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It's a Cold War: The Air National Guard's Role in Defending America, 1946–1989

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EXECUTIVE SUMMARY

Between 1947 and the end of the Cold War era in 1989, the Air National Guard (ANG) transitioned from a dual state and federal reserve force of 12 wings that mostly flew fighter and bomber aircraft to a reserve of varied missions responsible for 100 percent of the nation's continental air defense. The ANG made substantial contributions to the Cold War effort in areas of mission, operations, and organization. This historic context study, DoD Legacy Resource Management Program Project 07-340, examines the role of the ANG in the Cold War effort. It provides an overview of military aviation and the establishment of the ANG, the Cold War, and then focuses on the missions and operations of the ANG during the years 1946-1989. Installation forms and patterns of development are discussed. Property types associated with the ANG installations, e.g., flightline built resources including hangars, alert resources, and others built resources not at the flightlines. The study concludes with summary conclusions and recommendations. Appendices provide tabular information on the missions, an inventory of ANG installations and Cold War resources with rating of historic significance, a portfolio of definitive drawings for ANG built resources.

Air defense was and remains the ANG's most enduring and significant mission. During the Korean War, ANG Aircraft Control & Warning (AC&W) operators and ANG fighter-interceptor pilots served on alert duty to detect, intercept, and destroy incoming enemy aircraft both at home and overseas. Their success led to the ANG's involvement in air defense missions that continues today. Air defense was a major concern for the Cold War years 1957-1964 when the Soviets threat was assumed to be via first missiles and then with a second wave of bombers. Beginning first as an experiment involving two ANG fighter-interceptor squadrons in 1953, ANG fighter-interceptor squadrons contributed about half of Air Defense Council's (ADC) alert fighter-alert force and by 1992 had taken over our nation's continental air defense. The ANG's alert mission was part of the overall early Cold War air defense system that responded to air-based threats through networks of land- and ship-based radar, citizen observers, fighter-interceptors on alert, and Nike and successor missile radar and control sites that sent information to Boeing Michigan Aeronautical Research Center (BOMARC) and then Semi-Automatic Ground Environment (SAGE) command and control systems. On alert at local civilian airports and military installations alike, the ANG provided ready response to enemy threat and represented a local and tangible link in the remote and esoteric defenses of our nation.

The ANG alert program also contributed to the Cold War reorganization of the U.S. military. With budgets devoted to building up the nuclear weapons inventory and military-industrial research and development, the ANG proved that the reserve forces could be counted on to carry out long-term, complicated missions and operations. Their credible showing in areas of AC&W and fighter and air refueling missions led to the acceptance of the Total Force policy and assignment of the reserves to

gaining commands such as ADC or Strategic Air Comment (SAC). Adequately equipped and trained, the reserve forces made a solid contribution alongside the active forces.

Other ANG contributions to the Cold War were in the areas of aerial refueling, airlift, and special operations and communications. ANG received its first KC-97 tankers in 1961 and modified the aircraft as KC-97Ls to accept auxiliary jet engines for additional power against the load of its fuel. With initial success in Operation READY GO in response to the Berlin Crisis, the ANG undertook a wider refueling operation with Operation CREEK PARTY in 1967 when the French pulled out of the North Atlantic Treaty Organization (NATO) complicating NATO use of air space and landing locations. The operation continued for 10 years. Beginning in 1976 contributed tankers to the SAC nuclear force.

The ANG contributed in the area of regional and specialized airlift, providing specialized airlift to provision remote Distant Early Warning (DEW) line radar stations in Alaska and Greenland and in Antarctica. They use specially fitted cargo aircraft (C-123Js and C-130s) that operate cold climate and rugged conditions that other aircraft could not operate. Beginning in 1988 the ANG at first on temporary basis then permanently since 1998 has taken responsibility for Operation DEEP FREEZE, which is the only military unit to serve the U.S. Antarctic Program. Also of note were the ANG's airlift operations to U.S. Southern Command (USSOUTHCOM) with Operation VOLANT OAK and COVENANT COVE.

In the areas of special operations and communications, the ANG made contributions that made lasting effect on the Cold War geopolitics. Air guardsmen from the Alabama and Arkansas ANG were involved in the Bay of Pigs covert operation because of their knowledge and experience with outdated B-26 Invader aircraft, the same flown by the Cuban military. So secret was the operation that it could not be carried out as official ANG unit operation. The failure of the operation had enormous implications for U.S. relationships with Cuba and the public's perception of U.S. competency and actions to counter communism. It also demonstrated the extent to which maintaining "plausible deniability" undergirded military and political decisions but was unrealistic. The Oklahoma ANG made a significant contribution to military communications with its development and operation of the "Talking Bird" aircraft, a modified C-97E aircraft that enabled secure communications between the field and the White House. The aircraft was directly associated with President John Kennedy who personally used it for foreign travel. It was part of the lineage of Cold War-era military communications that included the SAC Looking Glass command aircraft.

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Abbreviations and Acronyms

AAA	Anti-Aircraft Artillery
AAF	Army Air Forces
ABM	Antiballistic Missile
AC&W	Air Control and Warning
ACC	Air Combat Command
ACHP	Advisory Council on Historic Preservation
ADC	Air Defense Command
ADCOM	Aerospace Command
AEW&C	Airborne Early Warning and Control
AFB	Air Force Base
AFCS	Air Force Communications Service
AFHRA	Air Force Historical Research Agency
AFM	Air Force Manuals
AFSPC	Air Force Space Command
AMC	Air Mobility Command
ANG	Air National Guard
ANGB	Air National Guard Base
ANGRC	ANG Readiness Center
ANGS	Air National Guard Station
ARG	Air Refueling Group
ARNG	Army National Guard
ARPA	Advanced Research Projects Agency
ARS	Air Refueling Squadron
AWACS	Airborne Warning and Control System
BMEWS	Ballistic Missile Early Warning System
BOMARC	Boeing-Michigan Aeronautical Research Center
CAA	Civil Aeronautics Administration
CASF	Composite Air Strike Force
CFR	Code of Federal Regulations
CIA	Central Intelligence Agency
CNR	Cultural/Natural Resources Database

CONAD	Continental Air Defense Command
DEW	Distant Early Warning
DMZ	Demilitarized Zone
DoD	Department of Defense
DSEG	Defense Systems Evaluation Group
EADS	Eastern Air Defense Sector
FAA	Federal Aviation Administration
FIS	Fighter Interceptor Squadrons
GCI	Ground Control Intercept
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
ICBM	Intercontinental Ballistic Missile
ICRMP	Integrated Cultural Resources Management Plan
IFC	Integrated Fire Control
IGY	International Geophysical Year
IRBM	Intermediate Range Ballistic Missiles
MAC	Military Airlift Command
MAD	Mutually Assured Destruction
MATS	Military Air Transportation Service
MIRV	Multiple Independently Targetable Reentry Vehicle
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NEADS	Northeast Air Defense Sector
NEPA	National Environmental Policy Act
NGAUS	National Guard Association of the United States
NGB	National Guard Bureau
NHPA	National Historic Preservation Act
NORAD	North American Air Defense Command
NPS	National Park Service
NRHP	National Register of Historic Places
NSC	National Security Council
OAS	Organization of American States

OTH-B	Over-the-Horizon Backscatter
PDF	Panama Defense Force
PRC	People's Republic of China
PT	Patrol Torpedo (boat)
SAC	Strategic Air Command
SAGE	Semi-Automatic Ground Environment
SALT	Strategic Arms Limitation Talks
SAM	Surface-To-Air Missile
SDI	Strategic Defense Initiative
SLBM	Submarine-Launched Ballistic Missiles
TAC	Tactical Air Command
TFS	Tactical Fighter Squadrons
TIAR	Inter-American Treaty of Reciprocal Assistance/Tratado Interamericano de Asistencia Recíproca (aka Rio Treaty)
U.S.S.R.	Union of Soviet Socialist Republics (Soviet Union)
WADS	Western Air Defense Sector
WPA	Works Progress Administration

1. INTRODUCTION, METHODOLOGY, AND LITERATURE REVIEW

1.1. Introduction

In March 1946 Winston Churchill delivered his now famous "Iron Curtain" speech in which he astutely commented on the changed geopolitical situation at the end of World War II. Churchill observed:

> *"From Stettin in the Baltic to Trieste in the Adriatic an iron curtain has descended across the Continent. Behind that line lie all the capitals of the ancient states of Central and Eastern Europe. Warsaw, Berlin, Prague, Vienna, Budapest, Belgrade, Bucharest and Sofia, all these famous cities and the populations around them lie in what I must call the Soviet sphere, and all are subject in one form or another, not only to Soviet influence but to a very high and, in some cases, increasing measure of control from Moscow"* (Churchill 1946).

Churchill's observations were surprisingly prescient. In the succeeding four decades, concern over the expansion of this Soviet sphere gave rise to new American foreign and military policies; innovations in defense technologies; reorganizations of the U.S. military; and realignments of the United States and foreign nations as alliances focused on the worldwide containment of Communism. The period 1946 to 1989 in American history is commonly referred to as the Cold War period. Journalist Walter Lippmann coined the term "Cold War" in his 1947 book, *The Cold War: A Study in U.S. Foreign Policy* (Lippmann 1947). These years were characterized by an intense and all-consuming rivalry between two superpowers and their respective economic and political systems: The United States as leader of the capitalist western nations, and the Union of Soviet Socialist Republics (U.S.S.R., or Soviet Union) as leader of the Communist and Eastern bloc countries. With nuclear weapons making annihilation possible, direct conflict was avoided and the rivalry was carried on through indirect means: limited warfare in regional or local conflicts, political intimidation, conflicts through third parties, foreign policies based on defensiveness and counter defensiveness, and reliance on technologies of surveillance and destruction. For nearly a half century, the Cold War dictated U.S. foreign policy and U.S. military organization, strategy, and even infrastructure. Equally broad changes affected American culture and society as a whole. The effect of the Cold War has been considerable.

The Air National Guard (ANG), the reserve force of the U.S. Air Force under the National Guard Bureau (NGB), has two distinct missions: 1) to provide peacetime protection and support to the citizens and property of each state at the call of the Governor, and 2) to train to be a ready force and, upon a mobilization order of the President, to support the national military strategy during wartime. Following World War II, the U.S. military was reorganized to better respond to postwar geopolitical realities

although this reorganization had begun during World War II. The ANG was created as a distinct military branch and reserve force to the U.S. Air Force under the National Security Act of 1947. Therefore, the ANG itself is a product of the Cold War and its history is integral to the history of the Cold War.

The ANG maintains lands, aircraft, and facilities—built resources including maintenance hangars, "molehole" alert crew quarters, armaments, medical emergency shelters, and the like—that contributed to the Cold War effort both here and abroad. Many of these built resources were constructed specifically for the Cold War effort; others were constructed earlier but were used by the ANG during the Cold War. These resources are part of the history of the ANG, the U.S. military, and the nation. The ANG—the air branch of our nation's "citizen militia"—served in the Cold War effort valiantly and proudly both at home and overseas. Many of the installations, buildings and other resources managed by the ANG are Cold War assets. The ANG, like other federal agencies, is charged with managing its assets including cultural resources. Section 110 of the National Historic Preservation Act (NHPA) directs federal agencies to establish programs to identify and nominate its resources to the National Register of Historic Places (NRHP), our nation's official listing of properties of historical significance. Section 106 of the NHPA charges federal agency officials with taking into account the effects of its undertakings on historic properties and affording the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. As part of the Section 106 process outlined at the ACHP's regulations, 36 *Code of Federal Regulations* (CFR) Part 800, federal agency officials are required to identify properties listed in or eligible for the NRHP potentially affected by an undertaking. The agency evaluates properties for NRHP eligibility in accordance with the regulations of the National Park Service (NPS) (36 CFR 60).

This study was conceived by Matthew Nowakowski, then Cultural Resources Program Manager and National Environmental Policy Act (NEPA) Advisor at the ANG Readiness Center (ANGRC), NGB A7AN). He recognized that the many historic context studies produced for and by the U.S. military including the Air Force do not address adequately the ANG and its unique role in the overall Cold War effort. This study, supported by the Department of Defense Legacy Resource Management Program as Legacy Project 07-320, is a historic context study specific to the ANG. Its objective is to understand the ANG's role in the Cold War and the significance of its Cold War-related resources. It was researched and prepared by engineering-environmental Management, Inc. (HDR Environmental, Operations and Construction, Inc., as of 2010). Research was begun by Jayne Aaron, then of engineering-environmental Management, Inc. and continued by an HDR Environmental, Operations and Construction, Inc. team composed of Marjorie Nowick, Kathryn Plimpton, Lex Palmer, and Daniel Hart who prepared this report. Melissa Wiedenfeld provided research assistance and Nancy Jepsen contributed to the research and edited the report.

Because of its scope and focus, this study has several limitations. Since it focuses on the ANG's military contributions to the Cold War effort, its subject is military history. The study does not address the non-military mission of the ANG. In areas such as response to natural disasters (e.g., floods, fires, and earthquakes), response to civil unrest, or rescue of individuals, the ANG has a unique mission and has made worthy contributions that merit recognition; however, these are outside the focus of this study. This study overlaps with other resource-based studies that provide more comprehensive treatment of particular resource or property types or periods. In some cases, ANG installations occupy facilities that had military purposes other than for ANG missions and that are addressed more directly in other historic contexts. For example, the ANG inventory includes a number of Nike missile sites that the ANG did not operate. They are discussed to the extent necessary to enable researchers to understand them and their overall presence in the ANG inventory. However, other historic contexts and studies deal with their history more directly and with more detail. Professionals should refer to these other studies for more focused treatment of these types of resources.

1.2. Methodology

This methodological section begins with a discussion on historic context studies and their use for NRHP evaluations. Then the ANG's existing cultural resources literature is reviewed, and data gaps are identified. In the final section, the methods used to collect and analyze data are discussed.

1.2.1. Historic Context Studies and the National Register of Historic Places Evaluation

National Register of Historic Places Evaluation

The process for evaluating properties for eligibility to the NRHP or nominating properties to the NRHP is outlined in NPS regulations (36 CFR 60; 36 CFR 63) and various NPS guidance. Buildings, structures, sites, objects, or historic districts are categories of properties that may be nominated to or determined eligible for the NRHP. To be listed in or eligible for listing in the NRHP, a property should be 50 years or older, possess historic significance based on its related historic context, and retain historic integrity expressive of that significance. However, there are exceptions relative to age and significance pertinent to the ANG that are discussed further. Properties are evaluated for NRHP eligibility using the NRHP evaluation criteria, as listed in 36 CFR 60.4. For a property to be significant, it must meet at least one of the four following criteria:

- Criterion A: The resource is associated with events that have made a significant contribution to the broad pattern of history.
- Criterion B: The resource is associated with the lives of people significant in the past.

- Criterion C: The resource embodies distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic value; or represents a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D: The resource has yielded, or may be likely to yield, information important in prehistory or history.

The property also must retain historic integrity expressive of its historic significance. Historic integrity refers to the authenticity of a resource's historic identity as evidenced by the survival of physical characteristics it possessed in the past and its capacity to convey information about the basis for which the property is significant. Integrity occurs as authenticity of location, design, setting, materials, workmanship, feeling, and association. In addition to being significant under one or more NRHP criteria, a property must possess integrity in a majority of these areas. Location refers to the place where an event occurred or a property was originally built. Design considers elements such as plan, form, and style of a property. Setting is the physical environment of the property. Materials refer to the physical elements used to construct the property. Workmanship refers to the craftsmanship of the creators of a property. Feeling is the ability of the property to convey its historic time and place. Association refers to the link between the property and a historically significant event or person.

Sites or structures that may not be considered individually significant may be considered eligible for listing in the NRHP as part of a historic district. According to National Register Bulletin 15, *How to Apply the National Register Criteria for Evaluation*, a historic district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects that are historically or aesthetically united by plan or physical development. The district represents a significant and distinguishable entity whose components may otherwise lack individual distinction.

There are exceptions or special requirements or criteria considerations by which a property may be eligible for the NRHP even if not generally considered for listing in the NRHP as described above. National Register Bulletin 15 explains:

> *Certain kinds of properties are not usually considered for listing in the National Register: religious properties, moved properties, birthplaces or graves, cemeteries, reconstructed properties, commemorative properties, and properties achieving significance within the past fifty years. These properties can be eligible for listing, however, if they meet special requirements, called criteria considerations, in addition to meeting the regular requirements (that is, being eligible under one or more of the four criteria A–D and possessing integrity). The criteria considerations need to be applied only to individual properties. Components of*

> *eligible districts do not have to meet the special requirements unless they make up the majority of the district or are the focal point of the district.*

Pertinent to the ANG is that Criteria Consideration G provides an exception to the 50-year age guideline under certain circumstances. It states that a property may achieve significance within the past 50 years if it is of exceptional importance. The phrase "exceptional importance" may be applied to the extraordinary importance of an event or to an entire category of resources so fragile that survivors of any age are unusual. The necessary perspective for judging a property to be of exceptional significance is to be provided by scholarly research and evaluation, and must consider both the historic context and the specific property's role in that context. A property may be of exceptional significance within a national, state, or local context.

Historic Context

The Secretary of the Interior's *Standards and Guidelines for Historic Preservation Projects* and guidance of the NPS require the evaluation of properties for NRHP eligibility relative to a historic context. A historic context is a special type of study that provides the conceptual framework for establishing historic significance, property types, and historic integrity thresholds (registration requirements) of the property types.

> *Decisions about the identification, evaluation, registration and treatment of historic properties are most reliably made when the relationship of individual properties to other similar properties is understood. Information about historic properties representing aspects of history, architecture, archeology, engineering and culture must be collected and organized to define these relationships. This organizational framework is called a "historic context." The historic context organizes information based on a cultural theme and its geographical and chronological limits. Contexts describe the significant broad patterns of development in an area that may be represented by historic properties. The development of historic contexts is the foundation for decisions about identification, evaluation, registration and treatment of historic properties*. (National Park Service 2011a)

The preservation planning guidelines outline a five-step process for preparing a historic context:

1. Identify the concept, time period and geographical limits for the historic context;
2. Assemble the existing information about the historic context and assess information regarding bias;

3. Synthesize information and identify important patterns, events, research values; values embodied in architecture, construction technology, or craftsmanship; or intangible cultural values of a group;
4. Define property types and their locational patterns and contributing or character-defining features (historic integrity thresholds); and
5. Identify any additional information needs (National Park Service 2011b).

This historic context study considers the ANG's role in the Cold War during the years 1946 to 1989. The geographical focus of the study are the current locations of the ANG in the continental United States, Alaska, Hawaii, and the U.S. territories of Guam, Puerto Rico, and U.S. Virgin Islands. Since the ANG's military mission took it to locations both in the United States as well as overseas, the historical analysis requires consideration of the ANG's activities worldwide. However, resources of current ANG locations are considered. As of 2010, the ANG operates from approximately 178 installations, most under the direct control of the ANG and at some locations where the ANG is a tenant such as on active Air Force and other service branch installations. The ANG installations range in size from approximately 5 acres to more than 500 acres. At airport locations, the typical installation is about 100 acres. As tenant on military installations, generally the ANG facilities are limited in number as the ANG makes use of the overall support facilities of the larger installation. The ANG inventory includes installations collocated at municipal airports, military installations, and remote radar sites.

1.2.2. Review of Existing Literature and Data Gaps

The ANG has a large body of cultural resources surveys and other historical studies of its ANG installations and facilities. As of December 2010, the ANG's Cultural/Natural Resources Database (CNR) included 103 cultural resources documents regarding 63 ANG installations in 43 states or territories. These documents included cultural resources surveys (archaeological and/or buildings), Integrated Cultural Resources Management Plans (ICRMP) and more specific cultural resource preservation plans, and documentation of buildings and other resources to state-level or Historic American Buildings Survey (HABS)/Historic American Engineering Record (HAER) standards. The cultural resources documents range in date of completion from 1997 to 2010 with most dating to the period 2004 to 2008. However, not all cultural resources documents may have been loaded into the CNR database either by the installation, NGB A7AN personnel, or the cultural resources project contractor particularly early project documents. Some of ANG cultural resources investigations address archaeological surveys and sites only and not built resources.

The content and organization of the cultural resources reports are guided by the ANG statements of work and vary considerably. Generally, the reports typically present a brief methodology section, a short prehistoric and historic context chapter, description of each surveyed building or structure constructed in 1989 or earlier, and then an evaluation of each for NRHP eligibility. The list of resources to be surveyed and evaluated is derived from the installation's real property list and the years of construction for resources on the list, e.g., includes those built resources constructed in 1989 or earlier.

The historic contexts and analysis in the cultural resource reports vary considerably in length, level of detail, and depth. Some are only a few pages in length and are based on limited secondary sources. Generally, these are ANG installation histories presented on the unit's internet webpage or secondary summaries on commercial websites. Typically, the historic contexts in the cultural resources reports describe the pre-military settlement and development of the area of the installation, the establishment and construction of the installation, and general history of the ANG units assigned to it. Often there is a *pro forma* history of the establishment of the ANG as an institution and the genesis of the ANG unit. Both military and non-military roles of the ANG are discussed, although there is greater emphasis on the military mission. Rarely are the ANG unit and installation placed in terms of the history of the state guard.

Sometimes the developmental history of the installation is only a brief paragraph that sketches the overall development of its facilities as generalized installation-only building campaigns based on the dates of construction of the existing buildings. In other cases, major transitions in the mission of the units are given but not correlated to changes in the facilities except in a most general manner. Real property changes such as acquisitions of additional land are not discussed as part of the developmental histories. The historic contexts do not always provide a complete discussion of the development of the installation property, its facilities, and their significance from which to gauge the historic integrity of the properties.

A few of the reports are more extensive and do make use of primary sources to present a more complete and detailed history of the installation and its resources. Some reports have made use of primary material from the installation's records, oral history interviews, historic photographs and maps, historic newspapers, and annual reports and manuscripts, and other primary materials. Survey reports on Kulis Air National Guard Base (ANGB) in Alaska, Forbes Field in Kansas, Selfridge ANGB in Michigan, and Bradley ANGB in Connecticut are examples of these more extensive treatments.

The Secretary of the Interior's *Standards and Guidelines for Historic Preservation Projects*, particularly the standards and guidelines for preservation planning and evaluation, emphasize the application of NRHP evaluation criteria and criteria considerations in terms of an explicitly stated historic context that

includes historic themes, associated property types, and integrity thresholds (registration requirements). Most of the ANG cultural resources reports do not provide sufficient about the history of the installation, the units, and their history in terms of explicitly stated historic themes, significant events, or even articulated periods of significance for the installation. In some cases, significant events in ANG's own history directly associated with surveyed resources are missed, and in other cases the connections between the significant historic events or patterns are not explored sufficiently or justified for the purposes of the NRHP eligibility evaluation. Without historic contexts that are explicit about issues of historic significance, property types, and historic integrity, *pro forma* evaluation statements such "this building did not make a significant contribution to history or is not significant in terms of architecture or engineering" are unjustified and problematic.

Some data gaps in the ANG cultural resources literature have been identified above. Underlying these gaps, however, is lack of explicit comparative discussion of an installation relative to others. Generally, each installation's cultural resources and ANG unit's history are considered in isolation of other ANG resources. This is not the fault of the individual researchers as there is no comparative framework or synthesized treatment or data about the installations, facilities, or ANG units from which an individual installation or unit can be placed.

A considerable literature of excellent ANG history has been produced by ANG historian Charles Gross, Ph.D., and the ANG History Office that can provide the basis for developing historic themes and data syntheses. While focused in terms of broader ANG institutional or organizational history, these works contain information about unit histories, ANG military operations, trends in the organizational development of the ANG, and the contributions of the ANG relative to the overall history of the overall military.

The existing body of military historic contexts is partially applicable to the ANG and evaluation of ANG built resources. Where the Air Defense Command (ADC) and Strategic Air Command (SAC) were gaining commands for ANG units being investigated, the two excellent historic contexts for Air Combat Command (ACC) and Air Mobility Command (AMC) by historian Karen Weitze can be applied (USAF 1999a, 1999b). They also are applicable where an ANG installation was previously an SAC or ADC Air Force Base. Historic contexts of military aircraft hangars by Webster (1998) and Aaron (2011) are applicable to the ANG installations. Webster's study looks at World War II and Cold War era hangars across the military on the basis of an architectural typology that considers plan, size, and structural system and shape of each hangar. Aaron's study applies Webster's approach for hangars of the reserve forces including the ANG. The intent of both studies is basically descriptive and therefore is ahistorical. Both

studies are directly applicable to the ANG and provide useful comparative data for considering ANG resources. However, they need to be used in conjunction with considerable historical research regarding the overall history of the ANG installation and hangar, past operations and missions, and when and why changes to a hangar were made.

1.2.3. Data Collection and Analysis

Data collection began in 2008 with the gathering of an extensive digital dataset of ANG real property information and cultural resources reports from the ANGRC. An installation real property spreadsheet was received for each installation; it gives a complete listing of facilities in the ANG's real property system by category code, year of construction, construction type (permanent/temporary), and square footage, then broken into use categories. The real property lists were consolidated, post-1989 facilities removed, and the remaining facilities were sorted and resorted in various ways such as by property type, year of construction, geographical area of installation, and other criteria involving the history of the bases.

