their training, the Reservists spent one year of active duty in the aviation section, then returned to civilian life subject to recall (Webster 1998).

Throughout the 1920s, Marine Corps aviation units saw service in Haiti, the Dominican Republic, Nicaragua (figure 3-9), China, and Guam (Condon n.d., USMC History Division 1962).

During these operations, the Marine pilots developed methods for air to ground communications during combat, dive-bombing, and troop and supply transport (USMC History Division 1962). The Marine Corps Reserve continued to supplement the aviation section in the 1930s. By 1938, the Marine Air

Reserve included over 100 pilot officers on inactive status and 60 cadets on active duty; 15 students were in training at Pensacola, and 600 inactive enlisted men contributed to the Marine Corps Aviation Reserve component (Webster 1998).

The Great Depression intensified the isolationist policies of the U.S. government, resulting in the contraction of the Marine Corps aviation program. Marine aviation and training became increasingly focused on support for ground troops. The period immediately prior to World War II saw a dramatic increase in Marine aviation personnel, including a jump from 145 pilots in 1936 to 425 in 1940, an increase that was partially precipitated by an influx of the limited number of loyal and tight-knit Marine Reserve pilots (Condon n.d.).

(Source: U.S. Marine Corps)

FIGURE 3-9. MARINE CORPS AVIATORS IN NICARAGUA, 1928

3.2.2.4 World War II

Navy Reserve

When the United States entered World War II, there were only 1,500 Naval Aviation Reservists who were deployable. One-third of the Naval Aviation Reserves were mobilized in 1940 and the rest were mobilized in 1941. By the end of the war, 83% of Naval aviation forces were Reservists. Training for volunteer Navy aviators took place on several of the Reserve air bases. Naval Reserve Air Base Squantum trained aviators from all Allied countries. NAS Anacostia grew to house the Photographic Science Laboratory, the Naval Imaging Command, the Aviation Experimental and Development Squadron, and the Tactical Air Intelligence Center. The Women Accepted for Voluntary Enlisted Service or WAVES (figure 3-10) also were housed at this location, among other air bases (Mersky1987:15–17). World War II resulted in dramatic changes for all services of the military. Navy aviation was no exception. Prior to the buildup for war (1938) the Navy was authorized 3,000 aircraft, which operated from 8 aircraft carriers, 11 air stations, and 8 Reserve air bases. By war's end, more than 100 carriers and over 37,000 aircraft were in operation. Shore installations exceeded 200 and were scattered across the country (Webster 1998).

(Source: U.S. Navy Photo No. 80-G-88212)

FIGURE 3-10. RESERVE WAVE METALSMITH BARBARA STROUD AT NAS JACKSONVILLE, 1943

Marine Corps Reserves

After World War II started, the 4th Marine Base Defense Aircraft Wing was established in 1942 in Hawai‘i with squadrons in Hawai‘i, Midway, Ewa, and Samoa. The name was changed in 1944 to the 4th Marine Aircraft Wing. As the war progressed, Marine pilots honed their dive-bombing and low-altitude flying skills, and when combined with the Marine infantry units, proved to be the forerunner of today’s air/ground team concept.

3.2.2.5 Cold War

[See section 2.1 of this document for a detailed discussion of U.S. Cold War policy for National Guard and Reserve forces.]

Navy Reserves

Following the end of World War II, the Naval Air Reserve Training Command was established with its headquarters in Glenview, Illinois. The purpose of the command was to retain and control the highly trained Naval Aviation Reservists across the country. A ready reserve of 5,000 officers and 30,000 enlisted personnel was paid to drill and maintain the Navy ships that had been mothballed. The standby Reserves were unpaid volunteers who were to backfill ready reservist slots if they were called to active duty. The Naval Air Reserve Training Command commissioned 55 groups in 1946 alone. In 1947, the ready reserve was renamed the Organized Reserve while the standby were dubbed the Volunteer Reserve. By 1948, 200 squadrons of Navy Aviation Reservists were flying over 500,000 hours a year in 1,500

aircraft and were practicing carrier takeoffs and landings as well as land-based operations (Mersky 1987:17–18).

After struggling through the late 1940s, Navy aviation experienced a Cold War resurgence in the 1950s and 1960s. Navy strategy evolved around development of long-range patrol aircraft, antisubmarine warfare, and modernization of the carrier-based jet inventory (Webster 1998). The Navy began using helicopters in the 1970s.

Marine Corps Reserves

The 4th Marine Base Defense Aircraft Wing was disbanded after the war, but in February 1946, the Marine Air Reserve Training Command or MARTC was created as an outlet for World War II Marine pilot veterans to maintain their skills. MARTC headquarters were at NAS Glenview, Illinois.

Demobilizations after World War II increased Marine Corps reliance on Reserve forces. In early 1950, the Marine Corps had skeleton units with less than 75,000 Marines on active duty. The Reserve component consisted of almost 130,000 personnel, most of whom were volunteer reservists. Ninety-eight percent of the officers and 25% of the enlisted men in the Reserves were veterans. The majority of these experienced Reservists were either Organized (unit) Aviation Reserve pilots or members of the Volunteer (individual) Reserve (Quinlan 1990).

While the Marine Air Reserve was not the major reserve component of the Marine Corps at this time, its forces grew to over 6,000 strong, and Reservists trained at 25 Marine Air Detachments across the country. As a result of this increase in personnel, the Marine Air Reserves were equipped to meet the challenge presented in 1950 after North Korea invaded South Korea. In the 1950s and 1960s, the Marine Corps brought jets and helicopters into their aircraft inventory.

3.2.2.6 Korean Conflict

Navy Reserve

Some 30,000 Naval Air Reservists were called up after the North Korean invasion of South Korea. Some Reserve squadrons, like the VF-781 from Los Alamitos, California, volunteered as a group. The challenge for many of these Reserve units was that they had been flying obsolete World War II aircraft and the transition to the modern Douglas AD Skyraiders aircraft flown by regular Navy pilots took time. Some Naval Air Reservists were introduced to the new jet fighter bombers (F9F Panther and Banshee) while in Korea (figure 3-11). As the Reservists adjusted, it was not unusual to find 50% to 100% of a fleet carrier's air group composed of Naval Air Reservists (Mersky1987:18–19).

Marine Corps Reserve

The Marine Air Reservists were instrumental in the first two months of the Korean Conflict by providing three fighter squadrons in-theater within two weeks of the mobilization, and enough men five weeks later to expand the number of Marine fighter squadrons in the Far East from two to six. In early 1951, over 50% of the officers and over 35% of the enlisted Marines in the 1st Marine Aviation Wing were Reservists.

(Source: U.S. Navy Photo No. NH-97281)

FIGURE 3-11. NAVY RESERVISTS FLYING F9F PANTHERS DURING THE KOREAN CONFLICT, 1951

The most significant military advancement of the Korean Conflict was the use of helicopters. Marine Observation Squadron 6 flew Lt. General Walton Walker of the 8th Army to scout a route for his troops through unknown territory. By the end of the war, just three years later, Marines were using helicopters for troop movement, command and control operations, and as a tactical tool for increased maneuverability and speed. Other military services quickly began using helicopters as well (Kreisher 2007).

3.2.2.7 Between Korea and Vietnam (1953–1961)

Navy Reserve

The Naval Air Reservists moved to jet aircraft shortly after the Korean Conflict, obtaining its first F9F Panthers in 1955. A full transition to jet aircraft, however, did not take place until the early 1960s; therefore, the Reserves continued to fly propeller-driven aircraft for training (Mersky1987:20, 22).

During the 1961–1962 Berlin Crisis, 3,600 Naval Air Reservists and 18 squadrons were activated, although they were not deployed. The rest of the 1960s saw a transition of the Navy Air Reserves from fighter training to antisubmarine warfare (Mersky1987).

Marine Corps Reserve

Because the Marine Air Reservists' skills were maintained via the MARTC, the Marine Air Reserve call-up did not experience the same challenges during the mobilization for Korea as the other Reserve components and the National Guard. In 1953, Marine Air Detachments were named Marine Air Reserve Training Detachments, which were located at Naval air stations. In the period between the Korean Conflict and the Vietnam War, major technological advancements were made in aviation equipment including jet fighters, turboprop planes, and helicopters.

3.2.2.8 Vietnam War and the 1970s

Navy Reserve

Other than some early transport missions to South Vietnam in 1966, the Naval Air Reserves were not used in the Vietnam War. However, Naval Air Reservists did join active duty (Mersky1987:22). Six Naval Air Reserve squadrons were activated in 1968 after the North Korean's seized the USS *Pueblo*. The squadrons were slow to mobilize from NAS Jacksonville, Florida, because they had to be trained on the newer aircraft and equipment. This brought to light the lack of integration of the Naval Air Reserves with active Naval Air Forces due to the discrepancy in training equipment, which left the Reservists ill prepared for active service (Mersky1987:23).

In 1970, the two Reserve Carrier Air Wings were created to mirror the organization composition of the active duty carrier air wings (Department of the Navy 1997). The wings were provided with equipment from the Navy's general pool rather than hand-me-down equipment from the active components. The units from each Reserve Carrier Air Wing were located along the coast that corresponded to the fleet it supported. East Coast NAS and fields included Washington D.C.; Cecil Field, Florida; and Atlanta, Georgia. West Coast NASs units were located at Miramar; Lemoore; Point Mugu; and Alameda, California. The patrol and helicopter wings were included in the new organization and also received modern equipment (Mersky1987:23). This new organization allowed the Naval Air Reserves to be deployable as entire squadrons rather than as individuals to backfill vacant slots or to bolster active duty units. The new organization was so successful that by the mid-1970s there were whole Reserve Carrier Air Wings deploying for active duty training to man and operate a fleet carrier for seven days (Department of the Navy 1997, Mersky 1987).

Marine Corps Reserve

The Marine Air Reserves were not called up for service in Vietnam. The MARTC, however, was reorganized in 1962 to match the division-wing concept of the Regular Marine Corps, and the 4th Marine Aviation Wing was recreated. In 1966, reorganization took place to ensure that Reserve components matched the preparedness of the Regular Marine Corps (Department of the Navy, Naval Historical Center 1997).

Although the Marine Air Reserves were not activated for duty during the Vietnam War, active duty Marines were heavily involved and Marine aviation was forever affected by the war, which became known as the "helicopter war." By the end of the war, the Marines had 12 medium transport helicopter squadrons and 6 heavy transport helicopter squadrons in-theater (figure 3-12). These aircraft were used for troop transport, equipment and supply movement, medical evacuations, and fighter/attack support for ground troops (Condon n.d.). In addition to the rotary wing aircraft, the Marines relied heavily on fixed-wing support for bombing and strafing missions, troop movement, and logistical support (Condon n.d.).

As part of the Total Force Policy instituted to more thoroughly integrate the Reserve and Active components of the military, the 4th Maine Aviation Wing/MARTC headquarters were moved to New Orleans, Louisiana, in 1974. The MARTC was disbanded in 1979 to better match the 4th's organization with that of the active duty units.

(Source: U.S. Navy Photo No. NH-96947)

FIGURE 3-12. MARINE CORPS HELICOPTERS ON DECK OF THE USS *VALLEY FORGE*, 1968

3.2.2.9 1980s and Post Cold War

Marine Corps and Navy Reserves

Perhaps the most important event for the Navy and Marine Corps Reserves in the 1980s was the effort by John Lehman, a former Navy Reservist and then Secretary of the Navy, to expand the Reserves and ensure their integration with the active duty Navy. In doing so, he guaranteed that the Reserves received up-to-date equipment and training. The 1980s also saw use of the Reserves to fly counter drug operation missions in Grenada, and the rescue of Marines from Lebanon after their barracks were bombed (Mersky1987:27). The 1980s were a decade of restructuring and growth for the Marine Corps Reserves. Under President Reagan, the Marine Corps Reserves became a force of 40,000 soldiers in organized Reserve units and another 68,000 individual volunteers (Doubler 2008).

Navy and Marine Corps Air Reservists served in the first Gulf War at the beginning of the 1990s. Navy Reservists also served in the Balkans in the late 1990s. Naval Air Reservists have continued to take part in the war on drugs and participate in rescue operations. Navy and Marine Corps Air Reservists are also involved in the Global War on Terror (Doubler 2008).

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4.0 AIRCRAFT DEVELOPMENT AND HANGAR CONSTRUCTION

4.1 OVERVIEW

The history of military hangar development can be effectively viewed from two, often interrelated, perspectives. There is a quantitative component. In other words, there are spikes and dips in hangar construction. Furthermore, there is a design component. Hangars built in 1940 were not the same as hangars built in 1917, and those constructed during the late decades of the Cold War were not copies of their World War II counterparts. Quantitative shifts and design changes have historically been determined by a variety of factors, but three overarching trends appear to dominate. The most obvious deterministic factor was the evolution of aircraft. As aviation technology developed over the decades of the twentieth century, the requirements for maintenance and storage space increased. Hangars became larger and more complex, as did the aircraft. A second important influence has been mission related. Mission can affect both the numbers of hangars constructed and the types of hangars. For example, the mobilizations for World War I and World War II resulted in a dramatic increase in airfield and hangar construction. The Interwar and post-war eras usually resulted in dramatic reductions in hangar construction. Mission-related construction can also be related to specific mission activities. A clear example would be the development of the Air Force Alert hangars during the Cold War. Policy and engineering represents the third factor. Hangar construction was largely dictated by standardized plans developed or approved by the USACE and the Navy's Bureau of Yards and Docks. The plans, in turn, reflected policy decisions made by military leaders. These decisions and plans reflected whether hangars would be temporary or permanent, the construction materials used, and where the structures would be built.

The history of Reserve and National Guard hangar construction is not considerably different from active duty construction. In fact, many installations have served both active duty and reserves. In general, Army and Air National Guard hangar construction was dictated by the same processes and used the same design plans as active duty Army and Air Force installations.

The following discussion is divided into two sections that provide an overview of aircraft development and hangar construction throughout the twentieth century.

4.2 MILITARY AIRCRAFT

4.2.1 Army and Air Force

Orville and Wilbur Wright designed and built a glider in 1902, which became the first fully controllable aircraft. On December 17, 1903, Wilbur and Orville Wright made the first sustained, controlled flight in a powered aircraft at Kitty Hawk, North Carolina. In late 1907, President Theodore Roosevelt directed the U.S. Army to acquire an aircraft; and in 1909, the newly formed Aeronautical Division of the Army began practicing bomb-dropping, photography, and strafing in Aeroplane No. I (McFarland 1997).

The value of airplanes to the military was established in 1916 when aircraft were used for reconnaissance in the punitive expedition into Mexico. Their importance was further bolstered in World War I. When the United States declared war on Germany on April 6, 1917, the U.S. military had 56 pilots and fewer than 250 aircraft. Nonetheless, aviators provided critical reconnaissance that halted the initial German

offensive against the city of Paris, France (McFarland 1997). The army expanded its aircraft inventory significantly during the war (Mixter and Emmons 1919). The primary U.S. fighter during World War I was the Curtiss JN-4D "Jenny" (figure 4-1). This bi-plane had an open cockpit and cloth body (Kuranda 2002). Other World War I aircraft included the Standard J-1, Thomas-Morse S4C Scout, Avro 504 K, De Havilland DH-4, French-produced SPAD VII, SPAD XII, and Nieuport, and the British-produced Eberhart SE-5E and Sopwith F-1 Camel. Guardsmen and Reservists flew the same aircraft as active duty pilots.

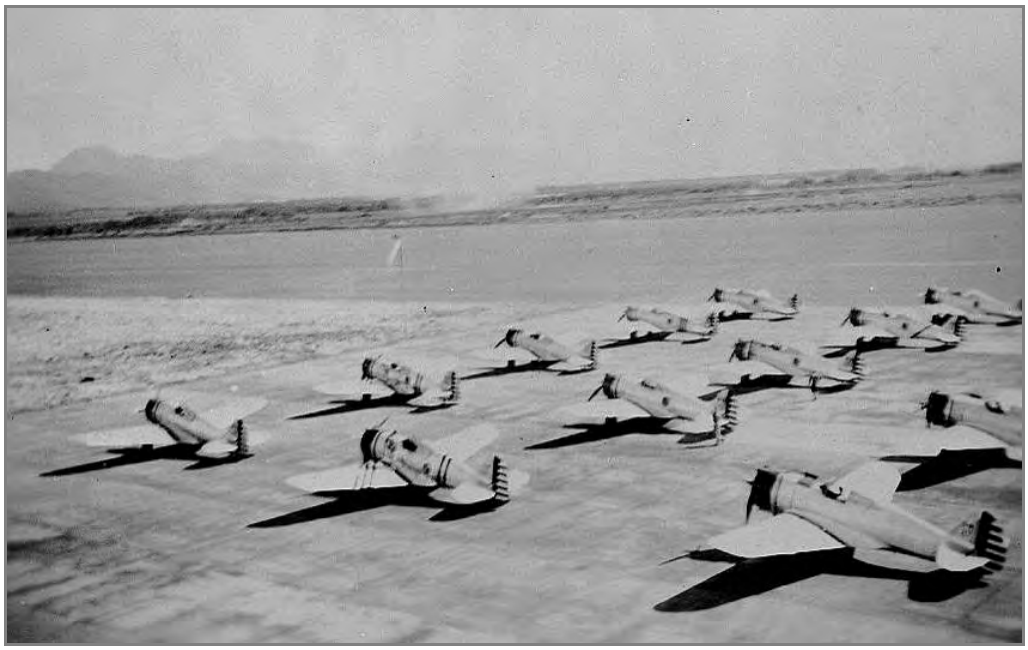
(Source: U.S. Air Force)

FIGURE 4-1. CURTISS JN-4D "JENNY"

Aircraft design changed dramatically between the 1920s and 1930s. The open cockpit, cloth-body bi-planes used during World War I were replaced by closed cockpit, metal-body, mono-wing aircraft with more powerful engines. Two major types of Army aircraft (fighters and bombers) were developed during this period (Kuranda 2002). The three major fighter planes in service before World War II were the Curtiss P-36 (figure 4-2), the Bell P-39 Aircobra, and the Curtiss P-40 Warhawk. The bombers were divided into light and heavy subtypes. The B-25 Mitchell was an example of a typical light bomber; and Boeing B-17 a heavy bomber (Kuranda 2002).

World War II marks the beginning of the U.S. industrial and governmental commitment of major resources to the development and production of functional military aircraft powered by gas-turbine aircraft engines (RAND 2002). Major advancements were made in the design of military aircraft. Faster, better-armed, and longer-range fighter planes were capable of early interception of enemy aircraft and had the ability to accompany strategic bombers. The United States was also eager to develop jet-powered military aircraft. They knew that significant new engine technology would be crucial to aircraft advancement (RAND 2002). New approaches, plans, and technology were incorporated into U.S. aircraft design; the first military jet flight occurred in April 1943 (NHC 1997). The Boeing-designed B-29 Superfortress (figure 4-3) was the first Very Heavy Bomber class produced, entering service in 1943, and the primary aircraft used for bombing raids on Japan (Kuranda 2002).

In 1950, the Army attained 725 aircraft, including 668 fixed-wing airplanes and 57 helicopters. During the Korean Conflict, the U.S. Army employed fixed-wing aircraft in a variety of missions including observation, reconnaissance, and in directing tanks and infantry. By 1953, the total number of aircraft had increased to 2,573, including 1,854 fixed-wing (with addition of the new Cessna L-19 Bird Dog), and 719 helicopters. The helicopters used for observation and rapid transport included the Bell H-13 Sioux (figure 4-4), Sikorsky H-19 Chickasaw, and Hiller H-23 Raven. Medical evacuation was an important component of the Army aviation mission (Kuranda 2002). Fixed-wing aircraft included the Sinson L-5 Sentinel and Cessna L-19 Bird Dog.



(Source: U.S. Air Force)

FIGURE 4-2. CURTISS P-36 AIRCRAFT AT HICKAM FIELD, HAWAIʻI, 1940

(Source: U.S. Air Force)

FIGURE 4-3. BOEING B-29 SUPERFORTRESS, 1940S

(Source: Kentucky Army National Guard)

FIGURE 4-4. BELL H-13 SIOUX HELICOPTER, 1940S

Between the conflicts in Korea and Vietnam, the U.S. Army aviation programs emphasized the use of rotary aircraft. The Army concentrated on developing programs that used the helicopter for tactical air support and transport of troops and supplies. With the arrival of the UH-1 Iroquois (a.k.a. Huey) helicopter and other turbine-powered aircraft, helicopter warfare became the most important innovation of the Vietnam War (Tolson 1989). Implementation of the concept of "airmobility" (the strategy of quick troop deployment using air transport) contributed to the decline in the use of fixed-wing aircraft by the U.S. Army during the final two decades of the Cold War era (Kuranda 2002). The most common helicopters used in Vietnam included the Huey (UH-1 Iroquois), AH-1 Cobra, CH-47 Chinook, OH-58 Kiowa, and CH-54 Tarhe. Army helicopter aviation continued to evolve through the 1980s and included the development of the AH-64 Apache (figure 4-5), UH-60 Black Hawk, and OH-58 D (Kiowa) aircraft (Trowbridge 2004).

(Source: U.S. Army)

FIGURE 4-5. BOEING AH-64 APACHE HELICOPTER

The establishment of the Air Force initiated what became a steady change-over to a largely jet-powered

fleet of military planes (NHC 1997). In 1947, the first frontline jet fighter, the Republic F-84 Thunderstreak/Thunderflash, was constructed and made operational for the USAF. The F-84 shepherded in a new age of military aviation and revolutionized military combat aviation. It was joined by the Boeing B-50 propeller-driven bomber and the Boeing B-57 jet bomber, both produced the same year (1947). The steady technological advancements in aircraft design and construction by the Union of Soviet Socialist Republics (USSR) military aviation encouraged parallel development in U.S. military aviation. Prior to 1955, two additional jet-powered fighter designs were added to the USAF: the North American F-86 Sabre and the F-100 Super Sabre (Military Factory n.d.).

The USAF mission required aircraft with increasingly greater range and power. The Boeing B-52 Stratofortress joined the USAF Strategic Air Command in 1955 as a staple in the long-range, high-altitude jet bomber fleet, which continues in service today. The KC-135 Stratotanker was added in 1956, and pioneered in-flight refueling during the Cold War era. This was the same airframe as the KC-135 Stratolifter (Boeing 707 civilian equivalent), which was used for air transport. Additional jet fighters and attack aircraft were acquired for the USAF in the late 1950s and 1960s. The Convair F-102 Delta Dagger and F-106 Delta Dart were used in Southeast Asian missions as were the McDonnell Douglas F-4 Phantom II and the Vought A-7 Corsair II (Military Factory n.d.).

In 1966, the USAF acquired the Lockheed SR-71 Blackbird high-altitude reconnaissance aircraft; the Lockheed C-5 Galaxy large transport jet was delivered in 1970. The implementation of Total Force Policy in 1973 resulted in the Air Force Reserves acquiring F-105 fighters (figure 4-6), AC-130 gunships, and KC-135s. In 1979, the McDonnell Douglas F-15 Eagle and the General Dynamics/Lockheed Martin F-16 Fighting Falcon joined the USAF as the next generation of fighter aircraft (Military Factory n.d.). Jet power continued to play a major role in military aviation as the Boeing KC-10 Extender refueling jet was acquired by the USAF in 1981, the "stealth technology" Lockheed F-117 Nighthawk fighter was added in 1982, and the Rockwell/Boeing B-1 Lancer bomber was delivered in 1985 (Military Factory n.d.).

Aircraft inventories have continued to evolve in the post-Cold War era. Today, Air Force and Army Reservists and Guardsmen fly a wide variety of aircraft including the KC-135, KC-135R Stratotanker (figure 4-7), F-16, C-141, C-17 Globemaster III, and the A-10 Tank Buster. Rotary aircraft include the U-60 Blackhawk, OH-58A, and A64 Apache.

4.2.2 Navy and Marine Corps

In 1917, the Marine Corps and Navy began flying Curtiss JN-4 trainers fitted with floats. The Navy designated the seaplanes like the N-9. Aviators also flew the British-designed De Havilland DH-4. Finally, the Navy acquired several flying boat models, including the HS-1, H-16, R-6, and finally the F-5L. The N-9 was particularly useful for Naval aviators during World War I. Marine Corps aviators flew mostly HS-2L flying boats, N-9 and R-6 seaplanes, and DH-4 observation planes during the war (Webster 1998).

The Navy commissioned its first aircraft carrier, the USS *Langley* (figure 4-8), in March 1922. Three years later, the Navy requested that manufacturers design a carrier-specific aircraft. Several companies (Curtiss, Vought, Douglas, and Martin) provided designs. The Martin SC, the Navy's first all-metal aircraft, was selected. The Interwar years witnessed other technological advancements for aircraft such as air-cooled engines and better instrumentation.

(Source: U.S. Air Force)

FIGURE 4-6. REPUBLIC F-105 THUNDERCHIEFS

(Source: U.S. Air Force)

FIGURE 4-7. BOEING KC-135R STRATOTANKER

(Source: U.S. Navy, Photograph No. NH 81279)

FIGURE 4-8. FIRST NAVAL AIRCRAFT CARRIER, USS *LANGLEY*, 1928

Throughout most of the Interwar period, Marine Corps aviation aircraft consisted mostly of old excess planes from the Army and Navy. As late as 1925, the entire Marine Corps aircraft inventory consisted of fewer than 50 aircraft. Finally, in the second half of the 1930s, Marine aviators received new aircraft including the Boeing F4F; Douglas DC-2; Vought SB2U; and Grumman F1f, F2f, and F3f fighters (Webster 1998).

In the first months of World War II, Navy pilots flew relatively outdated aircraft, including the Brewster F2A Buffalo and the Grumman F4F Wildcat fighters, the SBD Dauntless dive bomber, and the TBD Devastator torpedo bomber. By 1943, however, the Navy's aircraft inventory had developed into a cutting-edge fleet. Aircraft included the F6F Hellcat (figure 4-9), the SB2C Helldiver, and the TBF Avenger. The Marine Corps began flying the F4U Corsair (Webster1998).

The U.S. Navy and Marine Corps expanded their aircraft inventories following World War II and the commencement of the Cold War. The 1950s were characterized by the introduction of new jet fighter and attack aircraft technology. The Navy and Marine Corps added faster and more powerful aircraft, with the jet engine rapidly becoming the propulsion system of choice. The Navy acquired what would become a workhorse transport airframe with the 1956 introduction of the Lockheed C-130 Hercules, a turboprop aircraft. The Marine Corps also added rotary aircraft to its inventories, although helicopters were not as numerous in the Marine Corps aviation resource inventory as they had been for the Army (Military Factory 2007).

The 1960s were marked by a transition for the Navy to antisubmarine warfare. Reserve aviators acquired some new aircraft like the Grumman S2F Tracker and the P2V Neptune. Most Reservists, however, were still working with first-generation jet aircraft like the F1 (FJ) Fury, F2 Banshee, and F9 Cougar (Mersky 1987:22).

(Source: National Archives and Records Administration)

FIGURE 4-9. GRUMMAN F6F HELLCATS

Hostilities in Southeast Asia made the 1962 introduction of the McDonnell Douglas F-4 Phantom II, carrier-capable fighter jet a timely addition to both the Navy and Marine Corps fleets. The 1968 Navy acquisition of the Grumman A-6 Intruder added advanced range, maneuverability, and power capabilities (Military Factory 2007). In 1970, the Navy upgraded from the successful F-4 Phantom II to the variable-geometry, carrier-capable Grumman F-14 Tomcat, ushering in a new generation of multipurpose fighter and attack jet aircraft. Navy Reservists began flying the F-8H Crusader, A-4L Skyhawk, E-1B Tracer, and KA-3B Sky Warrior. Naval Reserve helicopter squadrons obtained H-3 Sea King and HH-1K helicopters in the 1970s. In 1975, HC-9 was created as the only Naval air (helicopter) squadron dedicated to search and rescue missions (Mersky1987:25, Department of the Navy 1997).

The Navy upgraded to the Boeing/McDonnell Douglas/Northrop F/A-18 Hornet in 1983. The F/A 18 Hornet was also a carrier-based aircraft that was added to both Navy and Marine Corps inventories. In 1985, the Marine Corps added the Boeing AV-8B Harrier "jump jet" (figure 4-10), which had the unique ability to vary the angle of engine thrust, thereby enabling vertical or very short roll takeoffs (Military Factory 2007). These aircraft are still in use in 2010. Other aircraft currently used by Navy and Marine Corps Reservists include the F-5, EA-6B Prowler, E-2 Hawkeye, C-130 Hercules, and PC-3. Navy Reservists also fly helicopters including the Sikorsky HH-60H and HH-60S. Marine Corps rotary aircraft include the MV-22 Osprey (tilt rotor), CH-46 Sea Knight (figure 4-11), AH-1W Super Cobra, CH-53E Super Stallion, and UH-1Y Venom.

(Source: U.S. Navy)

FIGURE 4-10. BOEING AV-8B HARRIER "JUMP JET"

(Source: U.S. Navy)

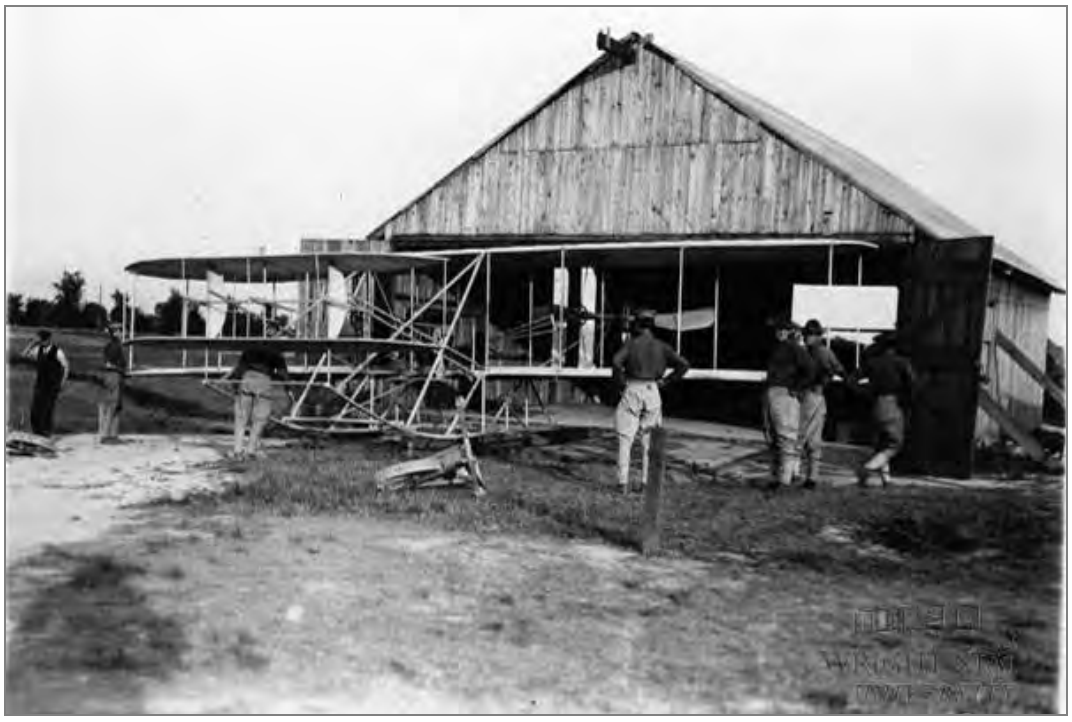
FIGURE 4-11. BOEING CH-46 SEA KNIGHT

4.3 HANGAR CONSTRUCTION

4.3.1 Army and Air Force

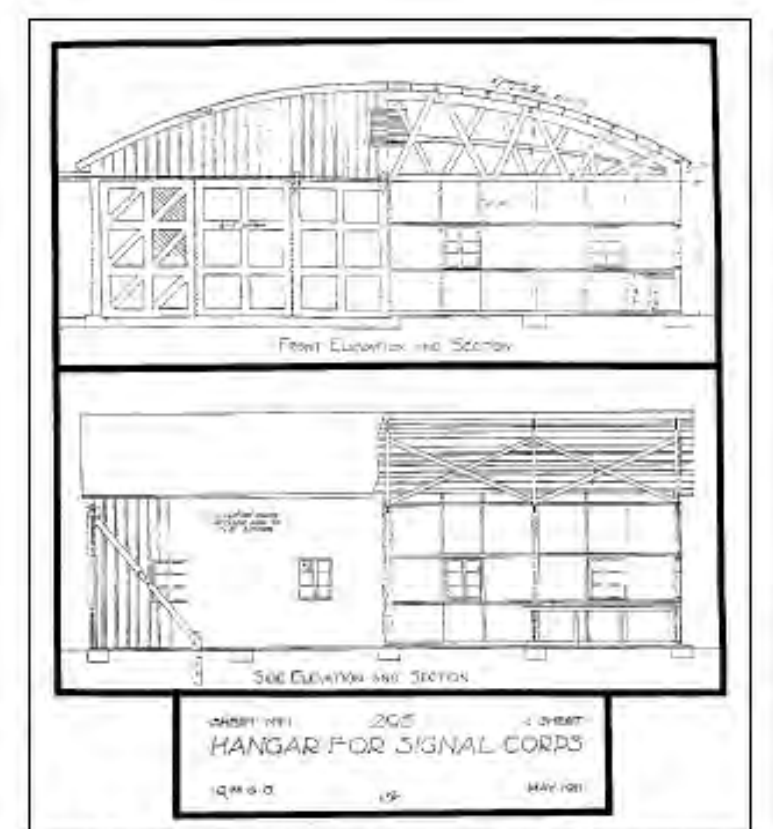
Historically, hangars were constructed to store aircraft. As the size and mechanical complexity of airplanes increased, the function of hangars expanded from covered storage to an enclosed workspace for aircraft repair. The earliest hangars were wood-frame construction and resembled barns or garages. As the military aviation program expanded, steel frame and masonry hangars were constructed. The increase in hangar size was related directly to aircraft size throughout World War II and the Cold War era. Airplane hangars generally were located along one side of an airfield and visually defined the boundary of the flight line because of their size and numbers. Hangars have been constructed during all periods since the introduction of military aircraft to the current day (Kuranda 2002).

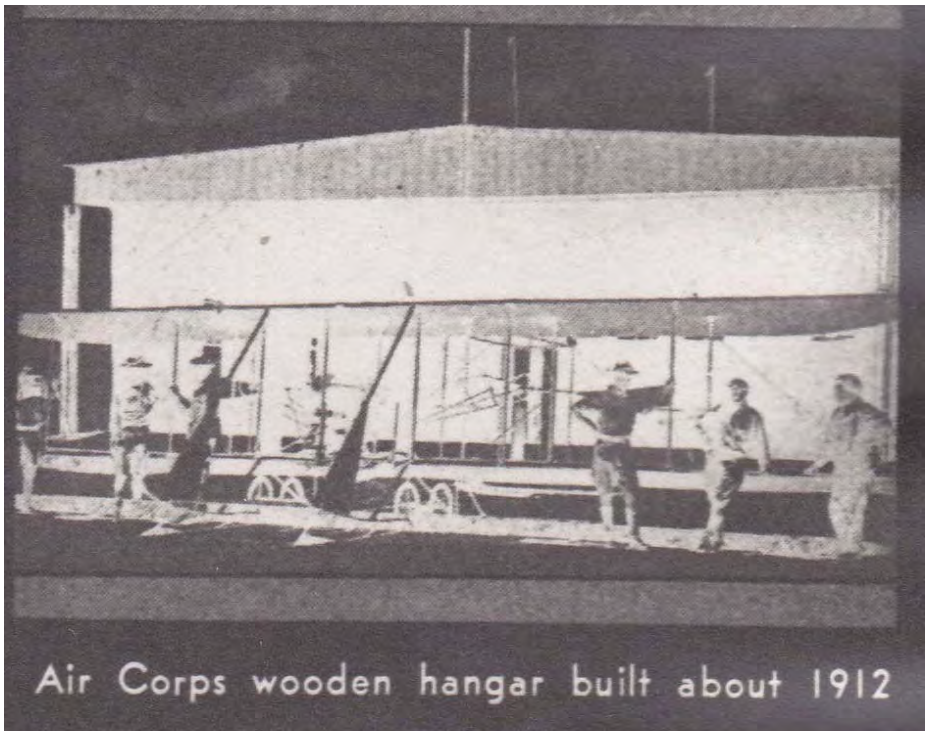
In the early years of military aviation (1910–1920), few buildings were required to support operations. The most pressing need for hangars became storage and maintenance facilities for the aircraft (figure 4-12). At the first military aviation training field in College Park, Maryland, the hangars were simple square, wood-frame structures. In 1911, the Quartermaster Corps issued its first standardized plan for a U.S. Army Signal Corps hangar. The plan depicted a square (46 feet (ft) by 46 ft), wood-frame building with a segmented arched roof (Standard Army Post Buildings 1891–1918:Plan 295) (figure 4-13). The walls were clad in board and batten wood siding. One elevation contained six large doors that folded and slid on overhead tracks. Originally, the floor of the hangar was dirt. In 1912, a concrete floor was used during construction of an aircraft hangar in the Philippines (Kuranda 2002).



(Source: Wright Brothers Aeroplane Company)

FIGURE 4-12. U.S. ARMY SIGNAL CORPS HANGAR AT FORT MYER, VIRGINIA, 1909

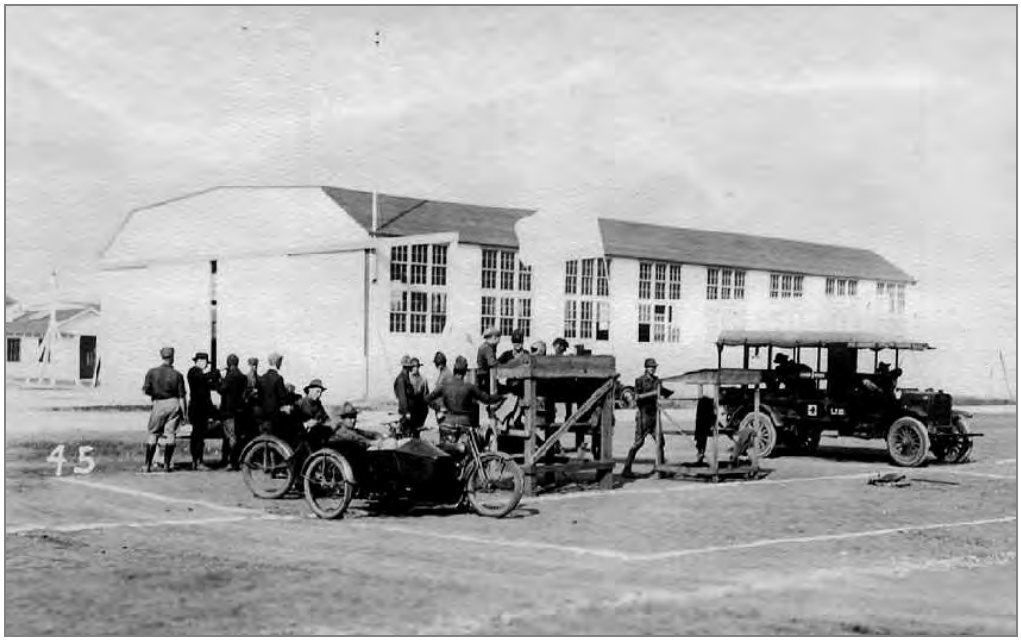




(Source: Webster 1998)

FIGURE 4-13. STANDARD ARMY POST BUILDINGS, 1891–1918: PLAN 295

The U.S. entry into World War I resulted in substantially increased numbers of aviators, aircraft, and airfields. Numerous airfields, including Selfridge Army Air Field in Michigan, were established to train aviators (Kuranda 2002). Inevitably, hangars were constructed at the airfields. Most hangar designs were based on standard plans developed by noted architect Albert Kahn. These wood-framed structures featured the gambrel roof and sliding doors on tracks that extended beyond the building. Later, in 1917, the Quartermaster Corps issued a new standard plan for hangars that depicted a metal frame structure with galvanized, corrugated iron walls with doors at the gable ends of the building (figure 4-14); Kahn also designed the hangars at another newly established airfield—Langley Field near Hampton, Virginia. The permanent brick hangars measured 60 ft by 367 ft (Webster 1998).



(Source: Fort Sam Houston Museum)

FIGURE 4-14. HANGAR CONSTRUCTED AT FORT BROOKS, TEXAS, 1918

Army Air Corps hangar construction in the Interwar years was somewhat erratic. Immediately following World War I, hanger development was constrained. Between 1927 and 1932, however, there was an increase in construction leading to innovations in hangar design. New Army hangars were composed of permanent materials and styled to complement the overall design of an installation. Permanent hangars were designed to be fireproof and featured a steel frame clad with brick or stucco-covered hollow clay tile. The typical hangar constructed in the early 1930s was rectangular with a gable roof, distinct corner piers, concrete floor, steel sash windows along the side elevations, and sliding metal doors on overhead tracks at the gabled ends (figure 4-15). The general hangar measured 110 ft wide. Hangars of this type were constructed singularly or in pairs as double units (Kuranda 2002).

The earliest example of permanent Army hangar construction was at Post Field, Fort Sill, Oklahoma, and was a combination fire-proof double hangar. Construction was completed in 1932 and combined many of the elements required to house the observation squadron under one roof, thus avoiding construction of a multibuilding complex. These components included shops, a parachute room, a photo lab, offices for Air Corps activities, and accommodations for visiting planes and personnel (Kuranda 2002).

The technical improvements to aircraft during the 1930s necessitated changes in the design of Army aviation ground support facilities. The size of hangars increased from a width of 110 ft used in designs constructed between 1927 and 1933, to a width of 120 ft to accommodate the increasing wingspan of bombers. By 1939, hangars measured approximately 400 ft by 325 ft (Kuranda 2002). The new hangar designs featured a segmental-arch roof supported by steel bowstring trusses (figure 4-16). The arched roof form also offered greater interior height.

(Source: Fort Lewis)

FIGURE 4-15. HANGAR CONSTRUCTED AT FORT LEWIS, WASHINGTON, 1930S

(Source: Webster 1998)

FIGURE 4-16. THREE-ARCH HANGAR, MCCLELLAN FIELD, CALIFORNIA, LATE 1930S

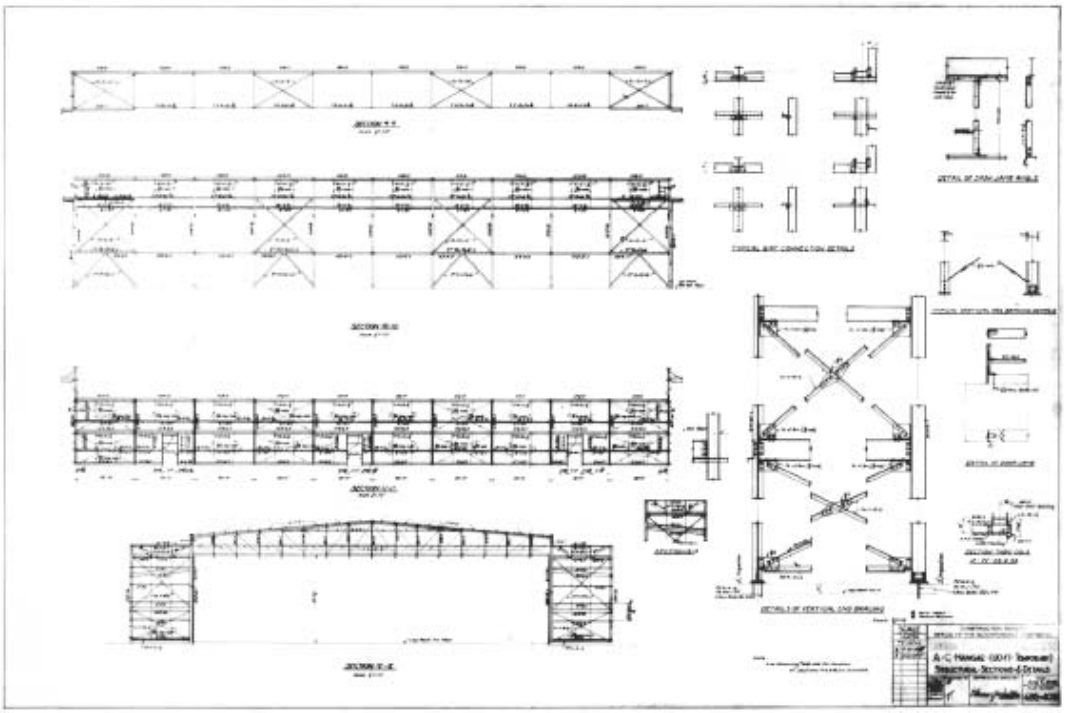
By 1939, the Army's Quartermaster Corps Construction Division simplified its hangar designs by deleting stylistic references and the distinctive corner piers. This redesign was in response to aircraft size and a change in hangar function from aircraft storage to temporary shelter for maintenance and repairs. All-metal aircraft were stored in the open with hold-down anchors or tie-downs on the apron or other parking areas to secure them against the wind (Building for Defense 1940:56–57). The Quartermaster Corps Construction Division hangar designs accommodated three types of arched roofs of various widths. The most common hangar type included a tied steel arch roof structure with spans of 275 ft, 250 ft, or 200 ft, with a door opening measuring 250 ft by 37 ft. The two other types of steel arches spanned widths of 200 ft and 255 ft. The 255 ft span arch was built under license from the Steel Arch Roof Construction Company. A 15-square-foot (ft^2) lift door was installed in the end wall over the center of the door opening to accommodate the tail of the aircraft, which reached a height of 45 ft on the larger aircraft. Half-shed additions or lean-tos were built along the sides of the hangars for shops and offices. The walls were concrete, brick, corrugated asbestos, or asbestos-covered metal. The roofs were either bituminous composition on timber decks or asbestos metal (Kuranda 2002).

As the Army Air Corps shifted to wartime footing prior to World War II, operational requirements exceeded the capacity of existing bases. New additions to Air Corps bases were constructed from less critical materials such as timber, masonry, or concrete, but preferably timber. The Air Corps directed that all construction on private land leased for the duration of the war be limited to temporary buildings, including hangars and control towers. The Air Corps Plans and Design Branch designed hangars based on the criteria that they be easily expandable to accommodate larger aircraft, use the least expensive type of door, have interior shops, and have access from both ends (Goodwin 1997).

Due to burgeoning military construction programs, oversight of the Air Corps construction program was transferred from the Quartermaster Corps Construction Division to the USACE in November 1940. The USACE continued many of the established practices of the Quartermaster Corps, including the use of standardized plans. Most construction to expand airfield facilities in the United States during World War II was completed by the end of 1943 (Kuranda 2002).

One of the most prevalent designs of all types employed at airfields was the design for the 120 ft hangar issued by the USACE in 1941 as Standard Air Corps Hangar and Repair Building, Plan No. 695-409, 120 Temporary Hangar (figures 4-17 and 4-18). This hangar was designed to meet Air Corps specifications, which included a 120 ft floor span with 28 ft vertical clearance. The 120 ft by 120 ft metal-frame hangar was flanked by two floors of offices and shops along the sides. The building rested on a 6-inch reinforced concrete slab. The walls were clad with either asbestos-covered metal or corrugated asbestos siding. The shallow, pitched, gabled roof was supported by Warren roof trusses with a 6 ft depth at the ends and an 11 ft depth at the center. The hangar doors comprised five manually operated, sliding sections that opened for a clear width of 120 ft. The hangar featured an 8.5 ft band of steel sash ribbon windows along the two sides, above the lean-to roof of the offices and shops. The outer walls of the offices and shops were also provided with bands of steel sash ribbon windows (Kuranda 2002). A variation of the 120 ft temporary hangar was the standard two-unit hangar used principally at training bases and technical training bases. The two-unit hangar consisted of two 120 ft hangars joined longitudinally (Kuranda 2002).

Although standardized construction dominated, there were some custom designs developed during World War II. For example, a hangar designed by architects Thorshov and Cerry, Inc., of Minneapolis, Minnesota, was built at the Army's Wold-Chamberlain Field (now Naval Air Reserve Center Minneapolis) in 1945. The steel-frame building, which still stands, consists of a large barrel vaulted roof supported by open web steel girders and concrete masonry walls. Massive hangar doors provide access to the hangar bays (see figure 5-5). Natural light is provided by 10 groups of three large multipaned windows along the north and south upper deck of the main structure (HHM, Inc. 2004). The Des Moines Air National Guard Base also has an existing World War II hangar.



(Source: USACE History Office)

FIGURE 4-17. USACE 1941 AS STANDARD AIR CORPS HANGAR AND REPAIR BUILDING, PLAN NO. 695-409

(Source: Webster 1998)

FIGURE 4-18. 120-FOOT TEMPORARY HANGAR, ELGIN AFB

Post-war demobilizations drastically reduced the size of the Army aviation program; which resulted in the decline of aviation-related construction. The Army construction program was further curtailed by the independence of the USAF in 1947, which resulted in the removal of the vast majority of fixed-wing aviation property from Army control. Real property transferred to the USAF included all the purpose-built airbases constructed since World War I. The USAF required facilities, including hangars, to accommodate the new mission and larger modern aircraft, especially bombers. Although these types of hangars were constructed only on USAF installations, the Army inherited some of the buildings originally constructed for the USAF.

All services of the military adopted new hangar designs in the 1950s. In general, Cold War-era designs exhibited clean crisp lines with minimal architectural ornamentation on the primary airfield buildings. The USACE updated the Army's standard plans from World War II and reissued them as "Hangar – 12,000 ft² (20,000 ft² with shops)" and "Hangar – 20,000 ft² (35,000 ft² with shops)." These plans were used primarily by the Air Force (figure 4-19).

Air Force Alert hangar plans developed in the 1950s consisted of multiple-bay structures constructed with flat steel trusses. Four plans were formulated. The first design was based on USACE Plans 39-01-37, which called for a partially open, four-bay structure measuring 298 ft by 66 ft. A smaller two-bay hangar was later developed based on Plan 39-01-69. Two other alert hangar designs relied on prefabricated structural components. These prefabricated designs, known as Butler hangars, dominated Cold War alert hangar construction. All four hangar designs were based on steel-frame structures anchored onto concrete pads and enclosed by corrugated steel walls. Roofs were either flat or gabled. The initial series of alert fighter hangars was erected at various installations, including Seymour Johnson, Andrews, Kirtland, Wright-Patterson, Travis, Grand Forks, Minot, Malmstrom, and Holloman AFBs (Weitze 1999).

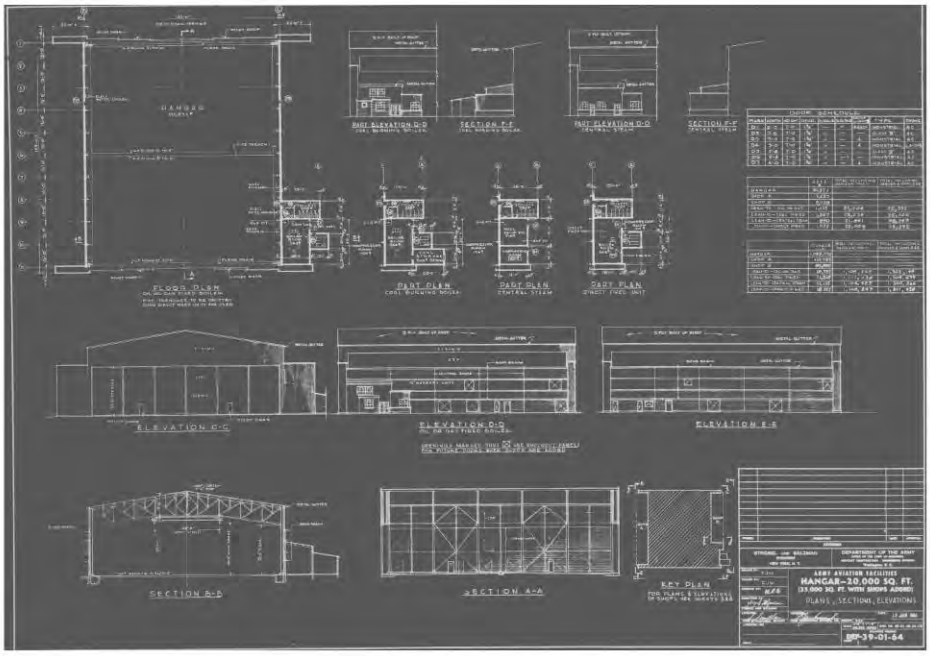
During the Cold War, the Army was severely restricted in the size and weight of its fixed-wing aircraft. The small Army aircraft did not require major increases in hangar size. During the early 1950s, the USACE developed a standard hangar for Army organic light aircraft. This hangar (Plan 39-01-26) was a shallow, four-bay, steel truss building. Other types of hangars constructed at Army airfields included temporary barrel arch hangars. An example of the latter style of hangar is housed at the Peoria, Illinois, ANG base.

Over the years, the army became increasingly reliant on helicopters during the Cold War. As the number of helicopters in the Army inventory swelled and the number of fixed-wing aircraft decreased, there was little alteration to airfields originally constructed in support of fixed-wing aircraft. Hangars were adapted easily to helicopter maintenance from maintenance of fixed-wing aircraft (Kuranda 2002).

Cold War National Guard and Air Reserve hangars can be found at Hector Field in North Dakota; Kulis Air National Guard Base in Alaska; Fort Smith in Arkansas (figure 4-20); Savannah, Georgia; Otis Air National Guard Base in Massachusetts; Maryland Air National Guard Base in Baltimore; and the Montana Air National Guard Base in Great Falls.

4.3.2 Navy and Marine Corps

The Navy's first aviation camp at Greenbury Point, Maryland, consisted of a small clearing that was cut into the woods with a number of tent hangars erected to shelter seaplanes. The site was poorly suited to flight operations, and the camp was moved in 1912. Greenbury Point was the first in a series of aviation camps that would constitute the Navy's aviation shore facilities. All of them were minimalist and transitory (Webster 1998).



(Source: USACE History Office)

FIGURE 4-19. USACE HANGAR – 20,000 FT² (35,000 FT² WITH SHOPS)

(Source: Public Domain)

FIGURE 4-20. COLD WAR HANGAR AT FORT SMITH, ARKANSAS, ANG BASE

In early 1917, the Chief of Naval Operations recommended construction of eight Naval air stations along the Atlantic coast. Ultimately, the stations were established at Montauk, Bay Shore, Rockaway Beach (figure 4-21), and Long Island, New York; Cape May, New Jersey; Key West, Florida; Chatham, Massachusetts; Hampton Roads, Virginia; and Coco Solo, Panama Canal Zone. Construction was completed by early 1918. Each air station featured two steel-frame hangars, one for airships (dirigibles)

(Source: U.S. Navy)

FIGURE 4-21. AERIAL VIEW OF NAS ROCKAWAY BEACH, CALIFORNIA, 1919

and one for seaplanes. The standard airship hangar measured 250 ft by 133 ft by 66 ft and had steel structural elements and metal cladding. The seaplane hangar measured 112 ft by 75 ft by 24 ft. This hangar consisted of vertical steel A-frame supports that formed the walls and supported a high gambrel roof truss. The seaplane hangar was clad entirely in corrugated metal. Both hangars were designed on the three-hinged arch principle, with 12 arch ribs for each completed hangar. Two more standard hangar designs were developed while these air stations were being constructed. The first was a wood-framed seaplane hangar that measured 65 ft by 183 ft by 24 ft, and consisted of three regular flat-gabled 61 ft bays. Instead of doors, the hangar had canvas curtains. A fourth design, used at Hampton Roads, consisted of a wooden hangar measuring 105 ft by 104 ft by 24 ft that featured an arched wood-lattice truss. A fifth Navy hangar design incorporated this same type of wood-lattice truss construction, but was considerably larger, with two large bays, each measuring 112 ft by 160 ft. All wooden hangar designs were easily modified to fit the needs of each particular air station (Webster 1998). Like their counterparts in the Army, the World War I-era Navy seaplane hangars were mass produced, classified as temporary construction, and fairly easily disassembled and moved.

The pressing need for Naval aviators during World War I led to the establishment of pilot training facilities at several locations. At the beginning of the war, all Navy aviators were trained at Pensacola, Florida. However, by the end of 1917, flight training facilities were operating at an old militia installation at Squantum, Massachusetts; Hampton Roads, Virginia; Key West, Bay Shore, Miami, Florida; Akron,

Ohio; Rockaway Beach, Oregon; East Greenwich, Rhode Island; and the Curtiss Exhibition School in Newport News, Virginia. Other Naval flight schools were established at Great Lakes, Illinois; Charleston, South Carolina; Santa Rosa, Florida; the University of Washington, Harvard University, Massachusetts Institute of Technology, and Dunwoody Institute in Minneapolis, Minnesota (Webster 1998).

The Marine Corps aviation-specific construction campaign during World War I was minor. The first designated Marine Corps Air Station was actually a flying school established in February 1918 out of the Curtiss School in Miami. Early on, tent hangars were used there to house their JN-4 trainers. Shortly thereafter, a couple of wood-frame hangars were constructed along the airstrip. Some construction continued as the Marine aviators prepared for war. By the time the 1st Marine Aviation Force departed Miami for Europe, they left behind a complex of hangars, shops, and warehouses.

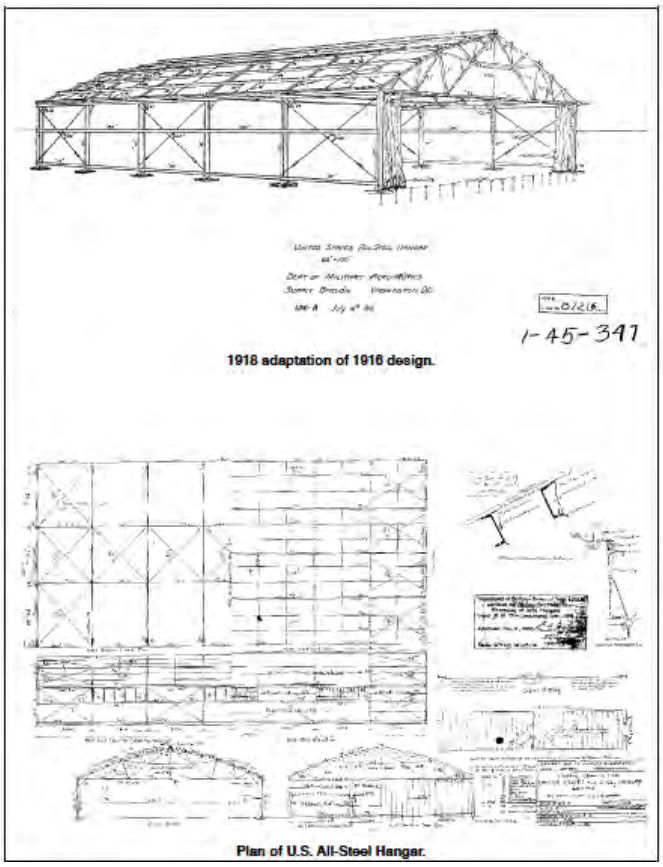
Interwar construction in support of Marine Corps aviation included the erection of hangars at Parris Island, South Carolina, and Quantico, Virginia. Parris Island received one U.S. All-Steel Hangar (figure 4-22) in 1919. In 1920, Quantico received its first five aircraft hangars, including three standard U.S. All-Steel Hangars acquired from the Army, and two standard 75 ft Coastal Air Station Seaplane Hangars. Two years later, two more 75 ft Coastal Air Station Seaplane Hangars were erected. In 1925, the air station acquired another U.S. All-Steel Hangar. In 1934 and 1935, five hangars were erected at Quantico. These five new structures constituted the last expansion to the Quantico facility prior to the beginning of World War II (Webster 1998).

Construction in support of Navy aviation was sporadic between World War I and World War II. Three hangars were constructed in 1919—two at NAS San Diego and one at Hampton Roads. The San Diego hangars, designed by Bertram Grosvenor Goodhue, consisted of three 110 ft by 100 ft bays (for an overall size of 110 ft by 300 ft). These hangars were considered permanent construction. They were spanned by steel trusses and had concrete interior walls. The hangars were clad in stucco and had timber roof sheathing. Each side elevation was decorated with Spanish Colonial Revival style ornamentation (figure 4-23). The hangar doors were sliding panels that operated on a motorized track (Webster 1998).

The Hampton Roads hangar was constructed from a standardized plan that called for two 150 ft by 180 ft bays with two 38 ft lean-tos abutted to the longer elevation. The hangar had clad steel siding, a timber roof deck, and asphalt asbestos roof sheathing. Sliding doors that operated on exposed steel tracks provided aircraft entry into the building (Webster 1998).

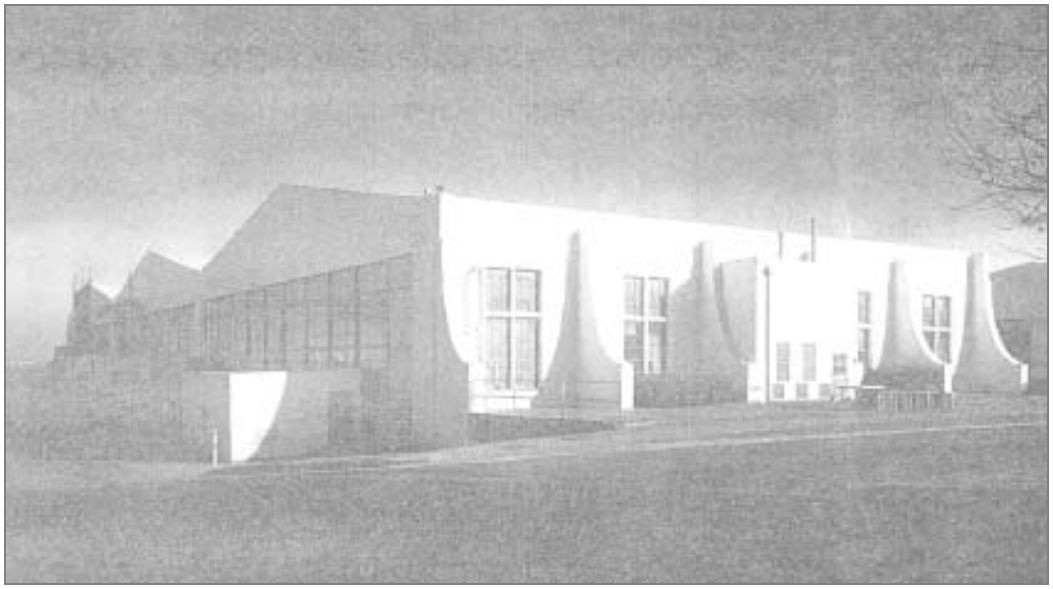
There was a spike in Naval hangar construction in 1929. Five hangars were constructed: two at Coco Solo and one each at Sand Point, San Diego, and Hampton Roads. The Coco Solo and Sand Point hangars were based on a standard design called Seaplane Hangar Design A, a 220 ft by 160 ft, two-bay hangar similar to earlier hangars constructed at Pearl Harbor and Coco Solo (figure 4-24). The San Diego hangar was probably also based on Seaplane Hangar Design A (Webster 1998).

The Hampton Roads hangar was very different from the other four. It was a large, substantial structure measuring 200 ft by 220 ft. The hangar consisted of extensive masonry cladding on steel structural elements. The hangar bay spanned 110 ft and was flanked by substantial lean-tos that made up the rest of the 90 ft front façade. A distinctive clerestory monitor ran the length of the building, down the centerline of the roof, and provided natural light. This design feature became common in World War II and pre-World War II hangars (Webster 1998).



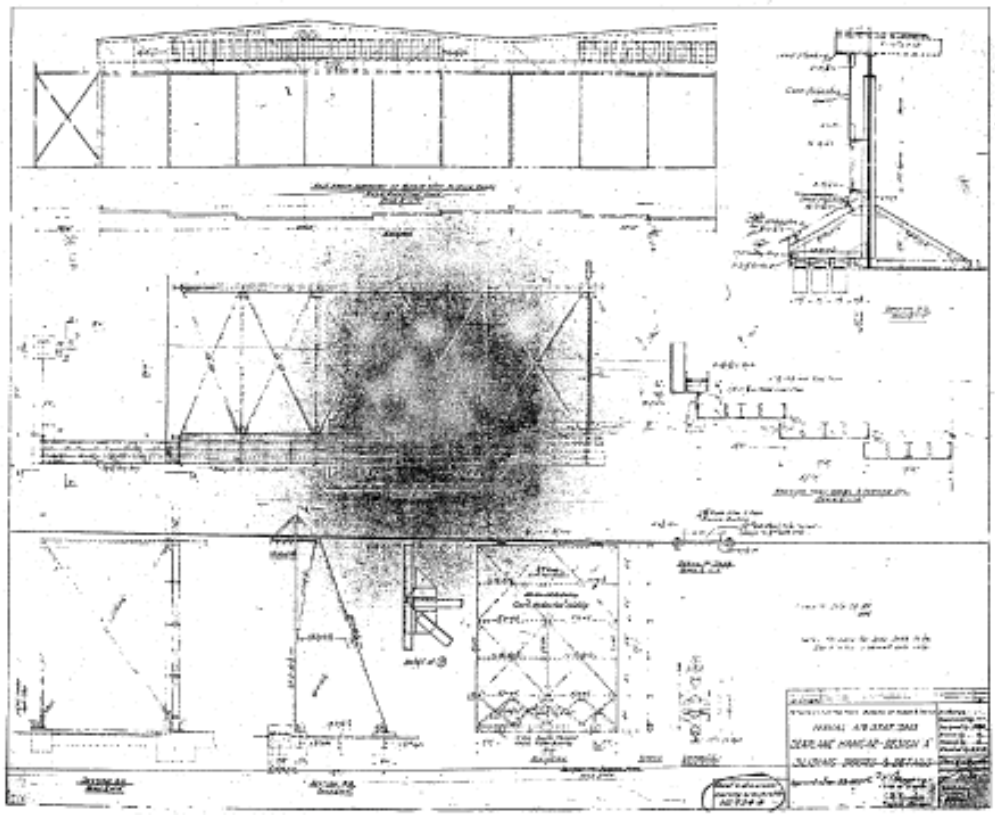
(Source: Webster 1998)

FIGURE 4-22. U.S. ALL STEEL HANGAR PLAN



(Source: Webster 1998)

FIGURE 4-23. GOODHUE-DESIGNED HANGARS AT NAS SAN DIEGO



(Source: Webster 1998)

FIGURE 4-24. NAVY BUREAU OF YARDS AND DOCKS SEAPLANE HANGAR DESIGN A, 1925

A Reserve hangar was constructed at Pearl Harbor in 1934. It was based on Seaplane Hangar Design A and intended to serve as a combined Reserve hangar and seaplane erecting shop. The hangar had three 110 ft by 160 ft bays (total footprint of 330 ft by 160 ft). Each of the three bays was spanned by a steel truss. The Pearl Harbor hangar was intended as a permanent construction, and thus, had substantial masonry cladding.

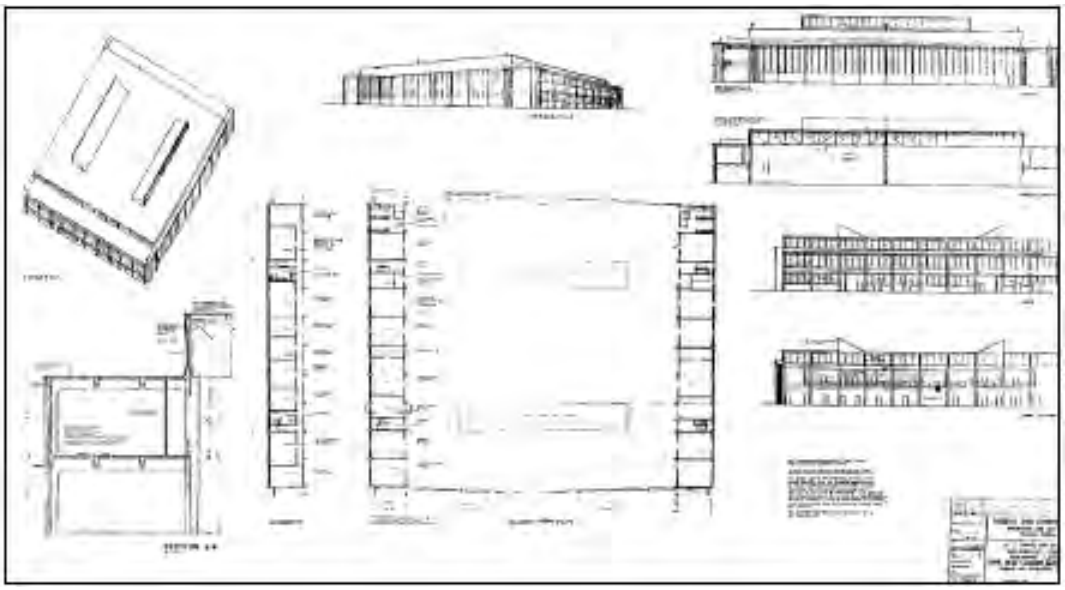
New Deal funding provided the impetus for hangar construction later in the 1930s. For example, Navy aviation witnessed an increase in construction in 1933. Seven hangars were constructed in San Diego and four were built at Corry Field, an auxiliary to NAS Pensacola. The seven hangars at San Diego were similar to the standard Seaplane Hangar Design A. The four Corry Field hangars were constructed from a new 1933 Bureau of Yards and Docks design that was later used at both the main field at Pensacola in 1937 and 1940, and at the Marine Corps Air Station at Quantico in 1935. The plan consisted of a single hangar bay measuring 110 ft by 160 ft with a flat gabled steel truss. The hangars had massive corner piers and substantial masonry construction (figure 4-25). A major construction program was also undertaken at NAS Pensacola in the mid-1930s. Using Emergency Relief Program funds, the Navy constructed six aircraft hangars and one enormous (221,000 ft^2) overhaul and repair hangar (two hangars connected by an extensive shop annex). The construction of these new hangars was completed by 1940 (Webster 1998).

(Source: Paul Freeman http://members.tripod.com/airfields_freeman/index.htm)

FIGURE 4-25. TWO OF THE ORIGINAL 1930S-ERA CORRY FIELD HANGARS (FLANKING A NEWER CONSTRUCTION)

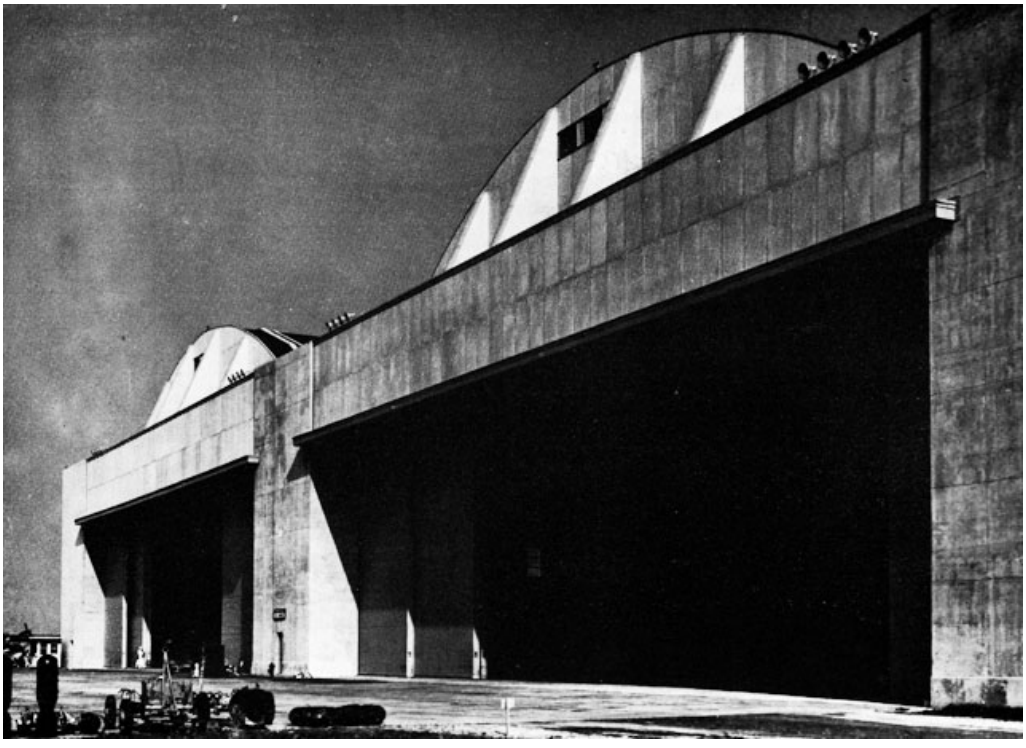
Like the Army, the U.S. mobilization for World War II resulted in the construction of Navy aviation facilities with a new urgency. The Naval Expansion Act of 1938 mandated construction of a network of air stations along both coasts of the continental United States and in Hawai‘i and Alaska. These air stations were categorized into three classes. Major air stations conducted air operations and provided major maintenance functions. Secondary stations supported regular air operations, and the third type was designated as a training facility (Webster 1998).

Funds for establishment of new Naval air stations and expansion of existing facilities was appropriated in 1940. Two new hangar designs, which dominated World War II Navy hangar construction, were developed as part of this Naval expansion. The plans, designed by the Albert Kahn Architectural Firm, were called the B-M Landplane Hangar and B-M Seaplane Hangar standard designs (figure 4-26). The landplane hangar consisted of a single square hangar bay (measuring 200 ft x 200 ft), spanned by a steel flat-gabled truss. The seaplane hangar was larger (320 ft x 240 ft); otherwise, the hangars were identical in design and ornamentation (Webster 1998). Monolithic concrete hangars using the Navy’s Monolithic Concrete Seaplane plan were also constructed during World War II and in the early days of the Cold War at various naval air stations (figure 4-27).



(Source: Webster 1998)

FIGURE 4-26. NAVY BUREAU OF YARDS AND DOCKS, TYPE B-M LANDPLANE/SEAPLANE HANGAR, 1941



(Source: U.S. Navy)

FIGURE 4-27. CONCRETE MONOLITHIC LANDPLANE HANGAR AT NAS PATUXENT RIVER, MARYLAND

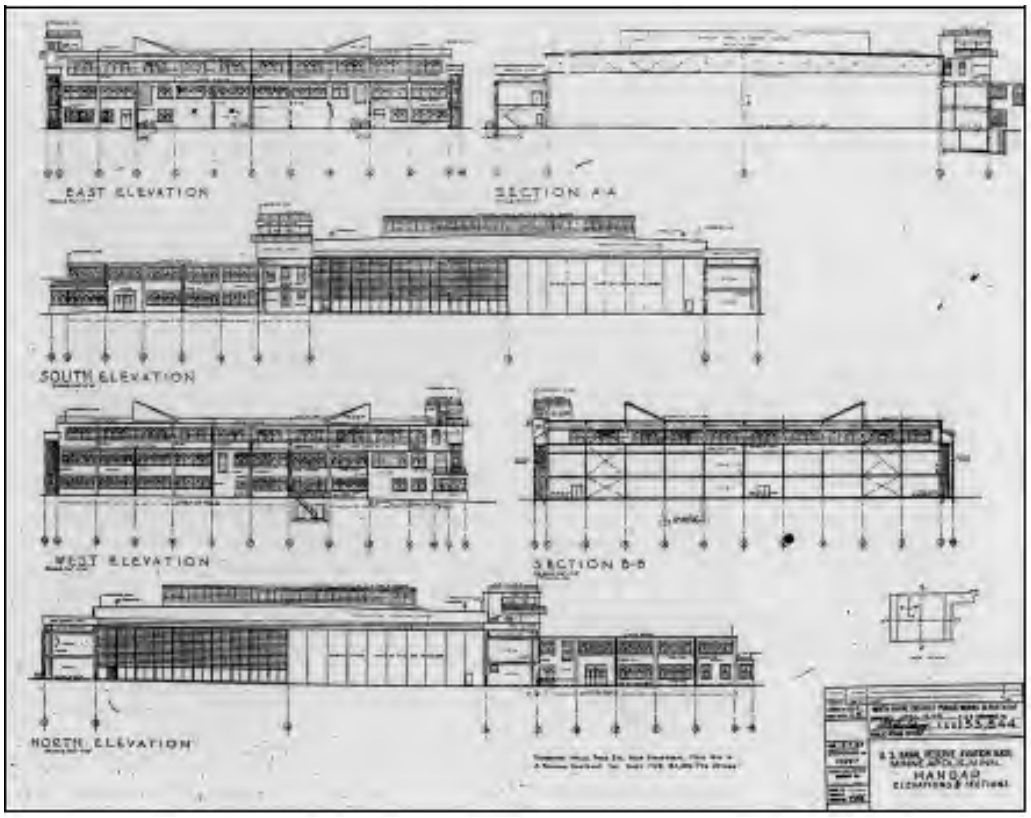
Examples of the B-M Landplane and Seaplane hangars were constructed at the vast majority of air stations that received new construction in the years leading up to and during World War II, including Norfolk, Pearl Harbor, Jacksonville, Corpus Christi, Quonset Point, Key West, Long Beach, Floyd Bennett Field, Kaneohe Bay, Barbers Point, and Kodiak. Some of the existing Naval Reserve Air Stations also received new hangars. Reserve stations received a modified B-M Hangar design that incorporated a tower and a substantial addition for a rifle range and classroom (figures 4-28 and 4-29).

Not all hangars conformed to the standard designs. For example, two landplane hangars were constructed in San Diego in 1941, which featured steel truss construction with a flat-gable profile and were clad with a combination of metal and concrete stucco materials. Apparently, the hangars were based on a design by the Roberts and Shaeffer Company of Chicago (Webster 1998).

The expansion of existing facilities was not the only trend triggered by the World War II mobilization. All services of the military were in need of space. For example, there was an acute shortage of training facilities for Navy and Marine Corps pilots during World War II. One way the Navy addressed these limitations was through the expansion of existing Reserve bases. Some Naval Reserve Air Stations were converted to active duty installations during World War II. For example, in 1941 a new air station was established at Floyd Bennett Field on Long Island at an old Naval Reserve Air Station that already had four hangars on the site. Like some other Naval Reserve Air Stations, the site had also served as a commercial airport (for New York City). The New Orleans Naval Air Reserve Base, commissioned in 1941, was re-designated as a Naval air station in 1943. Construction on the Reserve bases was usually limited to billeting, but there were exceptions. In January 1943, the Naval Reserve Aviation Base, Glenview, Illinois, was renamed NAS Glenview, Illinois. Subsequently, the Navy let a contract to add a hangar and other buildings to the site. The hangar specifications included two bays, sliding doors on both ends of the building, concrete foundation, concrete floor, timber framing throughout, asbestos shingle siding on the exterior, plywood finish on the interior, poured gypsum roof, tar and gravel roof. The hanger was to measure 241 ft by 201 ft. The Naval Reserve bases at Los Alamitos and Long Beach, California, also each received a new hangar (Webster 1998).

The Navy (and Army) also used municipal airfields for training. The construction at these sites was usually limited to temporary wooden hangars and assorted support buildings (Webster 1998). Moreover, appropriations in 1942 provided six new Marine Corps air stations. Five were in California and one was in Texas. At least half of the air stations were at sites previously occupied by municipal airports (Webster 1998).

After the cessation of hostilities, the air arms of the Navy and Marine Corps were reduced dramatically. The impact of postwar demobilization is starkly reflected in the fact that only one hangar was constructed for the Navy during the late 1940s. Establishment of the Air Force and resulting dedication of resources to the USAF also affected Navy and Marine construction. Navy and Marine Corps air stations received limited construction in the 1950s and 1960s. Hangars were constructed at Navy installations at Cecil Field, Miramar, Oceana, and Whidbey Island. The Marine Corps received a new air station at Beaufort, South Carolina, resulting in construction of three new hangars erected in 1956, and a fourth in 1959. Another Marine Corps Air Station was established at Yuma in 1959. Most hangar construction was reserved for the USAF. Navy and Marine Corps aviation construction continued to be piecemeal in the 1980s and 1990s. The Marine Corps air facilities at Camp Pendleton, California, and NAS Fallon and San Diego each received three new hangars; Whidbey Island received five hangars during the 1980s (Webster 1998).



(Source: Webster 1998)

FIGURE 4-28. NAVY BUREAU OF YARDS AND DOCKS TYPE B-M LANDPLANE/SEAPLANE HANGAR, 1941

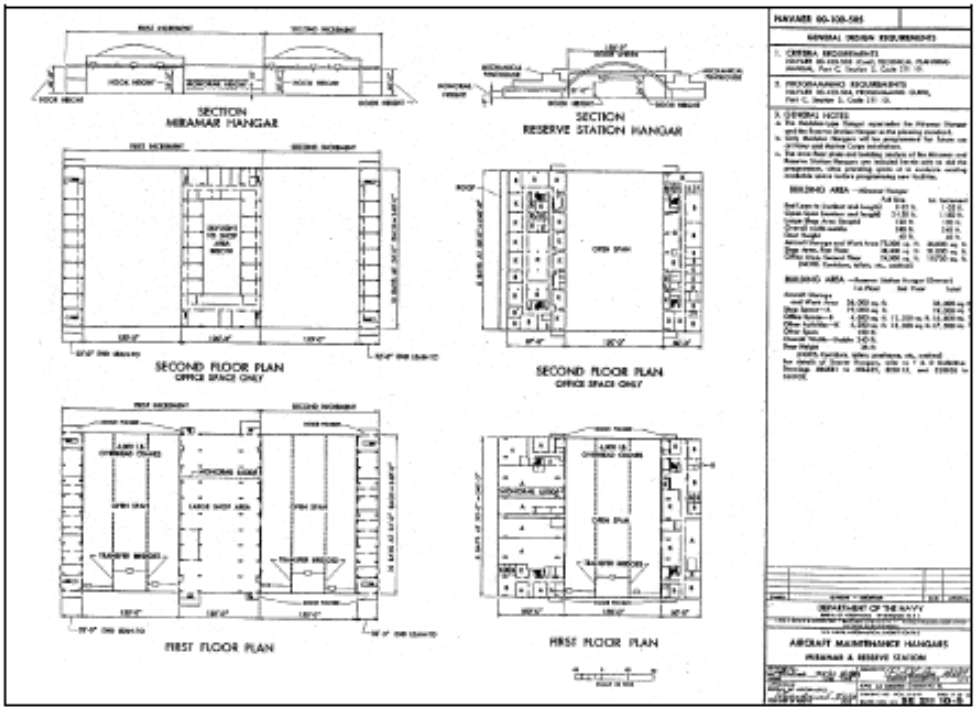
(Source: City of Jacksonville)

FIGURE 4-29. TYPE B-M HANGAR AT NAS JACKSONVILLE, FLORIDA

There were two dominant standard hangar designs developed for the Navy and Marine Corps during the 1950s. The two designs are known as the Denver Type Reserve Station Hangar and the Miramar Hangar. The Denver Type Reserve Station Hangar had an overall usable width of 240 ft and a clear span of 150 ft. The Denver Type hangar consisted of an arched hangar bay that was flanked on both sides by offices, shops, and storage spaces. The Miramar Hangar featured two 150 ft by 240 ft arched hangar bays separated by a 120 ft by 240 ft open shop area (figure 4-30). Second-story offices lined the perimeter of the central shop area and the outside lengths of the hangar bays (Webster 1998).