As part of the 2008 data collection effort, the ANG's library of installation cultural resources survey reports, historic context documents, and ICRMPs was collected from the ANGRC. In December 2010 a second collection of cultural resources reports was made from the ANG CNR database to incorporate new reports and additional reports newly scanned into digital format and available after the initial collection. As mentioned above, this library numbered 103 cultural resource documents representing 63 ANG installations in 43 states or territories. Most were cultural resources survey reports with a few ICRMPs and resource documentation packets. The cultural resources reports were analyzed for information about the ANG and Cold War history, unit and installation history, resources and property types, and NRHP eligibility.

Research for Chapters 2–4 on the history of the ANG and installation and resource developmental trends was conducted at various repositories, historic contexts, and using sources available on the internet. Works by ANG historian Charles Gross and the ANG History Program as well as material produced by the Air Force history program were the foundation for Chapters 2–4. A nearly complete collection of microfilmed ANG annual reports for years 1949 to 1960 was obtained from the U.S. Air Force Historical Research Agency (AFHRA), Maxwell Air Force Base. Additional manuscripts and records were consulted at AFHRA and the War College, and at Air University and Air Force websites and collections. The annual reports and other materials from AFHRA were most helpful in analyzing change in the ANG force structure and missions. Research was conducted at the National Archives and Records Center I and II in the record groups of the U.S. Air Force and NGB. Source materials included various memoranda, letters, and statistical reports. Historic context studies written for the DoD and Air Force on related

cultural resource topics were important to this study. Major studies used included Kuranda 2002; Webster 1998; Weitze 1999 (USAF 1999 a, b); Lewis, Roxlau, Rhodes, Boyer, and Murphey 1995; and Aaron 2011. This information was used to establish general trends, patterns, and key events of the Cold War and those involving the ANG. Histories of the various state ANGs were derived from the historic contexts in the cultural resources reports, secondary books and articles, and state and ANG websites and other internet sources. Historic newspapers were consulted regarding key events for additional historical detail.

The discussion of ANG installation types and trends in their developmental history in Chapters 5 and 6 make use of information on facilities in the ANG cultural resources reports which were used comparatively with information in the nationwide historic contexts focusing on various military property types. Historic contexts used included Kuranda (2002); Weitze (USAF 1999a, b), Webster (1998), and Aaron (2011). Information about construction assisted by the Works Progress Administration (WPA) for the DoD is from Goodfellow, Nowick, Blackwell, Hart, and Plimpton (2009). *Air Force Design Manuals, Definitive Designs of Air Force Structures* (AFM 88-2) dated 1952, 1957 with 1959 changes, 1967 with 1969 changes, and 1972 with 1976 changes provided information on standard designs for various property types, plans, architects, and other information. Articles in *The Military Engineer, Architectural Record,* and *Aero Digest* provided additional detail on infrastructural design changes and engineering problems and innovations of the period. Information from the survey reports on documented ANG buildings provided additional information not available from the definitive designs including buildings actually constructed at ANG bases and years of construction. This information together was invaluable for beginning to discern patterns across the ANG facilities portfolio.

Chapter 6 does not address all types of facilities that would be found at all ANG installations. It presents a selection of those types most tied to a mission. For example, Air Force Facilities Group 15 regarding water and similar infrastructure is not addressed. These examples were primarily support facilities that are not likely to be significant under any of the NRHP evaluation criteria. The examples of property types discussed in Chapter 6 are derived from Air Force manuals of definitive design plans, the above-cited historic context studies, and information contained in the ANG cultural resources reports as well as various "as-built" architectural drawings stored at the individual ANG installations. The architectural drawings maintained in the installation civil engineering records, in particular, are a very rich data source that should be tapped routinely during ANG installation survey research and evaluation projects.

1.3. Study Organization

This study is organized in seven chapters. Chapters 2 and 3 provide background on the establishment of the ANG and on the Cold War in general. The intent is that these two chapters serve as a backdrop for the

succeeding chapters that are more focused on the ANG and their built resources. Chapter 4 continues where Chapter 2 ended, and traces the evolution in the ANG force structure during the Cold War period, diversification of its missions, and its major operations. Chapter 5 examines the trends in the developmental history of the ANG installations, and looks at installation types. Chapter 6 provides a summary of selected ANG Cold War built resources in terms of property types. Chapter 7 provides a summary of recommendations and conclusions.

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2. ESTABLISHMENT OF THE AIR NATIONAL GUARD

The history of the ANG is divided across two chapters. This chapter traces the establishment of the ANG until 1947. Chapter 3 provides a summary of the Cold War including its major themes and events. Chapter 4 resumes the discussion of the ANG history, considering the ANG's post-1947 diversification of force structure, Cold War missions, and major operations.

The roots of the ANG were in the Army's and Army National Guard's early aviation units. For this reason, this chapter opens with a discussion of aviation in the U.S. Army, 1900–1946, followed by a section that provides an overview of the air arm of the Army National Guard and aviation in the state Army National Guard units. In the third section, the creation of an independent U.S. Air Force and the ANG as a distinct reserve branch of the U.S. Air Force is described.

2.1. Aviation in the U.S. Army

Aviation was first integrated into the U.S. Army in 1907 with the creation of an Aeronautical Division in the Office of the Chief Signal Officer. The Aeronautical Division, then consisting of one officer and two enlisted men, took "charge of all matters pertaining to military ballooning, air machines and all kindred subjects" (Wolk 1984:3). Orville and Wilbur Wright piloted the first heavier-than-air aircraft near Kitty Hawk, North Carolina, on 17 December 1903. They offered to sell their original plane to the Army in 1905. The Army declined, believing that the Wright Brothers were seeking research funding. The Army purchased the first military plane from the Wright brothers in 1909 (Haulman 2003:1-4).

In 1913, Congress debated reassigning the Aeronautical Division from the Signal Corps and creating a new Aviation Corps under the Army Chief of Staff. Some aviation advocates objected, arguing that military aviation was not developed sufficiently to merit its own organization. The War Department also objected and the proposed move was abandoned. Nevertheless, military aviation continued to grow within the Signal Corps. In 1914, Congress replaced the Signal Corps Aeronautical Division with the Aviation Section, and authorized a force of 60 officers and 260 enlisted men (Haulman 2003:11; Wolk 1984:3).

2.1.1. Army Aviation during World War I

Military aviation played only a supporting role in World War I, but its contributions to the military effort during the war demonstrated its potential. Aircraft were used for observation and support of military ground units. Military strategists envisioned that aviation would be used for such strategic missions as bombing the enemy's manufacturing, transportation, and communications resources. As a result, the role of aviation within the Army continued to expand. In May 1918, aviation was transferred to a more

autonomous position within the War Department with the creation of two War Department bureaus, the Division of Military Aeronautics and the Bureau of Aircraft Production (Haulman 2003:17). Days later, the Army Air Service was established, and the two bureaus were placed within it (Wolk 1984: 5-6; Haulman 2003:17).

Initially, the Army Air Service developed slowly after World War I as military officials analyzed the impact of aviation's wartime application. Textbooks at Army instructional schools continued to emphasize the observation function of aircraft, and the Reorganization Act of 1920 preserved the Air Service as a branch of the Army despite legislative efforts to separate aviation from the Army (Wolk 1984:7). Military officials continued to refine aviation's mission during the 1920s and 1930s.

Army installations with dedicated airfields were established during this time. The 1917 mobilization for World War I resulted in the establishment of Mitchell, Langley, Barksdale, March, Selfridge, and Hamilton Fields as dedicated World War I Army airfields. They were large square parcels with an undeveloped airstrip set in the middle, and a line of wood-frame hangars aligned in a single row along one side of the field. The field and hangars were designed by the prominent architectural firm of Albert Kahn.

2.1.2. The Interwar Period

Army doctrine and the administrative structure shifted toward the creation of an independent air force. Instructors at the Air Service Field Officers School taught doctrine based on an independent air force. In 1926, the school published *Employment of Combined Air Force*, the first publication that emphasized a strategic objective for the air arm. A General Headquarters Air Force was formed in 1935. Through the 1930s, military officials continued to debate administrative issues and lines of authority, while simultaneously debating the role of aviation. The commanding general of this new organization took over the operations of Air Corps units from the Army Corps area commanders, although the chief of the Air Corps continued to be in charge of unit support, handling equipment procurement, personnel issues, and funding. The chief of the Air Corps and the General Headquarters Air Force occupied the same level in the War Department hierarchy, and each responded directly and independently to the War Department. In 1936, air stations were removed from Army Corps area commanders' control and placed under the Air Corps. In 1939, the General Headquarters Air Force was placed under the office of the Chief of the Air Corps in an effort to consolidate operations (Wolk 1984:14–20).

During the military mobilization for World War II, aircraft production increased dramatically in anticipation of a central role for aviation. However, proponents of air branch independence received a setback when the General Headquarters Air Force was transferred to the Commander of Army Field

Forces. Army Corps area commanders resumed control of air stations; therefore, instead of responding directly to the War Department, General Headquarters Air Force was absorbed into a lower level of the War Department hierarchy. Meanwhile, the Air Corps took its own steps toward independence. In 1940, the War Department formed the ADC to handle planning, although the General Headquarters Air Force remained responsible for air defense (Wolk 1984:20-21, 24).

The creation of the Army Air Forces (AAF) on 20 June 1941 represented the next step toward air autonomy (Wolk 1984:21). Two significant events bolstered the authority of the AAF within the U.S. military structure. On 10 July 1941, the Deputy Chief of Staff for Air and the Navy's Chief of the Bureau of Aeronautics joined the Joint Army-Navy Board. The following month, Major General Henry "Hap" Arnold represented the air arm at the Atlantic Conference meeting between President Franklin D. Roosevelt and British Prime Minister Winston Churchill. When World War II began in Europe, Arnold became a member of the U.S. Joint Chiefs of Staff and the Anglo-American Combined Chiefs of Staff (Wolk 1984:22–23).

In the fall of 1941, military officials began debating whether to adopt General Arnold's proposal to reorganize the military structure to create a more complementary relationship between air and ground forces, and to allow for coordination between the two forces. This proposal would have placed the air forces on more equal footing with ground forces, but would not have established an autonomous command for air, a step contained in an earlier plan developed by General Arnold and rejected by the War Department. The War Plans Division of the War Department General Staff approved General Arnold's revised plan in principle, but the Japanese attack on Pearl Harbor put aside any further action on the proposal (Wolk 1984:26-27).

2.1.3. Army Aviation during World War II

For the duration of the war and six months afterward, the AAF was made one of three autonomous commands within the Army structure, joining the Army Ground Forces and the Services of Supply. This change was established in War Department Circular 59, *War Department Reorganization,* dated 2 March 1942. War Department Field Manual 100-20, *Command and Employment of Air Power*, issued 21 July 1943, illustrated the shift in air doctrine away from a support role. The Field Manual established the strategic, tactical, and air defense roles as the primary functional missions of the air forces. Until the close of the war, it was the definitive War Department directive on the employment of air power in joint operations (Wolk 1984:27, 30-31).

At the war's end, American air power had been crucial to the Allied victory and helped convince military planners that military aviation had come of age. In April 1942, Jimmy Doolittle, who had served under

General Billy Mitchell in World War I, led 16 B-25 Mitchell bombers in a low-level attack on Tokyo and other Japanese cities, for which he received the Medal of Honor. Curtis E. LeMay led the Twentieth Air Force on missions to target Japanese aircraft production and oil supply centers ("The Air Force is '20" 1967:4). These missions and the dropping of the atomic bomb on Hiroshima and Nagasaki demonstrated the strategic significance of military aviation (Air University 1955:53).

2.2. Aviation in the Army National Guard 1900–1946

2.2.1. Early Army National Guard Aviation

Army National Guard members organized informal aviator groups within their recognized units soon after the Army officially recognized the value of military aviation. The first of these informal groups was formed in 1908 when 25 volunteers from the New York National Guard gathered on 30 May at the Park Avenue Armory to learn ballooning. Unofficial National Guard aviation units soon organized in other states; one in California was established on 7 February 1911, and in Missouri within the next month.

The 1st Aero Company, New York National Guard, was organized in 1915 by Raynal C. Bolling, a New York National Guard member and the chief attorney for United States Steel Corporation. New York's 2nd Aero Company was organized in Buffalo in 1916. The two New York companies were the first two National Guard aviation organizations mobilized for federal service and served in the 1916 mobilization at the Mexican border (Gross 1985b:1–2; Gross 1955:30).

Early National Guard aviation units were self-supporting through private donations and received little state or federal support. The 1st Aero Company built its first aircraft for $500. When it was lost in a crash, the company secured the loan of an airplane and pilot from the Curtiss Aeroplane Company. The pilot, Beckwith Havens, is considered the National Guard's first aviator. In 1915, the Aero Club of America equipped the 1st Aero Company National Guard unit with five airplanes for $29,500 (Gross 1985b:1; McKinley 2001:131). Federal appropriations soon were authorized to train National Guard aviators. The first such appropriation was in 1917, when $76,000 was provided to train 18 National Guard aviators at three Air Corps aviation schools (Chief of the Militia Bureau 1917:53).

2.2.2. Army National Guard Aviation During World War I.

National Guard aviators served during World War I as members of the Signal Corps Reserve rather than with their units. The War Department decided against combat mobilization of the Signal Corps Reserve for several reasons (Gross 1985b:2). The units had insufficient funding to keep their equipment up to date, the units had difficulty recruiting mechanics, and the units had not sufficiently demonstrated their military worth during the Mexican border duty of 1916.

Aviators who wanted to volunteer for war service with the Army were crucial to the Allied victory. Approximately 100 National Guardsmen were either qualified or in training to become military pilots. In contrast, the Army had not built an aviation structure of personnel, technology, intelligence gathering, and equipment sophisticated enough to fight an air war. When the United States entered the war, only 26 of the Army's Signal Corps aviation section's 131 officers were qualified aviators, and none were trained for combat. Most of the Signal Corps' 250 aircraft were obsolete by European standards (Gross 1995:33).

National Guard aviators served with distinction in the war. Among these was Raynal C. Bolling, commander of the 1st Aero Company, who led a mission to Europe in June 1917 to gather information on Allied aircraft industries. He was killed by German infantry fire on 26 March 1918 (Gross 1985b:2). Major Rueben Fleet of the Washington State National Guard was a senior Air Service officer (McKinley 2001:132). He was assigned to Air Service Headquarters in Washington, D.C., where he planned and trained pilots for the first U.S. Air Mail from Washington to New York, which was inaugurated on 15 May 1918. In 1918, during air operations in France, Tennessee Guardsman Reed Chambers flew with the 94th Pursuit Squadron on the first-ever combat mission of a U.S. squadron. Second Lt. Ervin R. Bleckley of Kansas, a guardsman who flew as an aircraft observer in France with the 50th Aero Squadron of the American Expeditionary Forces, was killed trying to find the "lost battalion" of American infantry in the Argonne Forest. Both he and his pilot, 1st Lt. Harold E. Goettler, were awarded Medals of Honor posthumously (National Guard Bureau Historical Services Division 2004).

2.2.3. The Interwar Period of Army National Guard Aviation

After World War I, aviation units achieved a permanent place in the National Guard as part of infantry divisions. The U.S. government agreed to provide planes and equipment, pay personnel, and provide one regular Army officer for training in each state that formed a squadron. The states provided airfields and hangar facilities.

In 1920, federal authority was granted for each National Guard division to have one aero unit consisting of an observation squadron, a balloon company, a photo section, and a unit that would serve under the Military Intelligence Division (Chief of the Militia Bureau 1920:11). In 1921, the 109th Observation Squadron of the Minnesota National Guard became the first air unit to receive federal recognition (Gross 1995:36-37). An observation squadron was organized in Maryland the same year and five more were organized in other states. None of these units could receive flying equipment because they did not have ground facilities.

Between 1921 and 1930, 19 air observation squadrons were organized for all of the National Guard divisions. By 1930, 10 additional observation squadrons were formed as independent entities that were

unattached to divisional units (Gross 1985b:2). The squadrons focused on improving flying skills, supporting ground forces, and state missions such as providing transportation during flood-relief efforts or subduing civil unrest (National Guard Bureau Historical Services Division 2004).

The most famous National Guard aviator of the interwar period was Charles A. Lindbergh. He joined the 110th Observation Squadron of the Missouri National Guard in 1925, was promoted to captain the following year, and served as a flight commander, parachute officer, and pilot. He became the chief pilot on the airmail route between St. Louis and Chicago in 1926. Because of time constraints, Lindbergh's National Guard career virtually ended after his trans-Atlantic flight in 1927 (Gross 1995:39-40).

Despite aviation's permanent status in the National Guard, its development during the interwar period was gradual, and its growth was hindered by a lack of resources and a lingering atmosphere of informality. During the early 1920s, pilots injured in service were not compensated during their recovery, thus restricting the service to men wealthy enough to stop working (Chief of the Militia Bureau 1922:33). Through most of the 1920s, National Guard units used training aircraft left over from the Army. A National Guard modernization program began alongside the Air Corps Act of 1926 which expanded and modernized the Air Corps' fleet. However, the states did not consistently provide adequate airfields and equipment storage facilities until 1932 (Chief of the Militia Bureau 1932:2). National Guard squadrons abandoned planes capable of only daylight flight in good weather, and began receiving modern aircraft to support ground forces (Gross 1995:40).

Through the late 1930s, squadrons were "small, close-knit organizations." Aviators did not train as groups, fly cross-country, fly at night, or file flight plans. Units without armories met wherever they could find space. Some units were known as "flying country clubs." During their annual training, members of the New York 102nd Observation Squadron also played tennis, swam, went boating and water-skiing, and played polo using horses borrowed from the artillery (Gross 1995:40–42, 45).

By the 1930s, National Guard aviation units undertook more observation missions as the regular Army shifted to pursuit and bombardment aviation. The Air Corps did not want to undertake ground support missions, such as ground attack and observation, because it considered them marginal (Gross 1995:41). The chief of the Air Corps advocated training and equipping some squadrons for independent missions, but was thwarted by the National Guard, which focused on the infantry (Gross 1995:41, 46). The National Guard provided crews and 95 aircraft for the Air Corps' 1931 annual maneuvers that involved a series of mass flights across the country. Their goal was to "test the [Army Air Corps'] mobility and determine the problems of handling a large aerial force." Portions of 19 National Guard squadrons participated as a

composite wing, despite their usual practice of flying unaccompanied by other aircraft or in small formations (Gross 1995:44).

2.2.4. Army National Guard Aviation and World War II

National Guard aircraft and related aviation equipment underwent massive modernization during the 1930s. At the end of the decade, each squadron had photographic and radio equipment, and training was available in tactics, flying, maintenance engineering, radio, photography, and armament. In addition, officers were trained to lead larger units, in anticipation of wartime needs. There still existed a "serious deficiency in such training facilities as artillery ranges, infantry combat firing ranges, and aviation-gunnery rangers" (Chief of the National Guard Bureau 1939:24, 30; Chief of the National Guard Bureau 1940:14, 23, 25, 26, 37). Nevertheless, during prewar mobilization at the end of the decade, the Air Corps still viewed the National Guard's aircraft, as well as its observation mission, as obsolete (Gross 1995:46). When the National Guard was ordered into federal service in 1940, it provided 29 observation squadrons. None of the squadrons were attached to Army divisions, but several kept the numerical designations indicating their divisional affiliations. The majority of National Guard aviators were assigned to Army Air Corps individually rather than attached to National Guard units (Gross 1985b:2).

Approximately 4,800 National Guard aviation personnel were mobilized for World War II, including 613 pilots, "providing a significant augmentation of the Army's rapidly expanding air arm" (Gross 1995:53). One of their most significant contributions to the war was in training and leading the airmen of the AAF. Eight National Guard flying units spent World War II in the United States training AAF pilots (Doubler 1999). Most units were disbanded during the war, and once again, aviation personnel were assigned throughout the AAF. National Guard aviation units that were not disbanded did not focus on observation, but became reconnaissance, liaison, fighter, and bombardment squadrons (National Guard Bureau Historical Services Division 2004).

2.3. The Creation of an Independent Air Force and the Establishment of the Air National Guard

The following section summarizes major events leading to the creation of the ANG as a separate reserve force of a distinct U.S. Air Force.

2.3.1. The Post World War II Military

Postwar planning for a reconfigured military began as early as 1941. Military planners addressed two issues: the size of the regular armed forces, and the size and role of the air forces. Historically, the military demobilized during peacetime. The same pattern was true after World War II. A smaller Army

supported by a large reserve system was preferred because such a system "was considered more in accordance with the democratic citizen-solder concept" (Brayton 1972:139).

The creation of an independent air branch resulted from a struggle within the Army between those who would retain control of air units, and the AAF that advocated the creation of an independent service. Central to this debate was the military role of aviation and the value of strategic bombing as the tactical basis for the creation of an independent aviation service (Gross 1985a:70).

The AAF underwent reorganization within days of Churchill's famous March 1946 "iron curtain" speech. The AAF was divided into three major commands: ADC, SAC, and Tactical Air Command. The latter was given the mission to organize and administer the integrated air defense system of the continental United States.

2.3.2. Establishment of the Air National Guard

Many military officials were not convinced that the National Guard was necessary in postwar defense due to training limitations and the time required for mobilization (McKinley 2001:132). The Army, the AAF, and the Navy independently developed postwar planning staffs and plans. None of the services placed a National Guard aviation unit prominently in their plans (Gross 1995:58). The establishment of an independent air organization within the National Guard resulted from competing visions of aviation within the National Guard and considerable lobbying by the National Guard and National Guard Association of the United States (NGAUS).

Army Chief of Staff George C. Marshall, who dominated postwar military planning, promoted the creation of an independent aviation arm of the National Guard in order to gain the support of the NGAUS for universal military training. In return for supporting universal military training, the NGAUS, a private organization of active and retired National Guardsmen, received assurance that the National Guard would remain the Army's first-line reserve force. Marshall wanted to develop a postwar military plan that recognized the need for increased peacetime military preparedness, but recognized that Americans did not support a large standing army. (Gross 1995:57–58, 60).

The AAF supported an independent, active-duty air force affording the military advantage of strategic bombing. Its plan did not include a state-controlled National Guard, a federal reserve force, or universal military training. Lacking experience with reserve flying units, it focused on lobbying for an active-duty independent Air Force (Gross 1995:58).

The National Guard felt that its members were unfairly treated and had been made accountable for poor prewar Army planning, organization, and equipment during World War II. In addition, the National

Guard feared postwar Army policies would lead to the elimination of senior Guard leaders to create opportunities for younger regular Army officers. After the war, senior Guard officers sought the assistance of the NGAUS to give voice to their concerns (Gross 1985:71).

The NGAUS was a powerful lobby group for several reasons. Primary among these was its close relationship to state governments and political parties. The Adjutant General administered each state's National Guard organization and typically was a political appointee. The NGAUS, as an independent body free from federal government control, could lobby Congress as an outside party on issues affecting the National Guard. The NGAUS used its ties to local congressional districts, state governments, and political parties to lobby Congress for a more active role for the National Guard in the postwar military. From this successful lobbying an Army General Staff committee on the postwar National Guard was formed to discuss the issue of the air component of the National Guard. The committee met from August 1944 to September 1945 (Gross 1985: 71; 1995:60–61).

The AAF proposed a modified plan in October 1944 that included a National Guard air component, and the War Department Special Planning Division developed a counter proposal. The AAF's plan had a National Guard air component, but relegated the units to distinctly secondary roles without adequate resources. The War Department's counter proposal established dual-component reserve systems for the Army and the AAF, the National Guard as the Army's first line reserve force, and an independent air arm of the National Guard. The Secretary of War approved the War Department's plan on 13 October 1945 (Doubler 1999; Gross 1995:60–61).

The following winter was devoted to working out details of the plan. In December 1945, the Aviation Group of the National Guard was established to help plan and organize the new reserve component – the ANG. The plan called for the ANG to be a primarily air defense force. It was to consist of 72 fighter squadrons and 12 light bomber units. The following January, the Army Chief of Staff, General of the Armies Dwight D. Eisenhower, ordered the piecemeal activation of National Guard aviation units under an AAF plan. NGB officially announced the plan to the states in February 1946, and the plan was approved by the top military leaders in April 1946. The Army Chief of Staff endorsed the initiative on 25 April 1946. According to the plan the federal government would provide aircraft, supplies, instructors, and pay, and the states would provide personnel, bases, and storage facilities. Projected personnel were established at 58,000 divided among the states based on their male population the number of men aged 18 to 35 years in a given state. Air bases were located near population centers. (Gross 2007a, 1985b:20).

2.3.3. The ANG in a Separate, Independent U.S. Air Force

The National Security Act (Public Law 253 1947) passed into law on 18 September 1947, creating the U.S. Air Force as a separate military service within the armed forces and the ANG as its reserve component under the National Guard. At the end of 1947, the first year of its formal establishment, the ANG's personnel strength reached 40,995.

The Act established three departments within the national military establishment: The Department of the Army, the Department of the Navy, and the Department of the Air Force. Each department had its own secretary. Under the legislation, the President appointed the civilian secretaries of each department. The first Secretary of the Air Force was W. Stuart Symington, who previously served as the Assistant Secretary of War for Air. The legislation stipulated that functions of the Secretary or the Department of the Army, including those assigned to or under the authority of the Commanding General, AAF, and those deemed by the Secretary of Defense to be necessary or desirable for the operation or administration of the Air Force, were transferred to the Department of the Air Force (Air University 1955:57). The act directed that all transfers occur within two years. All AAF and Air Corps units and personnel were transferred to the Air Force.

3. OVERVIEW OF THE COLD WAR

3.1. Introduction

This chapter presents an overview of the Cold War as a backdrop to understand the ANG's place and contributions in this important historical period. The chapter is organized according to a three-part division of the period: Section 3.2 is Phase I, Inception of the Cold War (1946–1953); Section 3.3 is Phase II, Nuclear Escalation & Technological Development (1953–1963); and Section 3.4 is Phase III, Détente and New Deterrence (1963–1989).

This framework is an adaptation of one used by Lewis, Roxlau, Rhodes, Boyer, and Murphey (1995) in their Cold War historic context for the ACC. Their four-period scheme was based on policies, strategic decisions, and military events that had affected ACC's material culture and built environment. Thus the 1995 framework provides a useful starting point to consider the history of the ANG and the significance of its Cold War-related cultural resources. However, modifications to the framework have been made to account for ANG history: the latter two phases of the framework have been combined into a single late phase because there were relatively few changes that had major consequences for the ANG's material culture and built resources. This three-phased framework for the Cold War for the purposes of this study are shown in Table 3-1 and are as follows:

- Phase I, Inception of the Cold War (1946–1953);
- Phase II, Nuclear Escalation & Technological Development (1953–1963);
- Phase III, Détente and New Deterrence (1963–1989).

TABLE 3-1. THREE PHASES OF THE COLD WAR

Cold War Strategy & Policy	Events	Infrastructure & Weaponry
Phase I – July 1946 to January 1953 – Inception of the Cold War: concepts of containment of Communism, cost control, and deterrence as national military policy, National Security Council Report NSC-68	Berlin Blockade and Berlin Airlift 1948–1949, Rise of China (Mao Tse-tung's regime) – 1948, North Atlantic Treaty Organization (NATO) formation 1949, Korean War 1950–1953	Nuclear weapons, early air defense system
Phase II – January 1953 to November 1963 – Nuclear Escalation: development of air defense system (ADC, NORAD), Massive Retaliation under Eisenhower, "Flexible Response" under Kennedy	Soviet Warsaw Pact 1955, Soviet Sputnik satellites launch 1957, 1958, NORAD, U-2 Reconnaissance & Gary Powers 1960, Cuba Bay of Pigs Invasion 1960, Berlin Crisis 1961, Cuban Missile Crisis 1962	Development of nuclear weapons, B-52 bomber, ICBMs, satellite-based photo reconnaissance, radar systems (Pinetree & DEW Line), airborne reconnaissance U-2 aircraft, airborne control & control facilities
Phase III – November 1963 to 1989 – Détente and New Deterrence: (SALT I, Nuclear Nonproliferation Treaty, ABM Treaty), deterrence through nuclear parity, Schlesinger & Presidential Directive 58- limited nuclear war & flexible options; Reagan's military buildup as a means of negotiation & deterrence.	Vietnam War 1961–1975; Korean Airlines 007 – 1985, Geneva Summit – 1985, Fall of the Berlin Wall, Dec 1989–Feb 1990 Panama "Operation JUST CAUSE" – Dec 1989	Hardening of silos, SRAM, Minuteman II, Tomahawk missiles, MX, redundancy in command structure & communications; SDI

3.2. The ANG and the Inception of the Cold War: 1946–1953

The Cold War had its roots in agreements and reorganizations made at the end of World War II. At the Yalta Conference in February 1945, leaders of the United States, the United Kingdom, and the Soviet Union met to discuss postwar Europe. Berlin was divided into four sectors to be governed by the four victor countries. Movement between the sectors was guaranteed to all residents, and the Soviet Union agreed not to take over the countries of Eastern Europe.

However, only nine months after V-E Day, the Soviet sphere encompassed Poland, Romania, Bulgaria, and Albania, despite the agreement at Yalta. Winston Churchill observed the Soviet expansion as the descent of the Iron Curtain in his famous speech of March 1946. A year later, when Communists were at Turkey's and Greece's doors, President Truman announced to Congress his intention that the United States provide economic and military support for those countries to help stem the spread of Soviet influence. In his March 1947 speech to Congress, he stated that the United States should "support free peoples who are resisting attempted subjugation by armed minorities or by outside pressures" as a matter of policy. Known as the Truman Doctrine, the policy was further developed in 1950 in the National

Security Council (NSC) Report 68, *United States Objectives and Programs for National Security,* which was explicit that the Soviet Union was trying to spread its power across the globe and the United States should contain the spread of Communism through aggressive economic and military means.

An opening shot of the Cold War took place in Berlin. In June 1947, Secretary of State George Marshall announced the plan to provide technical and financial aid to rebuild Europe. In support of the rebuilding effort, the three allies combined the business operation of their three sectors of Berlin as a common economic unit and instituted a common currency. In retaliation, on 24 June 1948, the Soviets blocked military supplies moving via roads and rail from Berlin to the west. In response Britain, the United States, and western countries instituted an airlift of food and supplies to support the residents of western Berlin. The airlift lasted 324 days, and provided about 13,000 tons of supplies daily. The Berlin blockade and airlift was an example of the indirect military action that became the norm of the Cold War.

The United States joined with Latin American and European nations through alliances and treaties to fight the spread of Communism. Concerned about maintaining a western hemisphere free of Communism, and protecting the Panama Canal, the United States and Latin American countries entered into the Inter-American Treaty of Reciprocal Assistance (aka Rio Treaty or TIAR) of 1947, known as the "hemispheric defense" treaty. Led by Secretary Marshall, the Organization of American States (OAS) was created in April 1948. Twenty-one Latin American nations pledged to fight Communism. In April 1949 the United States, western European nations, and Canada formed the North Atlantic Treaty Organization (NATO) for collective military response against the Soviet Union.

The march of Communism gained ground in Asia. In November 1948 Chinese Communist forces took over Manchuria, and then on 1 October 1949 Mao Tse-tung and Communists proclaimed the establishment of the People's Republic of China (PRC). The following 25 June, North Koreans aided by the Soviets invaded south of the 38th parallel into South Korea. The United States appealed to the United Nations, and the United States, Britain, and other nations responded under the United Nations flag. North Korea continued southward, but U.S. General MacArthur repelled the invasion and crossed northward. The newly Communist country of China responded with a massive force and on 16 December 1950 President Harry Truman declared a national emergency. By spring 1951 the situation was deemed hopeless, and a stalemate was evident. Truman authorized a near doubling of active duty manpower to 1,061,000 by 30 June 1952. Ultimately the war ceased with an armistice that restored the border between the Koreas near the 38th parallel and created the Korean Demilitarized Zone (DMZ), a 2.5-mile wide buffer zone between the two countries. The pattern of U.S. containment through regional conflicts was clear beginning with the Korean War. Some historians remember the war as a key event that marked the

west's recognition of the military potential of China. Others recall it as the event that settled the question of civilian versus military control of the U.S. military with President Truman's firing of General McArthur. Certainly the tension between total versus limited war seen in the Korean conflict became typical of the Cold War.

Various congressional initiatives carried out during and after the Korean War helped increase recruitment for the reserve forces and improved their performance. In August 1951, Secretary of the Air Force approved a "Long Range Plan for Reserve Forces" that tied missions and personnel strengths of the air reserve components to the U.S. Air Force's master war plan. The "Armed Forces Reserve Act of 1952" divided reservists into three categories: ready, standby, and retired. The ready reserve was authorized at a strength of 1.5 million. ANG units were placed in the highest priority category: the ready reserve, a position that they had held in fact, if not law, since 1946. In 1955, President Eisenhower signed the Reserve Forces Act that gave better equipment and aircraft to the reserve forces and expanded missions. (ANG 2007b).

The Soviet testing of its first atomic bomb at the end of August 1949 had great consequences for the United States and the rest of the world. It spurred on U.S. efforts to design more advanced air defenses and weaponry, drawing together scientists and engineers in the government, private sector, and university laboratories. Efforts continued on expanding the U.S. strategic forces. Air Force officials successfully lobbied for additional funding to help protect the United States against the enemy, asserting that it was better able to protect the nation from Soviet attacks and to develop a strong retaliatory capability than the other branches (USAEC 1997:19). During this time, the United States established many permanent overseas military installations for its ground, sea, and air forces worldwide. Installations in Guam, Japan, and the Philippines were reestablished and expanded. Improvements in aerial refueling enabled expanded strategic defenses and overall presence.

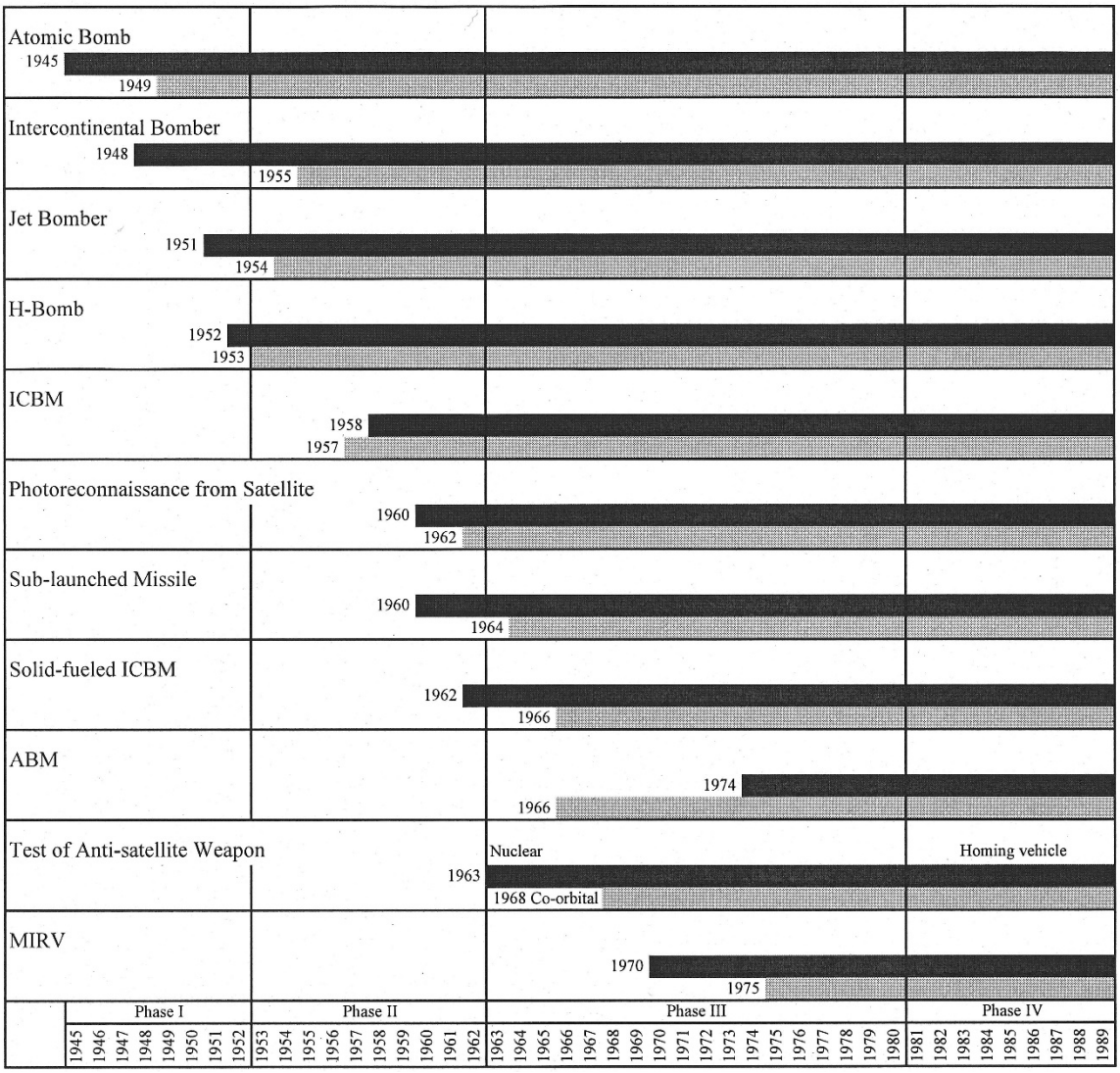
3.3. Nuclear Escalation: 1953–1963

The classic arms race between the United States and the Soviet Union reached technological maturity during the second phase of the Cold War, 1953–1963. The policy basis for the arms race was articulated in NSC Document 162-2, "*Statement of Policy by the National Security Council on Basic National Security Policy*," adopted in October 1953. Known as Eisenhower's "New Look" policy, the document set forth a more aggressive stance against the Communist threat that emphasized inflicting massive damage by offensive striking power. The policy document stated that the United States "will consider nuclear weapons as available for use as other munitions" (Brown 2008). The policy also advocated U.S. actions to strengthen the economies of European and other countries vulnerable to Communist influence,

involvement in regional conflicts, and participation in selective covert operations to prevent the expansion of Communism. It stated that as a matter of policy the United States should respond to military provocation "at places and with means of our own choosing" — which was interpreted to mean that the United States could respond to any foreign challenge with nuclear weapons. Eisenhower's New Look policy undergirded the U.S.-U.S.S.R. massive arms buildup of the 1950s and 1960s. As early as 1954, some military strategists began to debate the advantages of more response options with limited nuclear consequences. Eisenhower's "New Look" policy came under public scrutiny when John Kennedy campaigned for president on a "Flexible Response" platform that advocated a wider range of responses than a massive first strike or retaliation.

During the 1950s and 1960s, both the United States and the Soviet Union devoted enormous resources to designing and operating elaborate air defense systems and expanding stockpiles of nuclear weapons and weapons delivery systems. By 1960 the United States had more than 20,000 warheads in its stockpile, and had achieved the nuclear triad of weapons and weapons delivery via strategic bombers, submarine-launched ballistic missiles, and intercontinental ballistic missiles with second-strike capabilities. Both the United States and the Soviet Union assumed these arsenals would ensure deterrence against attack or destruction of the enemy. Figure 3-1 provides a comparative view of United States and Soviet weapons and defense systems during the Cold War. The United States was well ahead of the Soviet Union in the testing or development of most Cold War arms technologies. However, the Soviet Union was well ahead of the United States in the testing of anti-ballistic missiles (ABMs) and intercontinental ballistic missiles (ICBMs).

The U.S. military organization reflected the military buildup and air defense priorities. Responsibilities and command structure were divided among the SAC, TAC, and ADC. SAC was given responsibility for the United States's land-based strategic bomber aircraft and land-based ICBM strategic nuclear arsenal. SAC also controlled the infrastructure that supported the strategic bomber and ICBM operations, such as aerial refueling tanker aircraft to refuel the bombers in flight, strategic reconnaissance aircraft, command post aircraft, and, until 1957, fighter escorts.



(Source: Lewis et al. 1995)

FIGURE 3-1. THE COLD WAR ARMS RACE.

The two lines represent when the United States and the Soviet Union tested or developed military technological innovations. The darker line represents the United States and the lighter line represents the Soviet Union.

Established in 1946, TAC was elevated as a major command in 1950 to organize, command, equip, train and administer assigned or attached tactical forces. TAC planned for and participated in operations involving tactical fighters, tactical bombers, tactical missiles, troop carrier aircraft, assault, reconnaissance and support units. The Composite Air Strike Force (CASF), a mobile strike capability for moving units to "hot spots," was established in 1955. Its inventory included fighters for delivering both conventional and nuclear weapons, transports for airlifting men and equipment, tankers for mid-air refueling, and reconnaissance planes for aerial photography. The CASF was designed to augment combat-

ready units already assigned to the U.S. Air Force in Europe, the Pacific Air Force, and the Alaskan Air Command. During the 1950s, TAC fighter forces became supersonic with the addition of the F-100, F-101, F-104 and F-105, and were further strengthened during the 1960s by inclusion of the F-4, F-111 and A-7D. When SAC abandoned its fighter escort force in 1957, its aircraft were transferred to TAC. ANG units assigned to TAC contributed to the Berlin Crisis response, lent support in supported Southeast Asia, and provided replacements for units in Vietnam (National Museum of the U.S. Air Force 2009).

The responsibility of developing and operating a comprehensive air defense system fell to the ADC. The ADC went through several organizational iterations and was headquartered first at Mitchell Air Force Base (AFB), New York, and then at Ent AFB, Colorado. In 1954, the Continental Air Defense Command (CONAD) was established at Ent AFB as a joint-service force, taking control of Air Force ADC forces, Army Anti-Aircraft Command forces, and Navy air defense forces. Active and ANG forces operating radar, alert bomber-interceptors, the Boeing-Michigan Aeronautical Research Center (BOMARC) missiles, and the Semi-Automatic Ground Environment (SAGE) system came under ADC responsibility.

In 1992 SAC was disestablished and its bomber aircraft, ICBMs, strategic reconnaissance aircraft, and command post aircraft were merged with Air Force aircraft assets and reassigned to the newly-established ACC. This included B-52s in the Air Force Reserve and the B-1 bomber aircraft in the ANG inventory. Most of SAC's tanker aircraft, including those in the Air Force Reserve and ANG, were reassigned to the new AMC. The ICBM force was later transferred from ACC to the Air Force Space Command (AFSPC).

Air Defense Systems

Detection of the Soviet threat was carried out by complex radar systems across the United States and Canada, on ship-based radar facilities, and at Nike missile anti-aircraft sites. The first network of radar systems was proposed by the ADC in 1947. Using World War II technology, the ADC sought to build a network of 114 radars to protect the Northeast, the Chicago-Detroit area, and the west coast cites of Seattle, San Francisco, and Los Angeles (Winkler 1997). This plan was not implemented. Rather, as relations with the Soviet Union grew worse, World War II era radars were brought online in areas where there was a perceived threat, such as the Atomic Energy Commission plant in Washington. Postwar cuts in federal budgets prevented the construction of a true radar network.

In 1949 the military's request for a reliable and realistic air defense system was funded, prompted by Boeing Company's suggestion to move B-47 bomber production to the less vulnerable interior of the United States and Truman's announcement that the Soviet Union had detonated its first atomic bomb (Winkler 1997). ADC Headquarters Special Projects Officer Major General Gordon R. Saville proposed a manageable 75 station radar network. In December 1949 construction started on the first 24 of these sites.

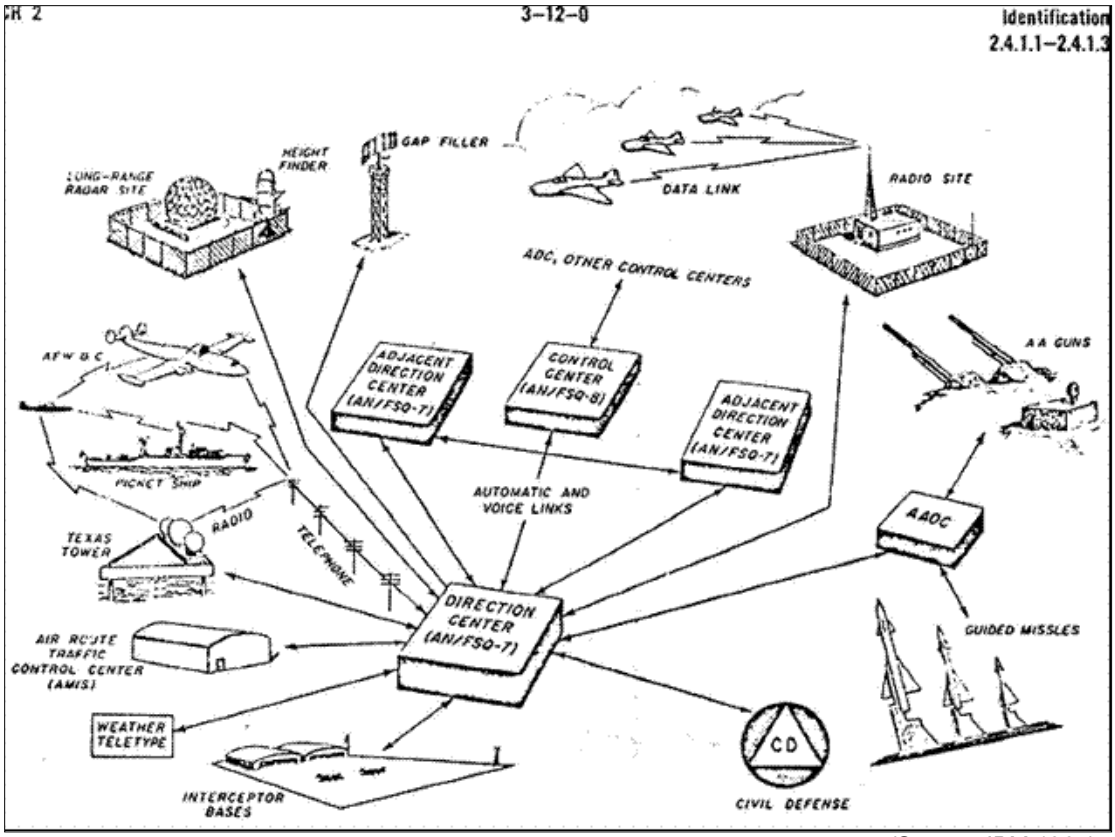
Agreements were made with Canada to extend the network north of the border; the stations that straddled the U.S.–Canadian border became known as the Pinetree Line (Winkler 1997). In addition to permanent radar sites, Truman supported funding for 44 mobile radars at key SAC bases.

Even with a radar network in place, there were still large holes in the U.S. air defenses. Communication problems during readiness alerts and limited capability to evaluate credible threats forced the United States to reevaluate the effectiveness of the system. Studies made during the summer of 1952 further affirmed the need for early warning. Scientists and engineers meeting at Massachusetts Institute of Technology recommended the construction of a Distant Early Warning (DEW) Line across the North American Arctic. Truman directed construction of the DEW Line radars at the end of 1952 (Winkler 1997). Navy picket ships were used to extend the DEW Line seaward.

Even with early warning radars in place in the United States, the Canadian Arctic, and at sea, the response to enemy bombers and missiles was still too slow. Transmitting information via telephone and teletype to regional ground control intercept (GCI) stations and then to the ADC Headquarters at Ent AFB in Colorado was cumbersome and impeded a rapid response. Development began on an automated command and control system. The research eventually resulted in IBM's AN/FSQ-7 machine, then the largest computer built (Winkler 1997). This computer became the center of the SAGE system. The SAGE system, deployed across the United States and Canada:

> *encompassed a network of analog computer-equipped direction centers [that] processed information from ground radars, picket ships, early-warning aircraft, and ground observers onto a generated radarscope (display scopes) to create a composite picture of the emerging air battle… Having an instantaneous view of the air picture over North America, defense commanders would be able to quickly evaluate the threats and effectively deploy interceptors and missiles to meet the threat* (Winkler 1997:32).

Outputs from the control centers were sent to alerted fighter interceptor aircraft and guided missile sites for response. The first directional center built was at McChord AFB in 1957. The first SAGE system became operational in Syracuse, New York, in January 1959, and was fully deployed by 1963. The buildings that housed the sector computers were huge aboveground, windowless concrete block structures often placed near cities or strategic locations on or near military installations.



(Source: IBM 1965)

FIGURE 3-2. SAGE SYSTEM.

The U.S. and Canadian joint North American Air Defense Command (NORAD) was established in 1958 to enable a more coordinated early detection of Soviet threat in the northern territories of Canada and the United States. Further communication and radar programs helped the United States to monitor air space for enemy bombers and detect ICBMs and intermediate range ballistic missiles (IRBMs). The Ballistic Missile Early Warning System (BMEWS) was deployed in Greenland and the United Kingdom in 1959; the Over-the-Horizon Backscatter (OTH-B) radar came online in the late 1950s and early 1960s in Maine, Oregon Alaska, Florida and Panama; and the World War II Airborne Warning and Control System (AWACS) was updated to the Airborne Early Warning and Control (AEW&C) developed for use during the Cold War (Lewis et al. 1995).

IRBMs and ICBMs rendered investments in anti-aircraft air defense systems like SAGE obsolete. In 1966 SAGE was inactivated and underwent several reorganizations. In 1983 the 22 air divisions were reduced to four—northeast, northwest, southeast, and southwest—and were transferred to ANG jurisdiction in 1993. The Eastern Air Defense Sector (EADS) operates from the ANGB in Rome, New York, and the Western Air Defense Sector (WADS) operates the system for the entire western United States from McChord AFB in Washington state (EADS 2009).

At the end of the 1940s the Soviet Union was still a distant enemy as they did not have the capability to strike the continental United States except through long-range bombers. The development of a radar network protected North America from this threat; however, like the United States, Russia was experiencing a period of technological innovation in the 1950s. Both countries realized that long-range missiles, especially missiles that could be equipped with nuclear warheads, would help to deter attacks.

Integrated into the SAGE system, the Nike system was the first guided surface-to-air missile (SAM) system in the United States. The Nike Ajax was successfully tested in 1951 by the Army. Nike sites were set up around military bases and other potential enemy targets as a final line of protection if enemy bombers made it to U.S. territory. The Ajax and later Hercules missiles had a range under 100 miles and a ceiling that topped out at 150,000 feet (Lonnquest and Winkler 1996). Developed by the U.S. Army, Bell Telephone Laboratories, and Douglas Aircraft, the Nike missile system was one of the world's first successful radar and anti-aircraft missile systems. Operational during 1953, the missiles were deployed at over 200 sites across the continental United States and were also widely used overseas by both United States and foreign armed forces. The system provided short-range point defense against incoming enemy bombers. The Nike and later Hercules missile systems were placed at major population centers and strategic locations such as major weapons plants. The Los Angeles area had 16 Nike missile sites, and New York City was protected by 20 sites. The Army, Army National Guard, or (jointly) the Army and Air Force operated the Nike-Hercules systems (Chiles 2005).