The E-Module Hangar, a third standard Cold War Navy design, was introduced in the late 1950s and has come to dominate Naval aviation technical construction efforts. This is partly due to the modularity of the design. The main structural members consist of a cantilever system that is exposed on the exterior. In this design a series of modules can be constructed and extended later as needed (figure 4-31). Two variations of this hangar construction system were adopted by the Navy: the Type I and Type II. The former measures110 ft by 96 ft and is designed to house carrier aircraft. The latter measures 115 ft by 120 ft and houses patrol aircraft. The modular design continued to dominate into the 1990s (Webster 1998).

Typical Cold War hangar designs exist at a variety of Naval and Marine Corps Reserve stations, including Naval Air Reserve Center Columbus, the Joint Air Reserve Training Center, Alvin Callender Field (see figure 5-4), New Orleans, and the Willow Grove Naval Air Reserve Station.



(Source: Webster 1998)

FIGURE 4-30. U.S. NAVY BUREAU OF YARDS AND DOCKS MIRAMAR HANGAR PLAN

(Source: U.S. Navy)

FIGURE 4-31. A-7A CORSAIRS FLYING OVER F-MODULE HANGARS AT NAS LEMOORE, CALIFORNIA, 1967

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5.0 HANGAR DESIGN

As stated earlier, the size and mechanical complexity of airplanes increased, the size of hangars increased, and the function of hangars expanded from covered storage to an enclosed workspace for highly technical aircraft repair. The physical form of a hangar is defined, most predominantly, by structural material. Military hangars historically have been constructed with wood, steel, or concrete as the basis for establishing structural integrity. These construction materials, in turn, have their own set of design capabilities and constraints that interact to determine the resulting building form.

A fourth type of hangar structure exists but has rarely been used in military applications. Known as composite construction, this type of hangar has primary structural components over hangar bays that are constructed of more than one structural material. A typical example within this category would be a hangar with concrete load-bearing walls topped with steel trusses. On initial inspection, it may appear that this type of construction exists in military applications. For example, many steel hangar spans rely on adjacent concrete office modules for support. This support, however, is secondary to the steel structure. Therefore, it is appropriate to refer to hangars of this type as steel construction. There do not appear to be any existing composite hangars in the DoD inventory.

Building material is the most important characteristic in defining hangar types. There are, however, other critical components that must be assessed in analyzing hangar design. The structure's cross section and doors provide important insight. Finally, other associated characteristics, including transoms, attached office and shop spaces, and tail cuts help to elucidate hangar history.

The following discussion is divided into three sections. First, "Primary Construction Material and Spanning Systems" will delineate each of the dominant hangar structural materials that define the principal types of military hangars. Each brief review of construction material is followed by a description of the related spanning systems that the hangar type adopts. Second, "Primary Form and Access" addresses hangar form from the perspective of the two principal elements defining the exterior appearance of the hangar, the structure's shape as reflected by its cross section, and the hangar doors. The third and fourth sections deal with hangar characteristics that are less overt. The third section, "Offices, Shops, and Quarters" describes some associated structures and spaces in military hangars. The third section, "Offices, Shops, and Quarters," describes some associated structures and spaces in military hangars.

5.1 PRIMARY CONSTRUCTION MATERIAL AND SPANNING SYSTEMS

5.1.1 Wood Construction

Wooden hangars are those whose primary structural components over hangar bays are of heavy timber construction. Although they may be listed as semipermanent or permanent construction in real property listings, most wooden hangars originally were considered temporary war mobilization structures, and in fact, were intended for construction and use overseas. Due to steel shortages during World War I, the Navy used wood to construct some of its hangars. It is interesting to note that all hangars in this division were constructed with trussed structural members. Few wooden hangars survive; many have been demolished and many extant ones are scheduled for demolition. The original wood cladding on most timber hangars has been replaced with contemporary materials such as metal siding. Wooden hangar construction in the military continued through World War II.

5.2 SPANNING SYSTEMS IN WOOD HANGARS

Four types of spanning systems predominated in the wood hangars. These consisted of wood trusses formed in a gambrel structural profile, flat gable wood truss, bowstring wood trusses, and an arched wood lattice truss system. The wood gambrel design was modular and consisted of bolted trusses with vertical and diagonal cross-braced supports. In two-bay hangars, the trusses emanated from the ends of the interior elevations and were bolted to center supports, which formed the division between the bays. Flat gable truss systems have vertical supports instead of diagonal ones. Bowstring wood trusses are similar to the gambrel trusses, but have arched top members rather than linear. The arched wood lattice truss incorporates the arched top member of the bowstring truss, but also has supports that intersect in a repetitive intersecting "X" pattern. The arched lattice truss was used only on wood hangars.

5.2.1 Concrete Construction

There are several categories of concrete hangar construction. The military has used structural elements composed of monolithic, or poured in place concrete, precast concrete, and concrete masonry units, commonly known as cinder block. It should be noted, however, that concrete walls on a hangar are not necessarily structural (load bearing). For example, a hangar constructed of steel columns and trusses also might have concrete masonry unit walls. Since the primary structural material is steel, the hangar should be considered a steel hangar. Concrete hangar construction appears to have been prevalent during the 1940s and 1950s. Monolithic concrete predominates as the structural system in this category. Concrete masonry unit structures, while common in Cold War military applications, appear to be limited to nonstructural or secondary support when used in hangars.

5.3 SPANNING SYSTEM DESIGN

Military concrete hangar spanning systems are defined by two designs. The first spanning system design is a single monolithic open arch (figures 5-1 and 5-2). This structural system was used in military hangars beginning in the 1930s, but became more common in the 1950s. Also known as a parabolic arch, this spanning system consists of a relatively thin shell of reinforced concrete slab of varying thickness. Regularly spaced structural (concrete) ribs of additional thickness often provide additional rigidity. Typically, the concrete is thickest at abutments and ribs. The second spanning system, a monolithic transverse arch, is a variation of the monolithic open arch. It differs in that instead of a single open arch, the system is composed of a series of smaller arches that delineate and divide the hangar bays. The open arch was used by the Navy in the Denver Type Reserve Station and Miramar hangar designs. The Air Force used the design in the Organizational Pull Thru designs beginning in the mid-1950s. The Navy's Monolithic Concrete Seaplane Plan used the open arch and transverse arch designs in different applications.

5.3.1 Steel Construction

Steel is the most common hangar material. The first steel hangars were constructed as early as 1916 (one still stands at NAS Pensacola), and by 1917 the Navy had adopted a standardized steel design developed by Albert Kahn (the U.S. All Steel Hangar). Steel hangar construction continues to this day. It is, therefore, not surprising that the largest number of existing military hangars are steel. The popularity of

(Source: Library of Congress, Photograph HAER ME, 2 LIME V. 1B-3)

FIGURE 5-1. CONCRETE HANGAR AT LORING AFB, CONSTRUCTED 1950S

(Source: Library of Congress, Photograph HAER ME, 2 LIME V. 1B-7)

FIGURE 5-2. INTERIOR OF LORING AFB CONCRETE HANGAR

steel is due in part to its high strength-to-weight ratio. Furthermore, steel can be readily fabricated as independent structural steel members that can be assembled to span long distances; plus, these members are easily transportable.

Steel also lends itself well to prefabrication. Indeed, prefabricated steel hangars have been a large component of military hangar construction since the late 1940s. Butler Manufacturing has, over time, been the predominant producer of prefabricated hangars. In the past, offices in Kansas City, Missouri; Galesburg, Illinois; Richmond, California; Minneapolis, Minnesota; and Birmingham, Alabama served military installations from coast to coast. Other companies providing designs for steel military hangars over the years included Belmont Iron Works in Philadelphia, Pennsylvania; Farm-Right Implements Company in Chicago, Illinois; Great Lakes Steel Corporation in Detroit, Michigan; Pittsburgh Bridge & Iron Works in Pittsburgh, Pennsylvania; R&D Constructors in Detroit, Michigan; and the Steelcraft Manufacturing Company in Rossmoyne, Ohio. McDonnell Aircraft Company, a unit of the McDonnell Douglas Corporation in St. Louis, Missouri, still manufactures pre-engineered structures for its own aircraft.

5.4 SPANNING SYSTEMS

Steel hangars can be classified within three spanning systems: truss, girder, and long-span joist construction. Most steel hangars are truss systems. Truss technology for hangar construction is based on bridge design, making it highly suitable for long-span design. Trusses are assembled from individual members, or chords, joined in structural triangles. The members generally are joined by pinned or riveted connections. Truss types are determined by the arrangement of individual members. The oldest known standing military hangar at NAS Pensacola is of steel truss construction; the technology is still in use today. Steel trusses in early hangars often resembled the form of the trusses in wood hangars (except there was no steel lattice truss), but there is great diversity in the design of trusses in military hangars. Historically, they have been configured in a wide variety of forms, with gables and arches being the most common (figure 5-3).

Long-span joists are similar to trusses in that they are made up of structural triangles, but they differ in scale. Joists are lighter in weight, made of smaller structural triangles, and have lower load limits. To compensate for what they lack in strength, joist spacing is tighter. The use of long-span joists in hangar design began in the mid-1950s and continues today.

Girders are the main horizontal members of a post-and-beam structural system. Unlike the truss, the girder is a solid structural member. Girder construction is favored for use in prefabricated structural elements. Its use in military hangar design first appeared during World War II and continues today. Most hangars of steel girder construction are prefabricated or pre-engineered. Girders do not lend themselves to the diversity of form that trusses do.

A final spanning system was developed just prior to World War II. Smith, Hinchman & Grylls, Inc., proposed to apply a self-anchoring spanning system adopted from bridge construction to hangars. The system used less steel than standard truss systems that required anchoring to the ground. It was theorized that self-anchoring spanning systems could be used for assembly purposes of 400 ft to 500 ft, with bays of 200 ft to 250 ft in width (Smith, Hinchman & Grylls, Inc. 1940).

(Source: California Military Museum)

FIGURE 5-3. STEEL HANGAR UNDER CONSTRUCTION AT NAS LIVERMORE, CALIFORNIA, JULY 1943 (BACKGROUND HANGAR WAS LIKELY CONSTRUCTED IN 1942)

5.5 PRIMARY FORM AND ACCESS

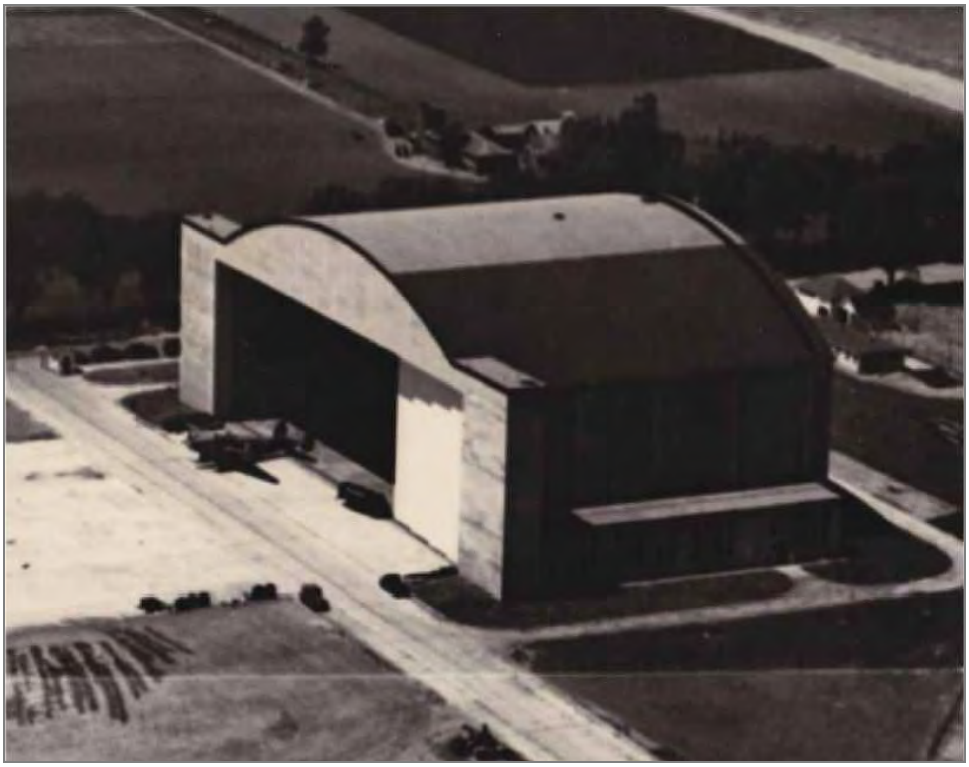
5.5.1 Hangar Form and Cross Section

In addition to structural material, the other major element determining hangar type is its cross-sectional form (e.g., gable, gambrel, etc.) over hangar bays. A cross section is the view that results from a plane cutting through a building perpendicular to a specified axis. A combination of transverse and longitudinal sections should be investigated when typing hangars because of the variety of modular structural systems employed in hangar design. The cross section of the hangar door opening should not be confused with the cross section of the hangar bay itself. Components that support hangar doors must withstand greater structural loads and operational stress, so they are more substantial than those spanning hangar bays. When considered with primary structural materials, cross sections clearly define the types of hangar construction.

The most common hangar cross-section forms are arches (figure 5-4) and gables (figure 5-5). Arches can be further divided into open arch, closed arch (truss forms a semicircle), and transverse arch (multiple arches). Gables can be closed or open. A closed gable looks like a triangle. An open gable is a triangle

(Source: U.S. Navy)

FIGURE 5-4. HANGAR WITH GABLED CROSS SECTION AT ALVIN CALLENDER FIELD, NEW ORLEANS, LOUISIANA, N.D.



(Source: U.S. Navy Seabee Museum)

FIGURE 5-5. HANGAR WITH ARCHED CROSS SECTION AT NAS MINNEAPOLIS, 1944

without the bottom side (an angle). Hangar cross sections most commonly will have flat (low angle) gables, standard gables, and offset gables (i.e., peak of gable is off-center). Another important cross section is the gambrel. This is a form that looks similar to a traditional barn in that it has a double slope with the lower pitch greater than the upper pitch. Yet another form is the monitor, which is like a gambrel, but with the upper pitch greater than the lower pitch. The sawtooth profile used in the Navy's B-M Hangar designs is unique. It consists of a mostly flat roofline with two "sawtooth" projections. Other forms include simple sloping shed and flat rooflines.

The military began to incorporate monitors (rows of windows at or near the roofline) into hangar design in the Interwar years. Hangar designs with sawtooth or monitor rooflines included rows of windows that provided more natural light for maintenance operations. This practice became less common in the Cold War years.

5.5.1.1 Doors

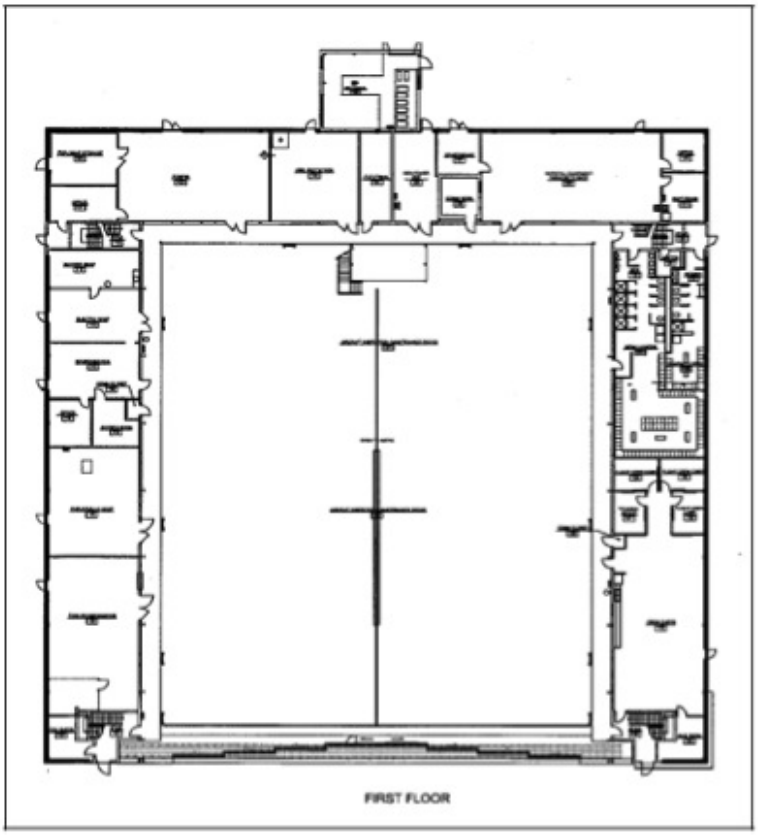
The large openings required for aircraft access are an inherently prominent component of any hangar. Therefore, architecturally, the hangar door is a conspicuous portion of any hangar building. The enclosure of hangar bays in military hangars is generally characterized by three methods. Initially, early hangars had rather uncomplicated door designs. Some doorways were left unadorned and others were merely covered with canvas sheets. In fact, design of the main hangar door was the most vexing challenge in the first decade of military aviation. Doors large enough to enclose hangar bays simply did not exist.

The solution was the use of a number of smaller doors that were hung on barn door rollers made to run on the tracks across the top of the door opening. This was known as a multileaved door. Even these small doors, however, were often too large and heavy for the track and the hangars that supported them. Nonetheless, this multileaf design evolved and became more dependable (Byrne 1939). Sliding doors occupied considerable space. When closed, the overlapping doors reduced the width of the hangar and when open, the leaves occupied space at one or both ends of the hangar. In an effort to mitigate this problem, many military hangars were designed with external tracks that extended beyond the structure itself. The external tracks also allowed development and use of large sliding doors in various configurations as technology permitted.

In fact, multileaved (figures 5-6 and 5-7) and large sliding doors have been employed in hangar construction at least since 1917 and continue to be used today. Modern track door systems consist of bottom rollers of cast steel, running on floor tracks. The doors and leaves are constructed of steel. Antifriction bearings are also incorporated into the system (Byrne 1939).

Another type of hangar door is the upward-acting, counter-balanced design (see figure 5-4) (figures 5-8 and 5-9) that generally is known as the canopy type door. Similar to a garage door, canopy doors are supported on the building structure above them and usually are counter-weighted. There are two types of canopy doors: balanced and cantilever. The balance type is suspended at its center, and counter-weighting is uniform throughout the cycle movement. The cantilever door is hinged to the building at its top and swings out and upward to the open position (Byrne 1939). This type of door first appeared in military construction during World War II.

All hangar door systems are variable in design and fenestration. Some hangar doors are completely solid (i.e., unbroken by windows or doors). Other hangar doors have smaller "pilot" entry doors incorporated in them. Finally, while it is not uncommon for hangar doors to have no windows, there are many with various window arrangements that allow natural light into the bays.



(Source: Cultural Resources Survey and Evaluation 178th Fighter Wing Springfield, Clark County, Ohio, Ohio Air National Guard Volume I, October 2008)

FIGURE 5-6. PLAN SHOWING MULTILEAVED DOORS ON HANGAR AT THE OHIO ANG BASE, SPRINGFIELD, OHIO

(Source: Biggs Army Airfield)

FIGURE 5-7. MULTILEAVED DOORS ON HANGAR AT BIGGS ARMY AIRFIELD, EL PASO, TEXAS

(Source: Ohio ANG Historic Context Study)

FIGURE 5-8. DETAIL OF CANOPY HANGAR DOOR AT OHIO ANG BASE IN TOLEDO, OHIO

(Source: ANG Final Report, Des Moines, Iowa, January 2009)

FIGURE 5-9. CANOPY HANGAR DOORS AT DES MOINES ANG BASE

One notable characteristic of some hangar doors is the tail cut. Also known as an aperture door, tail cuts are modifications to hangar doors that allow the hangar to accommodate larger aircraft. The tail cut is an adjustable opening that closes tightly around the tail of a plane or canopy door that can be opened to provide tail clearance for the large aircraft (figure 5-10). Tail cuts began to appear in hangar doors during the Cold War. The tail cut is an illustrative example of how changes in mission and aircraft can result in modifications of existing hangars.

5.5.1.2 Offices, Shops, and Quarters

Hangar design evolved as aviation missions and technology became more complex. One result of this evolution was the incorporation of a diversity of use-specific spaces into a single structure.

Early hangars were relatively rudimentary structures that were designed for a simple purpose—the storage and maintenance of aircraft. As such, they usually were large open structures that provided little or no space dedicated to supporting activities. It was not until the 1930s that the military began constructing multipurpose hangars. A good early example is the observation squadron hangar constructed at Fort Sill in 1932. The hangar incorporated many squadron's operations in one building. In addition to hangar bays, the structure included shops, a parachute room, a photographic laboratory, offices for Air Corps activities, and accommodations for visiting planes and personnel. This system became more common in World War II and continues to be used. It should be noted, however, that single-purpose hangars continue to be constructed today.

The shops and offices were generally incorporated into hangars in one of two ways. Throughout the history of military aviation, it was not uncommon for hangars to be constructed in pairs or groups. With a modicum of design modification, two hangars could be constructed in such a way that they were joined by a shop annex. This arrangement was adopted during World War II and continued into the Cold War years.

The second manner in which offices and shops were incorporated into hangar design was through the use of standardized plans that included spaces dedicated to supporting activities. The two most common arrangements of these multipurpose mission-related hangars was to have the hangar bays in the center of the building with offices and storage space along the flanks of the structure. The second design is reflected in the Navy's Miramar Hangar design that incorporated work space and offices in an area between two bays and on the outside flanks of the hangar.

Hangar design during the Cold War continued to incorporate mission roles into hangar function. This is clearly evident in the design of the alert hangars in which associated structures that were not necessarily part of the hangars themselves were designed to work as a coherent unit. Even pilot dormitories were constructed in a way that provided direct access to the hangar.

(Source: U.S. Air Force)

FIGURE 5-10. HANGAR WITH CANOPY DOOR TAIL CUT AT WRIGHT PATTERSON AFB

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6.0 IDENTIFICATION AND EVALUATION OF NATIONAL GUARD AND RESERVE HANGARS

The National Register of Historic Places was established by the NHPA. The NRHP is a list of buildings, structures, objects, sites, and districts that have demonstrated significance to U.S. history, architecture, archaeology, engineering, and/or culture. The NRHP is maintained by the Secretary of the Interior and is managed by the National Park Service Keeper of the Register. Regulations for listing a property in the NRHP were developed by the Department of the Interior and are found in 36 *Code of Federal Regulations* (CFR) Part 800 (36 CFR Part 60). The NHPA requires federal agencies to identify historically significant properties that are eligible for listing in the NRHP and manage those properties accordingly by taking into account the effects of their undertakings on properties listed in or eligible for listing in the NRHP (referred to as historic properties).

6.1 PROPERTY IDENTIFICATION AND METHODOLOGY

The *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 *Federal Register* 44716) outline the process for the identification of historic properties. The process includes developing a research design, conducting a review of archival literature, completing a field survey, and analyzing the results of the literature review and field survey.

A research design should define the purpose and objectives of the survey and the methodologies that will be employed to achieve the objectives. Most often, surveys to identify historic properties are undertaken in compliance with Section 106 of the NHPA, which requires federal agencies to take into account the effect of its actions on historic properties and to mitigate adverse effects. Another driver for performing inventories is Section 110 of the NHPA, which requires agencies to identify historic properties and manage them in the interest of the public. This requires the establishment of a baseline of known historic properties that must be kept updated, which is then used to develop a management plan for the properties. Depending on the driver, identification could be limited to a single property in compliance with a limited Section 106 action, or it may incorporate an entire installation in compliance with Section 110.

After the objective of identification has been defined, a methodology should be developed that will ensure that the identification meets the goals and also makes the best use of time and fiscal resources to ensure the information obtained from the identification is as comprehensive as possible in anticipation of future actions that may be required. The methodology should include how to determine dates for original construction and all alterations, repairs, and additions; construction techniques and materials; history of property function; and the history of surrounding properties. These types of information are critical to developing a historic context for the property and determining the property's historic significance and integrity.

Historic properties primarily are identified through a combination of literature and archival record reviews and field surveys. Record reviews are conducted using real property records, historic maps and aerial photographs, blueprints and construction drawings, and sometimes, oral histories. Generally, these types of records are kept by major command headquarters, installation real property managers and departments of public works, installation historians, and NARA. Other sources of information for National Guard and Reserves structures are local newspaper archives, historical societies, and libraries. Previous installation and unit histories may also contain information valuable to understanding the use

and history of a hanger, especially when trying to document the type of aircraft the hangar housed and other types of uses for the building.

Field surveys should be undertaken with care to gather as much information as possible, as efficiently as possible. Contemporary aerial photographs can be consulted before going into the field and used as a guide to map current features of the property and identify elements that have been added or removed. Using a current aerial also could reduce field mapping time. Photographs should be taken of all elements being inventoried. These photographs should be keyed on the aerial photograph to ensure they can be properly labeled. Photographs should be taken of each building and property feature, including closeups of unique and representative details. Even if the pictures are not used as part of an inventory report, they could be helpful to document a timeline of the property's condition.

Meticulous notes should be taken during a field survey. Oftentimes database forms or applets can be created and loaded onto data collectors (including most submeter GPS units) to standardize data collection. In this manner, data can then be linked to geospatial databases creating a useful management tool for both cultural resource managers and for facilities managers who may need to know, on a moment's notice, if a property or a specific element of a property is eligible for the NRHP.

6.2 NATIONAL REGISTER OF HISTORIC PLACES CRITERIA AND HISTORIC PROPERTIES

In order to be eligible for the NRHP, a property must meet certain criteria (36 CFR Part 60.4). The National Park Service published *National Bulletin 15: How to Apply the National Register Criteria for Evaluation* (NPS 1995) to provide guidance when assessing a property's eligibility for listing in the NRHP. Properties eligible for listing are usually over 50 years old and meet one or more of the following criteria:

- Criterion A: an association with an event(s) that made a significant contribution to the broad pattern of history.
- Criterion B: an association with a historically significant person.
- Criterion C: an embodiment of the distinctive characteristics of a period, construction technique or type; representing the work of a master; possessing high artistic value; or representing a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D: having yielded or having the potential to yield information significant to prehistory or history.

NRHP-eligible properties are classified as buildings, sites, districts, structures, or objects. A building is a type of construction that is created to provide any type of shelter for humans and can include houses, barns, hotels, churches, jailhouses, courthouses, etc. A structure is a building whose function is for something other than human shelter. An object is an artistic item that is usually small and simply constructed and moveable. A site is the location of an important event, human occupation or activity, or building or structure (standing, in ruins, or removed) where the location retains historic, cultural, or archaeological value. A district is a concentration, linkage, or continuity of sites, buildings, structures, and/or objects united historically or aesthetically by a plan or physical development. Hangars are classified as buildings or structures and can be part of a district.

In order to be eligible for the NRHP, properties should retain most of the seven aspects of integrity. These aspects are:

1. Location—the original location
2. Design—the building layout and use of space, plan, form, and style
3. Setting—the environment of the resource
4. Materials—the construction and finishing materials used
5. Workmanship—the detail elements of craftsmen
6. Feeling—the sense of a particular time
7. Association—the link to an event, person, or cultural resource

When assessing building integrity, the following actions should be taken: determine which aspects of integrity are most important to the property using the historic context(s); determine what characteristics the building must have to represent its significance; and determine if those characteristics currently convey that significance, which may require a comparison to similar properties to make a determination. Buildings on military installations are often modified to meet changing mission requirements and equipment needs. The modifications often extend the useful life of the buildings, but can compromise the buildings' integrity to such a degree that they do not retain a sufficient level to be eligible for listing in the NRHP. Within a district, the majority of the properties from the district's period of significance must have integrity, including integrity of the installation plan or arrangement of properties within the district.

In most circumstances, cemeteries, gravesites, birth places, properties owned by religious institutions or used for religious purposes, commemorative properties, reconstructed properties, and properties less than 50 years old are not eligible for listing in the NRHP. However, such properties may be eligible as elements of a historic district, or if one of the following list of criteria considerations is met:

A: religious property that is important from an architectural, artistic, or historical perspective

B. relocated building or structure that retains architectural value or which is the sole surviving property that has importance associated with a historically significant person or event

C. birth place or grave of a historically significant individual if there are no other extant properties associated with that person

D. cemetery that obtains significance from the graves of people of unmatched significance, from its age, from distinguishing design features, or from its association with a historically significant event

E. reconstructed building or structure when it is done in an appropriate environment and is part of a restorative master plan when there are no other structures or buildings with the same association(s) surviving

F. commemorative property if it has a design, tradition, or symbolic value of exceptional significance

G. property that is less than 50 years old that is of exceptional significance

NRHP-eligible properties must retain integrity of location, design, setting, materials, workmanship, feeling, and association. Integrity is defined by the National Park Service as a property's "ability to convey its significance." Of the criteria considerations listed, hangars would most likely fall under "B" or "G." If a hangar is moved, it must retain its architectural value or its association with a historically

significant person or event, as well as the remaining aspects of integrity, which can be difficult to demonstrate when a property is moved.

Military properties, including Cold War military construction, under 50 years of age, can meet criterion consideration G, including Cold War-era hangars. However, they must possess extraordinary importance, which must be demonstrated within the properties historic context. The National Park Service published *Guidelines for Evaluating and Nominating Properties that Have Achieved Significance Within the Past Fifty Years* to assist in the use of criterion consideration G. Hangars that do not meet the requirements under G should be evaluated under criteria A, B, C, and D once they are 50 years old.

Historic properties must characterize an important aspect of U.S. history, engineering, architecture, cultural, or archaeological, and may be significant on a local, regional, or national level. However, the only way to determine if a property meets the criteria and to determine at what level a property is significant is to evaluate the property within its historic context. A historic context categorizes the theme(s) under which a property's significance should be evaluated, defines the geographical boundaries of the property, and delineates the period of significance from which to evaluate the property. In the process of developing the historic context, a list of character-defining features that would be used to illustrate the properties significance should be developed, which can be helpful during the field survey and later when making an argument regarding NRHP eligibility status.

The level of significance pertains to the level at which the property is important, not where the property is located. A local level of significance means the particular property has importance at the town, city, county, or installation level, or some portion thereof, even if the property type can be found in a larger area. A property is of regional or state significance if it demonstrates an aspect of history that is of significance to the state as a whole. For example, a property that represents an impact to a state's economy or cultural image may be eligible on the state or regional level. A property is of national significance if it represents an aspect of U.S. history important to the nation. Cold War military structures of standard design used at several locations or a single structure associated with the Cold War familiar to the entire country are examples of properties of national significance.

6.3 ISSUES RELATED TO EVALUATING HANGARS USING THIS HISTORIC CONTEXT

This context is meant to supplement the 1998 Julie Webster military aircraft hangar context (Webster 1998) by providing information regarding the history of aviation and aircraft hangar construction in the National Guard and Reserve Components of the military. When evaluating a National Guard or Reserve aircraft hangar, it is important to know if the building was built by the National Guard or Reserves or if it was originally built by the Department of the Army, the Department of the Navy, or the Department of the Air Force, as opposed to a National Guard or Reserve Component. For buildings that were built by one of the mentioned military service departments and later transferred to the National Guard or Reserves, it will be important to determine which hangar context is appropriate (i.e., Webster 1998 or this one) or if both should be used when establishing a hangar's significance.

This context reflects a broad national context for the ARNG, ANG, and each Reserve branch aviation history. It does not focus on information on the regional or local (e.g., installation) level. When evaluating a hangar, it is also important to establish the historic context of the installation and its mission.

As a type of resource, military aircraft hangars may be significant to U.S. military history, architecture, or engineering. However, not every hangar owned or managed by the ARNG, ANG, or the Reserve

components of the military is eligible for the NRHP. Hangers meeting NRHP criteria may be individual buildings or they may be part of a larger district of interrelated components functioning together. Regardless, if a hangar is a stand-alone property or part of a district, it should represent the historic importance of the installation or the mission to be eligible for the NRHP.

When historic properties are evaluated, sometimes they are compared to similar properties within the same historic context to determine significance. Most often this is conducted when there are several of a particular type of property within a historic context. In those situations when the comparison reveals other hangars with better integrity than the one being evaluated, the hangar under evaluation may meet NRHP criteria on a local or regional level due to its association with the historic context of the installation or the mission, but fail to be eligible for the NRHP on the national level. A single hangar or a district containing hangars may be significant on both the national and installation levels. If a property is not eligible at the national level, it may still be eligible on the local or state level and subject to state or local laws.

6.4 APPLYING THE NATIONAL REGISTER OF HISTORIC PLACES CRITERIA TO HANGARS

6.4.1 Criterion A: Events or Broad Patterns

An example of an event would be the first flight by a military body while a broad pattern would be the World War I or World War II era or military aviation. Not all properties built during a particular era, like the Cold War, are significant to the Cold War historic context, however. In order to determine if a hangar is eligible under criterion A, the following must be answered: construction date, type of construction, design, and building function; if the hanger is associated with any historically significant military event or mission; and if the hangar is associated with this (2011) or Webster's (1998) context or an installation's context in a significant manner.

6.4.2 Criterion B: Person

An example of a historically significant person in this historic context is Charles A. Lindbergh. If a military hangar could be tied directly to him and his transatlantic flight, it might be eligible for the NRHP under criterion B. A locally significant individual important to the development of aviation at a specific installation might be linked to a hangar establishing its eligibility for listing in the NRHP. However, criterion B is rarely used to list properties in the NRHP and is used even less often as the sole criteria under which a property is listed. In order to find a hangar eligible for listing under criterion B, the following information must be established: the importance of the individual, the details of the person's association with the hangar, a comparison of other hangars or other properties' ability to demonstrate the person's historic significance, and the details outlining the hangar's association with the person's historic significance. This can include a hangar's association with a significant architect.

6.4.3 Criterion C: Design/Construction

Hangars, many of which were built using standard plans, may meet criterion C as embodying distinctive characteristics of construction type, period, or method, or in historic districts as representing distinguishable entities that lacked individuality. In most cases, hangars will not represent the work of a master or possesses high artistic value. In order to determine if a hangar is eligible under criterion C, the following

must be answered: construction date, type of construction, design, and building function; if it is a significant example of a hangar design type or construction method; and in comparison to other hangars of similar type, does it have the distinctive elements of that type's construction?

6.4.4 Criterion D: Yield Information

Criterion D is usually used to list archaeological sites that have the potential to yield significant information to U.S. prehistory or history. In some rare cases, a building may contain the potential to yield information that could not be obtained using other methods; for example, if there are no building drawings or records of the historically important building. It would be unlikely, but not impossible, that military aircraft hangars would meet criterion D.

7.0 ANALYSIS AND CONCLUSION

This study documented a total of 408 hangars within the combined inventory of the ARNG, ANG, Navy Reserves, Air Force Reserves, and Marine Corps Reserves. No information regarding Army Reserve hangars was acquired during this study. The breakdown of ownership of the hangars in the database is:

Army National Guard	226 Hangars	55.4%
Air National Guard	156 Hangars	38.3%
Navy Reserves	16 Hangars	3.9%
Air Force Reserves	8 Hangars	2.0%
Marine Corps Reserves	1 Hangar	0.2%

Even though the inventory consists of 408 hangars, the study was only able to collect acquisition or construction dates for 258 of them, and often the information collected on those 258 was incomplete—245 of the 258 hangars with known dates fall into the categories defined by Webster (1998), which were used here to ensure easy comparison between the two studies. Table 7-1 is a breakdown of the 245 hangars by time period and military service. The results represented here may be skewed by the lack of information. The most reliable numbers are those of the National Guard.

TABLE 7-1. BREAKDOWN OF 245 HANGARS BY MILITARY SERVICE AND ERA

	World War I (1917–1918)	Interwar Years (1919–1938)	World War II (1939–1945)	Cold War, Korea (1946–1954)	Cold War, Vietnam (1955–1975)	Cold War, Post-Vietnam (1976–1992)
Army National Guard	0	4	16	8	53	60
Air National Guard	0	0	11	14	61	14
Army Reserve	0	0	0	0	0	0
Air Force Reserve	0	0	1	0	0	0
Navy Reserve	0	0	1	1	0	0
Marine Corps Reserve	0	0	0	1	0	0
Totals	**0**	**4 (1.6%)**	**29 (11.8%)**	**24 (9.8%)**	**114 (46.5%)**	**74 (30%)**

A comparison of the results of this study with the Webster (1998) study shows that there are some differences in the trends of hangar construction between the regular, full-time military services and the National Guard and Reserves (table 7-2). The majority of the hangars, 141 of 245 (57.6%), are managed by the ARNG, while the ANG manages 100 (40.8%). There were no reported National Guard- or Reserve-owned or managed extant World War I hangars and only four existing Interwar years hangars, all of which are managed by the ARNG. The most prolific period of hangar construction was the Cold War, specifically the Vietnam and post-Vietnam eras. This corresponds directly with the development and implementation of the Total Force Policy (1973), a link that is exemplified when the information is analyzed even further to reveal that 81 of the 245 hangars (a full third) managed by the National Guard and Reserve components were constructed after the implementation of the Total Force Policy in 1973.

TABLE 7-2. COMPARISON BETWEEN HANGAR CONSTRUCTION TRENDS

	National Guard/Reserves[1]	Regular Military Services (Webster)[2]
World War I		1.0%
Interwar Years	1.6%	9.0%
World War II	11.8%	16.0%
Cold War, Korea	9.8%	5.0%
Cold War, Vietnam	46.5%	36.0%
Cold War, Post-Vietnam	30.0%	14.0%

Approximately 57.5 % (141) of the 245 hangars analyzed were recorded as permanent. There was only one hangar (a Kentucky ARNG hangar in Boone National Guard Center) documented as a temporary hangar. It was built in 1958, but there was no additional information collected regarding the hangar during this study. There were seven semipermanent hangars recorded and the status of the remaining 96 hangars is unknown.

Two hundred and two of the hangars were documented as being an "active" hangar, shelter, or maintenance building. All of these designations are interpreted here as indicating the buildings are still used as hangars. Twelve of the hangars were recorded as "DISP" or disposed; however, they continue to be reported as managed by the National Guard. The remaining 31 buildings do not have documented current use.

Only 22 hangars had documented plan numbers. The seven documented plans were all from the Cold War, Vietnam era, and included 19 ANG hangars built from the standard plans: 39-01-01 (1), 39-01-41 (3), 39-01-44 (2), 39-01-47 (1), 39-01-53 (2), AD-01-84 (9), and ARMCO-5-3 (1). The three ARNG hangars documented to have been built with standardized plans were in Topeka, Kansas, and were built from the 39-01-53 plan. Unfortunately, there was too little information collected on the building plans to be able to make reliable conclusions regarding the use of standardized plans for National Guard and Reserve hangars.

Eighty of the 245 hangars have been evaluated for listing in the NRHP—66 hangars (60 ANG, 5 ARNG, and 1 Navy Reserve) were determined not eligible for the NRHP. Some of the hangars that were evaluated were less than 50 years old and will need to be evaluated again once they turn 50. Fourteen hangars (5 ANG and 9 ARNG) were determined eligible for the NRHP. The NRHP eligibility of the remaining hangars has yet to be evaluated.

7.1 RECOMMENDATIONS

Based on the results of the Webster (1998) study and information reported in this context (2011), it is reasonable to conclude that many, if not most, of the hangars managed by the National Guard and the

[1]These percentages represent the number of hangars in the database with acquisition or construction dates (e.g., 245 of the 408 in the database).

[2]The missing 14% from Webster's numbers come from a lack of response to the survey. These percentages are the total number.

Reserves were built using standardized plans developed by their respective Regular, full-time military service. This conclusion is based on the idea that many of the former active duty installations, especially World War II installations, were given to the National Guard or Reserves to manage when they were deemed excess to the Regular military service component. In addition, National Guard and the Reserves used their respective engineering offices as their Regular military service counterparts. When combined, the Webster (1998) study and this study (2011) can be valuable tools to evaluate National Guard and Reserve aircraft hangars. The studies provide a national level historic context for military aircraft hangars; however, local and regional historic contexts should be developed as well when evaluating hangars' eligibility for the NRHP.

Based on the number of hangars and the fact that they likely were constructed from standardized plans, it is recommended that the DoD consider exploring alternative means for Section 106 compliance for projects related to hangars including demolition, renovation, rehabilitation, and creative re-use. Possible alternatives under 36 CFR 800, the Section 106 implementing regulation, include pursuing a program comment from the Advisory Council on Historic Preservation or the development of a programmatic agreement including documentation and preservation of the "best" example of each type of hangar. Of course, standards to set the parameters for what would constitute the best would also have to be established. These alternatives would take some time to develop; however, it likely would prove cost effective when examined against the expenditure of funds to evaluate and mitigate military hangars in a piecemeal fashion.

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APPENDIX A: ACRONYMS AND ABBREVIATIONS

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ACRONYMS AND ABBREVIATIONS

ADC	Air Defense Command
AFB	Air Force Base
ANG	Air National Guard
ARNG	Army National Guard
CFR	Code of Federal Regulations
DoD	Department of Defense
ft	Foot/Feet
ft^2	Square Feet
MARTC	Marine Air Reserve Training Command
NARA	National Archives and Records Administration
NAS	Naval Air Station
NATO	North Atlantic Treaty Organization
NHPA	National Historic Preservation Act of 1966, as amended
NRHP	National Register of Historic Places
ROTC	Reserve Officers Training Corps
UN	United Nations
USACE	U.S. Army Corps of Engineers
USACE-CERL	U.S. Army Construction Engineering Research Laboratories
USAF	U.S. Air Force
USAR	U.S. Army Reserve
USSR	Union of Soviet Socialists Republic

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APPENDIX B: DATABASE

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The following pages contain a printout of a database that was created in Microsoft Access. Information used to populate this database was largely provided by the National Guard Bureau and individual Army National Guard (ARNG) state cultural resource managers including real property inventories and cultural resource inventories and evaluations. Most of the Air National Guard (ANG) information came from cultural resources evaluations and inventories as well. Some limited cultural resource inventories were available on the internet. Unfortunately, it proved difficult to obtain much information regarding Army and Air Reserve hangars and there are very few Marine Reserve base hangars. The database contains links to pictures, facility forms, blueprints, and evaluation reports if they were provided by the cultural resource managers for inclusion.

The information contained in the database can be used by cultural resource managers to identify other hangars that are similar to the ones they are responsible for and if those have been evaluated for National Register eligibility and other details. This information will be helpful to cultural resource managers looking to evaluate their structures within a national context and in determining the uniqueness of their structures. The printout of the database was included here for those who do not have the requisite software for viewing the electronic version.

Definitions of Database Fields

Service: the military service identified as the agency responsible for the property, particularly the agency responsible for Section 106 compliance for undertakings conducted on the hangar.

Installation: the DoD installation on which the property is located or that is responsible for a hangar that is on a satellite property with connections to an installation.

Structure Name: the name of the structure as it was provided by the service and or installation responsible for the hangar.

City: the closest city to the installation where the hangar is located.

State: the state in which the hangar is located.

Building Number: the number assigned to the building that was provided by the service or installation responsible for the hangar.

Acquisition Date: generally, the year when the structure was built. Acquisition date rather than construction date was used in this database because the majority of the information came from the ARNG real property database and this field was more often populated than the construction date field.

Era: the era assigned to each structure, which was based on acquisition date, corresponding to the information in chapters 3 and 4. If the hanger covered two eras (e.g., planned during one era but constructed during another) the era when the structure was built is listed in the database; however, both eras should be taken into consideration when evaluating the hangar's importance.

Square Feet: the number of square feet of each structure was provided by the service or installation responsible for the hangar. Sometimes the numbers were listed in a database managed by the service or installation while other times the numbers were found in cultural resource inventories or reports of investigation.

NRHP (National Register of Historic Places): the NRHP listing status of the hangar. "Not Eligible" indicates the property has been evaluated and determined not eligible for the NRHP. "Eligible" indicates

the property has been evaluated and determined eligible for listing in the NRHP. "Unk" indicates that the property's NRHP status is not known or that the property has not been evaluated.

PERM/SEMI/TEMP/RELO: this field indicates if the hangar is of permanent (PERM), semi-permanent (SEMI), or temporary (TEMP) construction, or if it has been relocated (RELO). "Unk" indicates that the hangar's construction status is unknown.

Use: the use of the structure varies widely in the database and is based on the information provided by the service or installation. "ACT" indicates that the hangar is active but it is unk if the hangar is being used as a hangar or is being used in some other capacity. "DISP" indicates the property has been disposed of. "Alert" indicates it is a Cold War era alert hangar. The remaining indicators are self-explanatory.

Plan Number: the official plan number assigned to the plans used to construct the hangar.

Plan Description: the name of the hangar type assigned to the plans.

Structure: when the information was available, the structural material was identified here meaning the way material was arranged to bear structural loads over the hangar bay. For example, steel was typed as steel truss, steel girder, or steel long-span joist. The information in the database regarding the structure was taken from the limited amount of information provided to populate the field.

Cross Section: when the information was available, the cross section was identified here meaning the resulting view of a hanger bay were the bay to be cut perpendicular to its length along a vertical plane. This information was taken directly from property inventory reports. The information in the database was taken from the limited amount of information provided to populate the field.

Notes: this field includes any additional information available in the property inventory reports that may be of value when describing or evaluating the hangar including architect, the name of the construction company, and unique descriptions that do not fit into the other fields.

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
Alabama	MCRC	Montgomery	unk	260896	1949	Cold War, Korea	unk	unk	unk	unk	unk	unk	Leased from Montgomery Aviation
Alabama	ANG	Dannelly Field AGS	unk	unk	1950s	Cold War	unk	unk	unk	unk	unk	unk	
Alabama	ARNG	AASF02 BIRMINGHAM	AC MAINT HGR	1	1971	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Alabama	ANG	R W SHEPHERD RC HOPE HULL	AC MAINT HGR	3	1996	Post Cold War	unk	PERM	unk	unk	unk	unk	
Alabama	ARNG	FORT MCCLELLAN ARNG TNG CENTER	AC MAINT HGR	PT022	unk	unk	unk	PERM	unk	unk	unk	unk	
Alaska	ANG	Kulis ANGB	Hangar	3	1955	Cold War, Vietnam	Eligible	unk	unk	unk	unk	unk	1955 two-bay hangar for fighter aircraft with steel beams and flat-roof; 1957 hangar for transport aircraft with steel truss and metal cladding
Alaska	ARNG	NG BRYANT AkIRFIELD	AASF, HANGAR 1	47430	1958	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Alaska	ARNG	NG BRYANT AIRFIELD	AASF, HANGAR 4	47433	1962	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Alaska	ANG	Kulis ANGB	Helicopter Maintenance	2	1964	Cold War, Vietnam	Not Eligible	unk	ARMCO S-3	unk	unk	side-gable	originally was a warehouse
Alaska	ANG	Kulis ANGB	Fuel Hangar	45	1980	Cold War Post Vietnam	unk	unk	unk	unk	unk	gable	
Alaska	ANG	Elmendorf Joint Use Base	C12/UC35 HANGAR (EAFB)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Alaska	ANG	Elmendorf Joint Use Base	C12/UC35 HANGAR (EAFB)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Alaska	ARNG	NG BRYANT AIRFIELD	AASF, HANGAR 2	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Arizona	ARNG	PAPAGO MILITARY RESERVATION	AC MAINT HGR	unk	1953	Cold War, Korea	unk	PERM	unk	unk	unk	unk	
Arizona	ARNG	PAPAGO MILITARY RESERVATION	AC MAINT HGR	M5201	1973	Cold War, Vietnam	Not Eligible	PERM	unk	unk	unk	unk	brick, concrete slab, steel joint 4" OC, panel pocket hanger doors, L.H. Bell & Assoc
Arizona	ANG	SKY HARBOR AIRPORT - PHOENIX	AC HANGAR SPACE	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Arizona	ARNG	SILVER BELL ARMY HELIPORT	AC MAINT HGR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Arizona	ANG	Tucson IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Arizona	ARNG	SILVER BELL ARMY HELIPORT	AC MAINT HGR - Fixed Wing	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Arizona	ARNG	SILVER BELL ARMY HELIPORT	AC MAINT HANGAR-Singapore	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Arizona	ARNG	PAPAGO MILITARY RESERVATION	AC MAINT HANGAR AASF4	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Arizona	ARNG	PAPAGO MILITARY RESERVATION	AASF #4	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Arizona	ARNG	SILVER BELL ARMY HELIPORT	AC MAINT HGR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
Arkansas	ARNG	CAMP JOSEPH T ROBINSON	AASF Hangar	25351	1950	Cold War, Korea	Not Eligible	PERM	unk	unk	unk	unk	rigid-steel frame with low pitched gable roof, corrugated metal, queen post steel trusses and 6 open-steel girders, outrigger steel doors. Relocated to current site in 1960, additions added
Arkansas	ANG	Ft Smith MAP	unk	200	1955	Cold War, Vietnam	Not Eligible	unk	unk	Type H-2, 2 Story Lean-To	unk	unk	Mills & Petticord Architects-Engineers of Washington, D.C. Division – NGB, which included "Hangar to the USAF (Type H-2) 2 Story Lean-To."
Arkansas	ANG	Ft Smith MAP	Aircraft Maintenance Shop	214	1972	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	Mahaffey & Associates Engineers Plans to Navy
Arkansas	ANG	Ft Smith MAP	Maintenance Hangar	203	1978	Cold War Post Vietnam	unk	unk	unk	Fort Smith-rectangular plan	unk	gable	Mott, Mobley, Richter, McGowan & Griffin Architects of Fort Smith- rectangular plan, end-gabled, multi-story steel frame structure is shielded by a slightly pitched gabled built-up roof
Arkansas	ARNG	CAMP JOSEPH T ROBINSON	AASF Fire Station	unk	1983	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Arkansas	ARNG	CAMP JOSEPH T ROBINSON	AASF Maintenance Hangar	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Arkansas	ARNG	CAMP JOSEPH T ROBINSON	LRCP new AASF	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
California	ARNG	LOS ALAMITOS JFTB	AC MAINT HGR	61	1942	WWII	unk	PERM	unk	unk	unk	unk	
California	ARNG	LOS ALAMITOS JFTB	AC MAINT HGR	1	1942	WWII	Eligible	PERM	unk	unk	steel truss		
California	ARNG	LOS ALAMITOS JFTB	AC MAINT HANGAR	2	1942	WWII	Eligible	PERM	unk	unk	unk	unk	
California	ANG	Fresno Yosemite IAP	Hangar Maintenance	100	1955	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	cinder block and has a sheet-metal roof and fascia
California	ARNG	NG SACRAMENTO MATHER	AIRCRAFT AVIATION SUPPORT FAC	7001	1974	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
California	ARNG	STOCKTON AASF	AIRCRAFT AVIATION SUPPORT FAC	7000	1975	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
California	ARNG	FRESNO DAKOTA AVCRAD	AVCRAD	10000	1986	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
California	AFR	March Air Reserve Base	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
California	NAR	Naval Air Reserve Center Lemoore	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
California	NAR	Naval Air Reserve Center Point Mugu	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	In 1947, Congress appropriated funding to establish a permanent Navy presence here for this purpose. Since the mid-1940's, Point Mugu has had several "Center Names", all with the mission to develop,

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
													test, and evaluate missiles and related systems, and for
California	NAR	Naval Air Reserve Center San Diego	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
California	ARNG	NG SACRAMENTO MATHER	AIRCRAFT AVIATION	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
California	ARNG	NG SACRAMENTO MATHER	HANGAR-C12	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
California	ARNG	FRESNO DAKOTA AVCRAD	AVCRAD (UNDER CONST)	1000A	unk	unk	unk	PERM	unk	unk	unk	unk	
Colorado	ARNG	BUCKLEY AFB (Enclave)	Aviation Support Facility	1500	1977	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Colorado	ANG	BUCKLEY AFB (Enclave)	UH60 unheated storage	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Colorado	NAR	Naval Air Reserve Center Denver	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Colorado	ANG	BUCKLEY AFB (Enclave)	AC MAINT HGR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Colorado	ANG	BUCKLEY AFB (Enclave)	New AASF	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Colorado	ANG	Buckley AFB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Colorado	ANG	BUCKLEY AFB (Enclave)	CH47 unheated storage	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Connecticut	ARNG	AASF--Bradley International Airport	FUEL FARM OFFICE	unk	1951	Cold War, Korea	unk	PERM	unk	unk	unk	unk	
Connecticut	ARNG	AASF--Bradley International Airport	AVIATION HANGAR AND OFFICES	152	1952	Cold War, Korea	unk	PERM	unk	unk	unk	unk	barrel vault roof, brick offices
Connecticut	ARNG	AASF--Bradley International Airport	JP8 PUMP HOUSE BUILDING	unk	1955	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Connecticut	ARNG	AVCRAD GROTON	AVCRAD OFFICES/HANGAR	unk	1979	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Connecticut	ARNG	AASF--Bradley International Airport	STORAGE	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Connecticut	ARNG	AASF--Bradley International Airport	AVIATION NEW HANGER	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Connecticut	ANG	Bradley ANGB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
DC	ANG	Andrews AFB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
DC	NAR	Naval Air Facility Washington DC	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	Camp Springs - Andrews AFB; Navy reserve moved there in 1963
Delaware	ARNG	DUNCAN ARMORY AASF	AASF	AASF	1977	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
Delaware	ARNG	DUNCAN ARMORY AASF	AASF Hangar Expansion	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
District of Columbia	ARNG	FT BELVOIR	AASF HANGAR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Florida	ARNG	JACKSONVILLE Craig Field	AASF #1 Fac 00001(Jax Craig)	1	1969	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Florida	ARNG	JACKSONVILLE Craig Field	Aviation Operations 00004 Craig	4	1984	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Florida	ARNG	JACKSONVILLE Cecil Fld AASF1	Hangar 860 AASF #1	3	1987	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Florida	ANG	Jacksonville IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Florida	ARNG	ST AUGUSTINE C-12	Fac 00001 (St.Aug C-12 Hangar)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Florida	ARNG	BROOKSVILLE RC AASF#2 C23	AASF #2 Fac 00003 (Brooksville)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Florida	ARNG	LAKELAND AASF # 2	Hangar 4 00004 (Lakeland AASF#2)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Florida	AFR	Homestead Air Reserve Base	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Florida	ARNG	BROOKSVILLE RC AASF#2 C23	C-23 HANGAR AASF #2	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Florida	NAR	Naval Air Reserve Center Jacksonville	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Georgia	ANG	Savannah IAP	Maintenance Hangar	115	1950	Cold War, Korea	unk	unk	unk	unk	unk	unk	sidewalls of concrete buttressed by concrete diagonal bracing
Georgia	ARNG	HUNTER ARMY AVIATION FACILITY	AC MAINT HANGER	850	1954	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ARNG	NAS ATLANTA ENCLAVE	Hanger 1 (78th Avn)	1	1958	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ANG	Savannah IAP	Maintenance Hangar	1905	1959	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	flat gable	rect, gable end, steel
Georgia	ANG	Savannah IAP	Maintenance Hangar	199	1961	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	steel clad barrel vault
Georgia	ARNG	WINDER BRW ARPT	AC Maint Hanger # 2	5	1969	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ARNG	WINDER BRW ARPT	Winder-Barrow AASF #1	2	1971	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ARNG	WINDER BRW ARPT	AC Maint Hanger	6	1972	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ARNG	DOBBINS ARB	Dobbins AASF #2	555	1983	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ANG	Savannah IAP	Maintenance	1923	1984	Cold War Post Vietnam	unk	unk	unk	unk	unk	unk	concrete block, steel framing
Georgia	ARNG	HUNTER ARMY AVIATION FACILITY	AC MAINT HGR	OMH-3	1985	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ARNG	HUNTER ARMY AVIATION FACILITY	AC MAINT HGR	OMH-1	1985	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
Georgia	ARNG	HUNTER ARMY AVIATION FACILITY	AC MAINT HGR	OMH-2	1985	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ARNG	HUNTER ARMY AVIATION FACILITY	AASF HANGAR (LRCP)	0MH-4	1985	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ARNG	NAS ATLANTA ENCLAVE	Hanger 300 (78th Avn)	300	1987	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Georgia	ARNG	NAS ATLANTA ENCLAVE	Hanger 312 (Det 9 OSA)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Georgia	NAR	Naval Air Station Atlanta	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	Joint base at Dobbins - 1959
Georgia	ANG	Robins AFB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Georgia	ARNG	HUNTER ARMY AVIATION FACILITY	AC Maint Hanger	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Georgia	AFR	Dobbins Air Reserve Base	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Hawaii	ARNG	Wheeler	Admin and Aviation Supply Bldg 299 1110	113	1932	Interwar Years	unk	PERM	unk	unk	steel truss	unk	
Hawaii	ARNG	Barbers Points	Aircraft Maintenance	117	1944	WWII	Eligible	unk	unk	unk	unk	unk	
Hawaii	ARNG	Barbers Points	Aircraft Maintenance	282	1958	Cold War, Vietnam	Eligible	unk	unk	unk	unk	unk	
Hawaii	ARNG	Wheeler	AASF#1HANGAR	829	1976	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Hawaii	ARNG	HILO AASF 2	AASF #2 (old) Administration Office	618	1986	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Hawaii	ARNG	HILO AASF 2	AASF #2 Maintenance Hangar	620	1986	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Hawaii	ARNG	HILO AASF 2	AASF#2 New Maintenance Hangar	672	2001	Post Cold War	unk	PERM	unk	unk	unk	unk	
Hawaii	ANG	Hickam AFB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Hawaii	ARNG	Wheeler	C-26 HANGAR 945	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Idaho	ANG	Gowen Field	Hangar	148	1954	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	
Idaho	ANG	Gowen Field	Hangar	559	1958	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	
Idaho	ARNG	GOWEN FIELD BOISE	AASF MAINT	1502	1993	Post Cold War	unk	PERM	unk	unk	unk	unk	
Idaho	ANG	Gowen Field	Hangar	1530	unk	unk	unk	unk	unk	unk	unk	unk	
Idaho	ANG	Gowen Field	Hangar	1533	unk	unk	unk	unk	unk	unk	unk	unk	
Illinois	ANG	Scott AFB	unk	443	1939	WWII	unk	unk	unk	unk	unk	unk	
Illinois	ARNG	CHICAGO(MIDWAY ARMORY,AASF#2)	READINESS CENTER / AASF#2	1	1940	WWII	unk	PERM	unk	unk	unk	unk	
Illinois	ARNG	PEORIA AASF # 3	AC MAINT HGR	23	1947	Cold War, Korea	unk	PERM	unk	unk	unk	unk	poor condition
Illinois	ARNG	PEORIA AASF # 3	hangar	1	1948	Cold War, Korea	unk	PERM	unk	unk	unk	unk	Quonset-like hanger, folding accordion hanger doors
Illinois	ARNG	PEORIA AASF # 3	Aircraft Maintenance	2	1953	Cold War, Korea	unk	PERM	unk	unk	unk	unk	
Illinois	ARNG	PEORIA AASF # 3	Aircraft Maintenance	12	1961	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Illinois	ARNG	PEORIA AASF # 3	AC MAINT HGR	16	1971	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Illinois	ARNG	DECATUR AASF#1	AC MAINT HANGER 2	6	1977	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	

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Illinois	ARNG	DECATUR AASF#1	AC MAINT HGR\OPS BLDG	1	1977	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Illinois	ANG	Capital MAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Illinois	NAR	Naval Air Reserve Center Chicago	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Indiana	ARNG	Stout Field Joint Forces Headquarters	Hangar	8	1929	Interwar Years	Eligible	PERM	unk	unk	steel	long span truss	built by Curtiss Flying School of Indiana
Indiana	ARNG	Stout Field Joint Forces Headquarters	Hangar	5	1942	WWII	Eligibie	PERM	unk	unk	concrete		architect John P. Parrish, never used as hangar
Indiana	ARNG	Stout Field Joint Forces Headquarters	Hangar	9	1942	WWII	Eligible	PERM	unk	unk	steel	arch truss	architect John P. Parrish,
Indiana	ANG	Ft Wayne IAP	Aircraft Maintenance Hangar	734	1953	Cold War, Korea	Not Eligible	unk	unk	Hangar Two story Lean-to	steel truss	arched	Mills and Petticord
Indiana	ANG	Hulman Field	Jet Engine Maintenance Shop	25	1966	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Jas, Gamble, Rogers, Lovelock & Fritz under the USACE
Indiana	ANG	Hulman Field	Aircraft Shelter	26	1966	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Butler Manufacturing under USACE, Alert hanger under ADC
Indiana	ANG	Hulman Field	Aircraft Shelter	27	1966	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Butler Manufacturing under USACE, Alert hanger under ADC
Indiana	ANG	Hulman Field	Aircraft Shelter	28	1966	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Butler Manufacturing under USACE, Alert hanger under ADC
Indiana	ANG	Hulman Field	Aircraft Shelter	29	1966	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Butler Manufacturing under USACE, Alert hanger under ADC
Indiana	ARNG	SHELBYVILLE	Aircraft Maint Hangar	2	19791	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Indiana	ARNG	SHELBYVILLE	Aircraft Maint Hangar	3	1980	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Indiana	ARNG	RAYTHEON INPLS INTL AIRPORT	Raytheon Hangar	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Indiana	AFR	Grissom Air Reserve Base	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Indiana	ARNG	SHELBYVILLE	Aircraft Hangar(Joint Use Agreement)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Indiana	ARNG	SHELBYVILLE	Sprung 1	unk	unk	unk	unk	RELO	unk	unk	unk	unk	
Indiana	ARNG	SHELBYVILLE	Sprung 2	unk	unk	unk	unk	RELO	unk	unk	unk	unk	
Indiana	ARNG	SHELBYVILLE	Sprung 3	unk	unk	unk	unk	RELO	unk	unk	unk	unk	
Indiana	ARNG	SHELBYVILLE	Sprung 4	unk	unk	unk	unk	RELO	unk	unk	unk	unk	
Indiana	ARNG	SIGNATURE INDPLS INTL AIRPORT	SIGNATURE INDPLS INTL AIRPORT	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Indiana	ARNG	Gary LRCP	LAASF LRCP	1	unk	unk	unk	PERM	unk	unk	unk	unk	
Indiana	ARNG	Seymour LRCP	AASF LRCP	1	unk	unk	unk	PERM	unk	unk	unk	unk	
Iowa	ANG	Des Moines IAP	Hangar	100	1941	WWII	Eligible	unk	unk	unk	unk	flat low gable	concrete - WPA, Des Moines architect William N. Nielson; hollow box girders used

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Iowa	ANG	Sioux Gateway AP	Hangar	261	1957	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	metal - irregular
Iowa	ARNG	DAVENPORT AASF	AC MAINT HGR	AASF3	1972	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Iowa	ARNG	WATERLOO BIG ROCK	AC MAINT HGR	AASF2	1974	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Iowa	ARNG	BOONE	AIRCRAFT MAINTENANCE HANGAR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Iowa	ANG	ANKENY	AC MAINT HGR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Kansas	ANG?	TOPEKA FORBES FIELD	Maintenance Hangar	665	1956	Cold War, Vietnam	unk	PERM	39-01-53	Wing Multi-Purpose	steel truss	offset gable	SAC construction
Kansas	ANG?	TOPEKA FORBES FIELD	Maintenance Hangar	666	1956	Cold War, Vietnam	unk	PERM	39-01-53	Wing Multi-Purpose	steel truss	offset gable	SAC construction
Kansas	ARNG	TOPEKA FORBES FIELD	Hangar	682	1956	Cold War, Vietnam	unk	PERM	39-01-53	Wing Multi-purpose	steel truss	offset gable	
Kansas	ARNG	TOPEKA FORBES FIELD	Hangar	680	1956	Cold War, Vietnam	unk	PERM	39-01-53	Wing Multi-purpose	steel truss	offset gable	
Kansas	ARNG	TOPEKA FORBES FIELD	Hangar	681	1956	Cold War, Vietnam	unk	PERM	39-01-53	Wing Multi-purpose	steel truss	offset gable	
Kansas	ANG?	TOPEKA FORBES FIELD	Maintenance Hangar	662	1957	Cold War, Vietnam	unk	PERM	39-01-47	Double Cantilever Heavy Bomber A/C	arched steel trusses	low pitch gable	
Kansas	ARNG	FT RILEY	BUILDING 727 (A-TEAM)	727	1957	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Kansas	ARNG	SALINA KS TRAINING CENTER	2917 HEIN (AASF2)	2917H	1974	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Kansas	ANG	McConnell AFB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Kentucky	ARNG	FRANKFORT BOONE NG CENTER	AIR MAINT HANGER #1	BC401	1956	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Kentucky	ARNG	FRANKFORT BOONE NG CENTER	AIR MAINT HANGAR BC409	BC409	1958	Cold War, Vietnam	unk	TEMP	unk	unk	unk	unk	
Kentucky	ARNG	FRANKFORT BOONE NG CENTER	AIR MAINT HANGER #2	BC402	1972	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Kentucky	ARNG	FRANKFORT BOONE NG CENTER	AASF BC160	BC160	1972	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
Kentucky	ARNG	FRANKFORT BOONE NG CENTER	Aircraft Maint Hangar BC405	BC405	1972	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Kentucky	ANG	FRANKFORT BOONE NG CENTER	AIR MAINT HANGAR BC169	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Kentucky	ANG	FRANKFORT BOONE NG CENTER	AIR MAINT HANGAR BC416	unk	unk	unk	unk	TEMP	unk	unk	unk	unk	
Kentucky	ARNG	FRANKFORT BOONE NG CENTER	AASF (LRCP) FIXED WING	BC173	unk	unk	unk	PERM	unk	unk	unk	unk	
Kentucky	ARNG	FRANKFORT BOONE NG CENTER	Aircraft Hangar BC182 (LRCP)	BC182	unk	unk	unk	PERM	unk	unk	unk	unk	
Kentucky	ANG	FRANKFORT BOONE NG CENTER	AIR MAIN HANGAR BC414	unk	unk	unk	unk	TEMP	unk	unk	unk	unk	
Kentucky	ARNG	LONDON JSO	AIRCRAFT MAINT HANGAR	B5206	unk	unk	unk	PERM	unk	unk	unk	unk	
Louisiana	ARNG	NEW ORLEANS	AASF #1 AC HANGER and ADMIN	101	1941	WWII	unk	PERM	unk	unk	unk	unk	
Louisiana	ARNG	ESLER FIELD	AASF#2 HANGER #2	6002	1941	WWII	unk	PERM	unk	unk	unk	unk	
Louisiana	ARNG	ESLER FIELD	AASF#2 HANGER #1	6001	1941	WWII	unk	SEMI	unk	unk	unk	unk	
Louisiana	NAR	Naval Air Station Joint Reserve Base New Orleans	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	1957
Louisiana	ARNG	ESLER FIELD	T-HANGAR (FE)	unk	unk	unk	unk	SEMI	unk	unk	unk	unk	
Louisiana	ARNG	HAMMOND AIRPORT	AASF #1	30	unk	unk	unk	PERM	unk	unk	unk	unk	
Louisiana	ANG	NAS JRB New Orleans	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Maine	ARNG	BANGOR TS	AIRCRAFT MAINTENANCE HANGER	254	1942	WWII	Eligible (Demolished?)	PERM	unk	unk	unk	unk	gable offset/cantilevered dispersal maintenance hanger; internal steel support trusses and external shell covered in corrugated steel (SAC), USACE Stroeble and Salzman Engineers, Luria Engineers
Maine	ARNG	CAMP KEYES TS	AIRCRAFT MAINTENANCE HANGER	36	1957	Cold War, Vietnam	Not Eligible	PERM	unk	unk	unk	unk	one-story brick, Bunker and Savage architects

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Maine	ARNG	BANGOR TS	AIRCRAFT MAINTENANCE HANGER	260	1976	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Maine	NAR	Naval Air Reserve Center Brunswick	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Maine	ANG	BANGOR TS	AIRCRAFT MAINTENANCE HANGER	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Maryland	ARNG	EDGEWOOD AREA APG	AC MAINT HANGAR	E4040	1926	Interwar Years	unk	PERM	unk	unk	unk	unk	
Maryland	ANG	Martin State Airport	Maintenance Hangar	1070	1958	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	
Maryland	ARNG	EDGEWOOD AREA APG	AC MAINT HANGAR	E4081	1980	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Maryland	ARNG	PHILLIPS ARMY AIRFIELD (APG)	FIXED WING	1	1980	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Maryland	ARNG	EDGEWOOD AREA APG	ADD-ALT TO E4081 PLACE HOLDER	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Massachusetts	AFR	Westover Air Reserve Base	Base Hangar	1	1940	WWII	unk	PERM	unk	unk	steel arched beams	arched	272x279' central hangar section
Massachusetts	ANG	Otis ANGB	unk	175	1953	Cold War, Korea	Eligible	unk	unk	Multi-Cell Alert Hangar	unk	unk	ADC consistently used the Butler Multi-Cell Alert Hangar, as represented 175
Massachusetts	ANG	Otis ANGB	Engine Inspection and Repair	156	1955	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	
Massachusetts	ANG	Otis ANGB	Roads and Grounds Hangar	124	1955	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	Bulter Multi-Cell Alert Hangar
Massachusetts	ARNG	WESTOVER AFB	AASF #2	7400	1956	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Massachusetts	ANG	Otis ANGB	Maintenance Hangar	158	1956	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	
Massachusetts	ANG	Westfield Barnes ANGB	unk	15	1961	Cold War, Vietnam	Not Eligible	unk	39-01-01	Aircraft Maintenance Hangar-Reserve Training-Type B	unk	low pitch gable	standard plans (Drawing series #39-01-01 and was originally designed by Stroebel & Salzman Engineers of New York for the Army Office of Chief of Engineers) for "Aircraft Maintenance Hangar-Reserve Training-Type B" as modified for Westfield-Barnes Airport
Massachusetts	ARNG	OTIS AFB	AASF #1	2816	1971	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Massachusetts	ANG	Westfield Barnes ANGB	unk	27	1983	Cold War, Post Vietnam,	unk	unk	unk	unk	unk	slight pitch gable	standard plans for a "Fuel System Maintenance Dock Corrosion Control Facility by Caolo & Bieniek Associates, Inc. of West Springfield, Massachusetts
Massachusetts	ARNG	WESTFIELD/BARNES	AASF#2 BLDG #2	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Michigan	ARNG	GRAYLING AIRFIELD	AC MAINT HGR	1101	1969	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	

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Michigan	ARNG	GRAND LEDGE AASF	AASF #1	GL011	1980	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Michigan	ARNG	GRAND LEDGE HANGAR	AC MAINT HGR	unk	1993	Post Cold War	unk	PERM	unk	unk	unk	unk	
Michigan	ARNG	GRAYLING AIRFIELD	AC MAINT HGR	1194	1994	Post Cold War	unk	PERM	unk	unk	unk	unk	
Michigan	NAR	Naval Air Reserve Center Selfridge	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Michigan	ANG	SELFRIDGE AIR NG BASE	AC MAINT HGR (AASF#2)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Michigan	ANG	LANSING AIRPORT HANGAR	AC MAINT HANGER	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Michigan	ARNG	GRAYLING AIRFIELD	AC MAINT HGR	1130	unk	unk	unk	PERM	unk	unk	unk	unk	
Michigan	ARNG	GRAND LEDGE AASF	AC MAINT HANGER	GL190	unk	unk	unk	PERM	unk	unk	unk	unk	
Michigan	ARNG	GRAND LEDGE AASF	AC MAINT HGR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Minnesota	ARNG	CAMP RIPLEY	Old Hangar	8195	1931	Interwar Years	unk	PERM	unk	unk	unk	unk	
Minnesota	NAR	Naval Air Station Minneapolis	unk	P-1	1945	WWII	not eligible	unk	unk	unk	web steel girder	barrel vault	World-Chamberlain Fld, Army Air Corps base WWII, Army Transport Command Hangar. Air Force facility in 1955; steel frame superstructure with a large barrel vaulted roof supported by open web steel girders and concrete masonry unit walls, segmented doors,
Minnesota	ANG	Duluth ANGB	Alert Hangar	500	1952	Cold War, Korea	Eligible	unk	unk	unk	steel truss	unk	designed by Strobel & Sazlman, steel-framed hangar, 303 ft x 49 ft deep, ribbed sheet metal, flat roof
Minnesota	ANG	Duluth ANGB	Maintenance Hangar	103	1954	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	Standardized Strobel & Salzman, interior cantilevered trusses and a façade with modernized recessed panel doors
Minnesota	ANG	Duluth ANGB	Ready Aircraft Shelter	499	1956	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Butler Manufacturing
Minnesota	ANG	Duluth ANGB	Ready Aircraft Shelter	498	1956	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Butler Manufacturing
Minnesota	ANG	Duluth ANGB	Ready Aircraft Shelter	497	1956	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Butler Manufacturing
Minnesota	ARNG	AASF Leased Hangar	Leased Hangar	16001	1980	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Minnesota	ARNG	CAMP RIPLEY	Hangar unheated (Proposed)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Minnesota	ARNG	HOLMAN FIELD AASF	AASF- Proposed	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Minnesota	AFR	Minneapolis-St. Paul International Airport Air Reserve Station	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Minnesota	ARNG	ST CLOUD AASF	St Cloud AASF	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Minnesota	ARNG	ST CLOUD NG ARMORY	AASF (Proposed)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	

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Minnesota	ARNG	CAMP RIPLEY	LAASF Aviation (Proposed)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Minnesota	ARNG	CAMP RIPLEY	Winterized hangar (Proposed)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	MTA CAMP SHELBY	SW OF 07005 E OF RD NG0427	7094	1955	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	MTA CAMP SHELBY	Aircraft Hanger #1	7080	1974	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	MTA CAMP SHELBY	Aircraft Hanger #2	7083	1974	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	HAWKINS FIELD	AASF #1	101	1975	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	MERIDIAN	AASF #2	100	1976	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	TUPELO	AASF #3	1025	1981	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	GULFPORT AVCRAD	AVCRAD	122	1989	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	Tupelo AASF	Tupelo Flight Facility	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Mississippi	ARNG	MTA CAMP SHELBY	Unmanned Aircraft System (UAS)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Mississippi	ANG	Thompson Field ANGB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Missouri	ANG	Lambert Field	Hangar 2/Engine Shop	2	1941	WWII	unk	unk	unk	unk	unk	unk	
Missouri	ANG	Lambert Field	Hangar 1	1	1942	WWII	unk	unk	unk	unk	unk	unk	
Missouri	ARNG	WHITEMAN AFB KNOB NOSTER	AIRCRAFT PARTS STORAGE	52	1978	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Missouri	ARNG	SPRINGFIELD AVCRAD	AIRCRAFT MAINT HANGER	HANGR	1981	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Missouri	ANG	Lambert Field	Aircraft Shop	104	1983	Cold War Post Vietnam	unk	unk	unk	unk	unk	unk	
Missouri	ARNG	FT LEONARD WOOD	AC MAINT HANGER (5012)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Missouri	ARNG	SPRINGFIELD AVCRAD	(DO NOT USE) NEW AVCRAD (D)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Missouri	ANG	WHITEMAN AFB KNOB NOSTER	AASF (LRCP)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Montana	ANG	Great Falls IAP	Aircraft Hangar	25	1955	Cold War, Vietnam	Not Eligible	unk	39-01-041	unk	steel truss	flat gable	steel-frame, truss system, low-pitched gable USACE mid 1950s), plan no. 39-01-041
Montana	ANG	Great Falls IAP	unk	48	1968	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	steel-frame
Montana	ANG	Great Falls IAP	unk	45	1968	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	steel-frame
Montana	ANG	Great Falls IAP	unk	47	1968	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	steel-frame
Montana	ANG	Great Falls IAP	unk	46	1968	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	steel-frame

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Montana	ANG	Great Falls IAP	Maintenance Shop	36	1975	Cold War Post Vietnam	Not Eligible	unk	unk	unk	steel truss	low pitch gable	Davison & Kuhn Architects, steel-framed, low pitched gable
Montana	ANG	Great Falls IAP	Maintenance Shop	37	1975	Cold War Post Vietnam	Not Eligible	unk	unk	unk	steel truss	low pitch gable	Davison & Kuhn Architects, steel-framed, low pitched gable
Montana	ARNG	HELENA AVN RC- AASF-C12-CH47	C-12 MAINT HANGAR (AASF)	400	2002	Post Cold War	unk	PERM	unk	unk	unk	unk	
Montana	ARNG	HELENA AVN RC- AASF-C12-CH47	AC MAINTENANCE HANGAR (AASF)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Nebraska	ARNG	LINCOLN AASF/READINESS CENTER	AASF	AASF0	1959	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Nebraska	ANG	GRAND ISLAND AASF/RC	USAF HANGAR #1 - LEASE	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Nebraska	ANG	GRAND ISLAND AASF/RC	USAF HANGAR #2 - LEASE	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Nebraska	ARNG	GRAND ISLAND AASF/RC	AASF ADMIN - LEASE	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Nebraska	ARNG	GRAND ISLAND AASF/RC	ARMY AVIATION SUPPORT FACILITY	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Nevada	ARNG	HARRY REID TRAINING CENTER	AASF	AASF1	1984	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Nevada	ANG	Reno-Tahoe IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Nevada	ANG	HARRY REID TRAINING CENTER	C12 HANGER	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
New Hampshire	ARNG	STATE MILITARY RESERVATION	AASF	0000K	1959	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
New Hampshire	ARNG	STATE MILITARY RESERVATION	AASF HANGER 4	10187	1996	Post Cold War	unk	TEMP	unk	unk	unk	unk	
New Hampshire	ARNG	NH ARMY AVIATION SUPPORT FAC	ARMY AVIATION SUPPORT FACILITY	1	2003	Post Cold War	unk	PERM	unk	unk	unk	unk	
New Jersey	ARNG	LAKEHURST TS NAVAL AIR STATION	HANGAR/SHOP	307	1957	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
New Jersey	ARNG	TRENTON MERCER AVIATION	MAINT HANGAR	1	1977	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
New Jersey	ANG	Atlantic City IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
New Jersey	ANG	McGuire AFB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
New Mexico	ARNG	SANTA FE AASF	AIRCRAFT MAINTENANCE HANGER	1	1979	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
New Mexico	ANG	Kirtland AFB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
New Mexico	ARNG	LAS CRUCES HANGAR	LAS CRUCES HANGAR	1	unk	unk	unk	PERM	unk	unk	unk		
New York	ARNG	RONKONKOMA ARMORY	AASF	1	1977	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
New York	ARNG	ALBANY AASF 3	AIRCRAFT MAINT HANGER	1	1979	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	

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New York	ANG	Stewart IAP	unk	100	1988	Cold War Post Vietnam	Not Eligible	unk	unk	unk	unk	unk	rect, concrete block, vinyl siding, gabled middle bay
New York	ANG	Stewart IAP	unk	300	1990	Post Cold War	Not Eligible	unk	unk	unk	unk	unk	rect, concrete block,
New York	ANG	Stewart IAP	unk	301	1993	Post Cold War	Not Eligible	unk	unk	unk	unk	unk	U-shaped, concrete block, gabled roof
New York	ANG	Hancock Field	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
New York	AFR	Niagara Falls Air Reserve Station	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
New York	ARNG	PATRIOT WAY RC / FMS 11	AASF	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
New York	ARNG	PATRIOT WAY RC / FMS 11	AIRCRAFT MAINT HANGER	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
North Carolina	ARNG	SALISBURY	AASF #2 , Main Building	1	1976	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
North Carolina	ARNG	SALISBURY	Aviation Maint. Bldg. 2	2	1976	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
North Carolina	ARNG	MORRISVILLE	AC MAINT HANGAR	unk	1986	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
North Carolina	ARNG	MORRISVILLE	AASF	AASF1	1989	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
North Carolina	ARNG	MORRISVILLE	Fixed Wing Aircraft Hanger	T0004	unk	unk	unk	PERM	unk	unk	unk	unk	
North Dakota	ANG	Hector Field	Aircraft Hanger	217	1955	Cold War, Vietnam	Not Eligible	PERM	39-01-41	steel	unk	flat gable-open	
North Dakota	ANG	Hector Field	Aircraft Hangar	217	1955	Cold War, Vietnam	Not Eligible	PERM	39-01-41	steel	unk	flat gable-open	
North Dakota	ANG	Hector Field	Aircraft Hanger	370	1967	Cold War, Vietnam	Not Eligible	PERM	unk	steel	unk	low pitch gable	possibly moved to current location from another
North Dakota	ANG	Hector Field	Aircraft Hangar	370	1967	Cold War, Vietnam	Not Eligible	PERM	unk	steel	unk	low pitch gable	possibly moved to current location from another
North Dakota	ARNG	BISMARCK AASF COMPLEX	AASF	3410	1976	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
North Dakota	ARNG	BISMARCK AASF COMPLEX	C-12 Hangar	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
North Dakota	ANG	CD Leased Hangar	CD Leased Hangar	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Ohio	ANG	Mansfield-Lahm	Aircraft Maintenance Hangar	102	1950	Cold War, Korea	Not Eligible	unk	unk	unk	unk		

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Ohio	NAR	Naval Air Station Columbus	unk	unk	1953	Cold War, Korea	unk	unk	unk	unk	unk	gable	steel frame construction with exterior concrete masonry unit (CMU) block and ridge metal siding. A front-gable roof is covered with metal panel roofing material and single-story office and maintenance areas flank each side of the hangar deck. Large-scale,
Ohio	ANG	Rickenbacker IAP	unk	885	1954	Cold War, Vietnam	??	unk	39-01-044	Hangar-maintenance, double cantilever medium bomber A/C	unk	unk	rect, flat roof, steel frame, concrete block, double cantilever, flat exterior/arched interior truss system, standard design 39-01-44, Dec 1951, "Hangar-maintenance, double cantilever medium bomber A/C, by Kuljian Corps,
Ohio	ANG	Rickenbacker IAP	unk	888	1954	Cold War, Vietnam	??	unk	39-01-044	Hangar-maintenance, double cantilever medium bomber A/C	unk	unk	rect, flat roof, steel frame, concrete block, double cantilever, flat exterior/arched interior truss system, standard design 39-01-44, Dec 1951, "Hangar-maintenance, double cantilever medium bomber A/C, by Kuljian Corps,
Ohio	ANG	Springfield ANGB	Aircraft Maintenance Hangar	101	1955	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	gable	Mills and Petticord Architects
Ohio	ANG	Toledo Express AP	Aircraft Maintenance Hangar	101	1958	Cold War, Vietnam	Not Eligible	unk	unk	Hangar Type H-2, two story lean-to	unk	unk	
Ohio	ANG	Toledo Express AP	Fuel System Maintenance	124	1979	Cold War Post Vietnam	unk	unk	unk	Hangar Type H-2, two story lean-to	unk	unk	
Ohio	ARNG	GREEN	AIRCRAFT MAINTENANCE HANGER	AASF1	1986	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Oklahoma	ARNG	Norman Hanger	F/W Hangar	NOR01	1960	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Oklahoma	ARNG	Lexington AASF No 1	AIRCRAFT MAINT HANGAR	LE200	1975	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Oklahoma	ARNG	Tulsa AASF No 2	Aircraft Maintenance Hangar	TU200	1989	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Oklahoma	ANG	Tulsa IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Oregon	ANG	Portland IAP	unk	255	1956	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	rect, reinforce concrete and steel frame, shallow pitch, end gabled roof
Oregon	ARNG	MCNARY FIELD SALEM	Hangar 1	0HGR1	1972	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	