The issue of who would control U.S. air defense became a source of considerable tension between the Air Force and the Army. The Army wished to retain control of its anti-aircraft artillery and felt that their claim was enhanced by development of the Hawk and Nike series of SAMs. Having developed its own SAM, the BOMARC missile, the Air Force sought control of air defense, including ground-fired weapons. Defense authorities ultimately decided that the Army would deploy the Nike for point defense, and the Air Force would deploy the self-guided cruise BOMARC missile for long-distance response. Integrated into the SAGE system the BOMARC missile travelled at a speed of about Mach 2.5, a ceiling of 80,000 feet, and a range of 200 miles.

The BOMARC missile was tested for seven years and was operational in 1959. Despite grand plans for a nationwide network, only 500 nuclear-tipped BOMARCs were deployed at 10 sites in the northeast United States and two sites in Canada. Funding and confusion about the difference between BOMARC and the Army's Nike and Hercules missile programs plagued the BOMARC missiles. Sites with 56

launchers were planned but half-bases of 28 launchers were built. The BOMARC missile, which stayed in service until the early 1970s, was rendered outmoded by Soviet ICBMs (Boyne 1999; McMullen n.d.).

BOMARC missiles were deployed from dedicated launch sites on military bases. The 28-launcher sites were fenced, segregated facilities with launch shelters organized in four parallel rows with paved roads between them and a support area in the center with an assembly and maintenance building; a plant for heat, power, and chilled water; a vehicle storage and fire building; a fuel propellant building; and a fuel storage building. The 28-launcher sites were organized as four rows of seven launchers with support facilities to one side (Norvell 1961).

As soon as the Nike missiles were developed, military leaders were clamoring for a weapon that provided first strike capabilities with a nuclear warhead. By 1953 the Soviet Union and the United States had developed the hydrogen bomb and both countries were working feverishly on a long-range missile that could deliver this weapon. Throughout the mid to late 1950s teams on both sides of the world worked on designs. The United States was able to develop two IRBMs, Thor and Jupiter, in 1957-1958. These weapons could carry a nuclear warhead but only had a range of 1,500 miles. The Thor was deployed to the United Kingdom and the Jupiter to Italy and Turkey in 1958. The Russians, however, had developed the world's first ICBM in 1957, the P-7 Semyorka (Lonnquest and Winkler 1996). The P-7 could not only be equipped with a nuclear warhead but was used to launch the Soviet satellites Sputnik 1, 2, and 3 into orbit. As fear gripped the nation, the Eisenhower administration came under fire and debate about a so-called "missile gap" began. The DoD successfully leveraged this concern to demand an acceleration of ICBM development.

The first testing of an American ICBM was conducted at Cape Canaveral in June 1957 with successful test flights coming in late 1958. In August 1959 the Atlas ICBM was pushed into service at Vandenberg AFB (Lonnquest and Winkler 1996). By 1962 SAC had 13 Atlas missile squadrons at bases across the United States. The Titan ICBM was more powerful, hardened, and adaptable than the Atlas. Testing on the Titan 1 began in early 1959 and the Army Corps of Engineers began constructing large underground launch complexes for the missiles. Unlike Atlas missiles that launched from the open pads, Titan I could launch from silos. The first active Titan 1 squadron was activated at Lowry AFB, Colorado, in April 1960. By 1962 the United States had developed and deployed the Minuteman I and II ICBM. This weapon became the workhorse ICBM for the U.S. military (Lonnquest and Winkler 1996). Once the United States had developed stable and reliable IRBMs and ICBMs it began to further refine their designs, adding the Nike Zeus and Spartan ABMs to their arsenal in 1959 and 1967 and the Navy's Polaris submarine-launched ballistic missiles (SLBM) in 1960.

Surveillance and Reconnaissance Satellites

Early aerial reconnaissance via U-2 aircraft gave way to missile- deployed satellites for photo reconnaissance. Initially, satellite technology was not an important aspect of the U.S. military strategy. Project VANGUARD, the code name of the International Geophysical Year (IGY) satellite program, was behind schedule and over budget. Eisenhower's Secretary of Defense Charlie Wilson once stated that he "wouldn't care" if the Soviet Union launched a satellite before the United States did (Peebles 1997). When the Soviets launched Sputnik 1 in October 1957, Secretary Wilson and many others changed their minds about the importance of being the first country to space. The public reaction to the Sputnik launch was dramatic. Senator Lyndon Johnson's aide best expressed this feeling of hysteria, *"It really doesn't matter whether the satellite has any military value. The important thing is that the Russians have left the Earth and the race for the control of the universe has started"* (Peebles 1997:9).

The Soviet Union exploited this fear by quickly launching Sputnik 2, carrying the first animal into space in November 1957, and the geophysical satellite Sputnik 3 in May 1958. The weights of these satellites were beyond the lifting capabilities of any U.S. rocket. President Eisenhower reacted by creating the military Advanced Research Projects Agency (ARPA) in February 1958 and the civilian National Aeronautics and Space Administration (NASA) in October 1958. These two agencies were first tasked with getting American reconnaissance satellites into space. The first U.S. satellite, Explorer 1, was launched in January 1958 (Launius 2011).

The U.S. need for a photo reconnaissance satellite was never clearer than after Francis Gary Powers' U-2 aircraft was shot down by the Soviets in May 1960. Powers was approximately 1,500 miles into Soviet territory. He was captured and held until August when he was tried for espionage (Haulman 2003). This incident virtually grounded the U-2 spy planes. The July 1960 downing of an RB-47H reconnaissance aircraft over international waters put an end to further aerial reconnaissance (Air Force 2006). Finally, after several failed rocket booster tests, the U. S. successfully launched CORONA, the first photoreconnaissance satellite, into space (Peebles 1997).

Berlin and Cuba: Berlin Crisis, Bay of Pigs, and Cuban Missile Crisis

In a manner reminiscent of the Soviet blockade of Berlin and airlift of 1948-1949, Berlin again was the scene of Soviet-U.S. brinksmanship. On the eve of 13 August 1961 Soviet and East German soldiers and construction workers cut telephone lines between East and West Berlin and began erecting a wall to prevent allied access from the west to Berlin and the exodus of East Germans to the west. This was in clear violation of the Potsdam Agreement regarding the division of Berlin and guarantee of free access. The Kennedy Administration increased conventional tactical airpower in Europe and Berlin as a show of

force to the Soviets. President Kennedy acted boldly with Operations TACK HAMMER and STAIR STEP in which ANG forces played prominently; their rapid deployment to Germany, France, and elsewhere had unequivocally demonstrated the United States' determination to defend Berlin. It is possible that the sudden appearance of numerous tactical fighters with nuclear weapon delivery capability changed Khrushchev's attitude toward his Berlin "settlement."

The Soviet Union had an increasing role as advisors to counter revolutionaries, leftist insurgents, and dictators of third world countries that the United States perceived to be sympathetic to Communism. This was demonstrated during the failed Bay of Pigs invasion and the Cuban Missile Crisis. Three months after John F. Kennedy assumed the presidency, he launched a bold attempt to overthrow the Cuban government of Fidel Castro, which had taken control of the island nation during the previous year. The plan, developed by the Central Intelligence Agency (CIA) during the Eisenhower administration, involved the CIA and ANG training and supporting Cuban exiles to invade Cuba with light bombers and an amphibious assault. The initial target was the city of Trinidad but this was rejected as "too noisy" (Trest and Dodd 2001:56). The CIA alternative was the *Bahia de Cochinos* (Bay of Pigs). On 17 April 1960 the CIA-trained and -supported exiles launched their attack from camps in Nicaragua and Guatemala with the assistance of Air Guardsmen from Alabama. By the afternoon of April 19th the Bay of Pigs invasion was over. The Cuban exiles suffered a tremendous defeat including 103 casualties, and four Americans lost their lives.

Maintaining plausible deniability of U.S. involvement in the Bay of Pigs operation was important to the CIA and the Kennedy Administration even for many years afterward. Ironically the U.S. involvement in the failed invasion was obvious at the time and even commented on by the American media.

The Bay of Pigs left the United States with a "black eye" and set the stage for what would become a major confrontation of the Cold War, the Cuban Missile Crisis. On 14 October 1962, a U-2 plane flying over San Cristóbal, Cuba, captured images of what appeared to be the construction of a Soviet SS-4 IRBM site. On 19 October several U-2 flights showed four more construction sites. The Kennedy Administration met with advisors to discuss strategy and ultimately ordered a naval blockade of Cuba, demanding removal of the missiles and destruction of the sites. The DoD raised the alert level of SAC. The ADC and TAC moved into alert status while the country waited to see how the Soviet Union would respond. Negotiations on 26 and 27 October resulted in the United States secretly removing the Jupiter IRBMs from Italy and Turkey in exchange for the Soviets removing their missiles from Cuba (JFK Library 2011). The brinksmanship of the Cuban Missile Crisis and in other showdowns became a major theme of the Cold War.

3.4. Détente and New Deterrence: 1963–1989.

Although U.S. involvement in Vietnam began during the 1950s and earlier in cooperation with France, President Kennedy authorized U.S. advisors to assist the South Vietnamese government in 1961. Over the course of the next year, the North Vietnamese government initiated an offensive into South Vietnam, which resulted in the collapse of the South Vietnamese government. On 2 August 1964, three North Vietnamese PT (patrol torpedo) boats allegedly fired torpedoes at the U.S.S. *Maddox*, a destroyer in the international waters of the Tonkin Gulf, some 30 miles off the coast of North Vietnam. The attack came after six months of covert U.S. and South Vietnamese naval operations. A second attack is said to have taken place on 4 August. The attacks prompted a debate on appropriate response. Three days later, Congress passed the Gulf of Tonkin Resolution that authorized President Johnson to *"take all necessary measures to repel any armed attack against forces of the United States and to prevent further aggression."* It is notable that the resolution did not require the president to secure a formal Declaration of War from Congress. Near continuous air bombing of North Vietnam was initiated by the United States following the resolution.

In early 1968 North Vietnam showed greater force with the capture of the U.S.S. *Pueblo* and the Tet Offensive. Paris Peace talks were initiated but failed, and the Nixon administration secretly expanded bombing into Cambodia and then Laos. In 1972 President Nixon undertook secret peace talks with North Vietnam. He ordered heavy bombing during Operation LINEBACKER to bring concessions from North Vietnam. The United States and North Vietnam signed a cease-fire agreement that took effect in January 1973, ending U.S. involvement in country.

The United States could not sustain the enormous outlays for the arms race, and the American public became increasingly impatient with U.S. activities in Southeast Asia. Both factors came together to argue for a change of course. Military spending was constrained following Vietnam. As the conflict consumed a large portion of the Pentagon budget, purchases of new equipment were postponed (USN 1995:25). Each service extended the use of aging systems past their intended life; research and development programs received little funding (USN 1995:25).[1]

In many ways, the end of American involvement in Vietnam marked the beginning of the end of the Cold War. President Nixon suspended the draft and established the all-volunteer military in 1973. To attract volunteers following the elimination of the draft, the military offered a variety of incentives such as

[1] The reference for this citation is unknown.

improved family and bachelor housing and increased education benefits. The military also increased its recruitment efforts, particularly among minorities. The 1970s witnessed an increase in minority and female enrollment in the military, including the National Guard. While the ANG was able to maintain its force level through an influx of post-Vietnam Air Force pilots joining the Guard, the Army faced personnel shortages (Doubler 1999).

Nixon re-established diplomatic relations with mainland China; détente between the Soviet Union and United States began under the Nixon administration. The administration's overtures to the Soviets helped to reduce worldwide political and military tensions. Between 1969 and 1972, American and Soviet delegates negotiated to limit strategic nuclear weapons programs. The talks resulted in the interim Strategic Arms Limitation Talks (SALT) SALT I treaty. The treaty was criticized for concessions to the Soviets, but illustrated that both sides wanted to limit the nuclear arms race (USN 1995:23).

The ABM Treaty signed in 1972 imposed limitations on the number of ABM sites in the United States and the Soviet Union. The need for it was underscored by the Multiple Independently Targetable Reentry Vehicle (MIRV) system which allowed a single ICBM to deliver as many as ten separate warheads at a time. The Soviets could place 10 to 40 warheads on a single MIRV missile at a reasonable cost and outfit the missiles with electronic countermeasures and heavy decoys. At about the same time, the Soviet Union reached strategic parity with the United States in terms of ICBM forces. A nuclear war guaranteed destruction of both countries. For the United States this realization was expressed as the concept of Mutually Assured Destruction (MAD) in which any changes to the strategic balance had to be carefully weighed to ensure that mutual destruction was assured. Rather than limiting the number of ICBMs, the treaty limited each country to one defensive site and one for ICBMs. In the 1974 protocol, only one site was endorsed. The treaty represented a change in focus to surveillance and warning (USAF 1999a:15).

The Carter administration focused on limiting the number of Soviet and American nuclear weapons and continued arms limitation talks with the Soviet Union. These talks resulted in the SALT II agreement. The U.S. Senate did not ratify the agreement due to concerns that the agreement "gave the Soviet Union an unacceptable advantage in nuclear weapons" (USN 1995:26). President Carter withdrew the treaty after the Soviet invasion of Afghanistan in December 1979.

The Reagan years witnessed a return to a policy of strategic defense. President Reagan began his presidency in an atmosphere of "extreme mutual distrust between the United States and the Soviet Union" (USN 1995:26). The Reagan administration increased military spending and lobbied for the creation of the Strategic Defense Initiative (SDI) (popularly referred to as "Star Wars"), which was an elaborate ballistic missile defense system. SALT II was abandoned and new negotiations, the Strategic Arms

Reduction Talks, proposed. These negotiations eventually stalled due to Soviet opposition to SDI (USN 1995:26).

Soviet Premier Mikhail Gorbachev established a personal rapport with President Reagan. The two leaders held a series of summits in Geneva, Switzerland, and Reykjavik, Iceland, and neared an agreement on containment of nuclear weapons; however, disagreements over SDI prevented a tentative agreement (USN 1995:26). At Gorbachev's urging, Communist party officials agreed to relax control over Soviet society in an effort to advance Gorbachev's Glasnost policies of freedom of speech and transparency of government (Center for Air Force History 1994:93). Control over former Warsaw Pact countries eased. Throughout fall 1989, Eastern European countries renounced ties to Moscow and left the Soviet Bloc. On 9 November 1989 the Berlin Wall opened and East Germans were free to travel to West Berlin without restrictions, marking the beginning of the end of the Cold War (USN 1995:26).

Even with the symbolic act of the dismantling of the Berlin War in Europe signaling the end of the Cold War, U.S. interests closer to home seemed to echo the familiar tone of the Cold War. Throughout the Cold War years, Panama resented U.S. presence and control over the Panama Canal. Opposition reached its peak with riots in 1964. For the following years the United States and Panama negotiated the 1977 Torrijos-Carter Treaties, which the United States hoped would resolve the matter of the canal and U.S. status in the country. However, Panama became increasingly unstable with Manuel Noriega as president. In May of 1989, Noriega nullified the presidential elections after Guillermo Endara was elected President. This action further contributed to worsening internal conditions as well as international relations. On 3 October 1989 members of the Panama Defense Force (PDF) attempted an unsuccessful military coup. In response, Noriega purged the PDF military leadership, leaving only those that he felt he could trust. The United States had concerns for the safety of its personnel and property. On 15 December 1989, the National Assembly of Panama declared that a state of war existed with the United States and adopted measures to confront foreign aggression. The following day, a U.S. Marine lieutenant was shot. Planning for the Panama contingency had begun in February 1988 and was put into action in with Operation JUST CAUSE. This plan designed to oust Noriega was initiated on 20 December 1989. Forces had assembled at Forts Bragg, Benning, and Stewart and were transported to Panama on 148 aircraft. Units from the 75th Ranger Regiment and 82d Airborne Division conducted airborne assaults at Rio Hato and Torrijos/Tocumen airports, parachuting into the airport under the cover of night. Infantry brigades of 3rd, 5th, 7th Infantry Divisions took Panama City and on the Atlantic side of the canal while forces from 7th Infantry Division moved into the western areas of Panama and into Panama City. The 8th Air Force, SAC carried out 144 missions to refuel 229 receivers with over 12 million pounds of fuel. The F-117A Stealth Fighter was brought in, its first combat appearance. The ANG, which had airlift and fighter-based

operations in Panama for many years, contributed to the effort. The ANG's 193rd Special Operations Group of Pennsylvania was involved in the planning of the operation and participated as it unfolded. Troop withdrawal began on 27 December. Noreiga eventually surrendered to U.S. authorities voluntarily. The United States suffered 23 fatalities, with estimated enemy casualties around 450 although some had been killed by the PDF. The number of civilians dead was disputed afterward, and the Panamanian National Human Rights Commission and an independent inquiry headed by former Attorney General Ramsey Clark put the number at over 4,000. Although the loss of life was debated afterward, the operation successfully combined rapid deployment of critical combat power and precise utilization of forward deployed and in-country forces.

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4. THE AIR NATIONAL GUARD ROLE IN THE COLD WAR

This chapter discusses the evolution of the ANG's missions and force structure, and its contributions to the Cold War. Chapter 2 concluded at the establishment of the ANG as a discrete reserve force under the U.S. Air Force in 1947. This chapter picks up where Chapter 2 ended. It is organized as two major parts: Section 4.1 discusses the Cold War diversification and evolution of the ANG's force structure and missions, and Section 4.2 discusses the ANG's Cold War mobilizations and major operations. The overview of the Cold War presented in Chapter 3 provides a backdrop for more specific treatment of the ANG.

4.1. ANG Force Structure and Missions

As established in 1947, the ANG comprised 12 wings with fighters, light bombers, and support aircraft (Francillion 1993:39). The units mostly flew fighter and bomber aircraft, P-51 fighters, B-26 bombers, and C-47 transports. Statistics of Korean War assignments show that by the early 1950s Air Guardsmen also provided major support through radar aircraft warning and control support. After the Korean War, the ANG saw its force structure change considerably. The number of ANG units increased and many were assigned to new types of mission.

Lack of facilities suitable for jet aircraft affected the ANG's force structure and unit missions. As a solution to the "jet problem"—the unsuitability of some of the ANG's airfields for jets due to short runways or airspace problems—the ANG transitioned some of its fighter units to airlift and other missions. In other cases, the installation assignments were shuffled, and fighter units were assigned to installations that had adequate runway facilities for jets or that could be easily improved. As the ANG became better integrated with the Air Force and the Total Force policy took hold, the ANG found new mission types and unique mission niches that took advantage of its specialized expertise and aircraft.

In this section, the history of the ANG's involvement in major missions during the Cold War is presented. These are fighter and runway alert, aerial refueling, airlift, and special operations and communications.

4.1.1. Fighter/Interceptor and Alert Mission

Denver's 120th Fighter Squadron was the first postwar ANG unit to be federally recognized on 30 June 1946 even prior to the creation of the ANG under the new Air Force (Gross 1985; Tillman 2003). In the early years, the ANG fighter-interceptor squadrons flew P-51 Mustangs and T-6 Texans from World War II service. With the acceptance of jet aircraft, the ANG fighter squadrons flew F-84 Thunderjet and Thunderstreak, F-80c Shooting Star, F-86 Sabre, F-84, F-16, and then A-7 Corsair and F-102 Delta

Dagger supersonic aircraft in the later years of the Cold War. The ANG received its first jet aircraft in June 1948 when California's 196th Fighter Squadron became the first ANG unit to complete its conversion to jets. The Nebraska Air Guard's 173rd Fighter Squadron followed in short order. The ANG gained P-51 Mustangs and P-47 Thunderjets that the active Air Force had rejected as inadequate for their fighter mission, B-26 light attack bombers, and C-46 Commando and C-47 Skytrain transports during the early postwar years. In reality, the ANG's adoption of jets took many years; jets became available only gradually, and consideration was given to the effectiveness of the unit, airfield facilities and whether upgrades were required, and geographical distribution across the nation.

ANG pilots serving in the Korean War came from 69 tactical fighter units. They served as individuals, not as units, but represented 80 percent of the total pilot force strengths for the conflict (Gross 1985). The other fighter units remained in the United States as defense against a possible Soviet attack and to augment SAC, TAC, and ADC. The Air Force also sent three ANG fighter wings to supplement NATO forces in case of a Soviet assault in Europe (Gross 1985). The Korean War ended on 27 July 1953, and by October 1953 all federalized ANG units returned to state service. An administrative move that reinforced the long-term continental air defense role took place a month later—all ANG fighter squadrons shifted from TAC to ADC command to provide more mobilization capability in response to an increasing Soviet bomber threat.

Although continental air defense had been discussed as a possible mission for the ANG early on, it only gradually came to fruition. In general, the role of the ANG was highly contested; the new Air Force saw the ANG in a supporting role to its active force, but the ANG did not want to be relegated to a minor or ill-defined role that would leave it without adequate training, equipment, or a likely future. The issue of the ANG's major involvement in continental air defense was settled in May 1952 when it was proposed that small numbers of ANG pilots at strategic locations be placed on short tours of active duty to augment the ADC's runway alert program. (Francillon 1993: 51; "Air National Guard In Air Defense": 24-25). ANG leaders sought opportunities to develop this mission further.

In 1952 Major General Finch, a Georgia Air Guardsman and former Chief of the Air Division, NGB in cooperation with the NGB, suggested the Air Force use the ANG on a trial basis to augment their continental air defense fighter alert program. On 4 December 1952, Headquarters, U.S. Air Force authorized the ADC to place 10 ANG pilots on active duty at Hancock Field, New York, and Hayward, California, to test the Air Guard's runway alert concept at those locations. This was the start of ANG's involvement in continental air defense. The ANG initiated the alert program on an experimental 120-day basis on 1 March 1953. Two P-51 fighter squadrons, the 138th Fighter-Interceptor Squadron in

Syracuse's Hancock Field and the 194th Fighter-Bomber Squadron at the Hayward Municipal Airport stood alert from one hour before dawn until one hour after dark. The alert force involved five pilots at each location who signed on for voluntary tours of duty for the duration of the test. Working with SAC and ADC radar sites, the ANG periodically tested the pilots by scrambling the units (Gross 2000; Gross 1985).

(Source: Gross 1985: 106)

FIGURE 4-1. AN ANG AIRCRAFT CONTROL AND WARNING SQUADRON GUARDSMAN ON RUNWAY ALERT DUTY.

After a second successful test, the program became permanent on 15 August 1954 when eight ANG fighter-interceptor units joined regular Air Force detachments (USAF 1966). This ANG mission to provide continental air defense has continued to the present day. Each ANG unit provided two jet aircraft and five aircrews who were on alert status 14 hours a day year-round. ANG pilots and crews on alert duty became identified as the "Air Defense Alert Detachment" of their parent squadron. Pilots rotated through regular training scrambles and practice alerts against SAC B-36, B-47, and B-50 bombers. The units occasionally intercepted unknown aircraft, which often turned out to be lost or late commercial airliners (USAF 1966). In October 1954 an additional nine ANG units joined the program (Gross 1985).

(Photos courtesy of the Hayward Airport Authority)

FIGURE 4-2. HAYWARD ANGB AT THE TIME OF THE 194TH FIGHTER SQUADRON'S EXPERIMENT WITH THE RUNWAY ALERT PROGRAM (JUST PRIOR TO THE UNIT'S 1955 RELOCATION TO FRESNO ANGB).

The alert mission at the Hayward Municipal Airport was short lived. After the 194th transitioned to North American F-86 Sabre jet fighters on 1 November 1954, just months after the alert experiment, the unit moved to the Fresno ANGB in California's central valley. The 129th Air Resupply Squadron flying Curtiss C-46 Commandos, Gruman SA-16 flying boats, Lockheed C-130s replaced the 194th at the Hayward airport.

By 1957 the ADC's ANG fighter-interceptor force stood at 76 squadrons, 20 of which participated in the runway alert program. In 1959 six squadrons had expanded their 14-hour alert duty to 24 hours. Military planners reduced the ANG's fighter force to 40 squadrons in June 1960 based on new reduced estimates of the numbers of Soviet bombers threatening the United States. The 1956 ANG Annual Report noted the force's notable progress toward combat readiness:

> *A most interesting step was taken in Fiscal Year 1955 toward insuring the readiness and increasing the combat potential of the Air National Guard when, on 15 August 1965, 9 units began active participation in the air defense network of the Air Defense Command to be followed by 2 additional units on 1 September, 3 on 15 September, and 3 more on 1 October. Each of these 17 units, operating from home bases selected by ADC because of their strategic locations, furnish daily to the nearest Air Defense Group 2 jet fighter aircraft, 5 combat ready aircrews and 10 supporting personnel and extend the coverage and strengthen the air defense of this country. The operation since the inception has been highly successful. Operating under the direction of the ADC Controller, the units in less than 11 months flew over 20,000 hours while carrying out over 7,300 scrambles and 16,000 intercepts. All the*

> *combat crews of the 17 participating squadrons have been rotated through the 85 positions available to them and these crews have averaged 91 hours each under ADC control* (ANG Annual Report 1961).

By 1961, 25 ANG fighter squadrons were participating in ADC's runway alert program on permanent 24-hour alert. Nine of the participating squadrons were equipped with all-weather interceptors carrying nuclear-tipped rockets by 1962 (Gross 1985, 1995). In 1961, the ANG accounted for a surprising percentage of the alert force with 25 squadrons to the Air Force's 56 fighter squadrons (Weaver 2007:4)

While on alert status and in the event of war in the mid-1960s, these units were under operational control of ADC for employment by NORAD (USAF 1966) (Gross 1995, 2000). The runway alert program is significant as the first major attempt to integrate ANG and Air Force operations and the major unique mission of the ANG (Gross 2007). ANG historian Gross wrote

> *This use of air guardsmen to augment the active Air Force in its peacetime missions was a revolutionary innovation in air reserves programs which dominated the evolution of the Air Guard through the remainder of the decade* (Gross 1985:104).