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		AASF											
Oregon	ARNG	MCNARY FIELD SALEM AASF	Hangar 2	0HGR2	1976	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Oregon	ARNG	PANG BASE ENCLAVE	C 23 Hangar	375	1987	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Oregon	ANG	Portland IAP	unk	310	1988	Cold War Post Vietnam	Not Eligible	unk	unk	unk	unk	unk	rect, hipped and gabled roof, steel frame, syn stucco-clad
Oregon	ARNG	PENDLETON AASF	Pendleton Hangar	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Oregon	ANG	Kingsley Field	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Oregon	ARNG	MCNARY FIELD SALEM AASF	Hangar 3	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Pennsylvania	ARNG	FORT INDIANTOWN GAP	AIRCRAFT MAINTENANCE HANGER-DEMO	19020	1962	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Pennsylvania	ARNG	FORT INDIANTOWN GAP	AASF	19101	1975	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Pennsylvania	ARNG	FORT INDIANTOWN GAP	AUXILIARY HANGAR	19155	1987	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Pennsylvania	ARNG	JOHNSTOWN AVIATION SUPPORT FAC	JOHNSTOWN AVN SPT FACILITY	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Pennsylvania	NAR	Naval Air Station Joint Reserve Base Willow Grove	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	1943
Pennsylvania	AFR	Pittsburgh Air Reserve Station	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Pennsylvania	ANG	Pittsburgh IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Puerto Rico	ANG	Muniz ANGB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Puerto Rico	ARNG	ARMY AVIATION SUPPORT FACILITY	ARMY AVIATION FACILITY	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Rhode Island	ARNG	QUONSET POINT	AASF	4	1942	WWII	unk	PERM	unk	unk	unk	unk	
Rhode Island	ANG	Quonset State Airport	unk	8	1981	Cold War Post Vietnam	Not Eligible	unk	unk	unk	unk		CMU with brick veneer and metal panels
Rhode Island	ARNG	QUONSET POINT	AASF	7	unk	unk	unk	PERM	unk	unk	unk	unk	
South Carolina	ANG	McEntire JNGS	unk	253	1966	Cold War, Vietnam	Not Eligible	unk	unk	unk	unk	unk	metal with off-centered gable roof
South Carolina	ANG	Capital MAP	unk	465	1975	Cold War Post Vietnam	Not Eligible	unk	unk	unk	unk	unk	
South Carolina	ARNG	AASF UPSTATE (FYDP)	AASF UPSTATE	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
South Carolina	ANG	W COLUMBIA AAOF (LEASE)	HANGAR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
South Dakota	ANG	Joe Foss Field	Maintenance Hangar	40	1942	WWII	Not Eligible	unk	unk	unk	unk	shallow pitch gable	
South Dakota	ARNG	RAPID CITY AASF/ARMORY	AIRCRAFT MAINTENANCE HANGER	2	1973	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
South Dakota	ANG	Joe Foss Field	Maintenance Hangar	14	1979	Cold War Post Vietnam	unk	unk	unk	unk	composite	gable	
South Dakota	ARNG	RAPID CITY AASF/ARMORY	AIRCRAFT MAINTENANCE HANGER	1	1980	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
South Dakota	ARNG	RAPID CITY AASF/ARMORY	FUTURE AASF READINESS CENTER	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
South Dakota	ARNG	RAPID CITY AASF/ARMORY	CST READY BUILDING (FUTURE)	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
South Dakota	ARNG	RAPID CITY AASF/ARMORY	NEW HANGAR FACILITY	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Tennessee	ANG	VTS SMYRNA	AIRCRAFT MAINTENANCE HANGER	unk	1943	WWII	unk	PERM	unk	unk	unk	unk	
Tennessee	ARNG	VTS SMYRNA	AIRCRAFT MAINTENANCE HANGER	680	1950	Cold War, Korea	unk	PERM	unk	unk	unk	unk	
Tennessee	ANG	McGhee-Tyson ANGB	Maintenance Hangar	126	1952	Cold War, Korea	Not Eligible	unk	unk	unk	unk	unk	Strobel and Salzman Alert Hangar
Tennessee	ANG	McGhee-Tyson ANGB	Maintenance Hangar	113	1952	Cold War, Korea	Not Eligible	unk	unk	unk	unk	unk	Quonset hut roof
Tennessee	ANG	McGhee-Tyson ANGB	Maintenance Hangar	111	1953	Cold War, Korea	Not Eligible	unk	unk	unk	unk	unk	
Tennessee	ANG	McGhee-Tyson ANGB	Maintenance Hangar	111	1953	Cold War, Korea	Not Eligible	unk	unk	unk	unk	unk	
Tennessee	ARNG	VTS SMYRNA	AIRCRAFT MAINT HANGAR	681	1958	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Tennessee	ARNG	VTS SMYRNA	AIRCRAFT MAINT HANGAR	682	1958	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Tennessee	ARNG	AASF 2	AC MAINT HANGER	T-100	1980	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Tennessee	ARNG	AASF 2	AVIATION FLIGHT FACILITY2	2	1986	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Tennessee	ANG	JACKSON AIRPORT ARMORY	AIRCRAFT HANGER/AASF # 3	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Tennessee	ANG	Memphis IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Texas	ARNG	ELLINGTON FIELD	Aircraft Hangar	1382	1940	WWII	Eligible	PERM	unk	unk	unk	front gable	
Texas	ANG	Ellington Field	unk	1382	1942	WWII	Not Eligible	unk	unk	unk	unk	unk	Army -
Texas	ANG	Texas Naval Air Station	unk	1027	1946	Cold War, Korea	unk	unk	unk	unk	unk	unk	
Texas	ANG	Texas Naval Air Station	unk	1643	1953	Cold War, Korea	unk	unk	unk	unk	unk	unk	steel frame, corrugated metal, gabled roof
Texas	ANG	Texas Naval Air Station	unk	1050	1955	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	steel frame, flat roof
Texas	ARNG	MARTINDALE - AASF	AC MAINT HGR	2	1955	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Texas	ANG	Texas Naval Air Station	unk	1048	1958	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	steel frame, shed roof
Texas	ANG	Texas Naval Air Station	unk	1404	1958	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	steel frame, corrugated metal, gabled roof

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
Texas	ANG	Texas Naval Air Station	unk	1049	1958	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	steel frame, shed roof
Texas	ANG	Texas Naval Air Station	unk	1405	1958	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	steel frame, corrugated metal, gabled roof
Texas	ANG	Texas Naval Air Station	unk	1403	1958	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	steel frame, corrugated metal, gabled roof
Texas	ANG	Texas Naval Air Station	unk	1402	1958	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	steel frame, corrugated metal, gabled roof
Texas	ARNG	GRAND PRAIRIE (DNAS)	AASF	3	1977	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Texas	ANG	Ellington Field	unk	1394	1987	Cold War Post Vietnam	Not Eligible	unk	unk	unk	unk	unk	precast concrete walls, front gabled
Texas	ARNG	ELLINGTON FIELD	Physical Fitness Area	1394	1987	Cold War Post Vietnam	unk	PERM	unk	unk	unk	front gable	
Texas	NAR	Naval Air Station Joint Reserve Base Fort Worth	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	Tarrant Field Airdrone 1941, Carswell Air Force Base - 1948
Texas	ARNG	GRAND PRAIRIE (DNAS)	AIRCRAFT MAINT HGR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Texas	ARNG	BERGSTROM - (ABIA)	AASF	3	unk	unk	unk	PERM	unk	unk	unk	unk	
Texas	ANG	BERGSTROM - (ABIA)	RW AC MAINT HANGAR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Texas	ANG	BERGSTROM - (ABIA)	FIXED WING AC MAINT HANGAR	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Texas	ANG	Lackland AFB	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Utah	ANG	Salt Lake Air Base	C-12 HANGAR	unk	1950	Cold War, Korea	unk	PERM	unk	unk	unk	unk	
Utah	ARNG	E.J. GARN AVIATION COMPLEX	North Hangar	1	1977	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Utah	ARNG	E.J. GARN AVIATION COMPLEX	SOUTH HANGAR, AASF	2	1993	Post Cold War	unk	PERM	unk	unk	unk	unk	
Utah	ANG	Salt Lake City IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Vermont	ARNG	SO BURLINGTON	KNEELAND AFF	890	1957	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Vermont	ARNG	AASF/READINESS CENTER	AASF	1	2005	Post Cold War	unk	PERM	unk	unk	unk	unk	
Vermont	ANG	Burlington IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Virginia	ARNG	FORT PICKETT ARNG MTC	AIRCRAFT HANGAR	T0025	1942	WWII	unk	SEMI	unk	unk	unk	unk	
Virginia	ARNG	AASF BYRD FIELD	AC MAINT HGR	3993	1966	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Virginia	ARNG	AASF BYRD FIELD	AC MAINT HGR	3991	1966	Cold War, Vietnam	unk	SEMI	unk	unk	unk	unk	
Virginia	ARNG	AASF BYRD FIELD	AC MAINT HGR	3992	1966	Cold War, Vietnam	unk	SEMI	unk	unk	unk	unk	
Virginia	ARNG	AASF BYRD FIELD	AC MAINT HGR	3994	1966	Cold War, Vietnam	unk	SEMI	unk	unk	unk	unk	
Virginia	ARNG	AASF BYRD FIELD	AC MAINT HGR	3390	1975	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Virginia	ARNG	FORT PICKETT ARNG MTC	PROPOSED AASF-MTC FT PICKETT	60	unk	unk	unk	PERM	unk	unk	unk	unk	
Virginia	NAR	Naval Air Reserve Center Norfolk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
Virginia	ANG	Richmond IAP	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
Washington	ARNG	GEIGER FLD - SPOKANE	ADMIN BLDG, GEN PURP -C -AASF #2	2504	1945	WWII	unk	SEMI	unk	unk	unk	unk	
Washington	ANG	Spokane IAP	unk	2504	1945	WWII	Not Eligible	unk	unk	unk	unk	unk	barrel vault roof, concrete wall panels, , timber bow string trusses
Washington	ANG	McChord AFB	unk	300	1953	Cold War, Korea	Eligible	unk	unk	unk	unk	unk	Strobel & Salzman
Washington	ARNG	FAIRCHILD AFB - SPOKANE	AIRCRAFT MAINT HANGAR - 1001	4	1955	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
Washington	ARNG	GRAY FIELD FT. LEWIS	AIRCRAFT MAINT HANGAR - C-23	3272	1968	Cold War, Vietnam	unk	SEMI	unk	unk	unk	unk	
Washington	ARNG	GRAY FIELD FT. LEWIS	AIRCRAFT MAINT HANGAR - AASF#1	3106	1983	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Washington	ANG	Fairchild AFB	unk	1029	unk	unk	Not Eligible	unk	unk	unk	unk	unk	Luria Engineering standard design for SAC bomber
Washington	ANG	Fairchild AFB	unk	1033	unk	unk	Not Eligible	unk	unk	unk	unk	unk	Luria Engineering standard design for SAC bomber
Washington	ANG	Fairchild AFB	unk	1037	unk	unk	Not Eligible	unk	unk	unk	unk	unk	Luria Engineering standard design for SAC bomber
West Virginia	ARNG	Wood County Armory - AASF #1	AASF #1	unk	1972	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
West Virginia	ARNG	Wood County Armory - AASF #1	Aircraft Maint Hangar	10675	1972	Cold War, Vietnam	unk	PERM	unk	unk	unk	unk	
West Virginia	ARNG	WHEELING	Aircraft Maint Hangar	2	1995	Post Cold War	unk	PERM	unk	unk	unk	unk	
West Virginia	ARNG	Wood County Armory - AASF #1	Aircraft Instructional Bldg	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Wisconsin	ARNG	MADISON HANGARS	AASF #2 - HANGARS	1952	1940	WWII	unk	PERM	unk	unk	unk	unk	
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	504	1942	WWII	Not Eligible	unk	unk	unk	unk	unk	concrete, steel truss - Roger C. Kirchoff, Architect, Madison
Wisconsin	ANG	Truax Field	unk	400	1942	WWII	unk	unk	unk	unk	unk	unk	USACE - Metal sheeting, concrete block, brick façade, arched truss roof
Wisconsin	ANG	Truax Field	unk	406	1954	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	USACE - Metal sheeting, concrete block, brick façade, arched truss roof
Wisconsin	ANG	Gen Mitchell IAP	unk	304	1964	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	concrete block, flat roof, USACE
Wisconsin	ANG	Gen Mitchell IAP	unk	308	1964	Cold War, Vietnam	unk	unk	unk	unk	unk	unk	concrete block, flat roof, USACE
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	952	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	958	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer

State	Service	Installation	Structure Name	Building Number	Acquisition Date	Era	NRHP	PERM/SEMI/ TEMP/RELO	Plan Number	Plan Description	Structure	Cross Section	Notes
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	957	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	956	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	955	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	953	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	951	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	949	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer
Wisconsin	ANG	Volk Field Combat Readiness training Center	unk	954	1966	Cold War, Vietnam	Not Eligible	unk	AD 39-01-084	unk	unk	unk	prefabricated metal aircraft shelters, Definite drawing #AD-39-01-84, Butler Manufacturer
Wisconsin	ARNG	MADISON AASF 2	ARMY AVIATION SUPPORT FACILITY	1950	1981	Cold War Post Vietnam	unk	PERM	unk	unk	unk	unk	
Wisconsin	ARNG	WEST BEND AASF 1 ARMORY	AASF #1	unk	unk	unk	unk	PERM	unk	unk	unk	unk	
Wyoming	ANG	Cheyenne MAP	unk	16	1943	WWII	Not Eligible	unk	unk	unk	unk	unk	USACE, steel-truss arched roof, pre-cast concrete panels (built by United Airlines for AAC, USACE plan 1000 series
Wyoming	ARNG	CHEYENNE MUNICIPAL AIRPORT	AC MAINTENANCE HANGAR	3006	1980	Cold War Post Vietnam	Not Eligible	PERM	unk	unk	unk	gable	
Wyoming	ARNG	CHEYENNE MUNICIPAL AIRPORT	AC MAINTENANCE HANGAR 2	3007	1983	Cold War Post Vietnam	Not Eligible	PERM	unk	unk	unk	gable	

APPENDIX C: TRUSSES, GIRDERS, AND FORMS

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APPENDIX C – TRUSSES, GIRDERS, AND FORMS

The following tables are from Julie Webster's H*istorical and Architectural Overview of Military Aircraft Hangars: A General History, Thematic Typology, and Inventory of Aircraft Hangars Constructed on Department of Defense Installations (1998)* to illustrate forms and cross sections.

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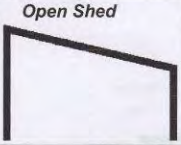
Table 6-1. Steel truss cross section typology.

Steel Trusses			
Cross section	**First known use**	**Plan description**	**Plan no.**
Closed Arch 	early 1930s	Air Corps Type A-A 121'-6" x 120' x 28' (2 Bay)	695-322 ✪
	early 1930s	Air Corps Type A-A 121'-6" x 120' x 28' (2 Bay) w/ Alternate Doors	695-333 ✪
	early 1930s	Air Corps Type D-D Operations	695-340 ✪
	early 1930s	Air Corps Type E-E Double (2 Bay)	695-357 ✪
	early 1930s	Air Corps Type F-F Shop (2 Bay)	695-371 ✪
	early 1940s	184' Demountable Type DH-1 (2 Bay)	24-1-1 ✪
Open Arch 	late 1930s	Repair Building Type Shop-B-A	695-675 ✪
	early 1940s	Repair Building Type Shop-B-A	1000-790 ✪
	mid-1940s	Heavy Bombard HANG-R-A	1000-927 ✪
	mid-1940s	Heavy Bombard HANG-O-A & HANG-P-A	1000-1252 ✪
	late 1940s	No Lean-To	39-01-06 ✪
	late 1940s	1 Story Lean-To	39-01-07 ✪
	late 1940s	2 Story Lean-To	39-01-08 ✪
	late 1950s	Large A/C Maintenance	39-01-77 ✪
	late 1950s	Maintenance	39-01-82-R1 ✪
	early 1960s	Organizational Maintenance	39-01-36 ✪
	early 1960s	Corrosion Control (Covered)	39-01-83 ✪
Closed Flat Gable 	1918	Y&D Standard 151' Type	varies ⚓
	1918	Y&D Standard 110' Type	varies ⚓
	1919	Steel Seaplane 3-Section 100' x 100' x 24'	varies ⚓
	1919	Steel Seaplane 2-Section 150' x 180' x 35'	83819 ⚓
	mid-1920s	Steel Seaplane 3-Section 110' x 160' x 24'	varies ⚓
	early 1940s	120' Temporary	695-400 ✪
	early 1940s	Air Corps School Type TUH-1 (2-Bay)	695-400.1 ✪
	early 1940s	Transport Squadron HANG-E-A (w/ Transverse Monitors)	695-695 ✪
	early 1940s	Transport Squadron HANG-E-A (w/ Transverse Monitors)	1000-355 ✪
	mid-1940s	Squadron OBH-1 (Steel)	117/5-2 ✪
Open Flat Gable 	early 1950s	Readiness w/ Shops	39-01-33 ✪
	early 1950s	Readiness w/ Shops	39-01-39 ✪
	early 1950s	Maintenance w/ Shops	39-01-41 ✪

Steel Trusses				
Cross section	**First known use**	**Plan description**	**Plan no.**	
Open Flat Gable 	mid-1950s	Readiness w/ Shops	39-01-39	✪
	mid-1950s	Maintenance w/ Shops	39-01-41	✪
	mid-1960s	Weapons Calibration Type A (Closed)	39-01-87	✪
Closed Gable 	1918	110' x 200' Standard	695-201	✪
	early 1930s	66' Connecting Two 110' x 200' Standards	695-219	✪
	early 1930s	Air Corps 1929-A Design 110' x 240'	695-232	✪
	early 1930s	Air Corps 1929-B Design	695-2??	✪
	early 1930s	Air Corps 1930-A Design	695-254	✪
	early 1930s	Air Corps 1930-B Design	695-272	✪
	early 1930s	Air Corps 1930-D Design	695-283	✪
	early 1930s	Air Corps 1930-E Design	695-284	✪
	mid-1930s	Air Corps Double Type H	68-12-120	✪
	late 1940s	Liaison Type Plane (Type 1 Construction)	39-01-01	✪
	late 1940s	Liaison Type Plane (Type 2 & 3 Construction)	39-01-02	✪
Open Gable 	early 1950s	Maintenance w/ Shops	39-01-41	✪
	early 1950s	Double Unit Arch Type	39-01-49	✪
	mid-1950s	AAF 4,000 Sq Ft	39-01-60	✪
	mid-1950s	Organizational Pull-Thru	39-01-65	✪
	mid-1950s	Organizational Pull-Thru	39-01-65-R1	✪
	mid-1950s	Reserve Training Type A	39-01-73	✪
	mid-1950s	Fighter Bomber	39-01-74	✪
	late 1950s	Maintenance	39-01-22	✪
	late 1950s	AAF 12,000 Sq Ft 20,000 w/ Shops	39-01-62	✪
	late 1950s	AAF 20,000 Sq Ft 35,000 w/ Shops	39-01-64	✪
	late 1950s	Reserve Training Type B	39-01-74	✪
	early 1960s	Weapons Calibration (Enclosed)	39-01-76-R1	✪
	early 1960s	Ready Fighter Shelter	39-01-84	✪
	mid-1960s	Weapons Calibration Type B (Closed)	39-01-87	✪
	early 1970s	Alert Shelter	39-01-88	✪
Gable Offset 	early 1950s	Wing Multi-Purpose	39-01-53	✪
	early 1950s	Wing Multi-Purpose	39-01-54	✪

Steel Trusses				
Cross section	**First known use**	**Plan description**	**Plan no.**	
Gable Offset 	late 1950s	Large A/C Fuel Maintenance	39-01-13	✪
	late 1950s	Type MB-3A/4A/9 for Large A/C	39-05-01	✪
	mid-1960s	Large A/C Maintenance	39-05-12	✪
Gambrel A-Frame 	1917	Y&D Standard 112' x 75' x 24' Seaplane	varies	⚓
Open Shed 	early-1950s	B-36 Maintenance	39-05-01	✪
	late 1980s	Maintenance	varies	⚓
External Structure 	late 1950s	Shore Facility-Module E	varies	⚓
	early 1970s	Type I Maintenance	1291710	⚓
	early 1970s	Type II Maintenance	1291712	⚓
	mid-1970s	Type I Maintenance for Two Carrier AEW Squadrons	1291714	⚓
Closed Gambrel 	1917	U.S. All-Steel 66'-0"	634.2-158	✪
Sawtooth 	early 1940s	B-M Land Plane	varies	⚓
	late 1930s	B-M Seaplane	varies	⚓
Monitor 	mid-1940s	Very Heavy Bomb HANG-T-A	1000-1365	✪
	early 1940s	B-M Land Plane (Alternate)	varies	⚓
	early 1940s	B-M Seaplane (Alternate)	varies	⚓
Flat 	early 1950s	Army Organic Light A/C (4 Bay)	39-01-26	✪
	early 1950s	Alert Fighter A/C 298' x 66' (4 Bay)	39-01-37	✪
	early 1950s	Alert Fighter A/C 303' x 69' (4 Bay)	39-01-38	✪
	mid-1950s	Alert Standard Type (4 Bay)	39-01-01	✪
	mid-1950s	Alert Fighter A/C (2 Bay)	39-01-69	✪
	late 1950s	Alert Fighter A/C (2 Bay)	39-01-69-R1	✪
	late 1950s	Ready Fighter (1, 3, & 4 Bay)	39-01-72	✪
	early 1980s	Fuel Maintenance	39-04-03	✪

Steel Trusses				
Cross section	**First known use**	**Plan description**	**Plan no.**	
Flat Exterior/ Arched Interior 	early 1950s	Double Cantilever Heavy Bomber 600' x 250' (3 Bay)	39-01-27	✪
	early 1950s	Double Cantilever Medium Bomber 350' x 250' (2 Bay)	39-01-28	✪
	early 1950s	Double Cantilever Medium Bomber 350' x 250' (2 Bay)	39-01-44	✪
	early 1950s	Double Cantilever Fighter A/C	39-01-45	✪
	early 1950s	Double Cantilever Medium Bomber A/C	39-01-46	✪
	early 1950s	Double Cantilever Heavy Bomber A/C	39-01-47	✪
	mid-1950s	Double Cantilever Heavy Bomber 600' x 250' (3 Bay)	39-01-43	✪
	mid-1950s	Double Cantilever Medium Bomber A/C	39-01-58	✪

Table 6-2. Steel girder cross section typology.

Steel Girders				
Cross section	**First known use**	**Plan description**	**Plan no.**	
Open Flat Gable 	mid-1960s	Small A/C Maintenance (2 Bay)	39-05-14	✪
	early 1970s	Corrosion Control Type A Small	1291764	⚓
	early 1970s	Corrosion Control Type B Large	1291765	⚓
Open Gable 	mid-1970s	Pre-Engineered Maintenance Type A	1403097	⚓
	mid-1970s	Pre-Engineered Maintenance Type B	1403098	⚓
	mid-1970s	Pre-Engineered Maintenance Type C	1403099	⚓
	early 1980s	Small A/C Maintenance	39-04-03	✪
	early 1980s	Small A/C Maintenance	39-04-04	✪
Open Gambrel 	mid-1950s	Alert Butler Type	39-01-03	✪
External Structure 	late 1950s	Shore Facility-Module E	varies	⚓
	mid-1960s	Type I Maintenance	1291710	⚓
	late 1960s	Type II Maintenance	1291712	⚓

Table 6-3. Steel long-span joist cross section typology.

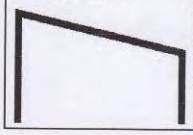
Steel Long-Span Joists				
Cross section	**First known use**	**Plan description**	**Plan no.**	
Open Shed 	mid 1950s	Large A/C Maintenance	39-01-53	✪
	early 1970s	Weapons Alignment Shelter (1 Bay)	1291733	⚓
	early 1970s	Weapons Alignment Shelter (2, 3 & 4 Bay)	1291734	⚓

Table 6-4. Wood truss cross section typology.

Wood Trusses				
Cross section	**First known use**	**Plan Description**	**Plan no.**	
Open Arch 	mid-1940s	Lighter-Than-Air	varies	⚓
Closed Arch 	unknown	Squadron OBH-2	117/6-3	✪
	mid-1940s	Type HANG-N-A	1000-1222	✪
	unknown	Squadron Type HANG-A-A	1000-1328	✪
	mid-1940s	A.T.C. Birchwood Type 202' x 200'	varies	✪
Closed Flat Gable 	unknown	Air Corps School Type TUH-2 (2 Bay)	695-611	✪
	early 1940s	Air Corps School Type HANG-A-A & C-A (2 Bay)	1000-292	✪
Closed Gambrel 	1917	Kahn's Signal Corps Mobilization	varies	✪
	1918 or 1916 (?)	Army Type Portable 110' x 180'	varies	✪

Table 6-5. Concrete arch cross section typology.

Concrete Arches				
Cross Section	**First Known Use**	**Plan Description**	**Plan No.**	
Open Arch 	early 1940s	Shore Facility – Denver Type Reserve Station	486581 520026	⚓
	early 1940s	Monolithic Concrete Seaplane	varies	⚓
	unknown	Shore Facility-Miramar Type	varies	⚓
	mid-1940s	Squadron Operations	varies	✪
	late 1940s	Monolithic Concrete	35-04-01	✪
	mid-1950s	Organizational Pull-Thru	39-01-65	✪
	mid-1950s	Organizational Pull-Thru	39-01-66	✪
	mid-1950s	Organizational Pull-Thru	39-01-67	✪
Transverse Arch 	late 1930s	Monolithic Concrete Seaplane	varies	⚓

Note: The *star* symbol in the right-hand column indicates an Army or Air Force plan; the *anchor* symbol indicates a Navy plan.

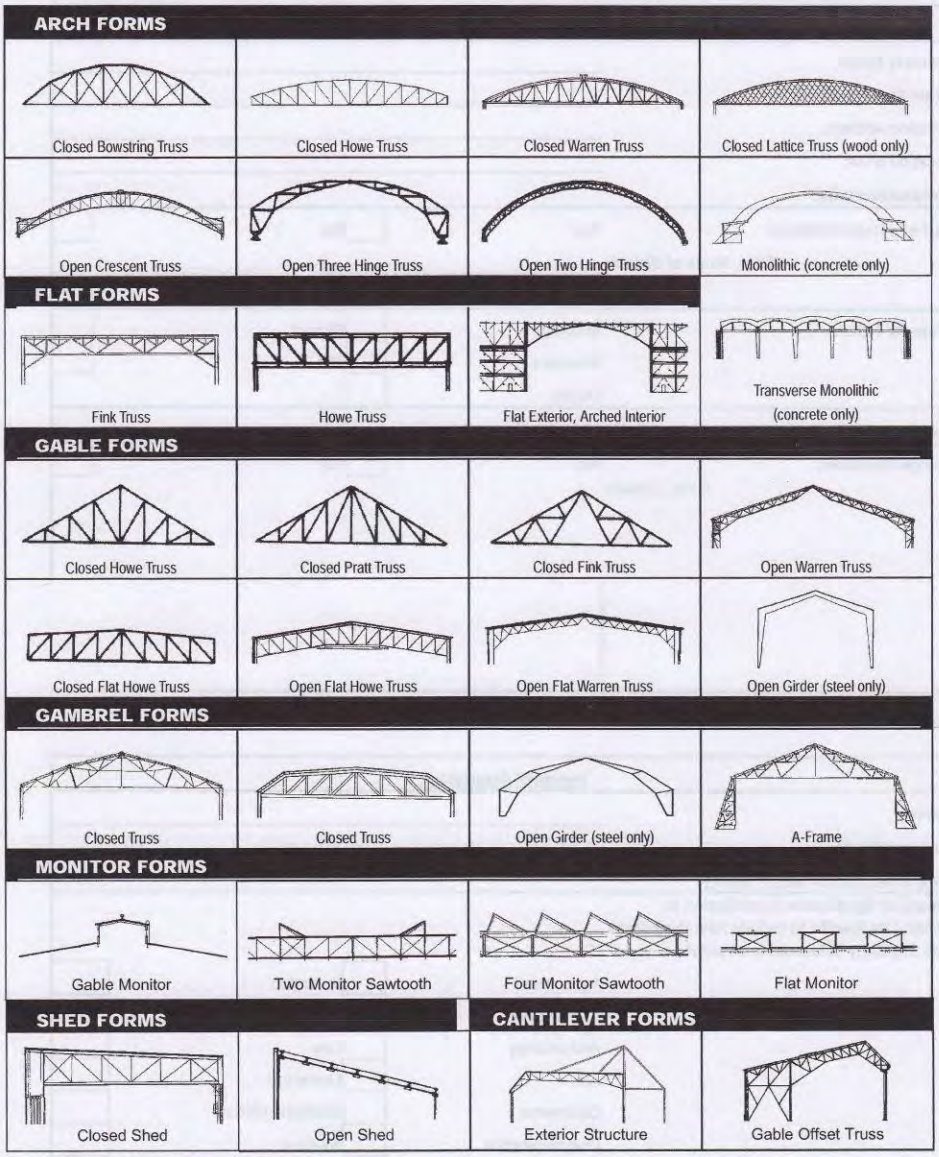


Figure 6-2. Detailed cross sections.

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APPENDIX D: REPRESENTATIONAL HANGARS

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This section contains descriptions taken directly from cultural resources inventory reports; text is not modified, only shortened. At the end of the information for each installment is the full reference from which the information was extracted.

Similar to the printout of the database, these descriptions are included here to provide additional information regarding hangars that have been evaluated for National Register eligibility. Many of these descriptions include condensed historic contexts for the hangars and the installations where they are located. This information may aid cultural resource managers in the development of historic contextual information for the hangars they are responsible for and enable them to better evaluate the hangars in comparison to others.

Air National Guard

Kulis Air National Guard Base, Alaska Air National Guard, Anchorage, Alaska

The Alaska ANG evolved from fighter to varied transport missions, often including rescue and airlift, for emergency response and relief. Operation Santa Claus (established 1957), numerous airlifts of wildlife, and rescue of scientists on Taku Glacier are but a few examples. The 144th Squadron's role provisioning remote Aircraft Control & Warning (AC&W), Distant Early Warning (DEW) Line, and other Alaska air detection and defense sites using C-47 (post-1957), C-123J aircraft (1960–1976), and other transport aircraft. These remote sites were important components of the Alaska front of the Cold War. Although the Air Force was responsible for provisioning these sites, from 1970 to 1976, the ANG's C-123J aircraft filled a needed gap in Elmendorf AFB's aircraft transport inventory. These aircraft were adapted especially for the Alaskan cold and remote sites with rugged and short runways and could land on ice and snow. These aircraft also enabled the 144th/176th recognized record of arctic rescue and airlift. The Alaska ANG (144th/176th) at Kulis ANG base was the only ANG unit nationwide with C-123J aircraft.

The 144th Squadron's role included providing unique emergency response to the Alaska International Airport (ANC) from damage from the Good Friday Earthquake on March 27, 1964, the most severe earthquake ever recorded in the western hemisphere. Pilots from the 144th quickly responded to reports of the collapse of the aircraft control tower at nearby ANC and used their ANG aircraft radios to relay reports of airport devastation. Radios in ANG aircraft also provided the airport's emergency radio communications until a temporary tower at Lake Spenard was arranged.

Building 3:

Name:	Building 3
Function:	Hangar1. Aerial, port
Date:	1955
Hangar Type:	unknown
Era:	Cold War, Vietnam
Service:	AK ANG
NRHP:	Eligible

Description: Building 3, Hangar 1 and Aerial Port, is the most historically and visually prominent building at Kulis ANGB. Its size and visual prominence establish the identity of Kulis ANGB from ANC. Building 3 faces north to the main runway of ANC and is located east of the base's main aircraft apron. Aircraft enter and leave Building 3 via its north façade through its three-story fabric aircraft doors. Signage above the entrance on the north façade announces the Alaska Air National Guard. Traces of the original aircraft ramp to the 1955 hangar, although no longer in existence, are visible in vegetative differences in the "island" between the apron and ANC runway.

Building 3 is a building complex composed of four components: the base's original hangar constructed in 1955 for fighter aircraft; the 1957 hangar for transport (airlift) aircraft; a two-story lean-to addition constructed in 1963 against the 1957 hangar; and an aerial port constructed after 1978 against the 1955 hangar. The central core of the building complex is the two hangars: the original 16,840 square foot (ft^2) hangar constructed in 1955 to the east, connected by a breezeway to the 26,950 ft^2 hangar constructed in 1957 to the west. Constructed in 1963 on the west side of the 1957 hangar is the two-story lean-to addition. To the east of the 1955 hangar is an aerial port added after 1978. Building 3 is an irregular rectangular in plan with its north façade being major aircraft entrance. The 1963 lean-to and post-1978 aerial port are appended onto the west and east sides, respectively, of the central core. The original 1955 hangar is a two-bay, single-story, poured concrete structure with steel beams and flat, membrane roof. It is 140 feet (ft) by 120 ft. Its aircraft hoists are intact. Originally it had a flat-roofed dormer from the middle of the building that has been removed. The two aircraft doors of the 1955 hangar have been converted from sliding to overhead type, although entirely within original rectangular door openings. It has fascia siding that appears to be added later, possibly during the 1970s.

The 1957 hangar is massive in proportions and towers over the tiny 1955 hangar. It is 176 ft by 157 ft in dimensions, three-and-a half stories (48 ft) in height, and is clad in galvanized metal/asbestos (gal-bestos) sheathing. It has original steel truss structural system with central high bay and intact hoist systems, membrane roof with slight gable configuration. Its door opening is modified full height and width, with two fabric folding doors that replaced its original sliding aircraft doors. These fabric aircraft doors are set into an entrance frame with fold-down steel beam. The floor track of the original sliding doors remains.

Added in 1963 west of the 1957 hangar is a two-story lean-to that extends the full depth of the 1957 hangar and is sheathed in the same gal-bestos cladding. The first floor of the lean-to that constitutes Building 3's west façade has eight windows with six- or eight-over two lights on its first floor. Upper window is fixed, and lower sash are awning-type. On second floor of lean-to are seven, horizontal metal windows, each made of six sliders. There are three pedestrian doors on west façade and a single pedestrian door with window with four-over-four lights on north façade. Constituting the east façade of Building 3 is the long and narrow post-1978 aerial port that extends beyond the depth of the 1955 hangar. The aerial port has a recent second-story, side gable addition and a parachute tower. Access/egress from the 1957 hangar is via the aircraft doors on the north façade, internally to lean-to, and via the breezeway to 1955 hangar. Utilities are contained in a small rear addition to the 1957 hangar, which is an enlargement of the original. Other modifications include replacement of 75% of the windows and aircraft doors, and utility upgrades.

Building 3 was the earliest building at Kulis ANGB, and as such was the earliest building constructed for the Alaska ANG. Building 3's two hangars constructed in 1955 and 1957 reflect the evolution of the Alaska ANG 144th /176th Squadron missions from fighter to airlift. In 1964, pilots from Kulis ANGB rescued controllers at ANC during the Good Friday Earthquake on 15 March 1964 and used ANG aircraft as temporary emergency aircraft control. From Building 3, Alaska ANG maintained its 123J Provider transport aircraft until 1976. The 123Js were well-suited for Alaska's remote terrain and arctic conditions, and the Alaska ANG was the only ANG unit nationwide to have flown it. These aircraft were used for many distinguished rescue and relief missions, including rescuing wildlife and scientists, natural disasters,

and Operation Santa Claus to remote Alaska native villages. From 1970 to 1976, the Alaska ANG flew 123Js weekly to supply the remote DEW Line stations for the Air Force's Alaska Air Command (ACC) at Elmendorf AFB, as the ANG was the only military unit in Alaska with this needed specialized aircraft. Thus, Building 3 is significant for its contribution to the establishment and evolution of the Alaska ANG, role in relief to the Good Friday Earthquake, and the Alaska front of the Cold War. It is significant at local, state, and national levels. Building 3 is eligible under NRHP evaluation criterion C as an unusual example of a building complex that is composed of two mid-1950s hangars constructed for differing aircraft and missions: fighter and transport (airlift).

Building 2:

Name:	Building 2
Function:	Helicopter Maintenance
Date:	1964
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	AK ANG
NRHP:	Not Eligible

Description: Building 2 is 200 ft by 96 ft and was constructed in 1964 as a warehouse. It was modified for helicopter maintenance purposes in 1991. It is a pre-engineered Armco S-3 building of steel frame construction with gable roof, corrugated metal sheathing, and parapet front on a concrete pad and footings. With the building's changed use for helicopter maintenance in 1991, a new gable parapet front was added to the building's west façade with sliding hangar doors. Its east façade faces Denali View Drive with two pedestrian doors flanked by a total of five double, awning-type windows. The building's south and north façades, both its long sides, have pedestrian and freight doors sheltered with canopies, and few windows: the south façade is composed of pedestrian and overhead doors beneath a canopy, a second single-leaf pedestrian door with gable canopy located about mid façade, and five sliding or double awning-type aluminum windows. The north façade consists of a simple canopy over overhead and pedestrian doors at midpoint and two double awning-type windows. Windows were replaced with aluminum in 1984. A weapons vault was added in 1987.

Building 45:

Name:	Building 45
Function:	Fuel Hangar
Date:	1980
Hangar Type:	Unknown
Era:	Cold War, Post-Vietnam
Service:	AK ANG
NRHP:	Not Eligible

Description: Building 45 was constructed in 1980 as a 17,570 ft² hangar and offices. It was the first building constructed on the south side of the apron after its extension. Large sheds have been added to the rear of the building for utilities, bringing the building's total area to 20,545 ft². Building 45 is rectangular in plan, constructed with steel frame over metal sheathing, with concrete lower walls and foundation. From the south flight line, Building 45 faces north on the apron and Anchorage International Airport with gable end roof and sliding aircraft doors with opening of top notched for aircraft tail.

Reference:

Historic Context Study and Cultural Resource Survey of Kulis Air National Guard Base, Alaska Air National Guard, National Guard Bureau, Air National Guard Readiness Center, NGH/A7CVN, and Alaska Air National Guard, Contract Number W9133n-04-D-0005, Delivery Order Number 0014, July 2007.

Fort Smith MAP, Arkansas Air National Guard, Fort Smith, Arkansas

Fort Smith Municipal Airport (MAP) dates to 1937 when 320 acres was set aside for a local airport. The first airport hanger was constructed in 1941 by WPA labor as the airport grounds were developed. Sod landing strips were provided for Fort Smith air traffic at the first official Fort Smith airport. By early 1945 crews were busy building two asphalt runways 100 ft wide and 3,500 ft long to replace the existing sod runways. Airport infrastructure was expanded in 1947, 1949 and 1950. Seven years later there were over 100 employees associated with the airport, including ANG personnel.

The Arkansas ANG began using the airport in 1953 when the 184th Tactical Reconnaissance Squadron, which became the 188th in 1957, was organized and federally recognized. The wing first used the RB-26, a twin-engine modified bomber, and then transitioned to jets, including the RF-80, RF-84F, RF-101, F-100, F-4C Phantom, F-16A Fighting Falcon, F-16C, and A-10 Thunderbolt II "Warthog."

Today Fort Smith MAP provides 110 leased acres to the Arkansas Air National Guard for the basing of the 188th Fighter Wing (FW). The mission of the 188th FW is to execute fighter missions designed to destroy enemy forces, supplies, equipment, communications systems, and installations with all types of tactical weapons. The unit currently flies the F-16 Falcon. The 188th FW occupies 3 administrative, 46 industrial, and 3 services buildings totaling approximately 332,102 ft² with 320 full-time personnel.

Building 200:

Name:	Building 200
Function:	Hangar 1. Aerial, port
Date:	1955
Hangar Type:	Type H-2--2 Story Lean-To
Era:	Cold War, Vietnam
Service:	AR ANG
NRHP:	Eligible

Description: This primary unit of this massive (60,514 ft²) rectangular plan, end-gabled, multi-story steel frame structure is shielded by a slight pitch gabled built-up roof. The taller central bays are clad in corrugated steel panels and the peripheral flat-roofed two-story dependencies or "lean-tos" are constructed of brick with metal spandrels. The principal elevation of this hangar, which opens on to the 188 FW tarmac, almost entirely consists of a series of huge track-suspended, telescoping cantilever doors that open and close to admit aircraft. It is flanked by two-story, brick dependencies with piercing patterns comprised of personnel entry doors and grouped windows that continue around to the side elevations. The side elevations are each comprised of flat roofed two-story brick units presenting eight bays defined by grouped windows separated by brick pilasters. The rear (south) elevation continues the grouped window patterns from the side elevations but also displays projecting single story brick functional bays.