The ANG's Cold War fighter role was not limited to continental air defense. Throughout the Cold War, the ANG's fighter pilots served in various missions and operations. As is described in detail in Section 4.2, 18 ANG Tactical Fighter Squadrons (TFS) were assigned to Europe in the largest jet deployment in ANG history. The ANG transported the jets across the Atlantic as part of Operation STAIR STEP in October-November 1961 (Gross 1994). ANG fighters also served in Europe and elsewhere during the Vietnam War. After the 1968 capture of the U.S.S. *Pueblo* and Tet Offensive, they filled vacancies in everyday roles vacated by Air Force personnel deployed to Southeast Asia (Gross 1985:149-151). The 120th TFS was one of a handful of squadrons that was engaged in Vietnam combat missions (USAF 1968a). Generally, the ANG provided second-line service; historian René Francillion wrote of the limited role that the ANG played in Vietnam:

> *…the Johnson administration's reliance on draftees to fight the war and its reluctance to call up Reservists and Guardsmen (only 22,745 Guardsmen were called to active duty during the Southeast Asia War as opposed to the call-up of 183,600 Guardsmen during the Korean War and 65,438 Guardsmen during the Berlin Crisis)* (Francillion 1993:66).

Many ANG pilots maintained alert beyond the United States. During 1968-70, the ANG Operation PALACE ALERT was a volunteer program for ANG F-102 pilots to serve with interceptor units in Germany, Holland, Okinawa, and the Philippines (USAF 1968c; USAF 1968a, 1968d). The program

lasted long enough to fill the need for alert pilots in places other than Vietnam (Gross 2007a). Again, when compared to the longer term continental defense mission, the number of Operation PALACE ALERT pilots was small and the duration of the program short.

The continental air defense role continued to grow in strength and became a mainstay of the ANG. In 1972 two ANG fighter units opened new dispersal alert sites under an ADC program to strengthen the air defenses of the southern border of the United States. ANG crews from Florida's 125th Fighter Group using F-102s assumed 5-minute alert status at Naval Air Station New Orleans in Louisiana. California's 144th Fighter Group assumed 5-minute alert status with two F-102s and pilots at Tucson, Arizona (Gross 2007a). ANG fighter pilots also served air defense over U.S. holdings overseas. In Operation CORONET COVE the ANG provided air defense for the Panama Canal between 1978 and 1990. The ANG picked up the mission from TAC, further strengthening the ANG air defense role (Gross 2007).

By 1992 the ANG provided 100 percent of the Air Forces' continental United Stated -based air defense interceptor force (Gross 1995, 2000). While the ANG took on other assignments to diversify in the 1960s, this primary assignment has continued through the ANG's history and is its most significant contribution to the Cold War.

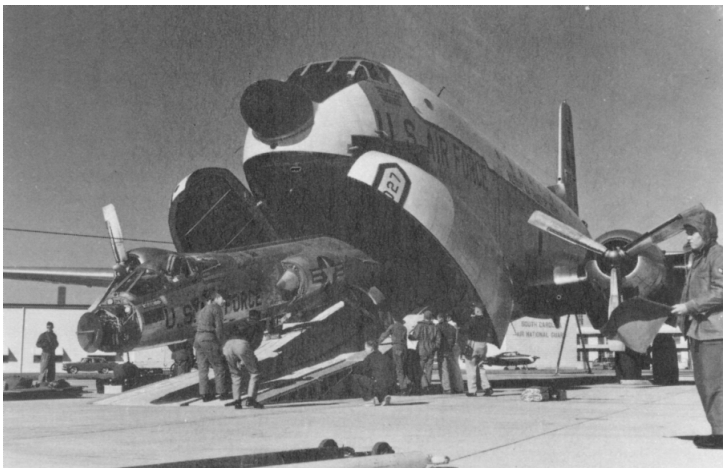
4.1.2. Aerial Refueling

U.S. efforts to develop aerial refueling techniques date to the 1920s and evolved slowly as the demand for long-range military flights did not surface until World War II. Historian Richard Smith wrote of the challenge of aerial distance for military planners,

> *As relations between the United States and the Soviet Union deteriorated after World War II, U.S. Army Air Forces' leaders started measuring distances between North America and such points in the U.S.S.R. as Magnitogorsk, Novosibirsk, Omsk, and Sverdlosk. They found them to be more than a few nautical miles too far to fly. A means of range extension became urgent* (Smith 1998:23).

Much of the demand for aerial refueling focused on the B-36 and B-52 long-range bombers that defense contractors had begun designing in 1946. The Air Force initially employed modified B-29 Stratofortress bombers (KB-29M/B-29MR) for aerial refueling in the late 1940s (National Museum of the Air Force 2010a; Smith 1998:26). General LeMay of SAC clearly understood the importance of this refueling capability; the Air Force established the first refueling units in 1948 with the 43rd Air Refueling Squadron (ARS) stationed at Davis-Monthan AFB in Arizona and the 509th ARS in Roswell, New Mexico's Walker AFB. The squadrons and others worked with defense contractors to develop aerial

refueling techniques (Smith 1998:26). Boeing Aircraft Company released the propeller-driven KC-97 Stratofreighter (a cargo version of the B-29) with an aerial refueling boom to the Air Force in 1950 that became the basis for the KC-97 Stratotanker. In 1956 the Air Force acquired the KC-135 jet tanker (Gross 2009:2).



(Source: Gross 1985: 129)

FIGURE 4-3. CREW LOADS A SOUTH CAROLINA 157TH FIGHTER INTERCEPTOR SQUADRON F-104 STARFIGHTER FOR TRANSPORT TO SPAIN.

It was not until 1957 that the ANG received its first KC-97F aerial tankers. Three new ANG units were created to fulfill this new mission—Illinois' 108th ARS, Wisconsin's 126th ARS, and Ohio's 145th ARS (Gross 2009:2; Francillion 1993:61). The 108th ARS performed the first ANG mid-air aerial refueling mission 6 September 1961 with an ANG fighter jet (Gross 2007:48).

Although the ANG was accustomed to obsolete technology such as propeller-driven aerial tankers, in 1964 the Illinois ANG 126th Air Refueling Group (ARG) experimented with modifications. They added two jet engines and radar equipment to the KC-97G design to enable the tankers to maintain sufficient air speed to fuel Air Force fighters. The Air Force adopted this suggestion and modified its Stratotankers (designated KC-97Ls) (Gross 2007:53). The Berlin Crisis mobilization had highlighted the need for additional aerial refueling capability. The ANG used tankers to enable Operation READY GO in 1964 in the deployment of fighter and reconnaissance jets non-stop between the United States to Europe for training and to prove their ability to the Air Force (Gross 2007:54).

For the remainder of the 1960s, the ANG provided aerial tanker support on various missions to supplement the Air Force. The turning point came in 1967 with France's withdrawal from NATO that required Air Force fighters to avoid French airspace and travel further to their air bases. This created a greater need for the ANG's tanker support in Europe. The Vietnam War also pulled Air Force tanker

pilots away from Europe. By May 1967 SAC could not provide sufficient aerial tanker capacity for the Air Force fighter and reconnaissance aircraft in Europe to counter the Warsaw Pact countries. In 1967 the ANG was called upon to provide tanker support from Germany as Operation CREEK PARTY. The Texas 132nd ARS initiated the operation on 1 March 1967; during the 11-year operation up to nine ANG squadrons on two-week rotations provided almost daily refueling at Rhein-Main AFB in Germany. During the operation, Air Guardsmen flew 6,512 sorties, completed 47,207 aerial refueling hookups, and off-loaded 137,398,620 pounds of fuel. The operation demonstrated that the Air Guard could sustain a significant mission overseas for a long period without resorting to politically-sensitive mobilizations. It established a template for the later widespread use of volunteer rotations by the Air Reserve components (The National Guardsman 1977:2; Gross 1985:150-151; Gross 1996:15; Gross, 2007:12; Gross 1999).

The ANG aerial tanker mission continued domestically for fighter support and overseas combat missions through the 1970s (Gross 2007:69). By 1970, SAC—which had positioned itself solely to carry the KC-135 mission—provided refueling for all the U.S. and allied forces. The demand for this mission proved too large and SAC began transferring KC-135s to the ANG and Air Force Reserve (Smith 1998:66). In 1975, the Ohio 145th ARS became the first Air Guard unit to acquire the KC-135A jet tanker. The 145th's tanker and additional KC-135 aircraft that came to the ANG were older tankers previously used by the Air Force to cut costs by DoD (Gross 2007:72–73).

A major development took place in 1976 when the ANG tanker units formally became part of the SAC nuclear alert force. The Ohio 160th ARG became the first to supply SAC KC-135 tanker capability, and by 1979 the last of 13 programmed ANG tanker units slated for SAC's nuclear alert program became operational (Gross 1998). As the Cold War neared its end, 168th ARS became the ANG's last new tanker unit. Stationed at Eielson AFB in Alaska, the unit flew KC-135Es (Gross 2007a). When SAC was disbanded in 1992, the tanker force—including the ANG refueling units—was assigned to the new AMC. The ANG's aerial refueling mission has continued to the present day and can be considered a significant ANG Cold War mission.

4.1.3. Airlift

Modern materiel airlift began during World War II as the Air Transport Command. The Troop Carrier Command created during World War II continued under the Tactical Air Command (Troop Carrier/Tactical Airlift Association 2010). With the passage of the 1947 National Security Act, the Military Air Transportation Service (MATS) was established as a joint Navy-Air Force major logistical entity until its replacement with the Military Airlift Command (MAC) in 1966. The ANG's fighter squadrons had support aircraft, including a limited number of transport aircraft often the C-47 Gooney

Bird. Prior to the Korean War when the Air Force and NGB were working out the role of the reserve forces, some at the Air Force opined that airlift was the perfect mission for a reserve because it was relatively easy, lacked tactical demands, and was the same in training as in active status. In February 1956 the first ANG unit dedicated solely to cargo airlift, the 150th Air Transport Squadron (Medium) of New Jersey was designated. The squadron utilized Curtis C-46D Commando aircraft (McMullen 1972: 17; Gross 2007:42).

Formalization of the ANG strategic airlift mission is credited to the Minnesota Air Guard's General John Dolny. The first ANG airlift mission took place in May 1961 as a response to a MATS request for support. The ANG flew C-97As to deliver cargo to destinations across the Pacific Ocean (Gross 2009:3). The ANG provided supplemental pilots and aircraft for MATS and its successor MAC (Francillion 1993:63). As with other Cold War missions, the ANG filled this assignment when crises surfaced or the Air Force became short-handed. The ANG provided cargo airlift support to Operation STAIR STEP and the allied response to the Berlin Crisis in 1961-62. As the operation ended, the ANG provided pilots and cargo aircraft to cross the Atlantic in 1962 and brought back materiel with C-97 aircraft (Gross 2007:50).

The ANG supplemented the Air Force regular force by carrying out 29 airlift missions in preparation of the Cuban Missile Crisis (Gross 2007:51). The ANG flew airlift to Florida and Guantanamo Bay in advance of possible hostilities. In 1965, the ANG provided supplemental MATS airlift for the Dominican Republic invasion (Francillion 1993:61-62). ANG volunteer pilots flew 43 cargo airlift missions.

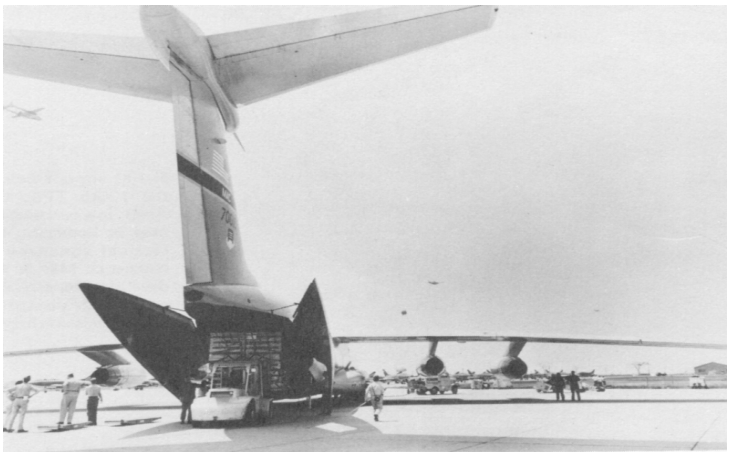
The ANG assisted Air Force airlift operations during the Vietnam War. By 1965, the ANG assumed many Air Force daily operational tasks to compensate for the regular duty units deployed to Southeast Asia. The ANG's earlier efforts enabled the Air Force to focus resources on the Southeast Asia conflict and other theaters. MAC requested ANG cargo airlift crews to help fill in the demand for regular Air Force airlift pilots assigned to the Southeast Asia theater. By 1966, ANG volunteers flew 75 overseas missions a month in C-97 and C-121 aircraft; the following year ANG pilots began making direct flights to Vietnam in C-124 Globemasters. As with all aspects of the ANG during the Vietnam War, the U.S.S. *Pueblo* Crisis and Tet Offensive in 1968 increased the need for ANG cargo airlift missions—raising its monthly trans-ocean missions to 115 (Gross 1985:149-151, 2007:55-58,61).

By 1964 the NGB ordered the ANG to utilize the Tennessee ANG 118th Military Airlift Wing to schedule domestic airlift and MAC missions to Southeast Asia. This unit became the Air Operations Center on the Nashville ANGB that eventually coordinated airlift operations nationwide on a 24 hour/7-day basis. The Air Operations Center, dispersed in various buildings of the base, was the organizational genesis of the ANGRC at Andrews Air Force Base (Gross 2007:54). In 1977–1979 the ANG provided

airlift support on Operation VOLANT OAK flights to Central and South America to support U.S. interests in Panama (Francillion 1993:74). In 1984, the ANG established the Advanced Airlift Tactics Training Center at Rosecrans ANGB in Missouri. The Center focuses on providing both classroom and real-world airlift training of tactical airlift practices to Air Force and ANG personnel (Gross 2007:85).

The ANG, flying specialized aircraft albeit sometimes outdated, took on several unique airlift missions. One of the missions involved polar installation support. The 144th Air Transport Squadron in Alaska flew C-47A Gooney Birds and then C-123J Providers specially outfitted with ski-mounted wheels to provision remote DEW Line and White Alice radar sites, as well as peacetime missions of transporting wildlife and feed for animals, provisions for flood victims, and supplies for others isolated in Alaska's rugged frontier.

In 1975 New York's 109th Tactical Airlift Group inherited the DEW mission from the Air Force's Alaskan Air Command. The mission involved resupplying the DEW radar stations on Greenland's icecap. In taking over the mission they also took over 11 specially equipped C-130s, five with skis for landing on snow/ice. The unit also supported other U.S. polar operations and provided arctic search and rescue capability. In the waning days of the Cold War, 1988, the 109th Tactical Airlift Group began supporting the Navy in Operation DEEP FREEZE. The 109th began flying missions to the National Science Foundation's research station on Antarctica, backing up existing Navy flights there. The 109th took over the entire operation in 1999 (Gross 2007:89-90).



(Source: Gross 1986: 161)

FIGURE 4-4. A C-141 BEING LOADED FOR THE NEW YORK 136TH TACTICAL FIGHTER SQUADRON F-100S FOR DELIVERY TO SOUTH VIETNAM.

The ANG also carried out tactical airlift. Aeromedical evacuation techniques had been developed during the Korean War. Army or Marine helicopters removed battlefield casualties to forward hospitals and then transported them outside of the combat area by specialized cargo aircraft (Bowers 1999:396). The 150th

Air Transport Squadron (Medium), New Jersey ANG was redesignated the 150th Aeromedical Transport Squadron (Light) on 1 February 1957, marking the Air Guard's debut in that mission (Gross 2007a). By 15 November 1957, the Mississippi ANG's 183rd Tactical Reconnaissance Squadron (Night Photographic) was redesignated the 183rd Aeromedical Transport Squadron and converted to C-119Fs. The latter aircraft was subsequently modified to the MC-119J configuration to better suit them for the aeromedical evacuation role (Gross 2007a). ANG involvement with aeromedical airlift during the Vietnam War began in 1965 when ANG pilots volunteered for aeromedical and cargo missions (Francillion 1993:62). The ANG provided this support in the 1968 U.S.S. *Pueblo* Crisis and Tet Offensive, and later for the 1989 Operation JUST CAUSE (Francillion 1993:65, 81). The ANG aeromedical evaluation role, however, was limited and supplemental to the Air Force.

4.1.4. Special Operations and Communications

The ANG participated in a variety of Cold War special operations that supported CIA missions, electronic surveillance, and radar/communications for military action. The ANG was associated with these missions, in part, because of their experience with older aircraft and their technological aptitude. Many of the missions were associated with major Cold War events including Vietnam, Bay of Pigs, and Panama. Because of the ANG's important role in the Bay of Pigs, it is discussed in detail in Section 4.2.2.

Certainly one of the major contributions of the ANG in the area of special operation and communications was the "Talking Bird" aircraft (Figure 4-5), a watershed in the development of communications technology and the most unique unit of the ANG. The concept behind the creation of "Talking Bird" aircraft came from General Curtis LeMay who was a ham radio operator. He wanted to experiment with the possibility of a flying command post that was able to carry all the communication and cryptographic equipment needed for impenetrable, reliable communication (Newman 2007). This type of aircraft was to be used as an initial onsite command post where facilities were not available for secure communications and would eventually be replaced by other facilities. Officially, the Air Force "experienced a need for improved methods of communications for command and control functions during early stages of contingency or potential contingency operations" (Felon 1962).

The prototype aircraft was a KC-97E tanker that had been in use by the Air Force since 1952. The aircraft was transferred to Tinker AFB in August of 1960 where personnel of the 205th Engineering Installation Squadron and 219th Ground Electronics Engineering & Installation Agency squadrons in Oklahoma City converted it to a pure communications platform. It was a model of engineering ingenuity since it was built of "off the shelf" electronic parts that had not been used together for this purpose. Modification and testing took three months, and on 4 November 1960 the "Talking Bird" concept became a reality. The

plane was christened *Miss Oklahoma City* and designated a C-97E/Special Category, the only such Special Category model in the Air Force inventory. After a short assignment elsewhere, the airplane was transferred to the Oklahoma ANG in February 1961. The aircraft was unique in that it had the capability of providing secure communications from the field to the Joint Chiefs of Staff and other leaders in Washington, D.C. It was the precursor to the later Looking Glass aircraft (OK ANG n.d.[a]).

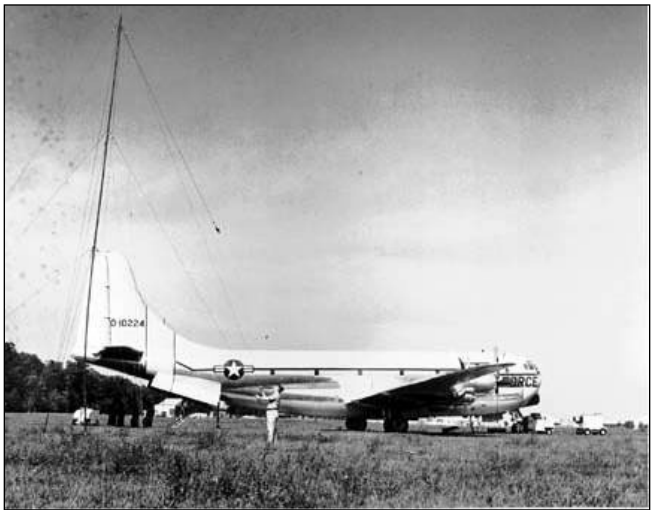


FIGURE 4-5. THE *MISS OKLAHOMA CITY* "TALKING BIRD" C-97 AIRCRAFT.

The *Miss Oklahoma City* had a flight crew of nine MATS-qualified Air Guardsmen assigned to the 137th Air Refueling Wing who were under the direct operational control of Headquarters U.S. Air Force Command Post in Washington, D.C. Orders were direct (top secret) from Air Force headquarters and the Pentagon. The aircraft and crew were on constant 4-hour alert in case they had to be deployed (Sawyer n.d.). There was a primary aircrew supported by a backup aircrew. Each crew had an aircraft commander pilot, co-pilot, two navigators, a communications officer, two flight engineers, and two loadmasters (Newman 2007). The aircraft could carry a communications team of up to 39 people. Due to the amount of communications equipment, spare parts, and personnel, a support aircraft usually had to accompany the Talking Bird on missions. The aircraft was outfitted with complete command and control functions including providing teletype and voice communications to the next higher Area Command Post, a complete telephone switchboard, two teletype printers, three auxiliary receivers, automatic voice control for radio relays, and a linear amplifier (Sawyer n.d.). The aircraft was always polished to a mirror-like shine and its highly polished red/blue/white-tipped propeller blades were distinct from the traditional yellow-tipped cargo plane blades. The flight crew wore bright orange flight suits with a logo designed specifically for the *Miss Oklahoma City* crew (OK ANG n.d.[a]).

The missions of the "Talking Bird" were varied. Her first mission was in support of the Southeast Asia Treaty Organization deliberations where she was based in the Philippines. Missions also included support of Operation STAIR STEP during the Berlin Crisis in 1961, operations associated with the Cuban Missile Crisis in 1962, presidential communications during foreign policy trips, humanitarian operations such as the Alaskan airlift following the 1964 earthquake, and training and public relations missions (OK ANG n.d.[a]). In 1961 the *Miss Oklahoma City* crews visited 22 countries, flew over 66,000 miles, logged 350 hours, and spent 140 days in the field that year. Over the next 11 years, the C-97 traveled to more than 34 countries on 82 missions.

Miss Oklahoma City was used to ensure secure communications between President Kennedy and Washington, D.C., during his overseas visits. During one of Kennedy's trips to South America, his group lost communications with Washington, D.C. As a result, the *Miss Oklahoma City*, which was on a different mission in South America, was dispatched to provide communications for the president. The aircraft and her technicians, many of whom worked for Bell Laboratories were very experienced with communications hardware and networks. They were able to provide secure communications to the president from his hotel room with the aircraft as intermediary. According to accounts, not even the Air Force had communications technicians with this level and breadth of experience. From that time forward, President Kennedy never left the country without *Miss Oklahoma City* (Newman 2007). Kennedy personally knew the ANG crew, and working for him was the highlight of many Guardsmen's careers (OK ANG n.d.[a]).

The ANG was associated with other special operations communications initiatives. Pennsylvania's 193rd Tactical Electronic Warfare Squadron volunteered for Operation COMMANDO BUZZ in Southeast Asia. On 26 July 1970 the unit employed two Lockheed EC-121S Coronet Solo electronic warfare aircraft and two support C-121Cs for this mission. They served in Thailand for a five-month assignment that involved relaying radio broadcasts for Phnom Penh broadcasts until December 1970 (Francillion 1993:70). Three other ANG wings flew RF-101 Voodoo aerial reconnaissance aircraft that took oblique angle photos of target areas with high speed cameras. The units served on 90-day rotations in Vietnam, and then were assigned duty in Panama, Alaska, Japan, and the Korean DMZ.

In 1974, the Air Guard assumed a new assignment conducting electronic probes and evaluations of the nation's air defense system. This aspect expanded on the existing continental defense assignment. The Kansas ANG's 190th Bombardment Tactical Group utilized Martin EB-57B Canberra aircraft to achieve this, and the unit became redesignated the 190th Defense Systems Evaluation Group (DSEG) under the

ADC on 6 April 1974 (Gross 2007a). The Vermont Air Guard's 158th Fighter Interceptor Group also joined this electronic mission in June 1974 and was redesignated the 158th DSEG (Gross 2007).

The ANG participated in a special operation mission in the final days of the Cold War with Operation JUST CAUSE. In December 1989 President George H. W. Bush initiated military operations to remove Panamanian leader Manuel Noriega and install a democratically elected government. The ANG 193rd Special Operations Group from Pennsylvania was involved in the initial planning for the operation and provided EC-130 aircraft that made 18 unspecified missions. The role of the 193rd in broadcasting from loudspeakers to persuade Noriega to surrender has been the subject of much writing (Gross 2007:92).

4.2. ANG Mobilizations and Operations

In this section, the major Cold War ANG mobilizations and operations are presented. The ANG contributions to the military operations of the Cold War should be read against the broader history of the Cold War presented in the previous chapter.

4.2.1. Korea

The Korean War was the first major mobilization for the ANG. More than 45,000 Air Guardsmen were called up to serve in the Korean War. With the exception of the 136th and 116th Fighter-Bomber Wings deployed to Korea and three more fighter wings deployed to Europe, most Air Guardsmen in Korea were mobilized as individual replacement pilots or mechanics in active units. Sixty-seven of the ANG's 84 flying squadrons were mobilized not in their unit structure but assigned on individual basis. In Europe, ANG fighters buttressed NATO forces in case of attack from the Soviets, two combat wings compiled excellent combat records in the Far East, and 16 wings augmented SAC, TAC, and ADC in the United States. By the end of the war, 101 Guardsmen lost their lives in action. Of the 5,148 ANG officers mobilized, 52 percent were pilots. Four ANG pilots shot down enemy MiG-15s with F-84s and F-86s to gain ace status: Captain Robinson Risner, an Oklahoma guardsman; Captain Clifford Jolley, from Utah; Captain Robert Love of the California Air Guard; and Major James Hagerstrom, a Texas Guardsman.

A less remembered contribution of the ANG in the Korean War was the considerable service of the ANG's air control and warning (AC&W) radar personnel. Nearly 11,000 of the approximately 45,000 Air Guardsmen mobilized during the war were from ANG AC&W units. Forty-five of the 48 ANG's AC&W squadrons, and all 12 radar calibration units were called up. Most were put into service in the continental United States but others were deployed to Alaska, Morocco, Libya, Newfoundland, Labrador, and Europe where maintaining alert missions was critical. The AC&W units were the last of the ANG squadrons to be deactivated at the end of the Korean War.

On the homefront during the Korean War, the Air Guardsmen's contributions to air defense were critical. The pilots and radar operators maintained the continental air defenses. Guardsmen also undertook more mundane assignments such as construction and repair of base facilities, operation of radar facilities, and completion of aircraft maintenance tasks.

The consensus of the military that the ANG did not show adequate readiness in the Korean War ultimately contributed to the later success of the ANG. ANG pilots served in the Korean War but on individual basis mostly as fill-ins and not with their original units or even given duties for which they had been trained. They suffered from poor equipment or were given assignments for which their aircraft and equipment were not suited. It took many months for the ANG units to mobilize, which reinforced the general view that the ANG was inferior to the active force. These shortcomings caused military planners and the Air Force to realize that the reserve force needed better training, wartime planning, and equipment. Ultimately these realizations contributed to changes of policy including the reserve force's better integration with the active force under the Total Force policy.

4.2.2. Latin America: Bay of Pigs, Cuban Missile Crisis, Dominican Republic, and Grenada

Faced with the possibility of Communism at its own backdoor, the United States actively supported dictators and revolutionaries alike in its defensive campaign to stem Communism in the Caribbean and Latin America. Preventing Soviet activity in Cuba and protecting American interests in Panama were the major focuses of American military efforts and the ANG's activity. Air Guardsman were deployed for missions, military interventions, and training in Mexico, Honduras, Costa Rica, Panama, Colombia, Venezuela, Cuba, Dominican Republic, Puerto Rico, and Grenada. The ANG's activities in Cuba and Panama, in particular, made a significant contribution to the Cold War. Historians and military strategists consider the Bay of Pigs incident as a major milestone of the Cold War.

Bay of Pigs

The ANG's involvement in the Bay of Pigs incident had considerable significance for the Cold War yet was a covert action that was carried out on an individual basis, not as an official ANG unit mission. In 1960, the CIA began equipping a group of Cuban exiles for an invasion of Cuba. To avoid the appearance of U.S. involvement, planes that were no longer in use by any branch of the military were selected. The CIA collected 16 B-26 Marauders, a light bomber, but needed men who could train Cuban pilots and mechanics, as well as armament and firefighting crews. The ANG 117th Tactical Reconnaissance Wing in Birmingham, Alabama, was the last unit to use the B-26s and the CIA approached the Alabama ANG to see if there were men willing to volunteer. Then Brigadier General George Reid Doster agreed to

participate. The Governor of Alabama agreed as well with the provision that the Alabama Guardsmen be used only in a supportive role (Trest and Dodd 2001).

Approximately 80 Guardsmen, most from the Alabama Guard and a few from Arkansas and Georgia, volunteered for the mission. The men were sent to one of two secret CIA bases: Retalhuleu in Guatemala or Puerto Cabezas in Nicaragua. There they spent a year preparing the Cuban exiles for an attack on their homeland. The CIA had been working with guerrillas since the spring of 1960, and with the recruitment of Guardsmen and other civilians, training could begin in earnest. A date of 5 March 1961 was selected. The CIA planned for an amphibious and airborne assault with the Cuban city of Trinidad as the target. Trinidad, a city of 18,000, was known to have anti-Castro activity and was near the Escambray Mountains, where resistance fighters were gathering. CIA planners believed that the daytime landing would spark a public revolt against Castro; however, if the planned failed, the Cuban exiles attacking Trinidad could escape into the mountains and join resistance fighters.

National Guardsman began training the Cuban B-26 crews in combat tactics including flying in close formation, bombing, strafing, and avoiding enemy fire—especially important as the B-26 had no air-to-air combat capabilities. Makeshift targets were created for improvised gunnery ranges. As training of the Cuban exiles continued, Alabama Guardsman felt confident that the CIA plan would be a success. This confidence was not shared by the Kennedy Administration however; on 17 February 1961 the date for the attack was postponed. On 11 March the President and his advisors rejected the Trinidad plan for being "too noisy" and gave the CIA planners four days to come up with an alternative (Trest and Dodd 2001:56). The CIA settled on the *Bahia de Cochinos* (Bay of Pigs) and the small town of Girón which was near a small airstrip that could be captured by the Cuban exiles. After the initial attack, the airstrip could be used by the B-26s so as to make the aggression appear to be an internal affair.

Though Castro's air force was small and included only armed T-33 trainers, Sea Furies, and B-26s bombers, the CIA and National Guardsman knew that surprise and air superiority were of critical importance to the success of the attack. The new Bay of Pigs plan included "heavy and sustained pre-invasion strikes against Cuban airfields to destroy all of Castro's military planes while still on the ground" (Trest and Dodd 2001:51). A new date for the invasion was selected, 17 April 1961.

Plausible deniability was extremely important to the United States such that a secondary aspect of the plan called for a Cuban exile to fly a B-26 with Cuban markings and "battle damage" to Miami International Airport immediately after the first pre-invasion strikes. He was to declare that he had just escaped from the fight over Cuban airfields and was defecting to the United States.

As the day of invasion approached, there was growing uneasiness in the CIA bases. There were concerns about the "uncertainty, indecision, and lack of commitment shown by the White House" (Trest and Dodd 2001:56). These fears proved well founded when the morning of the pre-invasion attacks, 15 April, it was announced that the number of bombers to be used would be cut in half, from 16 to 8. The Cuban exiles and National Guardsman who were preparing for the attacks argued that this could be disastrous to the mission, but the decision had been made. Eight B-26s succeeded in destroying many of Castro's planes, but eight Cuban planes survived the initial attack. Meanwhile, the Cuban exile had landed in Miami telling his cover story about defection. Reporters pointed out that the B-26 he was flying was different than those of Castro's air force, that the pilot's guns hadn't been fired, and that his "battle damage' had been poorly simulated; this prompted accusations of U.S. involvement in the attacks on Cuba.

After the involvement of the United States became clear, the White House called off the rest of the pre-invasion bomber strikes intended to destroy Castro's air force. Cuban exiles and National Guardsmen were shocked by the news that the next authorized strikes would take place on the morning of 17 April in support of Cuban exiles landing on the beach at Girón. Once the small airstrip was taken, B-26s could use it as a jumping off point for strategic attacks within Cuba.

As the invasion on the Bay of Pigs began, the B-26 pilots initiated nearly 24 hours of sustained attacks to support the ground invasion. Since Castro's planes had not been destroyed on the first day of strikes and the element of surprise was lost, the bombers and C-54 and C-46 transports that were resupplying the invading troops faced constant attack. The airstrip at Girón could not be secured and the Cuban exile pilots had to shuttle between the Bay of Pigs and Nicaragua, meaning nearly continuous flying. Air Guardsmen were busy helping to arm, refuel, repair, and load the returning bombers and transports.

By the end of 17 April, the Cuban exiles were down to 10 bombers, making the upcoming attacks on 18 April a daunting task. To help ease the load the CIA allowed American civilian crews to begin flying B-26 missions with the condition that they "operate over the beachhead and sea approaches only" (Trest and Dodd 2001:78). They were warned that if they fell into enemy hands, the United States would deny any knowledge of their presence in Cuba. While the civilian pilots helped to ease the fatigue of Cuban pilots, they did nothing to change the battle for air supremacy over the Bay of Pigs. Even with only six remaining jets, Castro was able to thwart the B-26 bombers and pick apart the invasion troops.

The CIA had found replacement B-26s at Eglin AFB in Florida and had secured permission to use unmarked F-51 Mustangs if the Cuban exiles could control the airstrip at Girón. However, the replacement B-26s never arrived and the Cuban exiles could not take the airstrip. The much needed air support of the F-51s was cancelled. At the end of the second day of fighting, an additional four B-26s

were lost and the invasion troops were barely able to maintain their position on the beaches at the Bay of Pigs. On the evening of 18 April the CIA announced that U.S. National Guardsmen would be allowed to fly B-26 bombing missions and transport resupply missions – the first instance of such a mission for the ANG. Seven Alabama ANG pilots volunteered for the bombing missions.

The six remaining B-26s, with their U.S. National Guardsmen and Cuban exile crews, took off early on the morning of 19 April buoyed by the news that the U.S.S. *Essex* (CV-9) would provide A-4D Skyhawks for air support. Castro's ground troops, supported by his small air force, had been closing in on the Cuban exiles at Girón and the B-26s ran into heavy enemy fire. The promised U.S. Navy Skyhawks never arrived to provide fighter support, possibly because of the time differences between Cuba, where the carrier was patrolling in international waters, and Nicaragua where the bombers were stationed. Alabama National Guardsmen reported seeing the A-4D jets arriving as they were leaving Cuban airspace.

During the final day of the Bay of Pigs invasion, two B-26s with American crews were shot down. Alabama Guardsman Major Riley Shamburger and his observer American Wade Carroll Gray were hit by a Cuban T-33 and crashed into the water "a few hundred yards offshore" (Trest and Dodd 2001:85). Alabama Guardsmen Captain Thomas Willard "Pete" Ray and his American observer Leo Francis Baker were inland attacking Castro's field headquarters when they were hit and brought down in an open field. While Ray and Baker survived the crash, they were soon killed by Castro's soldiers. Nearly 1,200 men were taken prisoner by Castro's forces. The CIA ended operations and began breaking down their camps in Nicaragua and Guatemala. The Guardsmen remained silent about the event, even to their families. The U.S. officially adhered to its denial of involvement in the event until recently. The names of the four killed pilots are listed on the CIA's Wall of Honor and Book of Honor at the agency's headquarters in Langley, Virginia. (Trest and Dodd 2001:90).

Cuban Missile Crisis

While ANG units were not deployed during the Cuban Missile Crisis, the ANG was involved in various ways. Volunteer aircrews from the ANG heavy transport units flew 28 special airlift missions during the crisis (Gross 2011). The ANG's interceptors based at the Luis Muñoz Marín International Airport ANGB in Puerto Rico were put on 24-hour alert, although not officially mobilized. Volk Field hosted elements of four ADC squadrons for 58 days. More than 20 alert aircraft remained on 15-minute alert around the clock which allowed ADC to disperse its resources to prevent losses in case the crisis escalated into a major conflict (Adjutant General's Office 1965:58). As Air Force bombers and fighters were mobilized on the mainland, many were sent to ANG bases closer to Cuba. The National Guardsmen on these bases established manned command posts to operate these installations around the clock (Gross 1995).

Puerto Rico and Dominican Republic

At about the time of the Cuban Missile Crisis, the nearby island nation of the Dominican Republic fell into a period of political and civil instability. Long-time Dominican dictator Rafael Trujillo was assassinated in 1961 and candidate Juan Bosch, a founder of the Dominican Revolutionary Party, was elected president in December 1962 and inaugurated in February 1963. Constitutionalists and military loyalists clashed, and political leadership changed several times over the next two years. Amid the island's instability, a concerned United States assumed the Dominican Republic would be the next Cuba. On 28 April 1965 President Johnson called up troops to the Dominican Republic at first to evacuate Americans and protect their property. Fourteen thousand U.S. Troops participated in Operation POWER PACK, which ended on 31 August 1965.

Operation QUICK KICK VII, thought of as a training dress rehearsal for the Dominican Republic invasion, took place in Puerto Rico earlier in April 1965. The multiservice training mission included communication support from the Will Rogers ANGB "Talking Bird" aircraft. A second all-services simulated amphibious landing training mission (Operation CLOVE HITCH III) also involved the 106th Fighter Squadron and 117th Air Refueling Wing. The ANG's involvement in Operation POWER PACK was limited to volunteers from ANG transport units and Oklahoma's "Talking Bird" flying command post.

Grenada

Two hundred and fifty Air Guardsmen, including the 193d Special Operations Group of the ANG, were called upon to participate in Operation URGENT FURY, the U.S. invasion of Grenada in October 1983. Leftist Prime Minister Maurice Bishop, who had been friendly to Cuba, had been captured and killed as part of a military coup. Given these events, the island governance was deemed unstable by President Reagan and leaders of some neighboring islands. The U.S. concern was underscored by suspicions that the construction of Point Salines Airport on the southern end of Grenada might be the jumping point for a new Cuban-Soviet base of operations. The United States used concern for the safety of the American medical students at St. George University in Grenada as justification for the short-lived invasion. On 25 October 1983 U.S. Navy, Marines, Army, and Air Force troops totaling 7,600 invaded the island country. The ANG's 193d Special Operations Group used its EC-130J Commando aircraft as a radio station. In the end, the United States faced criticism about American imperialism from the United Nations and the United Kingdom for its action.

4.2.3. Berlin Crisis

On the eve of 13 August 1961 Soviet and the East German soldiers and construction workers cut telephone wires and began erecting a wall between East and West Berlin to prevent Allied access to East Berlin and East Germans from relocating to the west (Francillon 1993). This was in clear violation of the agreement made at the Potsdam Conference of 1945. On 30 August President John F. Kennedy ordered 148,000 Guardsmen and Reservists to active duty: 112,000 were Army Reservists and 27,000 were from Air Force Reserve and ANG flying squadrons and support units. On 1 October 1961, 21,067 Air Guardsmen reported to their units, about a third of the ANG. The ANG was tasked to supply 18 fighter squadrons, air transport squadrons, and a tactical control group. In all, 163 ANG units were mobilized during the Berlin Crisis (Gross 1995:91).

The first phase of the Air Force deployment to Europe began on 5 September with Operation TACK HAMMER. TAC launched eight F-100D squadrons from its Composite Air Strike Force to augment Air Force strength with 144 fighters. All TACK HAMMER fighters moved across the Atlantic Ocean with air tanker refueling en route. The TACK HAMMER deployment was an interim measure until ANG units could relieve the TAC squadrons.

The initial 30 October deployment involved the 101st and 131st TFS of the Massachusetts ANG and the 138th TFS of New York ANG flying F-86H aircraft from Loring AFB in Maine and McGuire AFB in New Jersey. Three ANG fighter interceptor squadrons equipped with F-104A/Bs were called up on 1 November: the 151st from Tennessee, 157th from South Carolina, and 197th from Arizona. Sixty fighter aircraft, F-104Ds, were dismantled and transported across the Atlantic for service in Berlin. To reinforce NATO during the Berlin crisis, on the following day the first of 216 ANG jet fighter, reconnaissance, and trainer aircraft from mobilized units reached their bases in Western Europe.

Two squadrons in a second wave of F-84F and RF-84F aircraft departed 1 November from McGuire AFB by hop-scotching to Newfoundland, the Azore islands, and Spain. The interceptor squadrons utilizing F-104As did not refuel aerially. Thus, supplementary action was undertaken: Operation BRASS RING employed C-124 Globemaster to carry the dissembled fighter jets under MATS. Once they arrived in Europe these units became stationed at the following installations: 163 TFS Tennessee ANG and 197th TFS Arizona ANG at Chambley Air Base; 141st TFS New Jersey ANG-, 106th TRS Alabama ANG at Dreux Air Base; 166th TFS Ohio ANG at Etain Air Base; and 110th TFS Missouri ANG at Toul-Rosieres Air Base. The ANG's 151st Tennessee ANG and 197th Fighter Interceptor Squadrons (FIS) stationed at Ramstein Air Base went on alert status, while the 157th FIS South Carolina ANG also moved to alert condition at the Moron Air Base in Spain (Francillion 1993:60).

Eleven other ANG TFS were activated. These included: 120th Colorado; 121st Washington, D.C.; 169th and 170th Illinois; 113th Indiana; 119th New Jersey; 136th New York; 112th, 162nd, 164th Ohio; and 149th Virginia. Activated squadrons in the United States involved the tactical reconnaissance squadrons—106th Alabama; 184th Arkansas; and 153rd Mississippi. Six ANG air transport squadrons filled in for the Air Force MATS airlift function and flew worldwide missions in Boeing C-97 Stratofreighters: 115th and 195th California; 109th Minnesota; 133rd New Hampshire; 139th New York; and 125th Oklahoma (Francillion 1993:60).

The primary combat mission of the STAIR STEP units was air superiority and offensive tactical air support operations using conventional munitions to defend West Germany if the Soviets took action. Upon arrival in Europe the ANG's missions consisted of command inspections, theater flying training, air-ground close support operations, gunnery training, photo missions, and air defense alert duty. The operation involved transport of Lockheed T-33A Shooting Stars, Republic F-84E Thunderjets, Republic RF-84F Thunderstreaks, North American Sabre F-86Hs, and Lockheed F-104A Starfighters. Though equipped with conventional weapons, the STAIR STEP F-84F and F-86H squadrons maintained their proficiency to deliver nuclear weapons by practicing toss bombing.

The Berlin Crisis began to quell by March 1962, and the ANG wings returned from Europe over the spring and summer. The 151st Fighter Squadron from Tennessee was particularly noted for its performance during the Berlin Crisis as its 17 F-104 jets logged 576 flights and intercepted targets 90 percent of the time. Its high record of flights was made possible by its excellent mechanics keeping the jets ready to fly 98 percent of the time (Weaver 2007: 14). All had returned to their home stations without accident. President Kennedy's plan to maintain a show of force in Berlin had succeeded in preventing war. The crisis had cooled off; the Berlin Wall remained and divided East and West Germany for 28 years until the end of the Cold War. In all, this—the largest aircraft deployment in the ANG's history—was completed without losing a single plane.

4.2.4. Vietnam

Initially, the ANG provided support to the U.S. Air Force in Europe by filling everyday roles vacated by Air Force personnel deployed to Southeast Asia (Gross 1985:149–151). The ANG strategic airlift units began flying missions to Southeast Asia in December 1965 on a volunteer basis (Listman 2010). Preference was given to deploying draftees over the reserves to Southeast Asia and Vietnam, as noted by historian René Francillion,

> *...the Johnson administration's reliance on draftees to fight the war and its reluctance to call up Reservists and Guardsmen (only 22,745 Guardsmen were called to active duty during the*

Southeast Asia War as opposed to the call-up of 183,600 Guardsmen during the Korean War and 65,438 Guardsmen during the Berlin Crisis) (Francillion 1993:66).

On 23 January 1968 North Korea seized the U.S.S. *Pueblo*, a Navy ship fitted with spy electronics. Eight days later, the National Liberation Front launched the Tet Offensive in South Vietnam. These events changed the ANG's role in the conflict. President Johnson authorized the mobilization of 11 ANG wings with a reporting date of 27 January 1968, five days after the seizure of the ship. Most of the units called up flew North American F-100C Super Sabre fighter-bombers that could be outfitted with 500-pound, air-to-ground missiles, napalm, and machine guns for strafing. The fighter units flew sorties for ground support missions. By the end of the Vietnam conflict, 10,511 ANG personnel were mobilized in two call-ups. Of these only about 2,000 served directly in Vietnam and the remainder were deployed to South Korea and elsewhere. The fighter units were accorded awards for their performance (Listman 2010).

Three ANG wings flew RF-101 Voodoo aerial reconnaissance aircraft that took oblique angle photos of target areas with high speed cameras. The units served on 90-day rotations in Vietnam, then were assigned duty in Panama, Alaska, Japan, and the Korean DMZ. Volunteers of the New Jersey ANG and D.C. ANG provided about 85 percent of the men of the active force 355th TFS for a one-year period.

Other ANG units were sent to South Korea to protect American interests in the tense peninsula. So many Air Guardsmen served in late 1968-early 1969 that the ANG accounted for about 50 percent of the Air Force in Korea. There was a second partial mobilization of the ANG for Vietnam in 13 May 1968, consisting of three units that remained in the United States although some of their personnel were assigned overseas. The three units were the 104th TFS (Maryland), 138th TFS (New York), and 147th Aeromedical Squadron (Pennsylvania). From July 1970 to January 1971, the 193rd Tactical Electronic Warfare Squadron (Pennsylvania) flew EC-121 aircraft in Thailand in Operation COMMAND BUZZ. They operated airborne radar platforms and airborne control centers for U.S. tactical air operations over North Vietnam and the Gulf of Tonkin (Listman 2010; Speed 2006; McKinley 2001).

One reason that relatively few ANG units served in Vietnam early on was that President Johnson declined to mobilize National Guard units during the early years of the conflict (Doubler 1999). Draft laws permitted exceptions for education and professional deferments; those recruits joining the ANG could avoid the draft through six years of service (Doubler 1999).

Many ANG units, however, provided air defense for the United States, and were not called to federal service in Vietnam. President Johnson signed Executive Order 11392 on 25 January 1968. The Executive Order mobilized 9,343 ANG members for federal service and was authorized by the DoD Appropriation

Act of 1967. Under this order, the President could order any unit of the Ready Reserve for up to 24 months when necessary. The President federalized the National Guard units after conferring with Secretary of Defense McNamara and the Joint Chiefs of Staff (ARFR March 1968:2). The federalized ANG units served under TAC, MAC, and Air Force Communications Service (AFCS). Units from Maryland, New Jersey, New York, Colorado, Kansas, Iowa, New Mexico, Kentucky, Arkansas, and Nevada were the first called. As described above, the ANG did not represent a major component of the forces in Vietnam, but did make a contribution to the effort both on battlefield and in protecting U.S. interests.

4.2.5. Panama

The ANG had a long involvement in Panama throughout the Cold War. U.S. interests in protecting the Panama Canal have long been paramount and have driven the U.S. need to ensure the political security and predictability of the area. Following the political unrest in demonstration for Panamanian sovereignty over the Panama Canal in 1964, the ANG participated in Operation HIGHLAND FLING and Operation HIGHLAND FLING II in January 1965 and again in 1966. Airlift units from West Virginia, with communication support from Oklahoma's "Talking Bird" aircraft, deployed active duty personnel and equipment to Howard AFB for annual training.

More long-lasting were the ANG's Operations VOLANT OAK and later CORONET OAK, both airlift missions in support of Howard AFB in Panama flown exclusively by Air Guardsmen and their C-130s beginning in 1977. Following the passage of the Torrijos-Carter Treaties in 1977, ANG units provided airlift in 15-day rotations to Panama and two-day airlift trips to Argentina, Bolivia, Chile, Colombia, Ecuador, Guatemala, Peru, the U.S. Virgin Islands, and longer trips to Honduras or Uruguay. The Volant/Coronet Oak missions were responsible for supporting all of United States Southern Command airlift requirements. With the end of the Panama Canal Treaty and the closure of Howard AFB in 1999, the Coronet Oak mission moved to Luis Muñoz Marín ANGB in Puerto Rico.

A cousin of the CORONET OAK mission was Operation CORONET COVE; ANG A-7 fighter units protected the Panama Canal from September 1978 until January 1990. The units would deploy to Howard AFB for 15 days flying close air support for Panamanian ground forces.

Because of its long history and experience in Panama, the ANG played a major role in Operation JUST CAUSE. Pennsylvania's 193d Special Operations Group was part of the integral planning process by the Joint Chiefs of Staff and the Air Staff for the invasion of Panama. The 105th and the 172nd Military Airlift Groups provided airlift support for the operation. They flew 35 missions, completed 138 sorties, moved 1,911 passengers and 1,404.7 tons of cargo in 434.6 flying hours. The 136th and 146th Tactical

Airlift Wings and the 139th and 166th Tactical Airlift Groups had participated in VOLANT/CORONET OAK. During Operation JUST CAUSE, they flew 22 missions, completed 181 sorties, and moved 3,107 passengers and 551.3 tons of cargo. The ANG Operation CORONET COVE units, the 114th and the 180th Tactical Fighter Groups, flew 34 missions, completed 34 sorties and expended 71.7 flying hours and 2,715 rounds of ordnance. They provided close air support, armed reconnaissance, convoy escorts, and aircraft identification and intercept (Gross 1995:132). After the late 1989 U.S. military intervention in Panama, CORONET OAK was replaced by ANG F-16s for CORONET NIGHTHAWK, a mission to monitor drug trafficking in the area. Operation CORONET NIGHTHAWK continues today from the ANG base in Puerto Rico.

5. AIR NATIONAL GUARD INSTALLATION DEVELOPMENT

As of 2010, the ANG occupied 178 installations in the continental United States, Alaska, Hawaiian Islands, Guam, U.S. Virgin Islands, and Puerto Rico. The ANG's installations and facilities are highly diverse, reflecting both the ANG's own history and missions and those of the installations and units prior to the arrival of the ANG at that location. Although the ANG installations exhibit considerable diversity, there are common types of installations and facilities and patterns. A number of factors are responsible for these patterns. These include the pre-ANG history of the installation (pre-World War II early expansion, AAF, Navy, SAC, Nike missile, etc.); temporal period when ANG was established at an installation; current and past ANG unit missions and aircraft flown; and whether the ANG is or was at a municipal airport or dedicated military installation. This chapter focuses on developmental trends that affected the form of ANG installations. Facilities present on ANG installations are discussed according to property type in Chapter 6.