Building 200 was built in 1955 at a cost of $510,120 from plans provided by Mills & Petticord Architects-Engineers of Washington, D.C., to the USAF Division – National Guard Bureau, which included "Hangar (Type H-2) 2 Story Lean-To." It was erected to service ANG aircraft, and currently serves as an aircraft maintenance hangar and training facility/indoor firing range. Most of the first floor interior was occupied by an open hangar floor/maintenance bay that opened to the cantilever doors, and maintenance shops in the lean-tos on the other three sides, while administrative offices occupied the second story of the lean-tos. It has experienced a series of exterior and interior renovations though the ensuing decades beginning in 1967, that included reconfiguration of interior partitions in the lean-tos, as well as the replacement of the façade's most distinguishing feature, the telescoping doors.

Building 203:

Name:	Building 203
Function:	Maintenance Hangar
Date:	1978
Hangar Type:	Unknown
Era:	Cold War, Post-Vietnam
Service:	AR ANG
NRHP:	Not Eligible

Description: The central unit of this 11,000 ft², rectangular plan, end-gabled, multi-story steel frame structure is shielded by a slightly pitched gabled built-up roof. The primary bays are clad in corrugated steel panels, while peripheral flat-roofed single story dependencies or "lean-tos" are constructed of concrete block and brick. The principal elevation of this hangar consists almost entirely of a single track-suspended door that opens and closes to admit aircraft; the flanking brick dependencies nearly lack fenestration, pierced only by a single louvered vent. The opposing rear elevation is a purely functional composition, with four bays comprised of a central overhead door flanked by personnel entries. The side elevations are also functional, defined by centrally positioned personnel entries flanked by windows (west) or alternating sets or paired personnel entry doors and windows (east) with piercing patterns comprised of personnel entry doors and grouped windows that continue around to the side elevations.

Building 203 was built in 1978 at a cost of $430,119 from plans for a Fuel System Maintenance Dock provided by Mott, Mobley, Richter, McGowan & Griffin Architects of Fort Smith to the ANG. It continues to serve as a maintenance hangar today. It has experienced a series of exterior and interior renovations though the decades, including alteration of the façade's most distinguishing feature, its lift door. Building 203 is a standard plan aircraft maintenance support structure.

Building 214:

Name:	**Building 214**
Function:	Aircraft Maintenance Shop
Date:	1972
Hangar Type:	Unknown
Era:	Cold War, Post-Vietnam
Service:	AR ANG
NRHP:	Not Eligible

Description: The central unit of this 12,200 ft², rectangular plan, end-gabled, multi-story steel frame structure is shielded by a slightly pitched gabled built-up roof. The primary bays are clad in corrugated steel panels. The peripheral single story dependencies or "lean-tos" comprising much of the west and east elevations are flat-roofed and constructed of brick, and shed-roofed and constructed of steel panel, respectively. The principal (south) elevation of this hangar displays explicitly functional fenestration, composed of two overhead door bays and a single personnel entry door, while the rear/north elevation is pierced by an overhead door and personnel entry door. The west brick lean-to elevation presents symmetrical fenestration composed of six steel frame window bays, while the east shed roof lean-to is purely functional, pierced by two personnel entry doors and an overhead door.

Building 214 was originally built in 1972 as a 10,000 ft² structure at a cost of $210,818 from plans for an Aircraft Engine Inspection and Repair Shop provided by Mahaffey & Associates Engineers of Fayetteville, Arkansas, to the Department of the Navy Naval Facilities Engineering Command. An office and classroom was added in 1987 at a cost of $17,149, and a second, 1,800 ft addition was constructed in 1990 at a cost of $316,419. It continues to serve as an inspection and maintenance shop today. It is a standard plan aircraft support structure that has experienced alterations to key elements.

Reference:

Cultural Resource Survey of the 188th Fighter Wing Arkansas Air National Guard, Fort Smith Regional Airport, Fort Smith, Sebastian County, Arkansas. November 2007.

Fresno Yosemite IAP, California Air National Guard, Fresno, California

Fresno Air National Guard is the home of the 144th FW and has been for over 50 years. Its mission is to provide air defense protection for California from the Mexican border to Ukiah, using F-16 Fighting Falcon jet fighters. It also supports the nation's Counter-Drug program and responds to state emergencies as requested by the governor. The 144th FW is comprised of the headquarters unit and four subordinate units: the logistics group, the operations group, the support group and the medical squadron. It originated on April 4, 1948, six months after the formation of the Air National Guard. The first aircraft were assigned in June 1948. The site of the Fresno ANG Base has been used for military aviation since World War II, when it was known as Hammer Field.

Building 100:

Name:	Building 100
Function:	Maintenance Hangar
Date:	1955
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	CA ANG
NRHP:	Not Eligible

Description: This large two-story building is constructed of cinder block and has a sheet-metal roof and fascia, large horizontal sliding doors, side-hinged doors, and multi-pane hinged and sliding windows. Although both the interior and exterior of the building has been modified, the original structure maintains its basic outline. Support offices include supply, tool rooms, mobility coordination, metal shop, welding shops, hydraulic and maintenance, and administration areas. The attached cinder block construction is standard for all buildings on the facility.

Reference:

Draft Cultural Resource Survey for the 144th Fighter Wing, *Prepared for:* California Air National Guard *Prepared by:* engineering-environmental Management, Inc., September 2005.

Savannah IAP, Georgia Air National Guard, Savannah, Georgia

The Savannah International Airport (IAP) is home to the Georgia ANG (GA ANG) 165th Airlift Wing (AW). First known as the 158th Fighter Squadron, the 165th Airlift Wing was organized at Travis Field at Savannah IAP in 1946. .Within two years the 158th was one of the first units in the ANG to receive the F-80C "Star" new jet fighters,.

In March 1949, the 158th moved to Hunter Field where it was based until 10 October 1950 when it was called to active duty during the Korean Conflict. In November 1950 they transitioned to F-84 "Thunderjets." One year later, the unit deployed to Misawa Air Base, Japan, where its mission was to provide air defense for the northern portion of Japan. While in Japan, the squadron flew regularly to Korea to provide air support to allied forces. The 158th Fighter Squadron returned from Japan in 1952 and was released from active duty. The unit returned to Travis Field with P-51 fighters and later received F-84D, F-84F, and F-86L jet aircraft.

In 1962 the unit transitioned from a fighter mission to an airlift mission The 158th Fighter Squadron became 158th Air Transport Squadron and was assigned to the 165th Air Group. On 1 October 1995, the unit received its current designation, the 165th Airlift Wing. Over the years, the GA ANG transport squadron/wing squadron has flown the C-97 "Stratocruiser," the C-124 "Globemaster," the C-130E "Hercules," and the C-13OH "Hercules."

Building 115:

Name:	Building 115
Function:	Maintenance Hangar
Date:	1950
Hangar Type:	Unknown
Era:	Cold War, Korea
Service:	GA ANG
NRHP:	Not Eligible

Description: This rectangular 21,013 ft² structure is constructed of reinforced concrete and steel framing. The structure's sidewalls are constructed of reinforced concrete and are buttressed by a system of reinforced concrete diagonal bracing. The structure's arching steel canopy is supported by a system of interior steel trusses. Building 115 represents a building type common to military installations.

Building 199:

Name:	Building 199
Function:	Maintenance Hangar
Date:	1961
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	GA ANG
NRHP:	Not Eligible

111. Building 199, Maintenance Hangar/General Purpose Aircraft Shop.

Description: This rectangular-plan concrete block and steel frame building contains 35,680 ft². The building's primary (north) façade features 10 pairs of sliding steel panel doors providing entry for aircraft. Two pedestrian entrances are located on this elevation and are comprised of single-light, hollow core metal doors. The building's east elevation features a one-story, shed roof bay which runs the building's length. A second shed roof bay, constructed of steel frame, surmounts the first floor bay and is directly tied to the building's steel clad barrel vault. Original, four-light hopper-style sash are located on the south end of the east elevation. Original sash located on the north end of this elevation have been removed and replaced by painted grouped one-over-one, double-hung sash. Building 199 represents a building type common to military installations. The building has been altered from its original date of construction.

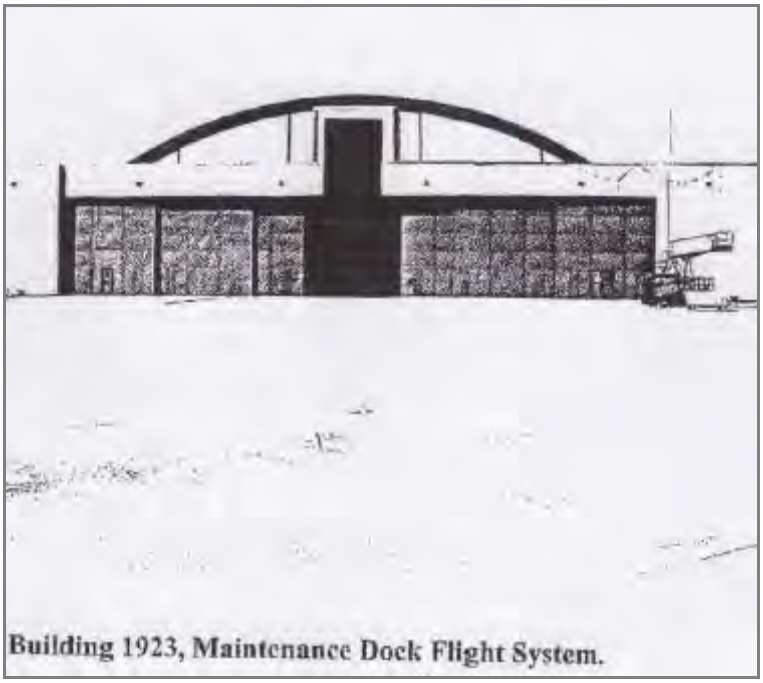
Building 1905:

Name:	Building 1905
Function:	Maintenance Hangar
Date:	1959
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	GA ANG
NRHP:	Not Eligible

Description: This one-story, rectangular-plan, gable end, steel frame structure contains 53,990 ft². The building rests on a cast concrete foundation and features reinforced, cast concrete side walls. The building's primary (west) façade contains three pairs of sliding steel doors which provides access to aircraft. Building 1905 represents a building type common to military installations.

Building 1923:

Name:	Building 1923
Function:	Maintenance Dock Flight System
Date:	1984
Hangar Type:	Unknown
Era:	Cold War, Post-Vietnam
Service:	GA ANG
NRHP:	Not Eligible



Building 1923, Maintenance Dock Flight System.

Description: This one-story, irregularly-shaped building is constructed of block sidewalls and steel framing. The building rests on a cast concrete foundation and features steel panel wall covering. The building's primary (south) façade contains three pairs of sliding steel doors and a barrel vault providing access to aircraft. Building 1923 represents a building type common to military installations.

Reference: Architectural Survey of Georgia Air National Guard Base, Savannah International Airport, Savannah, Georgia.

Sioux Gateway AP, Iowa Air National Guard, Sioux City, Iowa

The Sioux Gateway Airport (AP) traces its history to the construction of Sioux City Army Air Base, which began in March 1942, about three months after the Japanese attack on Pearl Harbor. The base was opened on July 5, 1942, and subsequently became a major training center for World War II bomber crews. After the war the base was briefly closed until it was transferred to the Iowa ANG in September 1946. Sioux City Air Base was one of the first Air Force Reserve bases established after the war, and in December 1946 the 185th Iowa Air National Guard unit was established at Sioux City. The unit is still based at the airfield.

The airfield also served as a component of the Air Force Reserves Air Defense Command until 1968 when parts of the facility were turned over to Sioux City.

Building 261:

Name:	Building 261
Function:	Hangar
Date:	1957
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	IA ANG
NRHP:	Not Eligible

Description: Building 261 is irregular in plan with four different roof heights and one and two-story interiors. The building has brick walls with vertical metal siding cladding above the brick. The exterior siding was added when the building was enlarged in 2005. The building has a one-story main block, which is the main hanger building. The main block is enclosed by two-story wings on the north, south and east sides of the building. The wings are topped by flat roofs. Fenestration mainly consists of ribbon-style awning windows on the first floor of the south wing.

The south wing of the building is accessed by several pedestrian entrances, consisting of single-leaf, metal doors on the west end and south elevation. A metal shed-roof structure supported by metal posts abuts the west end of the south wing. The north wing is pierced by ribbon-style awning windows and three single-leaf, metal pedestrian doors. Two of the doors are near the east end of the wing's north elevation and the third is in the center of the wing.

The east wing is L-shaped and contains a one-story addition on its east end. The addition is accessed on the east elevation via two overhead metal doors. Single-leaf, one-light metal pedestrian doors are to the right (north) of each overhead door. Fenestration of this wing consists of metal-framed awning windows below a fixed pane. A former doorway on the north elevation of the far northeast wing has been filled with brick topped by an awning window.

The central portion of the east wing contains a one-story, brick clad projecting bay. This central one-story area is the boiler room and is capped by a flat roof. A single-leaf, metal pedestrian door pierces the east elevation, and a former entrance or window opening to the right (north) has been filled with brick.

A T-shaped addition was constructed onto the west (front) end of the hangar in 2005 to accommodate larger aircraft, such as the KC-135. The addition contains a front-gabled roof. The main entrance into Building 261 is the tall, metal, sliding door on the west end of the west addition. Each of the six sections of the door contains a multi-pane fixed window. Similar windows pierce the north and south sides of the west addition. The west addition also is accessed through a metal, overhead door and a single-leaf, one-light metal pedestrian door on the north elevation. The addition has a high bay, central pavilion. Immediately to the north, east and south of the high bay pavilion are two-story wings.

Des Moines IAP, Iowa Air National Guard, Des Moines, Iowa

In July 1940, eight new Air Corps squadrons were authorized, including one in Iowa. On September 25, 1941, federal recognition was granted, with the primary activities for the squadron being reconnaissance, communications and armament duties. In November 1940, 17 acres of land were leased from the state. Plans for the National Guard hangar were approved on December 13, 1940. In July 1942, work on the hangar was halted because its completion was deemed not essential to the war effort. By December 1942, the WPA was being liquidated and all materials on the hangar were turned over to the city. On December 24, 1942, the unfinished building was turned over to the city. In January 1943, the Des Moines City Council voted to spend additional funds to assure a "usable unit" of the hangar, and during the same month, the Army decided to lease the hangar for storage purposes. The building was completed in late 1943.

A warehouse building was constructed in 1948, and in 1953, a vehicle maintenance shop was constructed. The U.S. House Armed Service Committee approved construction of the following new buildings in 1957: a rocket storage depot, a flight simulator building, a hazardous materials storage building and a power check pad. Additional construction was required on January 1, 1960, when the runway alert program was renewed to a 24-hour mission. New buildings included an operations and training building, a gatehouse, a new pilot housing and a number of smaller buildings, including a supply warehouse, were constructed. In addition, the main hangar was renovated with changes to the front entry and an extension of the front ramp. Construction of a weapons storage site began in 1964.

In early 1969, a runway alerts facility was completed. In May 1969, the transition from F-89s to F-84Fs required the construction of new fuel handling facilities. Other improvements made in the late 1960s included a taxiway and apron for the new alert facility, a new security building and a new storage shed.

A new aircraft engine shop was completed in 1974. An installation engineering shop building was constructed in 1977, as well as a flight communication building, a test cell and propulsion storage building and an addition to the flight simulator. Additions to the avionics and motor vehicle shop began in 1982, and a new multi-purpose operations/maintenance facility was constructed. In 1988, a new avionics shop was built and Building 440, a private industrial building, was acquired and converted into a vehicle maintenance shop.

Building 100:

Name:	Building 100
Function:	Hangar
Date:	1941
Hangar Type:	Unknown
Era:	WWII
Service:	IA ANG
NRHP:	Eligible

Description: Building 100 is a three-story, rectangular, reinforced concrete hangar-administrative structure in the Art Deco style, at the north end of the Des Moines Municipal Airport. It measures 415 ft 4 inches wide by 237 ft deep by 37 ft high and contains a total of 77,802 ft² of space. It has a flat-low gable membrane roof. The building is rectangular in plan and is comprised of two, three-story aircraft hangars that flank a central administrative block. On the north side is a smaller administrative wing. The building is built of six independent buildings units that about each other. The building's south elevation provides airfield access with apron and ramp and airfield beyond. The building's principal pedestrian and administrative entrance is on its north elevation.

The building's north façade appears as a single story, long and low in massing. It is the top floor of the building. The monumentality of the north façade is established by a strong visual axis of the "grand boulevard" from the front entrance north to McKinley Avenue. The boulevard is comprised of a central, grassy island and pair of drives. Originally, it terminated at the base's main entrance (gatehouse) on McKinley Avenue, but the main entrance has since been moved westward with the enlargement of the

base. The area north of the building is marked by paved parking and a security setback established by a line of visually intrusive and unattractive rectangular barriers.

The main pedestrian entry into Building 100 is through a distinctive Art Deco-style central entrance on the north façade of the north administrative wing. An unattractive airlock, added sometime between 1987 and 1998, fronts the building's main entrance and detracts from its Art Deco design. The three-story, north administrative wing measures 264 ft by 28 ft 4 inches. Its upper two stories are devoted to administrative functions, and its bottom floor houses mechanical systems and storage. The main entrance leads to the building's central lobby and to corridors that extend the length of the wing to interior administrative spaces. The most notable feature of the lobby is its original Art Deco-style terrazzo tile floor with airplane and propeller design. Stairs on either side of the lobby lead down to the lower levels of the wing. At the back of the lobby are an open doorway and steps down to the second floor of the central administrative wing with offices and officers club. This access was added prior to 1987. The lobby and interior offices have been remodeled with new partitions and finishes.

The two aircraft work areas are key elements of the building both functionally and architecturally. Each hangar space is 37 ft in height with clear spans of 140 ft supported by 4 massive hollow concrete bents below hollow box roof girders. Bent legs are 7 ft at base and 7 ft 4 inches thick at corners with 10-inch-thick walls and web. The box girders enable a nearly flat and shallow roof, an almost horizontal soffit at the main hangar door, and wide spacing between supporting frames. The hangars have sliding, motorized pocket hangar doors with bands of windows installed new in 2005. Natural light to each hangar work area is provided by four ridge-type skylights, the bands of windows in the hangar doors, and four windows opening to the outside on the north façade. On the east and west sides of the building are wings for shops and vehicular garages. Each wing is of seven bays with interior and exterior access. Vehicular and pedestrian doors have been in-filled with doors and combination windows, some glass block.

Between the two hangars is a two-story central administrative wing with an internal corridor that accesses the airfield and hangar spaces at its north end. The south façade of Building 100 is notable for its two-story, bow-type window of the central wing. The bay window overlooks the apron and airfield. Offices and shops are arranged along the central corridor on the lower level. On the second floor is the officers club with a stage and the bow window that overlooks the airfield.

Reference: Final Report Cultural Landscape Evaluation, Des Moines Air National Guard Base, Des Moines, Iowa, Prepared For: Air National Guard, Andrews AFB, Maryland. January 2004.

Hulman Field, Indiana Air National Guard, Terre Haute, Indiana

Hulman Field was established by the City of Terre Haute in1943. The airport was constructed with the assistance of federal funding and was dedicated on October 3, 1944. The facility consisted of three runways, taxiways, apron area, and a terminal building. In 1953, a new terminal building and control tower was completed and the apron area expanded.

The airport became the base for the 181st Fighter Wing in 1954. The 181st fighter mission continued until 2007 when the Wing fighters flew their last training mission out of Hulman Field International Airport. On May 3, 2008, the 181st Fighter Wing was re-designated as the 181st Intelligence Wing. New missions included a Distributive Ground Station (DGS) and an Air Support Operations Squadron (ASOS). The Wing continues to operate on 89,188 acres of leased land at the Terre Haute International Airport-Hulman Field. The Wing occupies 4 administrative, 23 industrial, and 4 services buildings totaling approximately 323,335 ft² with 275 full-time personnel.

Building 25:

Name:	Building 25
Function:	Jet Engine Maintenance Shop
Date:	1966
Hangar Type:	unknown
Era:	Cold War, Vietnam
Service:	IN ANG
NRHP:	Not Eligible

Description: Building 25 is a Jet Engine Maintenance Shop located at the southeast area of the IN ANG installation at Hulman Field. The building appears to be a standardized design for an ADC fighter jet maintenance dock. The building is steel-frame, clad in corrugated metal walls and metal trim, and is set on a concrete slab foundation. The roof is a broad, saddle-back, gable-front roof that is covered with elastometric rubber roll.

The south, principal, façade is fronted by a large sliding door that telescopes into door pockets at the sides. The side pockets protrude from the gabled slope of the roof behind the door frame. There are two personnel doors and one vehicular door incorporated into the telescoping doors and these are accessible when the doors are closed. The east side of the south façade comprises the side shop, and is pierced by a personnel door. The west side's shop has a personnel door and an adjacent small sliding window.

The west façade has three window bays consisting of sliding windows. The original window at the south end of the façade has been removed and replaced with a smaller, typical sliding window, and the remainder of the original window bay has been filled in with corrugated metal to match the siding. The east façade is windowless and is solid corrugated metal.

The north, rear, façade has three, one-story projecting wings, two of which were later additions. A mechanical room extends from the northwest corner of the building northward, and is original to the building. Its materials and its sloping shed roof are a continuation of the main building's roof and façade. The center of the north façade has a ca. 1991 addition that accommodates two vehicular bays with overhead doors and has a flat roof. This addition houses an engine storage area and a computer room. In between this center addition and the northeast wing is a ca. 1991 storage area that has an overhead door and a flat roof. All three wings at the north façade are clad in metal siding. The east end of the north façade, east of the wings, is solid corrugated metal siding with one personnel door. Building 25's interior comprises a large, open hangar at its center. At the west, north, and east sides of the interior are one-story shops, classrooms, and technical facilities that open directly onto the hangar space. A tool storage area that is enclosed by a security cage is located within the east side of the hangar space.

Building 25 was constructed at IN ANG, Hulman Field, in 1966 for the 181 TFG as a Jet Engine Maintenance Shop, which continues to be the building's function. Between 1962 and 1972, the 181 TFG operated under the ANG's ADC alert mission flying F-84, T-33, and C-47 aircraft. Building 25 provided the maintenance facilities for this mission. Drawings for the building originated from the USACE as the U.S. Air Force's standardized plan for an ADC maintenance dock for fighter jets (181 FW 2007). There was an addition to the building in ca. 1991 for a new engine storage area and a computer room at the rear of the building.

Building 26:

Name:	Building 26
Function:	Hangar
Date:	1966
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	IN ANG
NRHP:	Not Eligible

Description: Building 26 is a Weapon and Release System Shop, located at the southeast area of the IN ANG installation at Hulman Field. The building was originally an aircraft shelter identical to Buildings 27, 28, and 29 to the south. Around 1980, Building 26 received additions to its north end to convert the building into a Weapon and Release System Shop. The building is a rigid, steel-framed building with a gable-front roof and metal siding throughout. The north addition rises to approximately half the height of the shelter, is metal-framed with concrete-block walls, and has a low-pitched shed roof. The west, principal, façade consists of the original, gable-front aircraft shelter. The façade is mostly comprised of a large bay with telescoping doors to accommodate aircraft. The north end of the west façade consists of the ca. 1980 addition, which is pierced by a vehicular bay with an overhead door and a personnel door. The north, ca. 1980 addition runs the length of the building. The east, rear, façade is nearly identical to the west façade, with the exception of the north addition, which has a personnel door and an adjacent window

bay with a sliding window. The south façade comprises the tall, original 1966 hangar façade, and is windowless.

Building 26 was constructed at IN ANG, Hulman Field, in 1966 for the 181 TFG as an aircraft shelter. During that time, the 181 TFG operated under the ANG's ADC alert mission and flew F-84, T-33, and C-47 aircraft. The north additions in ca. 1980 added a weapons and release systems shop to the building and the building has served this function since then. Drawings for the original building came from the Butler Manufacturing Company, a company that produced numerous pre-manufactured buildings for the USACE in the 1950s and 1960s (181 FW 2007).

Building 27, 28, 29:

Name:	Building 27, 28, 29
Function:	Hangar
Date:	1966
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	IN ANG
NRHP:	Not Eligible

Description: Buildings 27, 28, and 29 are identical aircraft shelters that are located at the southeast area of the IN ANG installation. The buildings are positioned in a row running north-south, all facing west toward the installation's ramp and taxiway. The buildings are constructed of rigid steel framing with gable-front roofs that are covered in corrugated metal. The buildings are clad in metal siding throughout. Each building is connected to one another at the sides by pipes for steam heating (added in 1976), which are positioned about two-thirds of the height of side façades at the center (181 FW 2007). The west, principal, façade of each building is comprised of a large bay with telescoping doors to accommodate aircraft. The telescoping doors have a personnel door incorporated into them. The north and south side façades are solid, metal siding throughout. The east, rear, façades are identical to the west façades, and are comprised of a large aircraft door with an incorporated personnel door.

The aircraft shelters of Buildings 27, 28, and 29 were added to the Indiana ANG, Hulman Field, in 1966 for the 181 TFG's ADC alert mission that ran between 1962 and 1972. Drawings for the buildings came from the Butler Manufacturing Company, a company that produced numerous pre-manufactured buildings for the USACE in the 1950s and 1960s (181 FW 2007).

Reference: *Final* Cultural Resources Survey and Evaluation: 181st Fighter Wing, Terre Haute International Airport Indiana Air National Guard, *Vigo County, Indiana.* Indiana Air National Guard And Air National Guard Readiness Center, National Guard Bureau Contract No. W9133L-05-D-0009 ANG Project No.: ANGBR0653328 Delivery Order No.: 0013 August 2008.

Fort Wayne, Indiana Air National Guard, Fort Wayne, Indiana

Fort Wayne International Airport was originally named "Baer Field" as a World War II military base. The total cost of the airport in 1941 was $10 million. During World War II more than 100,000 military personnel served at the airport. The military base was made up of more than 100 buildings.

Following the war, the federal government sold the airport to the city of Fort Wayne for one dollar. Many buildings were torn down to allow for parking lot expansion. The city renamed the airport "Fort Wayne Municipal Airport" in 1946. In 1991 the Airport Authority changed the name again to Fort Wayne International Airport.

The 122nd Fighter Wing is based at Fort Wayne International Airport. The Wing traces its heritage to the 358th Fighter Group that was activated in January 1943 at Richmond Army Air Base, Virginia. The 358th flew P-47D "Thunderbolts" during World War II. Missions included interdiction and bomber escort from England. They also provided ground support. In May 1946, the group was designated as the 122nd Fighter Group (later to become Fighter Wing) and assigned to the Indiana ANG. Currently, the Wing occupies 166 acres of leased land on the Fort Wayne International Airport.

Building 734:

Name:	Building 734
Function:	Hangar
Date:	1953
Hangar Type:	Hangar, Two-story Lean-to
Era:	Cold War, Korea
Service:	IN ANG
NRHP:	Not Eligible

Description: The building consists of the hangar and two-story lean-tos for shops and offices that flank it on the north, east, and west sides. Building 734 is next to the aircraft parking apron, which is to the west, but the hangar faces south. The building has a composite structure, with the steel-frame hangar and concrete block masonry walls supporting the two-story lean-tos. The foundation is concrete. The hangar is encompassed by a round arched roof clad in a rubber membrane, which was installed ca. 1990. Arched steel trusses support the hangar roof. The lean-tos have flat, built-up roofs on a metal deck. Running bond brick veneer sheaths the exterior walls of the lean-tos and the faces of the arch on the north and south sides are clad in ribbed steel panels. The lean-tos have copper gutters and downspouts.

The south façade features the hangar entrance. The hangar doors consist of three custom-fabricated vertical rise fabric doors. These doors were installed in 2005. On both sides of the hangar doors are sidelights. The original hangar doors consisted of 10 sliding doors on tracks. Door pockets are on either side of the hangar opening. Fenestration on the west lean-to primarily consists of aluminum horizontal sliding windows with a panel above. A couple of windows are vinyl sash and a band of aluminum sash

fixed units with mirrored windows wraps the second story of the southwest corner. A couple of windows have been removed from the west lean-to and filled in with brick. A one-story lean-to addition at the southwest corner of the hangar has small vinyl horizontal sliding windows. This addition was built in the early to mid-1980s. The fenestration on the east lean-to consists of vinyl horizontal sliding windows with two transoms. The east side of the north lean-to has this type of windows, while the west side of the lean-to has the same type of aluminum windows found on the west lean-to. The original steel-sash clerestory windows are extant on the north elevation of the hangar.

The boiler room and associated chimney are on the north side of the building. The chimney is brick and has a square, telescoping shape. The original boilers have been replaced. What was originally the parachute tower (now used for a different purpose) is in the rear lean-to and projects one story above the lean-to, terminating just below the clerestory hangar windows. Three lean-tos have been added to the north elevation. Two of them were appended in the mid-1970s and the third one in the mid-1980s. They have concrete block walls with brick veneers and are pierced by overhead doors, personnel doors, and/or metal louvers. Another lean-to addition, this one for a fire protection room, was appended near the north end of the east elevation in the late 1980s.

The interior of the hangar features the arched steel trusses of the hangar roof. The trusses spring from the top of the first story of the side lean-tos. The concrete block walls of the lean-tos are exposed to the hangar interior and are pierced by a series of double steel doors on the first story and the original nine-light, steel-sash pivot windows on the second story. The hangar bay, which is 151 ft wide, has a painted concrete floor. Besides the multiple lean-to additions mentioned above, a number of other renovations, alterations, and repairs to the hangar have been completed over the course of its history. The roof was repaired in 1978, and then again in 1990, when the current rubber membrane was installed. In 1976, the original steel-sash windows on the two-story lean-tos were replaced with Litex-brand aluminum windows. Interior partitions in the two-story lean-tos were demolished and rebuilt in new locations to reconfigure office and shop spaces. A major renovation project involving interior and exterior modifications to the building was undertaken in 2005 and 2006.

The project involved removing the existing hangar doors and installing the current fabric ones, reconfiguring the interior partitions in the north and east lean-tos, enlarging the one-story lean-to addition at the northeast corner, removing multiple window and door openings on the north, west, and east elevations, and removing all doors and windows on the east elevation and replacing the former with new hollow metal doors and the latter with new horizontal sliding windows with transoms. Building 734 is in good condition. Currently, there are no plans to renovate or demolish this building; however, with the on-going conversion of the 122 FW to A-10 Warthogs, the Indiana ANG may demolish this hangar and replace it with a new hangar, facing the flight line, to match the space and facility requirements of the new air frame.

Building 734 represents a standardized plan for hangars. Mills and Petticord Architects and Engineers of Washington, D.C., designed “Hangar, Two-story Lean-to” under the direction of the Office of the Chief of Engineers, U.S. Army. The Chief of the National Guard Bureau approved the design in December 1948. As is typical for ANG installations across the U.S., a local architecture firm would slightly modify Mills and Petticord designs to suit the needs of a particular installation. No as-built drawings for Building 734 were on file at the 122 FW Civil Engineering office, so it is not known what architectural and engineering firm executed the final design of this hangar. Construction of Building 734 was completed in 1953. Maintenance hangars for ADC squadrons in the 1950s are characterized by steel-frame construction of the hangar; a center opening with sliding or recessing pocket doors; an interior truss system to support the roof; and attached side and rear shops. A moderately-pitched gable roof was the most common roof form, but arched-roof hangars were also constructed beginning in the late 1940s.

Reference:

Cultural Resources Survey and Evaluation: 122nd Fighter Wing, Fort Wayne, Allen County, Indiana, Indiana Air National Guard. *Final Report Architectural Survey* Volume III. *Prepared for:* Indiana National Guard National Guard Bureau Air National Guard Readiness Center NGB/A7AN Contract No.: W9133L-05-D-0009 Delivery Order No. 0043 ANG Project No.: ANG0853330 December 2009.

Barnes Field, Massachusetts Air National Guard, Westfield, Massachusetts

The area surrounding Barnes Field has been used by Massachusetts as a military training area since 1905. In the summer of 1917, the area was used as a World War I Troop Staging Area for various Massachusetts, Vermont, and Maine Militia Units mobilized.

In 1923, local citizens established Westfield Aviation Field on a 27-acre site. The airfield expanded in 1927 and 1936. During World War II, Barnes Field was used for training. The Air National Guard established a presence at Barnes Airport in October of 1946with the 104th Fighter Squadron. The 104th, which is still based at Barnes Field, has flown the P-47 "Thunderbolt," the P-51 "Mustang," the F-94 "Starfire," the F-86 "Sabre," the F-84 "Thunderstreak," the F-100D "Super Sabre," the A-10A "Thunderbolt II," and the F-15 "Eagle."

Building 15:

Name:	Building 15
Function:	Hangar
Date:	1961
Hangar Type:	Hangar-Reserve Training-Type B
Era:	Cold War, Vietnam
Service:	MA ANG
NRHP:	Not Eligible

Description: This is a large (37,639 ft²) rectangular plan, end-gabled, multi-story steel frame structure that is shielded by a low pitch gabled built-up roof. The taller central bays of the principal and rear elevations are sheathed almost entirely in corrugated steel panels, while the side elevations, including the peripheral single story, flat-roofed dependencies or "lean-tos," are constructed of brick. The principal and rear elevations of this hangar are identical and consist almost entirely of a series of huge track-suspended, sliding telescoping cantilever doors that are pierced by pilot doors. When open to admit aircraft the doors are contained in corner door pockets. Plans reveal that these doors originally contained voids covered with "corrugated tinted plastic" to admit light. The principal elevation's single story brick lean-to bays peripheral to the hangar door pockets are pierced by banks of louvered windows. The side elevations are also mirror images of one another, with fenestration composed of banks of steel louver windows and functionally positioned pedestrian entry doors. Approximately 25,000 ft² of the interior is devoted to hangar floor space.

The hangar was built at a cost of $1,091,736 in 1961 from standard plans (Drawing series 39-01-01, and was originally designed by Stroebel & Salzman Engineers of New York for the Army Office of Chief of Engineers) for "Aircraft Maintenance Hangar-Reserve Training-Type B" as modified for Westfield-Barnes Airport by Brask Engineering Company of Boston for the New England District USACE. Building 15 has experienced a series of renovations through the decades, including upgrading of interior spaces and exterior alterations that included the façade's most distinguishing feature, the telescoping doors, completed in 1979 during a Hangar Alteration-Energy Conservation project, as well as other elements such as the original steel windows. In 1992 the lean-tos were renovated through plans provided by Alonzo B. Reed, Inc., of Boston, to house administration staff. Building 15 was constructed to service and maintain ANG aircraft and never served in an alert capacity. Continuing to serve in an operational support role as a maintenance hangar, general purpose aircraft shop, and in weapons and release systems maintenance, Building 15 is a standard plan, functional structure that has experienced alterations to key elements.

Building 27:

Name:	Building 27
Function:	Fuel System Maintenance Dock Corrosion Control Facility
Date:	1983
Hangar Type:	Fuel System Maintenance Dock Corrosion Control Facility
Era:	Cold War, Post-Vietnam
Service:	MA ANG
NRHP:	Not Eligible

Description: This 92 ft by 120 ft, rectangular plan, end-gabled, multi-story steel frame structure rests on a concrete foundation and is shielded by a slight-pitch gabled built-up roof. The principal and rear elevations are sheathed almost entirely in insulated steel panels, while the peripheral single story dependencies or "lean-tos" are constructed of brick. The principal elevation of this hangar consists almost entirely of a series of large sliding telescoping cantilever doors, pierced by two pilot doors that are contained in corner door pockets when opened. The flanking brick bays are concealed almost entirely behind the door pockets. The side elevations consist of three functionally defined bays in the brick single story lean-tos represented by an overhead door and two single steel personnel access doors, surmounted by vent hoods in the hangar bays above. The rear elevation is also functional, comprised of a large overhead door and pedestrian access doors.

Building 27 is an 11,111 ft² structure built at a cost of $747,017 in 1983 from standard plans for a "Fuel System Maintenance Dock Corrosion Control Facility," provided by Caolo & Bieniek Associates, Inc., of West Springfield, Massachusetts. It continues to serve in this role today, augmented by an adjacent Corrosion Control Facility. It has experienced a series of renovations, the most significant of which occurred in 1995 when approximately 2,000 ft² of the interior of the original building was altered and upgraded and a 9,200 ft² Aircraft Erosion Control Hangar was constructed and joined to it (renovations and new building designed by Alderman & MacNeish, Inc., of West Springfield, Massachusetts).

Reference:

104th Fighter Wing, Massachusetts Air National Guard, Cultural Resource Survey 5-11 Final - August 2007.

Martin State Airport, Maryland Air National Guard, Middle River, Maryland

Martin State Airport was established as an aircraft manufacturing site east of Baltimore in 1929. The Maryland ANG began using the airfield in 1960. A large portion of the airport was sold to the state of Maryland in 1975.

Today, Martin State Airport hosts the 175th Wing of the Maryland ANG. The Wing was organized in 1962 as the 175th Fighter Group. From 1962 until 1996, the 175th and it 135th Airlift Group comprised the Maryland ANG groups. In 1996, the 175th was reorganized as a composite wing and 135th was inactivated, with its flying squadron reassigned to the new 175th Wing. At that time, support units previously assigned to the 135th were inactivated and their personnel transferred to equivalent units within the 175th. Subsequently, the 135th Airlift Group was reactivated and assigned to the 175th Wing as a subordinate group, with separate operations and maintenance units.

Building 1070:

Name:	Building 1070
Function:	Maintenance Hangar
Date:	1958
Hangar Type:	unknown
Era:	Cold War, Vietnam
Service:	MD ANG
NRHP:	Not Eligible

Description: The rectangular building is oriented to the south and terminates in a metal-covered gable roof. The center section of the building contains the open maintenance bay. A pair of four-leaf bypassing doors clad in insulated-metal panels opens the southern wall of the hangar. Translucent fiberglass panels in the doors provide natural light to the hanger interior. The doors nest in insulated-metal panel door pockets when open. Two-story, shed-roof office/shop sections are located on the north, west, and east sides of the hangar. The office/shop sections are constructed with brick sections at each corner, brick detailing below the first floor sills, and ribbons of fixed-sash and interior-opening awning-sash windows on both the first and second levels. The windows are composed of anodized frames with tinted glass. Insulated-metal panels trim the walls above the second-story windows and between the windows of the first and second floors. The formal entranced to the hangar is at the northwest corner and features a recessed entry with an angled wall and full-light, single-leaf door. Numerous overhead and pedestrian doors open the first floor of the office/shop sections. The roof structure of the hangar bay is composed of closed, Howe trusses. The structural elements of the trusses are fastened with rivets through steel gussets.

The hangar underwent extensive renovation in the late 1980s. The office/shop sections were completely renovated, and windows in the north, east, and west walls of the hangar bay were removed. Demolition plans show the original appearance of the building with bands of multi-light, metal-frame, awning windows; lack of brick detailing; windows overlooking the apron and runway; formal entrance centered on the north elevation, and bands of windows in the hangar walls and doors. The insulated-metal panel and tinted glass walls were installed during this renovation. Interior changes included the elimination of an open mezzanine level and the construction of additional office and shop spaces in the area.

Reference:

Phase I Cultural Resources Investigations at the Maryland Air National Guard Facility at Martin State Airport, Baltimore County, Maryland. May 2007.

Duluth Air Base, Minnesota Air National Guard, Duluth, Minnesota

The primary mission of the units stationed at Duluth Air Base, established during the Korean War, was air defense. Beginning in 1951, the USAF constructed facilities near the Johnson Airport in Duluth including hangars, a motor service building, a crash and rescue station, a heating plant, a post exchange, ammunition storage buildings, and other facilities. The base expanded in 1957 due to an expanded defense mission, radars were installed, and the base became a part of NORAD housing both U.S. and Canadian troops. The air defense mission was reassigned from Duluth in 1981, which led to the closure of the facility.

Building 500:

Name:	Building 500
Function:	Alert Hangar (First Generation)
Date:	1952
Hangar Type:	unknown
Era:	Cold War, Korea
Service:	MN ANG
NRHP:	Eligible

Description: Building 500 is a first generation alert hangar of the type designed by Strobel & Salzman for the USAF. The hangar has the setting of a fighter interceptor alert landscape, with an adjacent triangular concrete alert apron, short taxiway angled 45 degrees, and position near one end of the main runway. The hangar has the standard form of a four-pocket air defense alert hangar, a steel-frame bolted to a reinforced concrete pad, corrugated metal sheathing, front and rear doors for each aircraft pocket, and flat roof. The central portion of the building is a two-story alert crew quarters. The hangar has corrugated siding, painted nearly white, on the end walls and upper walls (parapet) above the hangar doors. Letters spelling "Minnesota Air National Guard" have been applied to the south parapet. The doors of the hangar have been replaced recently with units of heavy vinyl that are drawn upward similar to a Roman shade. Unpainted corrugated metal forms the walls between the aircraft pockets. Steel trusses are visible below the corrugated metal roof decking. The metal rails on which overhead doors were supported remain in place near the roof and modern heating and lighting fixtures also hang near it. Sets of alert lights, double sets of red, yellow, and green bulbs and a claxon remain in place near the runway side of the hangar doors.

The exterior walls of the alert crew quarters, including the projecting flight line command booth facing south and the runway, have been sheathed with corrugated metal, eliminating the windows in this area. A small room-sized extension projects from the north side of the crew quarters area. The alert crew quarters portion of the hangar includes a day room and kitchen on the south side of the building and a boiler room on the north side. A long, narrow hallway extends along the boiler room and provides passage through the area. Two sets of stairs give access to the upper level that contains a lounge adjacent to the flight line command booth, two bedrooms, an office, and a bathroom. This area appears to retain many original materials and finishes, except for the window sash that has been removed and replacement tiles floor in the kitchen. Building 500 is eligible for listing on the NRHP because it is representative of the Cold War alert mission. The hangar retains integrity in structure and location.

Building 497, 498, 499:

Name:	Buildings 497, 498, 499
Function:	Ready Aircraft Shelters
Date:	1956
Hangar Type:	unknown
Era:	Cold War, Vietnam
Service:	MN ANG
NRHP:	Not Eligible

Description: These steel-framed buildings with enclosed ribbed sheet steel are identical. They have gable roofs, pull-through aircraft pocket doors of heavy vinyl that draw up as Roman shades in the end walls. The rigid steel frame that supports the walls and roofs are exposed on the interior. They stand on concrete floors and are extensions of the apron. Man doors are in the side walls. They are prefabricated, standard modular Butler Manufacturing buildings.

Building 103:

Name:	Building 103
Function:	Maintenance Hangar
Date:	1954
Hangar Type:	unknown
Era:	Cold War, Vietnam
Service:	MN ANG
NRHP:	Not Eligible

Description: This hangar is an example of the standard design for a maintenance hangar provided by Strobel & Salzman to the USAF and was built in 1954. The building consists of a hangar space surrounded on three sides by slops. The walls of the shops consist of a waist-high portion of concrete block; the upper walls are clad with sheet metal. Openings into the shops are filled with solid and glazed metal doors; a vehicular-sized door is located in the east wall. Windows have industrial steel sash. The hangar portion of the building is enclosed with sheet metal. Windows have industrial steel sash. The aircraft door has recessing sliding doors with a row of translucent fiberglass panels at their upper edge. The doors are set below a tail-notch opening. The cantilevered truss work and steel columns at the perimeter of the building are exposed on the interior. The main gabled roof and the pitched roofs of the shop extensions are clad with sheet metal. The building appears to have had few alterations.

Reference:

Cultural Resources Survey of the 148th Fighter Wing, Minnesota Air National Guard, Duluth International Airport, Duluth, St. Louis, County, Minnesota Air National Guard Readiness Center, Andrews Air Force Base. Maryland Project No. ANG 0553334. May 2007.

Lambert Field, Missouri Air National Guard, St. Louis, Missouri

Major Albert Lambert, and the Robertson brothers, began investing in the expansion and improvement of airfields in 1907. With the Missouri Aviation Corporation, they leased 160-acre hayfield near Anglum, Missouri in 1920. Major Lambert paid for improvements by having the airfield cleared and graded for take-offs and landings. On October 4, 1923, the field was named Lambert Field. Major Lambert made multiple purchases of land to increase the airfield's capacity. Lambert Field was eventually sold to the City of St. Louis, and in 1930, it became known as the Lambert-St. Louis Municipal Airport. It was located on a total of 546 acres and had six runaways and numerous hangars. Along with commercial airlines, flying clubs, the Navy and the National Guard maintained a presence at the airfield.

In 1932, the citizens of St. Louis approved a $2 million bond for upgrades and construction of an airport terminal. Between 1941 and 1945, $3 million was spent on expansion and improvements and by1945, the airport was expanded to include 1,060 acres, 4 runways, 11 hangars and an administration building. By 1956, a new unique terminal was completed, along with a field lighting system and Lambert Field was expanded by 1,282 acres in order to build large concrete runways and a paved passenger parking lot.

Prior to the ANG at Lambert Field, the Navy built and occupied the facilities there, having been officially recognized as a Naval Reserve Aviation Base in 1930. A hangar was built on the northwest corner of the airport that was the home of the Navy until 1942. On both sides of the hangar were shops or offices. At the front end of the hangar was a sick bay on one side and a photo lab and officer's wardroom on the other. Eight other outlying fields were created to accommodate the heavy training schedule.

Construction was started in 1941 on the southwest corner of the airport for NAS that included a hangar, an overhaul and repair shop, the supply building, a steam plant, barracks, a public works building and garage, an underground refueling system, and a sewage treatment plant. Attached to the east side of the hangar was a U-shaped wing that held all of the administrative offices. Additional construction included a large steam plant and 12 two-story barracks, a bachelor officer's quarters, recreation hall, gymnasium, mess hall, swimming pool, sick bay, training building and many smaller buildings. The Navy moved to its new accommodations in 1942. On September 13, 1957, the Navy Department announced that the NAS in St. Louis would close on February 1, 1958.

In 1927, a bond measure passed to raise funds for construction of a new ANG hangar for the 131st FW squadron. The hangar was completed in 1931, and the squadron moved to its new location, which was in the southwest corner of Lambert Field. At the end of World War II, the squadron was demobilized, but was eventually granted federal recognition as a unit in September, 1946. In 1947, the unit became part of the new USAF, and by 1949, it had grown much larger, which led the ANG to lease an additional 40 acres in the northeast corner of Lambert Field. A new hangar was built on this portion of land, while the old hangar was reverted to city use.

During the 1970s, many new ANG facilities were built to handle jet aircraft. Avionics, jet fuel and support buildings were built to meet new technological requirements. During the 1980s, new support facilities were added.

Sixteen buildings and the tunnel at Lambert Field are historic, with all but one of them being of the World War II era.

Building 1:

Name:	Building 001
Function:	Hangar
Date:	1942
Hangar Type:	Unknown
Era:	WWII
Service:	MO ANG
NRHP:	Unknown

Description: This building was constructed for the NAS as a hangar and administration building, and it continues to be used as a hangar by the ANG. It was built in 1942, and covers 87, 391 ft². This World War II vernacular style building rests on a concrete slab foundation. The exterior is clad with brick, steel, and brown corrugated metal. The front façade has large hangar doors. The words "Missouri Air National Guard" are written above the north-facing hangar doors. Windows on the west side extend for the length of the hangar in two rows, one above the other. There are six panels of windows on each of the six northern bay doors. The panels are arranged two wide and three high. Each panel has a set of six lights, also arranged two wide and six high. A control tower was added in 1988 on the northeast side of the hangar.

A series of additions and renovations took place between 1944 and 1997. The earliest additions were the administration wings in 1944. Two wings extend eastward from the north and south end of the hangar, forming a "U" shape. The floor was replaced in 1981, an electrical upgrade took place in 1983, and the patrol-control room and bathrooms were upgraded in 1985. A new roof was installed in 1987. The interior was remodeled to include a weight room, doors and windows were replaced, and the ventilation system and ductwork was upgraded in 1990. A drop ceiling and fluorescent lights as well as offices were added in 1997.

Building 104:

Name:	Building 104
Function:	Aircraft Shop
Date:	1983
Hangar Type:	unknown
Era:	Cold War, Post-Vietnam
Service:	MO ANG
NRHP:	Unknown

Description: This building was constructed in 1983 and covers 216 ft². It was built as an addition to Building 001. It is on the north half of the installation in the north-central section. A square concrete building, it has a flat roof and is situated on a concrete slab foundation.

Building 2:

Name:	Building 002
Function:	Hangar 2/Engine Shop
Date:	1941
Hangar Type:	Unknown
Era:	WWII
Service:	MO ANG
NRHP:	Unknown

Description: Building 2, aka Hangar 2, is the Engine Shop. The NAS originally used it as the assembly and repair hangar. It was built in 1941 and covers 22,470 ft². This World War II vernacular style building rests on a concrete slab foundation. Both the hangar and the attached buildings have flat roofs. In 1984, the original hangar doors and most of the exterior walls were replaced. It was remodeled in 1989 and wall sections, doors, and windows were removed. Five window panels extend across the top with the southern-most windows converted for ventilation. The panels not converted for ventilation consist of smaller sets of lights, two wide and five high. The second floor contains office space and restrooms. One large bay door faces north. The building attached to the hangar contains office space, machine and repair shops, and storage to support jet maintenance. The building is clad with brick and corrugated metal. Wall openings include windows and nine doors.

Reference:

Final Report Cultural Resources Survey, Missouri Air National Guard Property at Lambert Field and Fort Leonard Wood, Missouri *Prepared for:* Missouri Air National Guard and National Guard Bureau Contract No.: W9133N-04-D-0005 ANG Project No.: ANG0553305 Delivery Order No.: 0005. July 2006.

Great Falls IAP, Montana Air National Guard, Great Falls, Montana

Great Falls International Airport (IAP) was established in 1928. The airport was leased by the United States War Department during World War II. The airport served as a home for the 7th Ferrying Command. While using the airport as an air base, the U.S. Army acquired an additional 740 acres of land and built several buildings and other facilities. The airport remained under government control until June 1948, at which point the United States deeded the airport back to the City of Great Falls with the stipulation that the facility could revert to military control in the event of a national emergency. The airport was released from this clause in 1961.

Today the 120th Fighter Wing (FW) of the Montana ANG occupies 141 acres of leased land on the Great Falls IAP. The airport complex encompasses approximately 2,045 acres of land. At the present time the complex includes the airfield, the terminal complex, some general aviation, commercial and noncommercial activities, airport and airline maintenance and support facilities and a new fire station. Also included on the airport premises is the Montana Air National Guard, which maintains and operates F-16 fighter aircraft and a transport planes. The 120th FW flies a general-purpose mission, including air defense, utilizing the F-16 Falcon. The 120th FW occupies three administrative, one service, and 43 industrial buildings totaling approximately 392,372 ft² with 350 full-time personnel. .

The Montana ANG 120th FW traces its history to 1947 when the 186th Fighter Squadron was activated and federally recognized. The Squadron was assigned to Great Falls IAP. The unit received its first jet aircraft in 1952, a T-33 "Shooting Star." This jet was followed by the F-86A "Sabre" a year later. Shortly thereafter, the squadron was re-designated the 186th Fighter-Interceptor Squadron. In 1955 the 186th Fighter-Interceptor Squadron was re-designated the 120th Fighter Group (Air Defense).

In 1958 the Montana ANG began a 5-minute runway alert assignment. This mission continued until 1996. In 1972, the unit was re-designated the 120th Fighter-Interceptor Group and assigned the F-106 Delta Dart. The F-16A/B arrived in 1987 and the 120th became the 120th Fighter Wing in 1995.

Building 25:

Name:	Building 25
Function:	Composite Maintenance Hangar
Date:	1955
Hangar Type:	Plan No. 39-01-41
Era:	Cold War, Vietnam
Service:	MT ANG
NRHP:	Not Eligible

Description: Building 25 is composite maintenance hangar based on a USACE standard design. It is an aircraft hangar measuring 202 ft 11 inches by 130 ft and is oriented on the aircraft apron. The building is set on a concrete foundation and is steel-framed with a truss system that supports the ceiling over the hangar. It is clad in corrugated metal throughout (replacement) with areas of brick masonry. The roof is a low-pitched gable. Two-story slops surround the central hangar portion of the building on three sides. The foundation is concrete block clad in brick masonry (original).

The principal façade is the northwest façade. The hangar entrance is enclosed by a large hangar tripartite door with a central folding portion and telescoping side doors. The two-story shops terminate at the façade. The shops to the east of the hangar door are a combination of the concrete-block with a brick veneer, and metal siding. The fenestration is metal frame ribbon windows and a man door pierces the first story. The shops west of the hangar are clad in metal framing. The second-story projects northward slightly, which is supported by two steel piers.

The northeast (side) façade is clad mostly in corrugated metal with a low brick-veneer wall below the window sills at the first story of the shops. The mezzanine of the hangar includes a row of metal-framed (typical) fenestration. The second-story of the shop includes few windows and mostly is solid wall, while

the first story includes wide windows that typically are four-light, metal-framed windows. Two-man doors pierce the façade.

The southwest (side) also consists of mostly corrugated metal, with brick-veneer wall below the window sills at the first story of the shops. The first and second story shops are pierced by 11, metal-framed, multi-light fenestration. The first story includes several man doors. The mezzanine level includes similar fenestration.

The southeast (rear) façade contains the two-story shops and similar fenestration across the first and second stories. Several utility shops, including a mechanical room and an arms repair shop, are attached to the building at this façade. These structures are entirely concrete-block masonry and are clad in brick veneer (original). The interior of the hangar includes a dropped ceiling and an enclosed mezzanine (neither is original). The surrounding shops are one-room deep and consist of maintenance shops and offices.

Buildings 36 and 37:

Name:	Buildings 36 and 37
Function:	Aircraft Shelters
Date:	1975
Hangar Type:	unknown
Era:	Cold War, Post-Vietnam
Service:	MT ANG
NRHP:	Not Eligible

Description: These buildings are identical and were built in 1975. They are aircraft shelters. They are tall, steel-framed buildings. The walls are corrugated metal throughout. The roofs are also metal framed and are low-pitch gable. Each building houses two planes and each measures 100 ft by 85 ft. The two interior bays are oriented northeast and southwest. The aircraft can access the structures from both the northeast and southwest sides through one of two overhead doors that pierce both façades. The bays are enclosed by pivoting, overhead doors.

The southeast façades of both buildings are virtually identical with the exception that Building 37 includes a tall, projecting addition housing a mechanical room. This addition has a man door at its southeast façade. Both buildings southeast façades include two-man doors with metal wind shields at the west side of the door. The northwest façade of both buildings are solid, corrugated metal walls.

Hector Field, North Dakota Air National Guard, Fargo, North Dakota

Hector Field (IAP), located in Fargo North Dakota, traces its beginning to 1927 when, Martin Hector leased a quarter-section of land at the northwest corner of Fargo for the establishment of an airport. Four years later he deeded the land to the city and his daughter-in-law donated several additional parcels totaling nearly 50 acres. Commercial air travel began on February 3, 1931. Fargo's Municipal Airport, Hector Field, was officially dedicated three months later.

The 119th Fighter Wing (FW), North Dakota ANG, is headquartered at Hector Field. Its mission is to protect the air sovereignty of North America. The unit is equipped with the F-16 A/B Air Defense Fighter, and is tasked to mobilize, generate, deploy, and execute wartime missions under the direction of the North American Aerospace Defense Command. Hector IAP contains 45 facilities within its 243 acre area.

The 119th FW was activated in 1947. The Wing has flown the F-51D, F-94A/C, F-89D/J, F-102A, F-101B, F-4D "Phantom," and F-16A. Beginning in 1953 the unit was tasked with air defense and provided five minute alert coverage at Fargo. This mission at Hector Field lasted until 1990. The Wing maintains continuous five minute alert through Langley Air Force Base, Virginia.

Building 217:

Name:	Building 217
Function:	Hangar
Date:	1955
Hangar Type:	Standard Plan 39-01-41
Era:	Cold War, Vietnam
Service:	ND ANG
NRHP:	Not Eligible

Description: Building 217 is irregular in plan. The original 1955 portion of the building consists of the hangar, which is surrounded by flanking, two-story shops and offices at the west, south, and east sides. The entire building is metal-frame, clad in metal sheeting (replacement). The roof over the hangar is a low-pitched, front-gable roof covered in metal, while the flanking offices are covered by a flat roof. The foundation is brick masonry and extends up to the window sills at the first-story offices. At the south and southwest areas of the back of the building, the brick cladding extends up to the second story. The fenestration at the offices/shops that enclose the building consists of continuous ribbon windows wrapping around all sides of the building at both stories. However, the fenestration at the first story is interrupted by areas of brick wall at the south façade. Building 217a is attached to Building 217 at its east façade. Building 217 is a utilitarian hangar, and presents no architectural style.

The principal (north) façade consists of the hangar entrance. The hangar is accessed by sliding doors that include a central portion that pivots and folds overhead (original). The interior of the hangar features a dropped acoustical-tile ceiling that was installed in 1982. The interior walls of the hangar are exposed concrete-block masonry. Flanking the east side of the hangar entrance is a glass-enclosed addition to the north end of the two-story shops that surround the hangar. This area is a maintenance operations control center, and was added in 1982.

A south wing, consisting of a boiler room and an old machine shop (no longer used), are attached to the south façade. This wing consists of a low, one-story section and a tall, one-story section. Both are also constructed of metal framing and cladding, and have brick façade in some areas.

The 119th FW of the North Dakota ANG originally built Building 217 in 1955 as an aircraft maintenance facility. When the North Dakota ANG reorganized for the national Air Defense Command alert mission following the Korean War in 1954, the ANG installation at Hector Field converted from propeller-driven

planes to faster jet aircraft equipped with radar. To accommodate the new aircraft, the unit lengthened the runway from 5,000 ft to 7,000 ft and constructed Building 217, a new hangar that cost the ANG $1.5 million. The new hangar was dedicated on September 24, 1955 (Jetletter 1955). Building 217 continues to serve its original function as an aircraft maintenance facility.

Building 217's design as an open structure with a flat-gable roof was introduced by the USACE in the mid-1950s. The design could have been based on the standardized design for Plan No.39-01-41 for a maintenance hangar with shops attached to its sides. This style is characterized as a composite structure due to combination of the steel framed hangar and steel sheeting used to enclose the upper walls of the hangar, and the concrete-block masonry of the interior walls surrounding the office modules, and of the brick façade at the rear (south) areas of the building. Although the masonry is secondary to the structural steel, the concrete-block wings add buttress-like support to the sides of the hangar. This design was not uncommon for hangars during the 1950s.

Building 217a:

Name:	Building 217a
Function:	Hangar
Date:	1955
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	ND ANG
NRHP:	Not Eligible

Description: Building 217a comprises the east wing of the Building 217 complex at the ANG 119 FW complex at Hector Field. Like Building 217, which is the aircraft maintenance hangar attached due west, Building 217a is a ca.1955 building. It is generally rectangular in plan, with a shallow projection at its east façade. The building is metal-frame clad in a variegated brick façade and has a flat roof. It is one-story and is comprised of an older ca.1955 portion at the west end, and the later, taller addition (undated) to the east end of the building, which is indicated by changes in the color of the brick façade. Building 217a is a utilitarian structure and presents no architectural style.

Building 217a lacks a distinctive principal façade. The north façade faces the installation's aircraft apron and is composed of five vehicular bays with overhead doors. The north façade of the east wing has solid masonry cladding. The east wall of this wing includes an additional bay opening with an overhead door. The south façade is mostly solid brick wall, with the exception of three plate-glass, metal-framed windows and a large bay opening with an overhead door at the east wing.

The North Dakota ANG built Building 217a in 1955 as an aircraft maintenance facility, attached to Building 217 aircraft maintenance hangar. The building continues to serve this function. Since original construction the building has had additions. A substantial, taller wing was constructed on the at the east side of the building.

Building 370:

Name:	Building 370
Function:	Hangar
Date:	1967
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	ND ANG
NRHP:	Not Eligible

Description: Building 370 is a ca.1967 aircraft hangar facility at the ANG 119 FW complex at Hector Field. The building is T-shaped, with a long, one-story spine and a two-story, cross-gabled wing at the west side. The building is clad in vertical metal sheeting (not original). The building's style is utilitarian and is devoid of ornamentation. The west wing is oriented north-south and comprises the hangar portion of the building. The south façade forms the principal façade. It is pierced by a large opening to accommodate aircraft, and this opening has sliding, metal doors, which fold into side door pockets that

protrude out from the side of the façade. The building has a low-pitched gable roof, clad in metal. The west façade of the wing is solid. The wing's north façade is pierced by two square windows and includes a small shed addition, also clad in metal sheeting.

The east wing of the building is oriented east-south, and is covered by a medium-pitched gable roof. The three façades of this portion of the building are mostly solid, with a few exceptions. The south façade is pierced by two man-doors and three square windows. The east, gabled façade is pierced by one man door and one square window. The north façade includes two large bays for vehicular access with by overhead doors. There are also two man doors at the west side of the façade.

The 119 FW of the North Dakota ANG built Building 370 in 1967 as a supplemental hangar along the east side of the aircraft apron. The building is still used for this purpose. Building 370 is believed to have been moved from another location (undetermined) to its present site in 1967. The building has also sustained major remodeling, consisting of the complete replacement of the building's original brick façade with the existing metal cladding. According to installation personnel, the brick façade was applied to the building after its relocation in order to match the other brick buildings on the installation. Details of the subsequent alteration are unclear, but station personnel suggest that the former brick façade may have been failing due to vibrations caused by the jet aircraft that are in close proximity, and particularly to that of the hush house, where the jet engines are tested.

Reference:

Cultural Resources Survey at Hector Field, Fargo, North Dakota, Final Report.

Mansfield-Lahm Airport, Ohio Air National Guard, Mansfield, Ohio

Mansfield-Lahm Airport was established in1925 when the Mansfield City Council purchased 190 acres of farm land for use as an air field. The air field was used by the U.S. Army during World War II as a Civilian Pilot Training Corps training facility. .

In 1948, the 164th Fighter squadron of the Ohio Air National Guard was formed at the Mansfield Lahm Airport and has been an integral part of the airport since. The 164th received F-51D Mustang fighters, a B-26 Invader attack bomber, and a C-47 transport. In 1953, the unit entered the jet age with the arrival of the F-80 Shooting Star, which was subsequently replaced by the F-84E Thunderjet and F-84F Thunderstreak.

On November 10, 1958, the unit was re-designated the 164th Tactical Fighter Squadron. On October 16, 1962, the unit was re-designated the 179th Tactical Fighter Group, with the Fighter Squadron retaining the original 164th designation. In 1972, the unit converted to the newer and faster F-100 aircraft. The 179th closed out its tactical fighter mission in 1976 and converted to an Airlift Wing and began flying the C-130B Hercules aircraft. In 1991 the unit upgraded to the C-130H.

Building 102:

Name:	Building 102
Function:	Hangar
Date:	1950
Hangar Type:	unknown
Era:	Cold War, Korea
Service:	OH ANG
NRHP:	Not Eligible

Description: Building 102 (RIC-00871-11) is the aircraft maintenance hangar. It is located in the central portion of the cantonment, southeast of the center of the aircraft apron. The hangar faces northwest toward the apron. The building consists of the hangar and one-story lean-tos for shops and offices that flank it on the northeast, southeast, and southwest sides (figure 5-36). It has a composite structure, with the steel-frame hangar and the one-story lean-tos with concrete block masonry walls and concrete floors.

In 2006, the state historic preservation office and the 179AW determined Building 102 is not eligible for inclusion in the NRHP.

Building 409:

Name:	Building 409
Function:	Fuel System Maintenance Hangar
Date:	1978
Hangar Type:	unknown
Era:	Cold War, Post-Vietnam
Service:	OH ANG
NRHP:	Not Eligible

Description: Building 409 is characterized by its external steel arch. The arch supports the large central hangar bay and the structure that projects above the flat roof of the hangar which accommodates the tail wing of the C-130H Hercules aircraft. This external structural system allows the hangar bay to be free of piers. The steel-frame hangar is accessed by five sliding doors on the northeast façade. When completely open, the 28 ft tall doors slide into the hollow "pockets" that extend 30 ft beyond each side of the 167 ft wide building. The exterior of the hangar and the hangar doors are sheathed with steel siding. Flanking both sides of the rear (southwest) of the hangar are one-story, flat-roofed sections built of concrete block and sheathed with running bond brick veneer. The section in the northwest part of the building may be an addition, as it has different colored brick. There is a recessed single-door entrance on the southwest elevation. Windows consist of three groups of four aluminum-frame casement units that have sills composed of headers. The northwest elevation is pierced by three single steel doors. Two of the doors have projecting soldier brick surrounds and lintels. There is a one-story lean-to on the southeast elevation. It has a flat roof and a steel siding exterior, and is pierced by a single steel door and a set of steel double doors.

Building 409 consists of the large hangar bay with repair and maintenance shops, offices, locker rooms, and mechanical room behind it. When it was built, it was only the second fuel system-corrosion control maintenance hangar of this type (with the external steel arch structure) in use at a USAF reserve base. The design and structure of this type of hangar was eventually replicated at other reserve bases across the U.S. On the southeast side of the hangar bay is the fire suppression and equipment room. A major renovation of the building was completed in 2002. Currently, there are no plans to renovate or demolish this building, which is in good condition.

Toledo Express Airport, Ohio Air National Guard, Swanton, Ohio

The Toledo Express Airport opened in 1954. Toledo Express Airport is Northwest Ohio's commercial airport located in western Lucas County about 20 miles from downtown Toledo.

The 180th Tactical Fighter Group was formed as a component of the Ohio Air National Guard at Toledo Express Airport in October 1962. The 180th flew F-84 Thunderstreak fighter bombers. It later converted to F-100 Super Sabres and A-7s. In 1993 the Fighter Group acquired F-16 fighters and became the 180th Fighter Wing FW. The 180th leases 135.4 acres at the airport, housing combat-ready F-16C Fighting Falcon jet fighters and associated Air National Guard support units. The Ohio ANG occupies 13 industrial, and 7 service buildings totaling approximately 321,882 ft² with 290 full-time personnel.

Building 101:

Name:	Building 101
Function:	Maintenance Hangar
Date:	1958
Hangar Type:	Hangar Type H-2, two story lean-to
Era:	Cold War, Vietnam
Service:	OH ANG
NRHP:	Not Eligible

Description: Building 101 is the aircraft maintenance hangar. It consists of the hangar and two-story lean-tos for shops and offices that flank it on the east, west, and south sides. It has a composite structure, with the steel-frame hangar and the two-story lean-tos with concrete block masonry walls and concrete floors. The hangar has a shallow pitched, front-gable roof clad in standing seam metal while the flanking lean-tos have flat, built-up roofs.

Steel trusses support the hangar roof and clerestory walls. The foundation is concrete. Common bond brick veneer extends up to a concrete water table on all sides of the lean-tos and on the walls of the boiler room on the rear (south) elevation. The exterior is clad with prefinished insulated horizontal steel panels supported by an infill of vertical girts; the exterior originally was clad with corrugated siding.

The north façade features the hangar entrance. The hangar doors consist of three, three-panel, custom-fabricated vertical rise fabric doors. The middle door is 78 ft wide and the two flanking doors are each 26 ft wide. These doors were installed during a major renovation of the hangar in 2000–2002. The original hangar doors consisted of two 26 ft wide sliding doors flanking a 78 ft wide middle canopy door that pivoted and folded overhead.

Exterior entrances on the east and west sides of the lean-tos are recessed and comprise glazed aluminum doors flanked on one side by wide fixed windows. A triangular hood supported by a wing wall covers each lean-to entrance. The fenestration of the lean-tos and clerestory consists of continuous bands of dual glazed aluminum-frame windows wrapping around the east, west, and south sides of the building. On the lean-to, the fenestration is awning units at the first story and fixed units at the second story. The clerestory

has only fixed windows. The existing fenestration replaced insulated windows, which had been installed in the early 1980s in replacement of the original continuous ribbon windows of steel sash wire glass.

The interior of the hangar features a painted concrete floor and a suspended acoustical-tile ceiling that was installed in 2000–2002. Portions of the steel-frame structure of the hangar are exposed to the first-story of the hangar. A catwalk around the second-story shops and offices was originally open to the hangar, but was enclosed in 2000–2002 as part of an overall interior renovation of the building. The walls of the enclosed hallway are pierced by six-light fixed windows.

Two major renovations of the hangar have been undertaken. The first in the early 1980s primarily involved exterior renovations to reduce heat loss and gain, and included replacing the existing steel sash wire glass windows with insulated windows, replacing the original steel sash wire glass windows in the hangar doors with translucent fiberglass glazing panels, adding insulated overhead doors, and installing a metal pan ceiling in the hangar. The second major renovation was in 2000–2002 and involved interior and exterior modifications to remove asbestos-containing materials and to reconfigure interior office and shop spaces. The project involved the removal of the exterior siding; exterior roofing; doors, including the hangar doors; windows; the majority of interior ceilings, flooring, finishes, and partitions, and the existing mechanical, electrical, and plumbing systems. All these were replaced with the building systems and finishes that are evident in and on the building today. The 2000–2002 renovation project also included the demolition of the parachute tower, which was in the rear lean-to just west of the boiler room. The parachute tower had a brick exterior and reached a height a bit taller than the clerestory of the hangar.

The two-story lean-tos contain a series of shops and offices accessed from the hangar bay. Other spaces include men's and women's locker rooms, training classrooms, and utility rooms.

Reference:

Cultural Resources Survey and Evaluation, 220th Engineering Installation Squadron, Zanesville, 180th Fighter Wing, Toledo, 179th Airlift Wing, Mansfield, and 123rd Air Control Squadron, Blue Ash And the Ohio Air National Guard Historic Context Study, Ohio Air National Guard. Muskingum, Lucas, Richland and Hamilton Counties, Ohio.

Springfield-Beckley Municipal Airport, Ohio Air National Guard, Clark County, Ohio

Springfield-Beckley Municipal Airport, located in central Ohio, approximately 5 miles south of the city of Springfield and approximately 50 miles west of Columbus, was established in 1946 and serves as an Ohio ANG base and municipal travel and cargo hub.

The 178th Fighter Wing uses 113.6 acres of leased land at the airport. The 178th occupies 8 administrative, 25 industrial, and 6 services buildings totaling approximately 336,330 ft² with 409 full-time personnel.

The 178th Fighter Wing of the Ohio Air National Guard was organized as the 162nd Fighter Squadron and was initially stationed at Cox-Dayton Municipal Airport, Vandalia, Ohio in 1946. In 1955, the unit moved to its new and current facility, the Springfield-Beckley Municipal Airport. Eight years later, the 162nd Fighter Squadron and support units were formed into the 178th Tactical Fighter Group. Today, the 178th is known as the 178th Fighter Wing.

Building 101:

Name:	Building 101
Function:	Maintenance Hangar
Date:	1955
Hangar Type:	Hangar Type H-2, two-story lean-to
Era:	Cold War, Vietnam
Service:	OH ANG
NRHP:	Not Eligible

Description: The building consists of the hangar and the two-story lean-tos for shops and offices that flank it on the north, west, and south sides. It has a composite structure, with the steel-frame hangar and the two-story lean-tos with concrete block masonry walls and concrete floors. The hangar has a shallow-pitched, front-gable roof covered in corrugated metal, while the flanking lean-tos have flat, built-up roofs.

Steel trusses support the hangar roof and clerestory walls. The foundation is concrete. Running bond brick veneer extends up to a concrete water table on all sides of the lean-tos except on the east façade, where the brick reaches two stories on a portion of the south lean-to and one story on a portion of the north lean-to. The rest of the exterior is clad with steel siding; the exterior originally was clad with corrugated steel siding.

The east façade features the hangar entrance. The hangar is accessed by eight sliding doors. Each door is approximately 15 ft wide. These doors replaced the original ones in 1968. The original hangar doors consisted of two 26 ft wide sliding doors flanking a 78 ft wide middle canopy door that pivoted and folded overhead. The interior of the hangar features a painted concrete floor and a suspended acoustical-tile ceiling that was installed in 1982. The first story of the interior concrete block walls of the lean-tos

and portions of the steel-frame structure of the hangar are exposed to the hangar. A catwalk around the second-story shops and offices was originally open to the hangar, but was enclosed in 2004 as part of an overall interior renovation of the building. The walls of the enclosed hallway are pierced by four-light fixed windows.

The fenestration of the lean-tos consists of continuous ribbon windows wrapping around all sides of the building at both stories. However, the fenestration at the first story is interrupted by areas of steel siding on both sides of a one-story lean-to on the west elevation. The fenestration is aluminum frame and consists of three rows of windows: a row of awning units between upper and lower rows of fixed units. The existing fenestration replaced the original continuous ribbon windows of steel-sash casements in 1982.

The one-story lean-to at the center of the west elevation was the former boiler room. A tall brick chimney, since demolished, was adjacent to the boiler room. The boiler room has been converted into a mechanical room. The lean-to is constructed of common bond brick. It is pierced by an overhead door and multiple metal louvered vents. The two-story lean-tos contain a series of shops and offices accessed from the hangar bay. Selected shops on the first floor include tool, pneudraulic, electrical, and survival equipment/parachute. Men's and women's locker rooms also are on the first floor. Typical second floor rooms include training classrooms, administrative offices, and plans and scheduling.

Building 101 represents a standardized plan for hangars. Mills and Petticord Architects and Engineers of Washington, D.C., designed "Hangar Type H-2, two-story lean-to" under the direction of the Air Force Division of the National Guard Bureau in 1951. This type of hangar is characterized by the steel frame hangar bay with a clerestory and shallow-pitched metal roof surrounded by two-story lean-tos with continuous bands of steel-sash windows interrupting the brick-clad exteriors. The lean-tos were constructed of concrete block, which add buttress-like support to the sides of the hangar. This design was not uncommon for hangars during the 1950s.

Reference:

Cultural Resources Survey and Evaluation, 178th Fighter Wing, Springfield, Clark County, Ohio, Ohio Air National Guard. Volume I.

Joe Foss Field, South Dakota Air National Guard, Sioux Falls, South Dakota

The first airport for Sioux Falls was established in 1929 in South Sioux Falls. It provided private passenger service, flight training, and airmail service. With growing interest in having a public airport, in May 1937 the City of Sioux Falls purchased 120 acres of land on the north side of the city for a municipal airport. About half of the construction of the airport was funded by a federal WPA grant. A stone hangar, stone administration building, and three intersecting runways 150 ft wide and 4,500 ft long were constructed. The Sioux Falls Municipal Airport was dedicated on September 15, 1939.

Civil operations at the municipal airport were intermittent during World War II. In 1941, the City of Sioux Falls offered the U.S. government the facilities of the municipal airport and adjacent land to establish an Army radio and communications school. The USACE developed the plans for the school's classrooms, administration buildings, barracks, hospitals, other support buildings, and infrastructure for up to 16,000 military and civilian personnel at one time. Additionally, the airport runways were lengthened and strengthened to handle the larger military aircraft.

The base then became a redeployment center for soldiers transferring from the European Theater to the Pacific Theater and was renamed Sioux Falls Army Air Field. The base subsequently became a separation point as soldiers became civilians. The Sioux Falls Army Air Field was deactivated on December 31, 1945, and the land and its buildings returned to the City of Sioux Falls.

In March 1955, the Sioux Falls Municipal Airport was officially renamed Joe Foss Field in honor of the South Dakota native. Joseph J. Foss was a Marine Corps pilot who shot down 26 enemy aircraft in a 63-day period between October 9, 1942, and January 15, 1943, at Guadalcanal, Solomon Islands, equaling the record of World War I flying ace Eddie Rickenbacker. For his distinguished service in the American war effort, Captain Joe Foss earned the Congressional Medal of Honor on May 11, 1943. Foss organized the South Dakota ANG in Sioux Falls and commanded the squadron from 1946 to 1950. He was elected to the South Dakota legislature in 1948, and in 1955 was elected the youngest governor in the history of South Dakota. He was also the first commissioner of the fledgling American Football League between 1959 and 1966.

On July 10, 1946, Joseph J. Foss was appointed to organize the South Dakota ANG and command its first squadron at Sioux Falls. The aircraft parking apron and six adjacent buildings from the Sioux Falls Radio Technical Training School became the nucleus of the base for the 175FS. The South Dakota ANG rehabilitated the buildings for its use (none of them were relocated) in late 1949. The former Base Engineering Maintenance and Inspection Building was converted into the squadron's hangar (Building 40). The inspection building's boiler room (Building 41) was also acquired and used for the same purpose for the hangar. A parachute building and training and inspection building were also renovated for the South Dakota ANG. The 175FS kept the former building as a parachute building (Building 46) and converted the latter building into a warehouse (Building 47). The other two buildings included a machine shop (no number; demolished) and a fire station (no number; demolished). The South Dakota ANG also built a link trainer building (demolished) for its installation. The 175FS had three runways at its disposal at the Sioux Falls Municipal Airport. All three runways had been improved for the Army base.

Several new buildings had been added to the installation by the time of the jet conversion in 1954.

In April 1956, the South Dakota ANG was reorganized into the 114th Fighter Group (114FG) and headquartered at Joe Foss Field. From 1960 until 1970, the 114FG operated under the direct supervision of the Air Defense Command (later Aerospace Defense Command) alert mission. Aircrews were placed

on five-minute alert, and four aircraft were armed and ready to defend the continental U.S. by intercepting and destroying enemy targets. New facilities related to the new F-102 aircraft were constructed on the installation by 1962. The cantonment had expanded to the west and southwest with the addition of these facilities.

A new air defense alert complex was completed in 1968, and 114FIS pilots were placed on 24-hour alert. The complex was constructed perpendicular to the newly extended northeast-southwest runway. Four 50 ft x 80 ft alert aircraft shelters (Buildings B71, B72, B73, and B76) lined the apron and a crew readiness quarter (Building B70) was adjacent to the northeast. The South Dakota ANG allowed the lease on the 15.3-acre tract to expire, and the Army now leases the tract and uses the former aircraft alert facilities.

Following the deactivation of the Aerospace Defense Command, the 114FG was assigned to the Tactical Air Command and re-designated the 114th Tactical Fighter Group (114TFG) in May 1970. The 114TFG participated in numerous joint forces and North Atlantic Treaty Organization training exercises stateside and abroad in the 1970s and 1980s.

The physical facilities of the South Dakota ANG at Joe Foss Field had expanded considerably during the late period of the Cold War. By late 1980s and early 1990s a POL complex had been established at the eastern portion of installation. The complex contained POL Operations (Building 54), pump house (Building 55), LOX (demolished), and other POL storage facilities. A base civil engineering complex was west of the POL complex, and included the civil engineering and security forces offices (Building 47) and multiple storage facilities (Buildings 44, 57, 48, 49, and 56; the former two are extant, the latter three were demolished). A maintenance complex was formed on the west side of the base around the existing Aircraft Maintenance Shop (Building 13) in 1968. Joining this building was an automotive maintenance facility (Building 11), Aircraft Engine/Non Destructive Inspection Shop (Building 12), and Avionics Hangar (Building 14).

Building 14:

Name:	Building 14
Function:	Maintenance Hangar
Date:	1979
Hangar Type:	unknown
Era:	Cold War Post-Vietnam
Service:	SD ANG
NRHP:	Not Eligible

Description: Building 14 comprises a hangar and avionics shops. The building is on West Military Way in the northwest corner of the installation. It is one of five buildings within the base's aircraft maintenance complex. The building consists of the hangar and one-story lean-tos for shops and offices, which flank the hangar on the north and south sides. It has a composite structure with a rigid steel frame structure supporting the hangar and concrete block masonry walls for the lean-tos. The entire building has a

reinforced concrete foundation and concrete slab floors. The hangar has a moderately pitched, front-gable, built-up roof and the flanking lean-tos have flat, built-up roofs. The exterior of the hangar is clad with prefinished insulated steel panels, and the lean-tos display running bond brick veneers.

The hangar is 160 ft wide and 147 ft deep. Its doors are on the east and west façades. The doors comprise six leafs set on tracks and are electronically controlled. The large openings for the hangar doors are supported by steel braces that connect the rigid steel frame structure to the top of the opening of the doors. The north and south elevations of the building are punctuated by a series of steel doors and a few windows. The north lean-to is one room wide and the south lean-to is two rooms wide. A lean-to was added to the southwest corner of the building in ca. 1991. The lean-to exhibits the same types of building materials and openings as the original lean-tos. The hangar is in good condition, and currently there are no plans to renovate or demolish the building.

Building 40:

Name:	Building 40
Function:	Maintenance Hangar
Date:	1942
Hangar Type:	unknown
Era:	WWII
Service:	SD ANG
NRHP:	Not Eligible

Description: The hangar doors face east and west, perpendicular to the aircraft parking apron. The building consists of the hangar and two-story lean-tos for shops and offices, which adjoin the north and south sides of the hangar. The building has a composite structure, with the steel-frame hangar and concrete block masonry walls for the two-story lean-tos. The hangar has a shallow-pitched, front-gable roof clad in standing seam metal while the flanking lean-tos have flat, built-up roofs. Steel trusses support the hangar roof and clerestory walls. The foundation is concrete and the floor of the hangar is concrete. Running bond brick veneer steps down from the first two bays at each end and extends along the base of the lean-tos. Brick veneer also was applied around each entrance to the lean-tos. The rest of the exterior is clad with prefinished insulated steel panels.

The hangar entrances are on the east and west sides of the building. Each hangar door consists of ten leafs installed on tracks. The doors are motorized and when fully opened, slide into pockets on each side of the opening. The doors comprise pre-engineered metal wall panels with small areas of glazing. Three steel personnel doors pierce each hangar door. The north lean-to, which faces the flight line, consists of a series of regularly-spaced pairs of aluminum sash windows. These consist of two types: one with three lights and another with four lights. The fenestration on the south lean-to is irregular and consists of far fewer windows than the north lean-to. The windows are also smaller and of a different type: aluminum-sash casements. The present architectural features and materials of Building 40 date to 1983, when a major renovation was undertaken. The Sioux Falls architecture and engineering firm the Spitznagel Partners designed the renovation, which included removing all the existing exterior wall cladding, the windows on

the south elevation, and the built-up roofs on both lean-tos and replacing these elements with those that are present on the building today. The face brick on the north and south lean-tos was also applied at this time. The present hangar doors were installed in 1988. The hangar's clerestory windows were removed ca. 1961 and replaced with metal panels. The interior of the building has been completely renovated. The north lean-to contains classrooms and medical readiness and disaster preparedness. The south lean-to houses offices and classrooms. These spaces are used primarily on drill weekends. The hangar is used primarily to store the unit's planes in inclement weather.