5.1. Early Military Aviation Development

The earliest aviation at military installations made use of whatever open space was available. The early biplanes of the Signal Corps and private aviators landed on polo fields and parade grounds of military forts, as initially there was little specialized aviation infrastructure. Jefferson Barracks in St. Louis made military aviation history when on 1 March 1912 its parade ground served as the landing site for the first Army parachute jump. Captain Albert Berry safely landed on the fort's parade ground after making the first parachute drop from a biplane at a height of 1,500 feet (New York Times 1912).

The first purposeful military aviation structures were two wooden hangars built in 1911 at Fort Sam Houston, home of the Signal Corps Aeronautical Division, and two wooden hangars at College Park, Maryland also built that same year. The four hangars were the basis for the Quartermaster Department's first standard hangar design, a 45 by 45 by 11-foot wood-frame structure with board and batten siding. Beginning with the March 1916 passage of the National Defense Act and subsequent legislation, the Army aviation program expanded. The initial four dedicated military airfields were Langley Field, Virginia; Kelly Field, Texas; Hazelhurst Field, New York; and Luke Field, Hawaii, followed by four additional "waves" of installation construction ending in 1918. By the end of World War I, the Signal Corps had two standard hangar designs and a standard airfield design by industrial designer Albert Kahn. The standard Signal Corps mobilization hangar was a wood-frame structure, 66 by100 feet, with a distinctive low gambrel roof supported by wood trusses and buttresses on the sides. The Signal Corps' larger U.S. All-Steel hangar was supported by steel roof trusses 66 feet in length that could be combined into bays of 20 feet in a modular fashion. These hangars were commonly lengths of 66 by 120 feet or 66

by 140 feet. Cladding was varied and included masonry, metal, or wood. Kahn's standard airfield design used a one-mile square section. Twelve hangars of the Signal Corps mobilization design lined up along the side of the airstrip and additional buildings were arranged in rectangular fashion. In a late 1917 design for Brooks Field, Kahn arranged the 65 buildings in a curvilinear fashion including 16 hangars, of which 12 were of standard Signal Corps mobilization hangar design (Pedrotty et al. 1999: 2-2-2-10). Selfridge Field and Ellington Field, both ANG installations today, date to this original World War I period and demonstrate the transition from an early Army airfield construction to modern military installation. Selfridge Field ANGB in Michigan was first established as a military airfield in 1917 as part of the U.S. mobilization for World War I. Outside of the city of Detroit, the War Department leased a 600-acre tract with a privately-owned grass landing strip. The Signal Corps used Albert Kahn's square-mile installation plan to construct a long row of wood-frame hangars and simple one-story temporary support buildings along one side of an undeveloped air strip. The 8th and 9th Aero Squadrons of the Signal Corps arrived on 7 July 1917, and the following day a JN-D8 "jenny" biplane took off from the airfield. This flight marks the beginning point for Selfridge's claim as one of the longest continuously operating military airfield in the United States.

Further development occurred during the 1920s. Selfridge was declared a permanent base in 1922, and its role changed from a training facility to a pursuit (fighter) base. The 1st Pursuit Squadron, assigned to Selfridge, flew en masse to Michigan from Ellington Field, Texas, the first successful completion of such a maneuver. Selfridge became the center of fighter aviation for the nation. In 1925 Congress approved a multi-million dollar building program that resulted in construction of a cantonment of two-story brick residences along curving residential streets. These buildings replaced frame temporary buildings that were the hallmark of the original Selfridge Field. Similarly planned residential neighborhoods with regionally appropriate architectural styles along curving streets are seen at Fort Sill and other Army and Navy bases of the period. Selfridge remained at the forefront of technological innovation. In June 1927, the first night flight was completed at Selfridge under light provided by a 5 million candlepower floodlight. Selfridge also is known as the first training base for the Tuskegee airmen who later moved to their airfield in Alabama. During the Cold War, Selfridge was a base dedicated to SAGE and Nike air defenses, and then to the SAC alert mission. The base gained a 1952 alert hangar, readiness crew facility, aircraft shelters, and ammo storage igloos which remain on the ANG real property inventory (Rutter 2011).

gure 2: Type 4 typical front elevation, Selfridge ANGB (NARA, Completion Report 1930-1932)

(Source: Library of Congress)

(Source: Detroit News)

FIGURES 5-1, 5-2. SELFRIDGE FIELD, HOUSING AND AERIAL PHOTO CA. 1930.

The strategic location of new military airfields had been chosen in the 1920–1930s, with a focus on the west and east coast and the US-Canadian and Mexican borders. The War Department and Drum Board also stressed the need for more airfields across the United States and its island territories. As aircraft became heavier and all-weather takeoff and landing considered necessary, paved runways came into being. Ford Airport in Dearborn, Michigan, is considered to be the first U.S. concrete runway, constructed in 1927-1928. The Army Air Corps was slow to adopt hard-surfaced runways. The paving of aprons around hangars came earlier than the runways so airplane mechanics could work on planes without muddy ground. Concrete runways for AAF installations came into being by the late 1930s. AAF and Quartermaster Corps designs utilized existing highway specifications. The minimum runway length then was only 3,000 feet long (R.C. Goodwin 2002:73). The five-year Army Air Corps expansion campaigns were replaced with President Franklin D. Roosevelt's New Deal work programs that brought work relief in the form of new military construction. They also encompassed special projects such as fabrication of aviation fueling stations (R.C. Goodwin 2002:40; Goodfellow et al. 2009).

The 1935 Wilcox Act authorized military construction for new Air Corps bases in the northwest and northeast; McChord Field in Washington state embodied this trend. Construction began in 1938 utilizing new design standards that included paved intersection runways and aprons illustrating the evolution away from grass fields to an all-weather hard surface flight line. Runways at this time had a triangular configuration and X-pattern designed to take advantage of local wind patterns to enable aircraft take off and landings. With either runway configuration, aircraft could land and take off, providing additional flexibility (Goodwin 2002: 41, 73).

Prior to and during World War II, the open field dirt landing strip began to disappear as aircraft became heavier and the growing demand for air travel resulted in the need for all-weather airports that became prevalent just prior to and during World War II:

> *Depending on the prevailing winds, one to three runways were necessary at an airfield. Airfields were generally planned in the following manner. A large tract of land, frequently a mile square, was secured, graded, and leveled. To maximize the take off and landing area, supporting building complexes frequently were located along one side of the field, or, later, in one corner of the property. Runways occupied the remaining area. These fields often included three runways that connected in a triangle or intersected, at or around, a central point. This plan was advantageous for control tower operations. The entire field could be observed from the control tower. Each of the three runways was approximately 150 feet wide. On each side of the runway, an additional strip 200 to 250 feet in width was leveled and seeded. These areas provided an extra margin of safety for aircraft operation* (R.C. Goodwin 2002:72).

The adjacent taxiways allowed aircraft to quickly clear away from the runway and allow other planes to take off or land. Taxiways typically had 50-foot widths and utilized the same construction materials and techniques as the runways (R.C. Goodwin 2002:73).

5.1.1. Municipal Airports

In 1957 the ANG reported that its 93 installations consisted of 76 tactical, 9 support (rescue, aeromedical, and transport), and 8 permanent field training bases. Seventy-one of the 93 installations were on municipal airports, two on state-owned airports, and one at a privately-owned airport. Thirty-eight were jointly owned with other military branches; of these, 14 were regular Air Force installations and 5 were Navy stations. In addition, the ANG had 41 non-flying installations such as AC&W sites (ANG Annual Report 1958). Today approximately 77 ANG installations are at present-day municipal airports. Many were World War II AAF airfields that had been appropriated by the U.S. government for military use just prior to or during World War II. An analysis of the later use of 395 World War II AAF airfields as of 1995 or 50 years after their use concluded that most (71 percent) are now used as civil airports. Of these, about nearly one third (31 percent) are used by the military in some capacity, either as military installations or civil airports with military use such as ANG or Air Force reserve (Murdock 2002).

The federal government did not have an official role in local aviation until the 1920s when a national system for air travel and a national air mail system were needed. Airfields were mostly unpaved strips without facilities, many owned by private aviators. The Civil Aeronautics Act of 1938 funded the

evaluation and improvement of the nation's 1,907 civilian airports. A survey conducted prior to the passage of the legislation found that refueling facilities were available at only 882 civil airports, only 230 airports had adequate light, and only 231 had adequate hard-surface runways. The Bureau of Air Commerce approached local governments and offered to build joint-use airports if the land for military facilities was provided free of charge. Local leaders and municipal governments welcomed this assistance, which was seen as a source of construction jobs and future local business. In some cases, state legislatures had to be convinced to authorize issuance of bonds to finance the airports.

Local airports of the period were small, generally with one or two runways, and a simple aircraft hangar (Murdock 2002). Wind socks or compass roses were in the center of the runways for judging wind condition and direction. Terminal facilities were virtually nonexistent. The simple airstrips gave rise to airfields with multiple runways, generally with triangularly-arranged or somewhat later with two intersecting connected runways in the form of an X. The triangular or X-configured runways allowed flexibility in the use of the runways given changing weather and wind conditions. Aids to navigation were limited with night lights and beacons. A national system of landmarks painted in the characteristic checkerboard and then beacons served as early aids to navigation. These small municipal airports gave way to larger airfields with additional, paved runways, taxiways, and aprons and hangars.

During the Depression, the WPA sponsored many airfield and airport construction projects both as a means of public employment and to improve the nation's infrastructure. Typical projects were grading, drainage, paving of runways, and ground improvements. In July 1936, the WPA moved to coordinate all of the local airport work under a centralized airport program, and an Airways and Airports section was set up as part of the WPA Engineering Division. Procedures were adopted that required full use of the information available from what was then the Bureau of Air Commerce (later the Civil Aeronautics Administration [CAA], and now the Federal Aviation Administration [FAA]); this agency reviewed all airport projects with respect to their technical aeronautic features. The WPA itself was more stringent in its review of airport projects and made use of the standard plans of the CAA including designs and specifications for drainage and paving. The CAA criteria for selection of airport sites were the basis for WPA funding and design (Murdock 2002). WPA projects sponsored by the War Department and the Navy Department were not subject to CAA requirements but met the requirements of the sponsoring department.

Under this more formal WPA airport program, airports were built throughout the country including runway pavements of the highest type, new hangars, and new administration buildings. Large projects were usually planned for gradual construction over a period of years, and the choice of construction at any

time was governed by the need of particular facilities to meet the demands of commercial aviation, the availability of WPA labor possessing the requisite skills, and the ability of sponsors to finance the local share of the costs. WPA labor was used for facilities modernization at municipal airports at Boeing Field (Seattle) and Portland-Columbia, Washington; Witchita and Topeka, Kansas; and St. Paul, Minnesota as well as military installations such as at Lowry Field, Colorado, and McChord Field, Washington. Airfield enlargements and runway extensions typically were improved to 3,800 to 5,600 feet in length and 150 feet in width (Aero Digest 1940:59).

Once the national defense emergency was declared, the WPA was called upon to carry out an accelerated program of airport construction and improvement in strategic areas all over the country. Projects certified by the War or Navy Department as important to national defense could be granted exemption by the Commissioner of WPA from certain regular WPA requirements. These exemptions made possible longer working hours and larger monthly earnings for WPA workers, and permitted the hiring of non-relief workers to any necessary extent. The exemptions also waived the requirement that the sponsors contribute a certain proportion of the total costs. Congress allocated funds to the CAA that, in many instances, were used to supplement sponsors' contributions (Aero Digest 1940:39). On 31 December 1942, 202 airport projects were in operation. During the whole of the preceding seven years, projects had been carried on at 1,045 airport sites. This work was divided almost equally between the earlier civil phase and the later defense phase of the program; in the defense phase, about as much work was done in two years as in the preceding five years (DoD 2009).

(National Archives and Records Administration, Record Group 69, Negative 4516)

FIGURES 5-3, 5-4. OKLAHOMA CITY AIRPORT (LEFT) SHOWING WPA-CONSTRUCTED X-CONFIGURED RUNWAY AND HANGAR); MARCH FIELD (RIGHT) IN 1940 SHOWING TRIANGULAR INTERSECTING RUNWAY CONFIGURATION COMMON IN THE 1930S–1940S.

In states where state guard organizations sought facilities for its aviation arm, airport construction also drew on funding made available through the WPA's armory construction program. The assistance of the WPA was sought by the NGAUS. Some air arms of state guard organizations used the WPA program to support the construction of armories, which could be combined with a hangar structure. Aircraft ramps or taxiways could be funded through the WPA airport program. Thus, the WPA program provided several funding sources for municipal airport facilities such as runways and ramps, and for armories and National Guard aviation facilities, all of which could be used at local airports.

Sponsorship of local airports and National Guard aviation units necessarily involved local leaders, state politicians, and the federal government. The Des Moines ANGB illustrates the intertwined roles of local citizens and federal and state governments in obtaining a National Guard aviation unit. During the 1920s there were a number of small, private airfields in Des Moines but a modern airport was needed. In 1929 the Iowa General Assembly passed legislation that allowed the city to levy assessments and sell bonds to build the airport. An initial 160 acres south of downtown were leased, and construction of the new airport began in 1932. Progress lagged behind schedule because of lack of funds prompting the CAA and later the WPA to provide funds to speed the completion of the airport. The airport opened in 1933 in somewhat unfinished fashion, with two, 1,800 feet long by 100 feet wide asphalt runways edged with concrete. By the end of the 1930s, the Des Moines airport had expanded with four runways in place.

Iowa had long sought a National Guard air unit for the Des Moines area but had been denied despite many local efforts. A citizens' committee established in May 1940 promoted the possibility about the time that the 1940 War Department Appropriations Bill authorized eight new squadrons. Governor George A. Wilson made a request to NGB and confirmed the airport's recent expansion would be sufficient for the largest military aircraft. NGB approval for the 124th TFS came in July 1940. Shortly after, the City Council gave Des Moines architect William N. Nielson permission to prepare plans for a combined hangar/armory. The bulk of the funding was to come from the WPA; however, WPA officials rejected the project, indicating additional funding and sponsorship by the city would be needed. With the city's bond limit reached, local businessmen agreed to use a bank loan for the needed funds. Nielson completed architectural drawings with a reduced budget, eliminating taxi strips and runway improvements and cutting 2,000 square feet from the building's 28,000-square feet. Still it was within Army standards and sufficient to house 14 planes, 31 officers, and 115 enlisted men (Des Moines Tribune 1940). NGB approved the building plans on 13 December 1940. Land costs were picked up by the citizens' committee; local businessmen and NGB each provided $50,000; and WPA funded $250,000 for the hangar-armory construction. Construction began in January 1941. The installation's original structures were the main hangar-administrative building and a warehouse aligned perpendicular to the airfield (ANGRC 2008).

Locating ANG installations at municipal airports continued through early years of the Cold War. It provided an extra measure of protection to the nation's population centers especially through the ANG's leadership in the runway alert program

5.1.2. Cold War ANG Installations Collocated with Military Installations

Many of ANG installations began as municipal airports that were appropriated for World War II military use and then were expanded and rebuilt by the military during the Cold War. Other ANG installations were authorized and constructed as entirely new military installations. The ANG sometimes occupied a small portion of a military installation, or in other cases became a later occupant. The iterations are variable, and affect both the built resources extant and the historic themes to be the basis for evaluation of the NRHP eligibility of the resources.

Klamath Falls ANGB in Oregon is an example of a military installation that began as a modest municipal airport and went through various military iterations during later years, in contrast to Selfridge ANGB has been discussed in terms of its transitions from an early World War I era military installation. When Klamath Falls Municipal Airport was established mid-1930s, it consisted only of an airstrip and small hangar on a 4,950 by 2,640-foot parcel southeast of the town of Klamath Falls. The paved airstrip was limited, only 4,000 long by 100 feet wide. In 1942 the Army appropriated the municipal field for use as an aircraft dispersal site and constructed some facilities. However, the base was not used by the Army and instead the Navy took over the site on 1 November 1943. The Navy began construction of a Naval Air Station and built an 1,800 by 400-foot parking ramp, tower, and various barracks and shops. The Navy moved a 100 by 200-foot steel hangar to the base; the structure had been used at an Army Air Field in Alaska, was dismantled and shipped to California, and then to Klamath Falls. At the end of World War II the Navy decided it no longer needed a military airfield in the Klamath Falls vicinity and the installation was deactivated in 1946 (ANGRC 2002).

Klamath Falls, known as Kingsley Field, had a second life as a Cold War installation under the Air Force. In 1954 the Air Force assigned an all-weather fighter-inceptor squadron and an aircraft warning and control squadron to the installation. Kingsley Field was an important link in the west coast system of the Aerospace Command (ADCOM), the U.S. support command to NORAD. The installation became part of ADC's 25th Air Division with an assigned fighter-interceptor alert mission. The clear inland weather of the high desert was advantageous for year-round flying unlike the coasts of the Pacific Northwest. With the largest clear zone in the western United States, Kingsley Field was sufficient for storing large quantities of weapons, including nuclear weapons.

Under the Air Force, Kingsley Field's World War II-era runway system was expanded to a 10,301- foot long asphalt and concrete runway and intersecting 5,260-foot asphalt runway. Also constructed were extensive weapons storage facilities, an alert hangar, and various flight line and operations facilities as well as personnel morale, recreation, and support facilities. In 1979 Kingsley Field was reduced to an alert detachment site and the City took over maintenance of the runways and general aviation facilities under a joint arrangement. In 1981 the Oregon ANG took over Kingsley Field, and in 1983 it was officially designated an ANGB. The major unit, the 8123rd Fighter Interceptor Training Squadron, conducted an F-4C pilot operational training school and the following year was designated the 114th Fighter Squadron. Support facilities were added to the base, but otherwise it retained and used its earlier Cold War facilities. Under the ANG, the Cold War-era facilities have been remodeled and new ones added. The base retains the alert hangar originally built for the Air Force.

5.2. ANG Installation Developmental Trends

Military aviation saw an increased investment after World War II with the establishment of the Air Force under the National Security Act. Notable trends in installation development were the introduction of jet aircraft into the ANG inventory with the necessary adjustments to facilities and installations; introduction of new installation types related to new Cold War missions; and standardization of Air Force and ANG building types through the issuance of design manuals and other means.

5.2.1. The Jet Problem

The introduction of jet aircraft prompted what is termed in the historical literature as the "jet problem." Jet aircraft necessitated longer runways of different construction, larger-sized installations located away from developed areas, and expansive clear air space zones for approaches and landings and for noise buffers. A 1948 study of ANG bases evaluated the ANG's facilities for jet suitability and specifically looked for runways with a minimum length of 9,000 feet (7,000 feet of runway and 1,000 foot overruns on each end). Only 17 of the existing 78 ANG facilities were close to these requirements, and there were only seven installations that could be used for light bombardment aircraft (NGB 1949). This left 54 installations requiring major upgrades for jet aircraft.

NGB leaders called for the Air Force to provide a schedule of ANG installations to receive jet aircraft to help prioritize installation upgrades, funding from Congress to support the upgrades, and time to do the construction prior to the arrival of the jet aircraft. Another difficulty was that the military had no authority (outside of declaring martial law as was done during the World War II years) to require modification to civil airports, which was the job of the CAA. Before the NGB could provide the funds for extending runways at these places, Congress would have to give the NGB authority to provide the funding or direct

construction. Budget requests in 1950 were eliminated by military leadership and were not included in the military budget request to Congress (NGB 1949).

The "jet problem" was not limited to the ANG but plagued the active forces and civilian aviation alike. The changed needs from World War II airports were discussed widely in the aviation engineering literature. A military planner noted in a 1956 article in *The Military Engineer* the difference between the World War II and postwar aviation needs:

> *In 1942 there was a standard of four runways with a 45-degree internal angle between each two adjacent runways so that the aircraft could be operated regardless of wind direction at any hour of the day. This pattern was in use at civilian and military airports…." When the United States entered World War II there followed a tremendous expansion of the Army Air Corps and a need for several hundred new air bases. Time was limited and it was, therefore, essential to take advantage of every existing airport. Many of these peacetime airports were improved and efficiently utilized. Some of them were located near the communities which they served and, even in extreme instances, were not more than 5 or 6 miles away from population centers. Runways of 5,000 feet and 6,000 feet in length or less were then adequate and this matter of distance did not seem to be of importance at this time. Today, however, runway lengths of 10,000 feet and 12,000 feet are not uncommon and room must be available for expansion* (De Longe 1956:420–422).

The need for increased clear space for the longer, shallower approaches and takeoffs of jet aircraft and as adequate noise buffers necessitated larger-sized installations further from developed communities. A military planner in 1953 noted:

> *"Airfields of one square mile (640 acres)* [required] *many square miles to obtain areas free of obstacles and approach-zone hazards. Airbases require more related facilities including cantonments, flight line support, and larger areas with clear airspace. Approaches for landing and takeoff with the new jet aircraft are flatter than the World War II counterparts, requiring 1:50 and preferably at 1:100 instead of 1:40 flight angles. Runways are longer and wider than formerly, 10,000 feet in length being common and 14,000 feet not unusual* (Washbourne 1953:256–258).

The noise path of a C-47 might be 4 miles by 1 mile, but a jet bomber might cause noise over an area 24 miles by 4 miles. In locating military installations on former World War II airfields, consideration was given to installations in communities that could accommodate the installation. Distance to town, nature of

transportation network, and topography were major considerations. During the World War II era, stepping stone installations with airfields every 30–50 miles were needed for maintenance, refueling, and personnel needs. This was not the case with the speed and range of modern jet aircraft (De Longe 1956).

Within the installation, jet aircraft noise presented sufficient concerns that the overall size of installations had to increase and design specifications mandated a distance of at least 2,000 feet between administrative, community, and housing facilities from operational zones. The Air Force had determined that noise should be no more than 85 decibels relative to facilities near the airfield. Otherwise sound-proofing of structures might be recommended. Direction of prevailing winds and topography of site locations were recommended to be considered—rolling terrain and trees could help muffle noise. Planting trees on established air installations also could provide noise mitigation (De Longe 1956).

The 1953 Air Force design guidelines set forth new specifications for runways and related facilities that took into account jet aircraft. The design guidelines specified concrete pavements on permanent bases, with concrete or asphalt optional in secondary and secondary bases. Runway pavements were deemed preferable in concrete to support the weight of aircraft and deterioration from spilled jet fuel and other problems. Runway shoulders were to be stable and not have rocks or gravel that could be sucked into the jet engines. Lighting moved beyond the edges of runways and taxiways because of the position of wings and landing gear. Fueling requirements increasingly were moved underground with hydrant and nose arrangements although aboveground tank farms were still needed and mobile tank trucks were less used.

Although these were general principles repeated frequently in the literature of the period, apparently studies of actual use indicated otherwise. The Director of the Military Construction Office, Chief of Engineers, War Department wrote in 1946 that a study of airfield use indicated the multiple runways at airfields were rarely used by large bomber aircraft, and instead one or two runways at a given airfield were used repeatedly. Moreover, the study showed that runways used by jet aircraft need not be oriented with regard to the winds. He also recommended that runways could be shorter than previously thought, approximately 4,000 feet in length, if they have clear zones of about 1,500 feet at either end capable of supporting the aircraft. Finally apron and taxiway pavements were recommended to be about 25 percent stronger than runways because aircraft did not rest on runways for extended periods. In contrast with the heavier aircraft, the lighter aircraft did use the multiple runways of the X-shaped and triangular arrangement and were more dependent on runway orientation relative to the wind (French 1946: 46–47, 152–155).

The ANG employed a number of solutions to the "jet problem." It constructed new airfield facilities where it could, encouraged local leaders to modernize the civilian airport, and in many cases adjusted the

unit missions appropriate to limitations of the airfield facilities. In other cases, fighter units were relocated to installations that had sufficient airfield facilities. Yeager ANGB is a case in point. Their fighter squadron transitioned to airlift and special operations in response to the hilltop location of the airport that limited the length of the runway. At Hayward ANGB, where the first experiment with the runway alert mission was conducted, the short runway and developed community nearby limited the adoption of jet fighters for the 194th Fighter Squadron. Shortly after the adoption the unit moved to Fresno ANGB, which was located in a sparsely settled agricultural area. The Fresno base had a major airfield from its prior service as Hammer Field, an AAF field that had been a sub-unit of Camp Pinedale. As such it was an auxiliary munitions storage facility, home to the 4th Air Force, and site of a regional AAF hospital (California State Military Museum 2011). The Hayward ANGB fighter aircraft were replaced with the older troop carriers and special operations aircraft that did not have the airfield requirements of the fighters.

5.2.2. 1946–1949 Birth of Standardized ANG Construction

The years between 1946 and 1949 marked the first concerted effort by the ANG to establish standards for ANG base and facility construction (NGB 1949). The effort was prompted in part by the need for ANG construction amid limited postwar funding. Of the $127 million requested by the ANG in 1947, only $31 million was received. Similarly, in 1948 and 1949, $248 million and $161 million were requested but only $45 and $78 million were received for ANG programs. The year 1948 was described as having inadequate procurement and maintenance (presumably mainly of aircraft) and only $4,144,321 was spent on construction, about 9.1 percent of the overall ANG budget. The next year, 1949, was described in more specific terms as having, "inadequate procurement, construction curtailed." However, despite funding limitations, spending on construction more than doubled to $11,277,220 and accounted for about 14 percent of the overall ANG 1949 budget (NGB 1949).