Building 40 was constructed in 1942 as part of the Army Air Force's Sioux Falls Radio Technical Training School. It was the Base Engineering Maintenance and Inspection Building, and was designated Building 25. Perkins and McWayne-Stanley Engineering Company designed the building under the auspices of the U.S. Engineer Office in Omaha Nebraska. As-built drawings of Building 40 are not on file at the 114FW Civil Engineering office. However, historical photographs, probably dating from the 1960s, on display at the Civil Engineering office illustrate the appearance of the hangar during the early period of the South Dakota ANG at Joe Foss Field. The building was clad in corrugated metal, contained glazed hangar doors, and exhibited metal-sash awning windows on the south lean-to and industrial sash windows on the south clerestory. The north lean-to had pairs of metal-sash awning windows and there were no windows at the clerestory.

Reference:

Cultural Resources Survey: 114th Fighter Wing, Sioux Falls, Minnehaha County, SD, South Dakota Air National Guard, Volume I. South Dakota Air National Guard, National Guard Bureau, Air National Guard Readiness Center, NGB/A7AN Contract No.: W9133L-05-D-0009 Delivery Order No. 0045 ANG Project No.: ANG0853334. July 2009.

McGhee Tyson ANGB, Tennessee Air National Guard, Alcoa, Tennessee

The McGhee Tyson municipal airport was opened in 1927 on a 60 acre stretch of land near Knoxville, Tennessee. The airport acquired 351 acres in 1935. In 1941 the city constructed a new air traffic control tower on the airport. Two years later the airport built two 5,000 ft runways, and in 1951 the U.S. Air Force constructed several facilities on the field along with a 7,500 ft runway.

Concerned with the defense of Alcoa, Oak Ridge's secretive nuclear facilities and TVA dams, military planners deployed the first operational Air Force units to McGhee Tyson Municipal Airport on April 1, 1950. On January 26, 1951, an official announcement was made that a new $5.5 million Air Force Base was to be built as a home for 30–50 jet fighters. The Air force base operated from 1952 until 1958. After the announcement of the base closure, the National Guard Bureau announced the constitution of the 134th Fighter Interceptor Group which would inherit all facilities including aircraft and the mission. Federal recognition of the 134th came on December 15, 1957, and all on-base Air Force operations ceased on January 8, 1958. Ten months later five pilots and their F-86D jet fighters were placed on daytime readiness alert.

In April 1964, the 134th became the first National Guard flying unit equipped with KC-97s to achieve operational status for refueling missions. The 134th ARW began flying the Boeing KC-135A in 1976. These aircraft were later upgraded to "E" models in 1982 and finally replaced with "R" models in 2006.

Today the airport is home to the 134th Air Refueling Wing (ARW). Air National Guard facilities consist of 39 buildings totaling 651,000 ft². Day-to-day activities are managed by a force of 823 full-time personnel. .

Building 111:

Name:	Building 111
Function:	Hangar
Date:	1953
Hangar Type:	unknown
Era:	Cold War, Korea
Service:	TN ANG
NRHP:	Not Eligible

Description: This maintenance hangar was built in 1953 and is a rectangular plan, 33,954 ft², end-gabled, multi-story steel frame building. The walls are sheathed in corrugated steel panels and peripheral single story shed roof dependencies are found on all but the principal elevation that faces the flight line. This side of the hangar consists almost entirely of a two panel track mounted door system with a tail door above to allow the entry of aircraft. Renovations to the building include an addition on the rear elevation, the sealing of original door and window openings, and the creation of new doors and window openings on

the interior as well as the exterior. Building 111 is a standard plan structure that has experienced alterations.

Building 113:

Name:	Building 113
Function:	Hangar
Date:	1952
Hangar Type:	unknown
Era:	Cold War, Korea
Service:	TN ANG
NRHP:	Not Eligible

Description: This hangar is a rectangular plan, 35,908 ft², multi-story steel frame building with a Quonset hut roof. The exterior walls are sheathed in corrugated steel panels and have peripheral one-story dependencies on all except the south (primary façade) elevation. The hangar has experienced alterations over the years that include sealing and covering original window/vent openings on all elevations, replacement of the exterior siding, and the addition of a steel arch that projects above the roofline on the south elevation. Building 113 is a standard plan structure that has experienced alterations.

Building 126:

Name:	Building 126
Function:	Alert Hangar
Date:	1952
Hangar Type:	unknown
Era:	Cold War, Korea
Service:	TN ANG
NRHP:	Not Eligible

Description: Building 126 was constructed in 1952 as the alert hangar when the installation was used by the USAF. This 24,479 ft², three-story compound block building has a two-story center block, flat roof, and is sheathed in corrugated metal. Each of the two end blocks has two large bays with overhead metal doors that open to both the north and south elevations to accommodate aircraft. The minimal fenestration is primarily confined to the center block, which has a small shed dependency is located on the north elevation. A number of single and double pedestrian steel entry doors (some with canopies) are positioned around all building elevations.

Although no original plans were found for this resource, Building 126 appears to be a Strobel and Salzman Alert Hanger. Renovations have greatly reduced the size of each of the eight bay door openings and the center block fenestration has been altered by replacement of original windows. Bay doors have also been replaced by smaller overhead track metal doors. Six-over-six double hung vinyl windows have been added on the main blocks. A renovated functional structure, Building 126 now has limited ability to convey the military strategies of the Cold War.

Reference:

Cultural Resources Survey 134th Air Refueling Wing McGhee Tyson Air National Guard Base McGhee Tyson Airport Blount County, Tennessee, March 2009.

Ellington Field, Texas Air National Guard, Houston, Texas

Ellington Field is a flat tract of land less than 20 miles southeast of Houston. In 1917, the federal government leased, then later purchased from local land owners, 1,280 acres of prairie grasslands to build a training base to meet the demand for more fighter pilots after the U.S. entered WW I. Construction on the airfield started on September 14, 1917. The general contractor was the American Construction Company. Work was completed in 60 days and the airfield was named Ellington Field, in honor of Lt. Eric Lamar Ellington. Ellington Field had 24 hangars, 12 barracks, and 4 shops, as well as a hospital, officers club, 2 stores, and 4 movie theaters. Most of the buildings were made of wood; however, the enlisted men's barracks were canvas tents. The main runway was over 8,000 ft long and nearly 800 ft wide. The first aircraft flew out of Ellington Field on November 27, 1917.

It was formally deactivated in 1920, but orders to abandon the field were halted when the War Department authorized the Texas National Guard to establish an aviation squadron at Ellington Field. By 1927, the 111th Observation Squadron moved away from Ellington Field. In 1940, during WW II, Congress authorized the expansion of the USACE, which resulted in the need for more trained pilots, navigators and bombers to fly and operate new aircraft. This led to the reopening of Ellington Field because the War Department thought Houston was a target for enemy attack from the Gulf of Mexico due to its oil refineries.

Construction on the second Ellington Field began in 1940. It was a joint endeavor between the Army and the Tellepson Construction Company of Houston. Five control towers and two 42,000 ft^2 steel hangars were constructed, as well as administrative buildings, 5 mess halls, and 74 barracks. The airfield was completed by April 11, 1941. In December, 1940, the U.S. Advanced Flying School started at Ellington. In time, it also became the site for bomber pilot training, as well as the USAAC Bombardier School. In 1943, the pilot and bombardier training programs were transferred, and the Army Air Force Navigator Training School located at Ellington.

In September 1946, the AAF closed all activities at Ellington, leaving a caretaker unit of less than 100 Air Force personnel at the base, and the TX ANG, who were located at the south end of the base. The field remained an Air Guard base until July 28, 1948, when once again it was to become an active Air Force base. It was renamed Ellington AFB. Extensive repairs were needed once again. In 1949, ANG was moved to the north section of the field and the 111th Squadron moved into the small hangar.

The Texas Air Guard, after being relocated to La Porte, Texas, was transferred back to Ellington in 1956 and renamed the 147th Fighter Group. This sparked expansion on the northern end of the installation, including warehousing and maintenance facilities directly north of the hangar. The original 1940 hangar was still utilized, although extensive alterations had been done to it.

The use of this site by the USAF ceased in the late 1990s, but the FAA still operates long-range radar at Ellington. In the 1960s, NASA located the Space Task Group's astronaut training complex at Ellington. In 1974, Texas ANG and the AF reserve units left Ellington and it was scheduled to close by Summer 1976. The Texas ANG unit decided to stay. During World War II, more land had been acquired. As of 1974, the installation had grown to 2,434.94 acres. From 1976 to 1984, a USAF caretaker unit oversaw the maintenance of the base and the Texas ANG remained at the base. In 1984, the City of Houston purchased Ellington Field for use as a civil airport.

Building 1382:

Name:	Building 1382
Function:	Aircraft Hangar
Date:	1940
Hangar Type:	Unknown
Era:	WWII
Service:	TX ANG
NRHP:	Eligible

Description: A large aircraft hangar with a central bay and two, two-story side wings that is 61,388 ft². It is a front-gabled building with a corrugated metal fascia and corrugated metal-clad walls. The primary façade facing the flight line has a set of sliding doors leading into the central bay, and the windows have 72 lights in each door. At least two sets of entrance doors lead into the hangar and side wings. The side façades of the central bay have clerestory windows, and the hangar's side wings have a horizontal band of windows with replacement sashes on the second story that wrap around all three of their façades.

Extensive alterations to all of the external façades of the hangar and its wings have compromised its integrity of design, materials, and workmanship. All façades have received metal siding in a two-toned design in contrasting colors. One of the wings originally had distinctive horizontal bands of ribbon windows on its first and second stories. During one of the renovations, the first-story band was covered up by metal siding, altering the appearance of the building. The windows on all sides and stories of the hangar have been replaced and are very different in appearance from the original sets of windows and their design.

Building 1394:

Name:	Building 1394
Function:	Aircraft Hangar
Date:	1987
Hangar Type:	Unknown
Era:	Cold War, Post-Vietnam
Service:	TX ANG
NRHP:	Not Eligible

Description: A multiple-story, one-bay repair hangar with a rectangular floor plan on the flight line in the northeastern corner of the installation. It is 10,910 ft². Its walls are clad with pre-cast concrete panels, and its front-gabled roof is covered in corrugated metal. The shed roof of the side wings are covered in corrugated metal as well. The primary façade of the hangar has sliding doors leading into the central bay and pre-cast concrete wing walls. No windows pierce the clerestory of the central bay. The northern side wing has five sets of double leaf doors. The southern side wing was not discernible. No major alterations were made to this building since its construction.

Reference:

Draft Final Cultural Resource Survey Texas Air National Guard, 147th Fighter Wing, Ellington Field, Texas, November 2006.

Army National Guard

Wheeler Army Air Field, Hawai'i Army National Guard, Wahiawa, Hawai'i

Wheeler Army Air Field was established in 1922 as the drill grounds for the 17th Cavalry on 31 acres between the Ko'olau and Wai'anae mountain ranges, located in the town of Wahiawa. It was initially named the Hawaiian Divisional Air Service Flying Field, but in 1922 the name was changed to Wheeler Army Air Field. Its mission was to meet the increasing needs for facilities to support planes used by the U.S. Army's Hawaiian Department. Wheeler became a permanent Army post separated from Schofield Barracks in 1939. It was damaged heavily during the Pearl Harbor attack on December 7, 1941. A new round of construction began that created two new runways and support facilities. Soon after World War II, Wheeler Field became obsolete, was transferred to the Air Force and renamed Wheeler Air Force Base, then deactivated a short time later. It was reactivated during the Korean War as a shared base between the Air Force, Navy, Army and Air National Guard. Property management responsibilities were turned over to the Army in 1977, and in 1987, portions of the base were designated as a National Historic Landmark. The Army took over the base from the Air Force in 1991, renamed it the Wheeler Army Air Field, and the base is now home to the HI ANG's Hawaiian Regional Operational Coordination Center. Many of its original buildings have been renovated and are part of the historical district.

Building 110:

bb	110
Function:	Hangar
Date:	1944
Hangar Type:	Unknown
Era:	WWII
Service:	HI ARNG
NRHP:	Eligible

Description: This hangar is 120 ft long with two equal bays, each measuring 110 ft in width. It has a steel truss roof supported by steel columns with concrete block wall sides and steel sash windows. There are four decorative corner pilasters, and the connecting sections at the middle of the hangar, and the storage compartments for the hangar doors are stucco-covered concrete block. It has a full-height, primarily glass, sliding door. The original stucco on metal lathe parapet walls at both ends of the building have been replaced with concrete sliding panels with asbestos. Horizontal wood reinforcing has been added to some stucco parapet walls. The door storage spaces are present on both sides of Hangar 110. The roof is constructed of corrugated metal, and it generally retains its original exterior appearance and original function. Windows have been replaced or painted on the airfield side, a few of the large sliding exterior doors have been removed, and replacement of some additional windows has occurred.

Building 113:

Name:	Building 113
Function:	Hangar
Date:	1932
Hangar Type:	Unknown
Era:	Interwar
Service:	HI ARNG
NRHP:	Eligible

Description: The hangar is 120 ft long with two equal bays, each measuring 110 ft in width. It has a steel truss roof supported by steel columns with concrete block wall sides and steel sash windows. There are four decorative corner pilasters, and the connecting sections at the middle of the hangar, and the storage compartments for the hangar doors are stucco-covered concrete block. The full-height, primarily glass, sliding doors have been replaced with fixed walls on the north sides of both hangars and on the south side of Hangar 113. The original stucco on metal lathe parapet walls at both ends of the buildings have been replaced with concrete sliding panels with asbestos. Horizontal wood reinforcing has been added to some stucco parapet walls. The door storage spaces on the airfield side of Building 113 have been replaced. The roof is constructed of corrugated metal, and the interior of Hangar 113 has been

completely renovated for use as a gymnasium and office space. The building generally retains its original exterior appearance and original function. Windows have been replaced or painted on the airfield side, a few of the large sliding exterior doors have been removed, and replacement of some windows has occurred.

Barbers Point, Hawai‘i Army National Guard, Kalaeloa, Hawai‘i

In 1932, in the town of Kapolei, a portion of the Ewa Plain was acquired by the military for a dirigible mooring mast field. Known as Barbers Point Naval Air Station, it was commissioned on April 15, 1942, to support the air station located on Ford Island in Pearl Harbor. At the start of World War II, the base's mission expanded to include aircraft repair. Its mission changed once again in 1946 at the start of the Cold War, to that of the main Pacific air station. Its mission included air patrols, headquarters for Fleet Air Hawai‘i, all-weather training, logistics, and fleet air service.

In July 1958, Barbers Point became the headquarters of the Pacific Airborne Command as part of the Distant Early Warning Line, which prevented Soviet bombers from getting through. This mission ceased operation in 1965. In 1968, VQ-3 became part of the Barbers Point mission, with the responsibility of maintaining communications with U.S. submarines in a "post-nuclear" environment.

By 1989, the end of the Cold War resulted in discontinuing antisubmarine patrols. The base was chosen as a BRAC candidate and realignment was completed by 1999, with 150 acres conveyed from the Navy to the Department of the Army. Hawai‘i ARNG uses 147 of these acres, with the other three licensed to the Hawai‘i Air National Guard.

Building 117:

Name:	Building 117
Function:	Hangar
Date:	1944
Hangar Type:	unknown
Era:	WWII
Service:	HI ARNG
NRHP:	Eligible

Description: Built in 1944 as part of the facilities at NAS Barbers Point, this building was involved in the repair and assembly of World War II carrier planes.

Building 282:

Name:	Building 282
Function:	Hangar
Date:	1958 to 1965
Hangar Type:	Unknown
Era:	Cold War, Vietnam
Service:	HI ARNG
NRHP:	Eligible

Description: This is one of the two major structures associated with the Pacific Barrier Command in the service and maintenance of the Warning Star aircraft that provided around the clock surveillance of the Pacific Ocean during the Cold War.

Reference: Angela Kieran-Vast, Natural Resources Field Supervisor, Hawai‘i ARNG Environmental Office, October 2009.

Peoria Army Aviation Support Facility 3, Illinois Army National Guard, Peoria, Illinois

The Peoria guard unit moved into the structures on Peoria Army Aviation Support Facility 3 within the last decade. There are no drawings or other documentation to substantiate construction dates, but most structures were likely erected in the 1940s and 1950s.

Peoria's first armory was deemed inadequate after World War I and the state awarded a new armory to the city. It was dedicated on January 30, 1925, and was Peoria's primary public arena until 1950. Due to a planned construction, the west wall of the armory was built of temporary construction. Proposals to expand the facility in 1939 and again near the end of World War II were rejected as all Illinois post-war funds went to new facilities, not existing ones.

Peoria's air base was transferred to the Air National Guard in 1947. After the completion of a new airbase, the ANG transferred the old facilities to the ARNG who transformed them into an Army Aviation Support Facility.

Building 1:

Name:	Building 1
Function:	Hangar
Date:	1948
Hangar Type:	Quonset-hut like
Era:	Cold War, Korea
Service:	IL ARNG
NRHP:	Not Eligible

Description: The Quonset-like hangar is the most dominant largest building. The hangar's south façade features brick piers that serve as the west and east anchors of the wall. The aircraft door is composed of metal and folds to open in an accordion-like fashion to either side. Almost completely covered with corrugated metal, the structure features a band of multiple-light windows along its north façade. A rectangular, one-story, brick addition with a flat roof (Building 5) extends from the hangar at its northwest corner.

Reference:

Environmental Condition of Property Peoria Army Aviation Facility Peoria, Illinois, Illinois Department of Military Affairs 1301 North McArthur Blvd., Springfield, IL 62702-1301. Prepared by: Mike Springman, The Illinois Sustainable Technology Center (ISTC) Revised August 11, 2009.

Forbes Field, Kansas Army National Guard, Topeka, Kansas

In 1942, at the onset of World War II, the U.S. government purchased 1,920 acres of agricultural land to establish an airfield. The completed airfield included three intersecting runways; aircraft parking aprons, hangars and refueling facilities; vehicle maintenance and repair areas; electrical, gas, water and sewer utilities; an ordnance storage area, a skeet range, a rifle range, an aircraft machine gun test firing berm; and a number of aboveground and underground fuel storage tanks. Known as the Topeka Army Airfield (TAAF), it was used for operational training of heavy bombardment crews before they were deployed overseas. Within a year, the airfield became a processing center for pre-deployment personnel and equipment of the 21st Bombardment Wing. By 1945, TAAF became a center for shipping ground personnel overseas.

The Strategic Air Command drove the expansion of Forbes AFB in the early days of the Cold War. TAAF was renamed Forbes Air Force Base. It was deactivated once again in October 1949. In 1951, the base was reactivated to support Korean War operations. In December, 1952, Forbes AFB was to become a critical link in the Strategic Air Command's global jet bomber system. As such, the base gained 3,100 acres to accommodate the new infrastructure. The original runways and aprons were modified and extended. A 12,800 ft runway was added to handle both the newest and largest aircraft the Air Force had fielded to date. It was begun in 1954 and finished the next year.

In April, 1955, the largest hangar at Forbes AFB was started. It was a double cantilever heavy bomber maintenance hangar and was designed by the Kuljian Corporation in 1951. The cantilever system inside the building extended from the interior shop towers. This type of hangar construction was relatively easy to expand and adapt for different types of aircraft, and they were easier to assemble due to standardized, shippable parts that could be manufactured and erected by non-specialized labor. Also constructed in 1955 and completed in 1956 were identical smaller nose-dock maintenance hangars. Four flanked the abovementioned hangar and three lied on what became the KSARNG parcel, now used for helicopter maintenance and storage. The two nose docks to the southeast were demolished in the 1970s to make room for new buildings. The remaining two are both still in service.

After most of the critical infrastructure relating to aircraft and mission support was completed in 1957, attention turned to building base housing. In 1958, Forbes AFB was selected to become an intercontinental ballistic missile site. Building of the missile site was completed in 1960, but it was later decommissioned in 1964. By 1960, the Strategic Air Command mission at Forbes was the alert concept. This mission resulted in the development of an alert hangar, constructed solely for the alert units at the flight line. General plans consisted of a formal alert apron and a permanent alert crew quarters. The time needed to get from these quarters to the aircraft was only 3 minutes.

Also during this time, half of the facilities now used by the 190th ARW and Kansas ARNG were constructed. Thirteen buildings were constructed to support the Strategic Air Command expansion, including aircraft hangars, maintenance shops, support facilities and administration facilities. The remaining buildings were all constructed during the Kansas ANG tenure at Forbes. In 1973, Forbes AFB was closed and parts of it were occupied by the Kansas ANG, Kansas ARNG, and AAFES transferred to the Kansas ANG. Forbes remained a Tactical Air Command installation until the time when the base was closed. It was ultimately transferred to the City of Topeka for conversion to a civilian airfield. The transfer took three years and in May 1976, the base was formally named Forbes Field.

On July 1, 1976, the Tactical Air Command transferred 513 acres of the base to the National Guard Bureau, who parceled out 215 acres the KS ANG occupied to be used as a new ANGB. Parcel 3 was immediately occupied by Kansas ARNG. It had three nose-dock hangars, which were to be used as

helicopter hangars. On August 22, 1977, the 190th received notice that it would become the 190th Air Refueling Group, part of the refueling force associated with the bomber alert program. As part of this transition, $5.9 million was spent on new buildings and renovations, including five new buildings to support the Kansas ANG in their mission. Between 1978 and 1980, the fire station, maintenance shops and the dining facility were built. Other buildings were expanded to accommodate the new aircraft. The security police department was also expanded. A few other less critical support buildings, including an entry control building, a maintenance shop and storage buildings, were added in the mid to late 1980s. In 1988, a new storage building was added to accommodate two new KC-135 aircraft.

Building 662:

Name:	662
Function:	Maintenance Hangar
Date:	1957
Hangar Type:	Double Cantilever Heavy Bomber A/C 39-01-47
Era:	Cold War, Vietnam
Service:	KS ANG
NRHP:	unknown

Description: Building 662 was adapted by Capitol Engineering of Topeka for Forbes AFB. Adaptations designed into the building mainly included a third story with offices as well as other smaller additions. The building is rectangular in plan, measuring 662 ft 10 inches northeast-southwest by 270 ft 8 inches northwest-southeast and covers 166,914 ft². It rests on a reinforced concrete foundation, has a very low pitch gable roof, and is clad with corrugated metal siding. The three-story building is 65 ft 10 inches high, supported by interior arched steel trusses.

The northwest elevation provides aircraft access. There are 16 sliding panels providing access to three interior bays along the length of the elevation. Within the sliding doors are rectangular doors that allow pedestrian access and aircraft tails to project from the hangar. The doors have been re-clad and have a set of two-by-six fixed pane windows in each panel, totaling 16 on the entire elevation.

The southeast elevation has been altered from its original aircraft functions. The original sliding aircraft doors have been removed, and the façade clad with metal siding. A one-story addition has been constructed with three single-leaf pedestrian doors. In addition, there are four sets of vertical retracting metal freight doors and six sets of double-leaf pedestrian doors on the elevation.

The northeast elevation has two double-leaf pedestrian doors and one single-leaf pedestrian door. Two recent additions have been constructed. Both are veneered in red brick and have a metal box fascia. The south addition has a recessed double-leaf pedestrian door. There is a metal ladder to the second and third floors.

The southwest elevation has two one-story brick veneer additions. One houses a stairway leading to a basement. There are also two single-leaf pedestrian doors and a double-leaf pedestrian door accessing this elevation. Two large rectangular vents are located near the roofline.

Building 665, 666:

Name:	Building 665 and 666
Function:	Maintenance Hangar
Date:	1956
Hangar Type:	Wing Multi-purpose 39-01-53
Era:	Cold War, Post-Vietnam
Service:	KS ANG
NRHP:	Unknown

Description: Buildings 665 and 666 are identical structures constructed by the Strategic Air Command in 1956 using the standard wing multi-purpose 39-01-53 hangar design. They are 28,991 ft² and measure 295 ft 6 inches northeast-southwest by 126 ft 9 inches northwest-southeast, including offsets. They are supported by offset gable steel roof trusses that are boxed with metal sheathing. The main body of the building is clad with corrugated metal siding.

The northeast façade has three multi-panel sliding doors. The center door has a center aperture where an aircraft tail section can remain outside while the forward section of the aircraft is serviced. There is one pedestrian door inset within the larger center hangar door just east of the midpoint. The southwest elevation has four 12 ft by 14 ft vertical retracting bay doors, a metal sliding window at each end, and a metal stairwell and door on either end. The southeast elevation has no wall openings. The northwest elevation has a single pedestrian door.

Building 680:

Name:	Building 680
Function:	Hangar
Date:	1956
Hangar Type:	Wing Multi-purpose 39-01-53
Era:	Cold War, Vietnam
Service:	KS ARNG
NRHP:	Unknown

Description: Building 680 was constructed by the Strategic Air Command in 1956 using the standard wing multi-purpose 39-01-53 hangar design. It covers 28,996 ft² and measures 295 ft 6 inches northeast/southwest by 126 ft 9 inches northwest/southeast, including offsets. It is supported by offset gable steel roof trusses with a corrugated metal roof. The exterior material is corrugated metal siding. The northwest elevation has a central nose bay flanked by four boarded up vehicle doors, two on either side of the nose bay. On the second story there are three two-over-two pane windows, two three-over-two pane windows, and two single-leaf pedestrian doors accessed by an exterior metal riser stairway. The southwest elevation has a small shed addition on the ground floor and a small band of windows on the second floor. The northeast elevation has a shed addition in the northwest corner with a louvered window-sized vent, two single-leaf pedestrian doors, and five boarded up windows. The southeast elevation consists of three nose-dock doors.

Building 681:

Name:	Building 681
Function:	Hangar
Date:	1956
Hangar Type:	Wing Multi-purpose 39-01-53
Era:	Cold War, Vietnam
Service:	KS ARNG
NRHP:	Unknown

Description: Building 682 was constructed by the Strategic Air Command in 1956 using the standard wing multi-purpose 39-01-53 hangar design. It covers 28,991 ft² and measures 295 ft 6 inches northeast-southwest by 126 ft 9 inches north-west-southeast, including offsets. It is supported by offset gable steel roof trusses beneath corrugated metal roof. The exterior is of corrugated metal siding. The entire exterior has been clad with new corrugate metal. The northwest elevation has a central nose bay flanked by four vehicle doors, two on either side of the nose bay. On the second story there are three two-over-two pane windows, two three-over-two pane windows and two single-leaf pedestrian doors accessed by an exterior

metal riser stairway. At least three single-leaf pedestrian doors are evident as well. The southwest elevation has a small shed addition on the ground floor and a small band of windows on the second floor. The northeast elevation has a shed addition in the northwest corner with a louvered window-sized vent, two single-leaf pedestrian doors, and five metal sliding windows. The southeast elevation consists of three nose-dock doors.

Building 682:

Name:	Building 682
Function:	Hangar
Date:	1956
Hangar Type:	Wing Multi-purpose 39-01-53
Era:	Cold War, Vietnam
Service:	KS ARNG
NRHP:	Unknown

Description: Building 681 was constructed by the Strategic Air Command in 1956 using the standard wing multi-purpose 39-01-53 hangar design. It covers 28,996 ft² and measures 295 ft 6 inches northeast-southwest by 126 ft 9 inches northwest-southeast, including offsets. It is supported by offset gable steel roof trusses that are roofed with corrugated metal. Its exterior is clad in corrugated metal siding. The northwest elevation has a central nose bay flanked by four vehicle doors, two on either side of the nose bay. On the second story there are three two-over-two pane windows, three-over-two pane windows, and two single-leaf pedestrian doors accessed by an exterior metal riser stairway. At least three single-leaf pedestrian doors are evident as well. The southwest elevation has a small shed addition on the ground floor and a small band of windows on the second floor. The northeast elevation has a shed addition in the northwest corner with a louvered window-sized vent, two single-leaf pedestrian doors, and five boarded up windows. The southeast elevation consists of three sliding nose-dock doors.

Reference:

Cultural Resources Survey and Evaluation Report for Kansas Air National Guard Properties at Forbes Field, Topeka, Kansas, Kansas Air National Guard and National Guard Bureau, Contract No.: W9133N-04-D-0005 ANG Project No.: ANG0553305 Delivery Order No.: 0006. April 2008.

Air Force Reserve

Westover ARB, Massachusetts Air Force Reserve, Chicopee, Massachusetts

Westover Air Reserve Base (ARB) is one of four airfields, ordered by the 1935 Wilcox Act to be located at the corners of the U.S. Its mission was to improve the nation's security. Money for the base was appropriated in 1939. The installation was home to the various Army Air Corps divisions during World War II. It was part of the Northeast Air District and hosted the First Air Force I Bomber Command and the Army Air Forces Antisubmarine Unit. During the course of the war, Westover became the largest military air facility in the Northeast. After the war, it became an Air Transport Command base.

With the creation of the Air Force, the base was renamed Westover Air Force Base in 1948. The Eighth Air Force was headquartered at Westover from 1955 until 1970. The base was closed in the spring of 1973 and was reopened as an Air Force Reserve base one year later.

Westover ARB is the country's largest reserve base, covering more than 2,500 acres. In addition to Air Force Reserve units the base is home to Army, Marine, and Navy reserve units.

Building 1:

Name:	Building 1
Function:	Hangar
Date:	1940
Hangar Type:	unknown
Era:	WWII
Service:	Air Force Reserve
NRHP:	Not Eligible

Description: Base Hangar Building 1 was designed to be the main hangar for airplane maintenance and repair when the Northeast Air Base was first conceived. It was originally designated as a center for airplane assembly, repair and maintenance, fighter pilot and submarine surveillance crew training. Construction was accelerated when involvement in World War II became more a certainty. Construction was under way in July of 1940 and the first plane was assigned in December of 1940.The hangar sits on 2.368 acres. Additional major renovations included technical rooms and equipment added in 1958, 1959, 1964, and 1972, and in 1988 and 1991.

Considered permanent buildings, the hangars were constructed for maximum safety with fireproof brick and corrugated asbestos exteriors. The hangar was organized on the first floor with rooms in the brick wings at each side for parachute rooms, post operations, night lighting, meteorological department, technical library, storage and shipping across the runway side with smaller rooms for rubber storage, clothing cold storage, bomb sight storage, radio repair rooms, engine shops and toilets on the first floor. On the second floor, officers were arranged along the sides. At the end of the war the base became an Air

Transport Command. The hangar was used during the Korean and Vietnam Wars, Desert Storm and for worldwide humanitarian flights.

It is the largest of the five hangars planned for the Northeast Air Base and constructed according to the plans of the U.S. Army Quartermaster Corps. Rectangular in plan (272 ft x 279 ft), it has a central hangar section, which has a broad arched roof raising the equivalent of four stories in height at its apex. Its interior space is free of all supporting posts. At each side of the hangar section is a two-story brick and concrete wing which serves to anchor the steel arch beams and act as the office/shop support space for hangar work. Unlike the other hangars, the base hangar has a single story brick and concrete section which extends across the street façade of the building. It has rounded corners and strip windows above the concrete scored base which contribute to the hangar's Art Moderne style. The interior of the hangar space is lit on the street or north façade by a symmetrical series of vertical windows which are graduated in height to fill the available space of the arch. On the south or runway façade the building originally had ten moveable, glass paneled doors on steel tracks. The doors on the west side have been removed and the opening filled in allowing for only three double vehicle bays. The east side of the opening has been retained. On the south façade are two 15 ft x 15 ft towers, one at each corner into which the doors retract. They were also designed to be used as parachute drying towers according to the as-built drawings. The exterior of the hangar section is corrugated metal replicating the appearance in large part of the original corrugated asbestos siding. Beneath the corrugated metal and roofing materials, the entire hangar is sheathed in wood, both roof and walls.

Navy Reserve

Naval Air Reserve Center, Minneapolis, Minnesota

Naval Air Reserve Center (NAR) Minneapolis, Minnesota includes six buildings and one structure, including an administrative facility, the hangar, a hazardous storage building, a guardhouse, a warehouse and the Marine Corps vehicle maintenance shop. It is 5 miles southwest of Minneapolis, near Richfield, Minnesota, and sits between two major runways at the Minneapolis-St. Paul International Airport, enclosed by chain-link fencing. Total acreage of the Reserve Center is 115.34 acres.

The Minneapolis-St. Paul International Airport has many of the pre- and post- World War II structures still extant on the northern side of the airport. Primarily established to be an Army Air Corps training facility prior to World War II, it was known as the Wold-Chamberlain Field for the first half century of its existence. It was an extremely active Army Air Corps training facility during World War II and experienced rapid expansion during 1942–1945. The P-1 hangar was built during this time and was known as the Army Transport Command Hangar.

The current NAR Minneapolis site was established in 1955 by the Air Force as an early Cold-War training facility. The administrative facility and facility T-46 were constructed to complement the existing P-1 hangar. They were designed to be an expansion of the existing Air Force training facility, a mission the site fulfilled until the Air Force plans to excess the property resulted in a tenant agreement for the Department of the Navy (DON) to use the site for reserve air training in 1971. The DON improved the new NAR to meet its own training needs and remained a tenant until it acquired title to the property from the Air Force in 1994. In 1999, planned expansion of the Minneapolis-St. Paul International Airport prompted an agreement between the Metropolitan Airport Commission and the DON. The MAC constructed nearby replacement facilities in return for the current site. The transfer of property occurred in 2003 when a new 96,000 ft² Naval Reserve facility was completed.

Building P-1:

Name:	P-1
Function:	Hangar
Date:	1945
Hangar Type:	Unknown
Era:	WWII
Service:	Navy Air Reserve
NRHP:	Not Eligible

Description: its most prominent physical feature is the central hangar deck. It is composed of a steel frame superstructure with a large barrel vaulted roof supported by open web steel girders and concrete masonry unit walls. Opening into the hangar deck area are massive segmented hangar doors. Providing an abundance of natural light to the hangar deck are 10 groups of three large multi-paned windows located along the north and south upper deck of the main structure. One- and two-story additions flank each side of the main hangar deck and provide for various spaces housing the administrative, classroom and maintenance areas. Painted CMU block forms the exterior walls. Dark brown metal coping lines on the low parapet walls surround each individual addition of the building. Painted in light beige, the walls are contrasted greatly by the vibrant blue hangar and utility doors.

Reference:

Final Naval Reserve Force Cultural Resources Survey Naval Air Reserve Minneapolis, MN, November 2004.

Naval Air Reserve Center, Columbus, Ohio

Naval Air Reserve (NAR) Columbus was used to train and maintain Reservists for mobilization and active duty during the late Cold War, as well as during Vietnam and the Persian Gulf conflicts. NAR Columbus includes the following buildings: Reserve Training Building; Reserve Training Building (Hangar) Administration Building; Headquarters Building; Maintenance Shop; Supply Storage; Storage Building; Vehicle Maintenance Building; and the Drill Hall. The complex is 10 miles southwest of Columbus, Ohio, near Lockbourne in Franklin County, and is associated with the Rickenbacker International Airport. The nine buildings sit on a 24.21-acre site on the northwest side of the airport. It opened in 1942 during WW II as Lockbourne Army Air Base. The Air National Guard assumed control of it in 1949. The main buildings were constructed in the mid-1950's with additional improvements added in the 1960s. Lockbourne Army Air Base officially changed to Rickenbacker Air Force Base in 1974. A short time later, in 1979, Rickenbacker was recommended for closure, but it never fully did. In 1982, the Navy acquired title to NAR Columbus, including 8 buildings. The reserves still utilize the runways, although the airfield is now under the stewardship of the Rickenbacker Port Authority.

Building Unknown:

Name:	1001
Function:	Hangar
Date:	1953
Hangar Type:	Unknown
Era:	Cold War, Korea
Service:	Navy Air Reserve
NRHP:	Unknown

Description: The hangar is the largest building at NAR Columbus and is used for aircraft storage and maintenance. Constructed in 1953, the rectangular building features steel frame construction with exterior concrete masonry unit block and ridge metal siding. A front-gable roof is covered with metal panel roofing material and single-story office and maintenance areas flank each side of the hangar deck. Large-scale, slightly recessed hangar bay doors dominate the building's west or front façade and provide access to the main tarmac of the airfield. A tail-section door under the gable end accommodates large transport and cargo planes. While the front façade is painted gray, side additions are visibly contrasted with painted vertical metal panel exterior cladding. The south elevation is a beige metal lean-to addition that runs the length of the building. Roof heights vary, but the pitch is consistent and the lower roofline has shallow overhangs with horizontal and vertical metal drains. Windows have metal frames, side-by-side, two-light windows. Metal and glass single doors are at either end of the elevation. An overhead sliding door at the southeast side provides access for vehicles and eight metal louvered vents facilitate ventilation. The north elevation also has a lean-to addition with a shed roof. Painted dark blue, the addition has a stepped roofline where it meets the main hangar building, and exterior vertical drains provide visual segmentation of the otherwise plain elevation. A protruding entry has a centered metal door with decorative frame, and fenestration is limited to one metal frame vertical, two-light window and three louvered metal vents.

Reference:

Final Naval Reserve Force Cultural Resources Survey, Naval Air Reserve Center Columbus, OH, November 2004, Department of Navy, Naval Facilities Engineer Command, Contract N62467-98-D-0994, DO 11.

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APPENDIX E: PREPARERS

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PREPARERS

In 1990, Congress passed legislation establishing the DoD Legacy Resource Management Program to provide financial assistance to the DoD efforts to preserve our natural and cultural heritage. The program assists DoD in protecting and enhancing resources while supporting military readiness. This project was awarded in 2009.

The cultural resources management specialist for the DoD Legacy Resources Management Program is Ms. Cecilia Brothers. The project sponsor was Mr. Matt Nowakowski, National Guard Bureau, Air National Guard Headquarters. Mr. Nowakowski also served as technical point of contact for the project.

- **Jayne Aaron**, LEED AP, Architectural Historian, Project Manager, Principal Investigator. Ms. Aaron has over 18 years of hands-on experience as a project manager, architectural historian/cultural resources specialist, and NEPA specialist. She has over 15 years of experience managing programs and contracts for federal clients. Ms. Aaron meets the qualifications of the Secretary of the Interior for Architectural Historian. She has been involved in all aspects of Section 106 compliance for cultural resources, including the evaluation of U.S. Coast Guard vessels, numerous military installations, and land management agency buildings and structures. She has also designed innovative strategies and management plans to integrate new and existing regulations, policies, and guidance, and cultural and natural resource management activities into single planning and compliance programs, including NEPA, Environmental Justice, and the National Historic Preservation Act, and Native American Graves Protection and Repatriation Act. As part of her compliance responsibilities, Ms. Aaron has participated in consultation and meetings with a variety of stakeholder groups, including state and federal regulators, American Indian tribes, environmental consultants, and the public. She has written public releases, given presentations, responded to public comments, and facilitated meetings for various sized groups. She has also designed and developed training courses, and has taught in numerous educational and training programs.

- **Karstin Carmany-George, Archaeologist.** Ms. Carmany-George served as the first cultural resource manager for the Indiana National Guard, and in that position, developed an award winning, comprehensive program combining GIS, archaeological field work, and consultation to ensure the agency was able to meet its goal of troop readiness training while maintaining compliance with federal and state laws. Her sections 106/110 and NEPA project experience includes, but is not limited to, an expedited Section 106 process for the development of a mental hospital's historic district into an urban training center; resource evaluation and management using GIS, in-depth historic context used to evaluate historic archaeological sites, land development, and use; and programmatic agreement development. Ms. Carmany-George has participated in over 400 archaeological projects in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. She has participated in other anthropological and ethnographic projects including two ethnographic field studies to various American Indian reservations, American Indian advisory councils in an ethnographic museum setting, and an ethnographic study of gender relations on the campus of Ball State University, collaborative museum exhibition development with local American Indians, and tribal notification procedure development in compliance with cultural resource management.

- **Christopher Baker, Historian.** Mr. Baker has worked as a historian/cultural resource specialist advising clients on the management of historic resources. He has prepared cultural resource management documents and conducted impacts assessments (EAs and EISs); evaluated historic buildings, districts, and structures; developed cultural resource management plans and mitigation;

and designed innovative strategies to integrate new and existing regulations, policies, guidance, and resource management activities into single planning and compliance programs. He was involved in environmental planning, cultural resources management, and National Environmental Policy Act projects in 19 states for NASA, the Army National Guard, U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, National Park Service, Air National Guard, U.S. Coast Guard, U.S. Air Force, Colorado Springs Utilities, and the Denver Housing Authority. This work required a thorough understanding of appropriate federal regulations and directives (NHPA, NEPA, ESA, Preserve America, etc.), state regulations, and agency guidance.

- **Wanda Gray Lafferty, Document Specialist.** Ms. Lafferty has over 30 years of experience in business communications, marketing development, and convention planning and execution; creating brochures, newsletters, and other marketing materials; editing and document composition of general management plans, environmental impact statements, and environmental assessments; and as corporate paralegal and office administrator for law firms. Her work has included facilitation of Native American Consultation meetings and workshops, preparation of informational materials for public involvement under NEPA, technical editing, and document development. Previously, she designed, created, and maintained a Web site, was responsible for the design and creation of all public relations and media materials, and served as communications and membership director for a legal-based environmental nonprofit organization with a yearly budget of over $2 million; managed convention planning, booth and related marketing materials design, and was responsible for all travel arrangements and hosting of hospitality suites for an environmentally responsible oil exploration subsidiary of the fifth-largest oil exploration company in the world.