Despite the relative lack of funding to develop facilities for ANG units, construction in 1949 was described as "perhaps the most interesting" activity of the Air Installations Branch of the NGB. While other regular service construction programs were greatly curtailed, Congress recognized the need for new or replacement buildings for the ANG and appropriated funding for that purpose under the newly passed National Defense Act (NGB 1949). The upgraded budget coincides with the assignment of the first jet aircraft to the ANG in 1948, which required upgraded runways and other infrastructure. The ANG estimated that it realistically needed $52 million for all units to reach the minimum number of sufficient facilities to accommodate new jet aircraft as well as for their existing inventory of other aircraft (NGB 1949). Knowing this was an unrealistic expectation, the ANG was forthright about its need to establish priorities and make hard decisions about the allocation of the $17 million that it did receive (NGB 1949).

When it became apparent in 1947 that at least some funding would be made available for ANG construction, standardized plans were recognized as warranted. Earlier, prewar and World War II ANG structures were understood to be inadequate for the purposes of postwar ANG units (NGB 1949). Structural steel was very expensive during and following World War II; therefore, it was not feasible for use in building ANG structures immediately after the war. For the construction of ANG hangars after the war, closed AAF airfields and regular services junkyards were visited. Several train loads of prefabricated hangar parts designed for the use in the Pacific Ocean were shipped around the country to various ANG units and erected. Likely trusses from U.S. All-Steel hangars were reused and may have been the first use of standardized construction in the ANG (NGB 1949).

As junkyards were being scoured for excess hangar parts, the Washington, D.C. architectural firm of Mills & Petticord was retained through the Army Corps of Engineers and with the consent of the Secretary of War to design an ANG standard hangar plan suited to their postwar needs. The architects spent time with many ANG units to watch them operate and to better determine their requirements. The resulting design was enthusiastically endorsed by National Guard commanders throughout the country (NGB 1949). Mills & Petticord produced three different designs for ANG use in 1949. The first was a hangar with only a plain open bay aircraft working area, the second was a hangar with one-story lean-tos around three sides of the building, and the third was a hangar with two-story lean-tos. Local conditions and funding availability would be the determining factors in deciding which type of hangar would ultimately be built at a particular location (NGB 1949). Where possible, NGB encouraged the construction of a hangar with one-story lean-tos with administrative space in a separate building. The separate administrative building was also designed by the architects since there was not a standard Air Force design for such a building. In addition, a special warehouse was designed specifically for the storage requirements of each subordinate unit at each ANG facility. Lastly, because no standardized design for aircraft control and warning units was available, structures for their use were pioneered and given the stamp of approval by the Air Force for training and tactical purposes (NGB 1949).

The firm of Mills & Petticord retained by NGB was a prominent Washington, D.C., firm with substantial work for the military and governmental connections. The firm was established as Mills & Petticord, Washington, D.C., in 1938, and then reorganized in 1951 as Mills, Petticord, & Mills. In 1975, the firm merged with HOK Group, Inc. The principals were Alan Balch Mills and George Washington Petticord, Jr. Alan Balch Mills was born in 1887 and educated at the University of Pennsylvania. Mills had extensive governmental experience prior to establishing the firm, having served as New Jersey State Architect during 1921–1926 and then as Executive Assistant to the Supervising Architect, Treasury Department 1934–1938. Before the design of ANG hangar designs, the firm was responsible for the

design of the hangar and adjacent support building for the 106th Observation Squadron at the Birmingham Municipal Airport, Alabama, constructed in 1937. Both Birmingham buildings were funded by the WPA. The firm also was responsible for the East Wing of the National Museum of Natural History in Washington, D.C., and numerous other buildings in the nation's capital (AIA 1962: 486).

The Mills & Petticord 1949 standard hangar design was used at Yeager ANGB, Hayward ANGB, Stratton ANGB, and others ANG installations. Plans for Hangar 1 at Yeager, constructed in 1950, show a hangar with an arched truss, open bay aircraft work space surrounded by one-story masonry lean-to shops on its side and back facades. The height of the aircraft work space was sufficient for fighter aircraft and C-130s alike. The hangar at Hayward ANGB, also constructed in 1950, is similar to that of the Yeager except it has two-story lean-tos.

FIGURES 5-5, 5-6. YEAGER ANGB (LEFT) AND HAYWARD ANGB (RIGHT), BOTH EXAMPLES OF 1949 HANGAR DESIGNS BY MILLS & PETTICORD.

The major difference was the one-story lean-tos of the Yeager example, and the two-story lean-tos of the Hayward hangar.

At least initially, because of the lack of qualified personnel and the highly technical nature, size, and span of the newly designed ANG buildings, the Army Corps of Engineers would perform and supervise ANG construction. The Army Corps' process for building future ANG bases and expanding existing bases was conceptualized to work as follows:

> *Step one was for the engineers to develop a site plan to determine the correct location of each proposed structure in relation to existing structures and facilities, as well as to take into account the locations where future facilities may be needed. This plan would become the installation's "Master Plan". It ensured the orderly development of the facility and had to have the approval of the airport management, the Adjutant General of the state in which it was to be built, the Chief of the NGB, and sometimes the regional director of the CAA (forerunner of the Federal Aviation Administration).*

> *Concurrently, the standard plans for the structures were to be adapted for local climatic and soil conditions, building codes, and other requirements. The Army Corps of Engineers would prepare bidding documents and cost estimates which were submitted to the NGB for review since they ultimately held the purse strings. As soon as funds were made available, the Army Corps of Engineers received the green light to proceed with the project. If funds were not available, the bidding documents were held in the office of the appropriate District Engineer in case additional funds were made available and the project could move forward* (NGB 1949).

An inventory of ANG property was conducted beginning in 1948 prior to the commencement of the building campaign of 1949–1951. In 1948, as part of the ongoing downsizing of the military and transition to the Air Force, the ANG received property from the War Assets Administration or by license from the regular services which resulted in the acquisition of a number of additional buildings of which the ANG only had vague descriptions. This inventory was initiated so a subsequent maintenance or replacement program could be established including the newly acquired structures (NGB 1949). Other types of surveys were also carried out by the ANG at this time. Entire airports were surveyed so specific plots of land could be acquired, leased, or licensed that best suited the ANG; runway extension surveys were conducted to determine the feasibility of extending them for new jet aircraft; and other miscellaneous surveys were conducted as required by the Air Force prior to their approval of use of a particular airport by ANG units (NGB 1949).

Standard facility design has a long history in the military. The Quartermaster issued standard designs as early as the World War I years, and the development of standard hangar plans by the Signal Corps was previously mentioned. The Air Force first issued definitive designs in 1951-52 as guides in planning, programming, and designing Air Force, Air Reserve, and ANG facilities. The definitive plan designs were produced by the Architectural Services Branch of the Air Force's Directorate of Installations with collaboration across the services to standardize response to mission requirements, cost, new technology, and materials. These designs were given to participating architects through decentralized offices of the Army Corps of Engineers. The designs were used by local architects and engineers to build new installations. The designs were consistent with the DoD Instructions and Air Force Manuals (AFM), and encouraged local architects and engineers to use them as the basis for a given project but modify them for local conditions. The *U.S. Air Force Design Manual, Definitive Designs of Air Force Structures* (AFM 88-2 1975) provides designs in two parts: Part I for active Air Force, and Part II for ANG/Air Force Reserve use, while other AFMs include only isolated air reserve force designs in their manuals.

Definitive drawings were provided for various types of facilities within 15 facility groups according to the Air Force category code system. An example is Land Operational Facilities that correspond to Facility Group 14. Among the drawings of this group are plans for fire stations, aircraft alert shelter, readiness crew building and utility plant, alert shelter complex, reconnaissance photo laboratory, solely and combined six squadron operations structures for varying aircraft, combined facility for composite squadron operations— tactical air support squadron and direct air support flight (F-102/F-106), and combined facility for composite squadron operations—air refueling (KC-97). Each definitive drawing gives a floor plan, section, room dimensions, and square footage, plus general instructions for structural, plumbing, electrical, and heating. Rooms are assigned as to function. Finishes are not indicated although furniture is indicated schematically. Directions in the manual introduction make clear that pre-manufactured structures or materials meeting the specifications are acceptable, if not encouraged. Aircraft-related buildings show the specific aircraft laid out in their corresponding bays. Flight simulators and some support buildings were specific to aircraft as well.

The design manuals were periodically updated with new designs according to changes in mission needs, technological change, and overall military priorities. Updates to the design manuals were issued with some older drawings maintained, while new drawings superseded and replaced earlier versions for other facility types. Thus the 1975 design manual had definitive designs originally published as early as 1955, which is noted to have replaced a 1951 design. Most designs date through-1974.

Later ANG/Air Forces Reserves definitive designs were produced by Spector, Peake, and Howell, architects and engineers of Falls Church, Virginia, and authorized by the Air Force in November 1974.The firm was organized in 1968; educated at the University of Michigan and the Beaux-Arts Institute of Design, principal Victor B. Spector headed an earlier firm local to the Washington, D.C. area, Victor B. Spector and Associates. Spector is noted for having designed the underground storage structure for Nike and Hercules missiles and published the security manual for National Guard installations. His non-military local work included banks, churches, and corporate headquarters buildings. Other architectural firms that produced definitive designs were Albert Goenner and Associates of Washington, D.C.; Carroll, Grisdale, and Van Allen, architects of Philadelphia; and Griffels and Vallet, Inc. and L. Rossetti of Detroit, among others (AIA 1970).

5.3. ANG Installation Types

In its real property accounting and annual reports, the NGB classified ANG installations into two general types: flying installations and non-flying installations. As listed in Table 5-1, flying installations are those that have an airfield or access to an airfield via a taxiway, runway, or ramp as well as flight line or

aircraft-related facilities. The flying installation type includes municipal airports, most military installations, and training ranges. It should be noted that an ANG installation would be designated as a flying installation type if it was designed for flying and had access to an airfield and related facilities even if the installation was not used for flying at the time.

The second ANG installation type is the non-flying installation. These installations were not designed for a flying mission and do not have an airfield, connection to an airfield, or aircraft-related facilities. Sub-types of ANG non-flying installations are former Nike missile sites, radar sites, and other non-flying installation types.

TABLE 5-1. ANG INSTALLATION TYPES

Flying Installations
Municipal Airport
Military Installation (Navy, Army Air Forces, SAC, ADC)
Ranges
Non-Flying Installations
Nike Missile Sites
Radar Sites
Other Non-Flying

Municipal airport-type ANG installations are those installations located at municipal airports. The ANG installation is generally to a side or corner of a civilian airport on land leased to the Air Force by the airport authority. The ANG aircraft facilities, hangars, and ramps are connected via a taxiway to runways shared with commercial air traffic. The airport control tower provides air control for the ANG as well as the other air traffic. Some ANG fire and crash facilities serve both the civilian airport as well as the military.

Facilities at municipal airport-type installations are those needed to support the flying mission whether fighter, airlift, aeromedical, search and rescue or other mission. Typical facilities include aircraft maintenance and specialized-type hangars (test cell, corrosive, etc.); hush house or test engine facility, petroleum, oil, lubricant facility; aeroport; fire and crash station; operations facilities; storage; administrative; personnel support such as dining hall; weapons storage; and a variety of other storage types.

5.3.1. Flying Installations

Initially ANG installations with flying missions were mostly at municipal airports, an outgrowth of the early aviation facilities available to the growing aviation arms of the state national guards prior to the

formal establishment of the ANG. The ANG expanded into missions requiring larger facilities or greater security, and began to collocate on military installations including those of any service branch. Generally, they were incorporated onto Air Force installations or took over former Naval Air Stations that had closed after World War II. The Colorado ANG's long occupancy of Buckley AFB, formerly a Naval Air Station auxiliary field during World War II and then an early ANG base is examples. Both Selfridge ANGB and Klamath Falls ANGB have been discussed elsewhere in this chapter. ANG units are commonly located on Air Force, former SAC bases because of the availability of facilities for the ANG refueling mission. They also are found on former ADC installations, as well as former MATS installations. The flying installations have been discussed elsewhere in this chapter.

5.3.2. Non-flying Installations

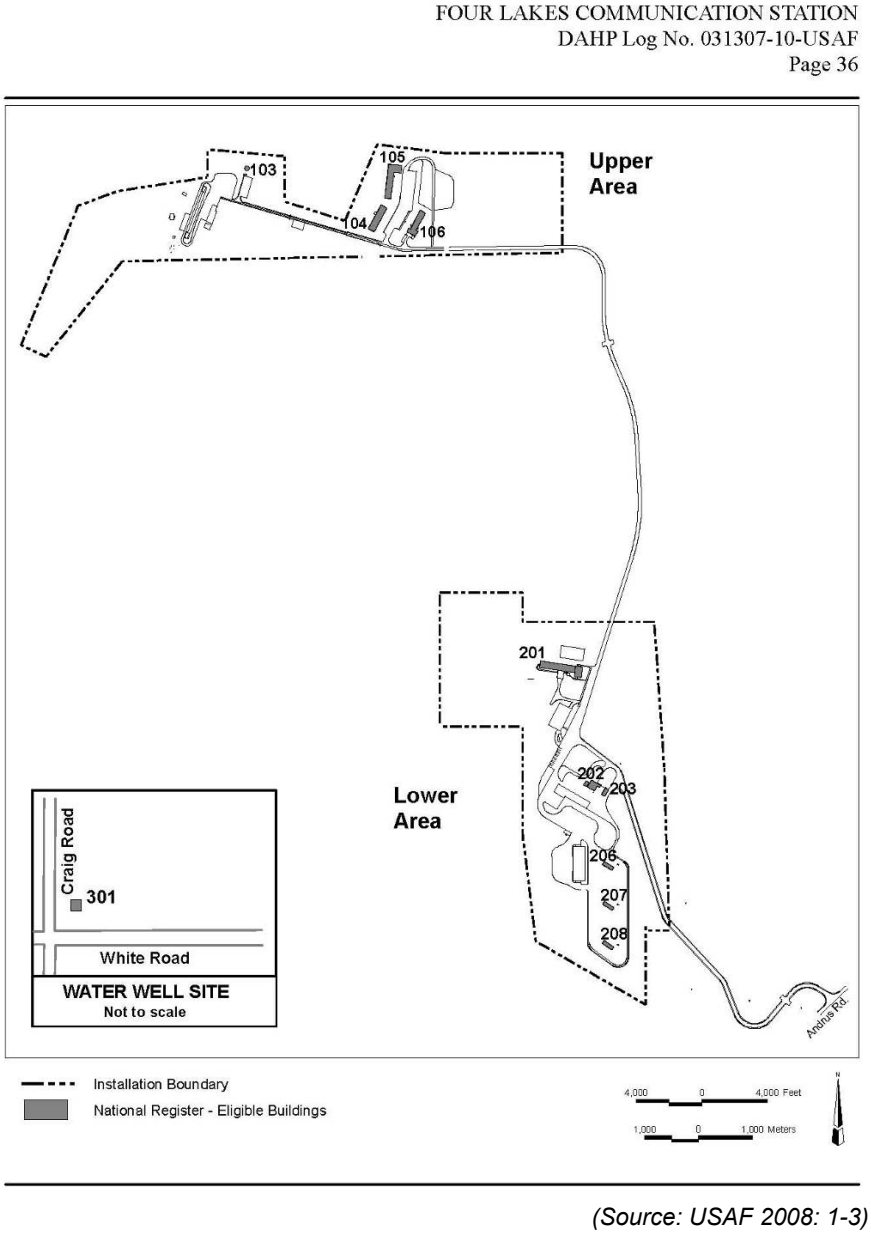
The ANG occupies installations that do not have facilities for a flying mission. Combat communications squadrons, air defense squadrons, and engineering squadrons are units that do not fly. They may be housed in installations located on or off military bases. Combat communications squadrons, in particular, require security and often are collocated in military bases in buildings. The two most common non-flying type installations, Nike missile sites and radar sites, are discussed in this section.

Nike Missile Sites

As part of the On-Site Program, the Army and Army National Guard (ARNG) occupied and operated the anti-aircraft artillery (AAA) batteries around military installations during the 1950s. As Ajax missile sites came online, the active Army began moving to these locations. In 1957 the active Army received the newer Hercules missiles, and the ARNG was moved from AAA batteries to the Ajax sites that the active Army was departing. In the reorganizations, the Air Force was assigned some responsibilities. Many of the Nike sites such as McGuire, Selfridge, and Stewart were at active Air Force bases. As Nike sites were abandoned, they were often turned over to ARNG units or placed in excess status (Thelen 2011; Morgan and Berhow 2002). The ANG later inherited the Nike missile sites as convenient installation facilities through its connections with the state national guard or as part of Air Force installations. ANG combat communications squadrons that require security but no flying facilities are commonly placed in former Nike missile sites. ANG installations that occupy former Nike missile sites currently or formerly include the following: Selfridge ANGB, Four Lakes Air National Guard Station (ANGS), Orange ANGS, Sepulveda ANGS, and Coventry ANGS. There are additional installations in all likelihood.

The typical Nike site consists of two or three distinct parcels; the integrated fire control (IFC) area, the administration area, and the launch area. The first two areas may be located on the same parcel depending on the site. The Army Anti-Aircraft Command required the IFC and launch area to be within visual site of

each other but at least 3,000 feet apart (Bender 2004). Due to difficulties with land acquisition and terrain, some were more than a mile apart. This led initial Nike battery designs to call for a site to be at least 120 acres of land. In urban and industrialized areas this land requirement was problematic. A later design moved missiles into underground magazines so the sites required only 40 acres. The IFC area was located on high ground and contained three acquisition and tracking radars, the battery control trailer, the radar control trailer, a maintenance/spare trailer, and a power plant. The Nike missiles were initially designed to be mobile so the equipment used to track incoming enemy aircraft and guide the missiles were located in trailers. Depending on terrain and site conditions, the Administration area was either combined with the IFC or on its own parcel. This area contained barracks, a mess hall, recreation and administration buildings, vehicle maintenance and wash rack, fuel tanks and pumps, a security checkpoint, and other buildings that might be required (Figure 5-7). These buildings vary in construction materials and design. Some Nike sites had segregated housing areas.



(Source: USAF 2008: 1-3)

FIGURE 5-7. FOUR LAKES NIKE SITE F-37, WASHINGTON, NOW FOUR LAKES COMMUNICATIONS STATION; IFC IN UPPER AREA AND ADMINISTRATIVE AREA IN UPPER AND LOWER AREAS. LAUNCH AREA NOT SHOWN.

The most common type of Nike missile site follows the Chatelain plan. These sites utilize the belowground magazine designed by ARAACOM design architect Leon Chatelain, Jr., in 1953. The sites contain two or three distinct parcels: the IFC (Radar) area, the administration area (often combined with IFC), and the launch area. The launch area was geographically separated from the IFC and Administration areas. This distance depended on terrain and other factors; however, the launch site was always within visual site of the IFC. ANG installations at Nike missile sites are decommissioned Nike sites so the

overall site areas are recognizable but not all components are in place. The launch area contained the underground missile magazine. An elevator would raise the missiles to the surface and crewmen would move the missile to the aboveground launcher via a series of metal rails. The launchers would raise the Ajax or Hercules missiles to a nearly vertical position before being fired (Figure 5-9). Many early Nike batteries were modified with the introduction of the Hercules missile. This required enlarging the underground magazine by up to 20 feet in length and 5 feet in width. The elevators that carried the missile to the surface also had to be enlarged for Hercules missiles (HAER IL-116 1992).

FIGURES 5-8. FOUR LAKES ANGS COMMUNICATIONS STATION, WASHINGTON, DECOMMISSIONED LAUNCH AREA (LEFT); ADMINISTRATION AREA (RIGHT)

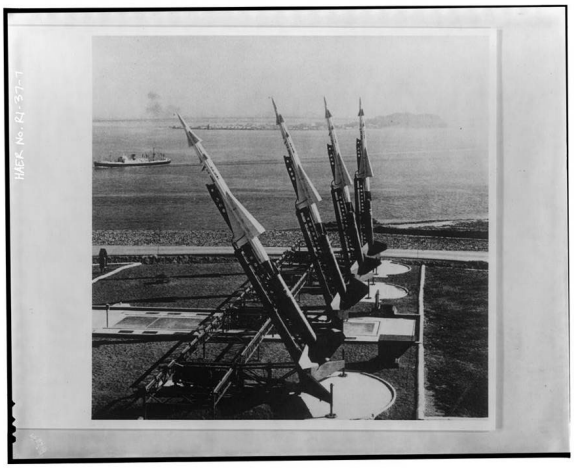


FIGURE 5-9. NIKE AJAX MISSILES ON ABOVEGROUND LAUNCHERS. CARLISLE BARRACKS NIKE SITE, PENNSYLVANIA.

The less common types of Nike sites are those with aboveground missile storage. Initial designs for Nike Ajax sites included the IFC, administration, and launch areas much like the Chatelain plan sites. Missiles were stored on their launchers and were covered when not in use. This early design required larger parcels that made land acquisition difficult, especially in heavily industrialized and urban areas. Even though most Nike batteries were built with Chatelain's underground magazine storage, many early sites contained the aboveground storage areas. These later batteries continued to be constructed in areas where weather and land was not a hindrance such as the 1961 Hercules missile site at Bellows Nike Battery in O'ahu, Hawai'i.

Computer and communication systems were housed in a battery control or administration area separated from the launching area. The control site at larger sites also served as battalion headquarters. Component buildings were single-story concrete block structures and radars were mounted on metal towers. These towers were cylindrical or square metal frames housing the acquisition and tracking radar for the batteries that guided missiles to their targets. Other facilities included security gate houses and electrical generator buildings to ensure a ready or backup power supply. The missile assembly building was used to assemble and service the missiles, which arrived at the base in component parts, while the warhead building served as a storage facility for the missile warheads.

Radar Sites

ANG air defense squadrons had AC&W operators associated with them. Initially AC&W squadrons operated mobile radar equipment (light) and later radar equipment mounted to fixed towers. About 1964 the squadrons became Air Defense Squadrons or squadron detachments although it is not known if there was a mission change, organization transition, or merely a name change. The squadrons operated radar sites. They processed and analyzed data from the radar equipment as well as installed, maintained, and calibrated the equipment. The squadrons were associated with alert fighter-interceptor units and larger radar networks that spanned air defense zones. Needing the clear view of the skies, the radar sites were location specific, installed atop prominent highpoints or overlooking oceans. Current ANG radar sites are in Colorado, Utah, Puerto Rico, and the Hawaiian Islands. Interestingly, the ANG's early radars at the Punta Salinas Radar Site, Puerto Rico were mounted atop World War II bunkers to take advantage of the height of the summit location overlooking the Atlantic and the height of the bunkers.

The ANG's Cold War radar technology required two radar antennae worked in tandem: one antenna detected the height of aircraft or foreign objects, the other detected distance. The radar antenna could be mobile, mounted to towers, or housed was in a fiberglass geodesic dome (radome) that capped a two-story, steel-framed and sheet metal clad base structure. The console and other equipment for the radar

antenna were operated from the floors below the antenna, and the antennae rotated under the dome housing. The data received by the radar antenna was transmitted via lines in a subterranean trough that led into an operations building where a room of analysts processed and interpreted the data. In the operations building was a secure operations room with a terraced floor supporting banks of analysts facing the front of the room at a large working board and glass map projection. The personnel were arranged by specialty and rank, with the uppermost tier given to the specialist who was authorized to communicate and alert the fighter-interceptors. The operations buildings were simple, concrete buildings with a taller section devoted to the operations room; the additional height was required by terraced floor of the operations room. Later radar sites with upgraded radar equipment needed only one radar antenna as the height and distance were integrated into a single facility. These later installations did not require onsite operations buildings as the data from the radome could be conveyed by modern communications technology and then processed remotely at another site. Facilities generally required administration buildings, maintenance and storage, and infrastructure.

FIGURE 5-10. PUNTA SALINAS RADAR SITE, PUERTO RICO.
NOTE THE TWO RADOMES WITH THE OPERATIONS BUILDING BETWEEN THEM.

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6. PROPERTY TYPES

6.1. Introduction

The NPS defines a property type as "*a grouping of individual properties based on shared physical or associative characteristics. Property types link the ideas incorporated in the theoretical historic context with actual historic properties that illustrate those ideas. Property types are to be directly related to the conceptual basis of the historic context* (NPS 2011b). This chapter focuses on property types and standard plans for buildings most associated with the ANG military mission. It focuses on flight line resources including hangars, crash and fire stations, and other facilities. It also includes discussion of certain building types associated with administration and training that are not commonly recognized. Consequently, it does not address all types of facilities at ANG installations.

Section 6.2 is devoted to resources associated with the flight line, and section 6.3 addresses non-flight line property types. Section 6.2.1 looks at general flight line resources not specifically associated with the alert program. Within this category are general maintenance hangars, specialized maintenance hangars, and crash and fire stations. Section 6.2.2 focuses on resources associated with the alert program including aprons, specialized alert hangars, readiness hangars, and crew readiness quarters. Section 6.3 is a catch-all section that addresses resources not associated with the flight line including administration, training, housing, and chapels. Although not as directly associated with the ANG mission, they are frequently not recognized or are dismissed.

6.2. Flight Line Property Types

6.2.1. Non-Alert Flight Line Resources (Non-Alert)

Generally, ANG flying installations have a parking apron that accesses the aircraft hangars, shops, crash and fire stations, and other facilities on the flight line. The apron is accessed by a taxiway that also leads to the runway. At civilian airports, the often ANG uses the airport's runways and control tower and does not have its own. Military bases have runways and aviation control towers that the ANG uses.

General Maintenance Hangars

Maintenance hangars vary considerably depending on the mission of the installation, the type of aircraft in service, and the hangar's year of construction. Most maintenance hangars were designed to totally enclose an aircraft for service. With few exceptions, the maintenance hangars occupy a rectangular footprint and have gable, flat, gambrel, or barrel-shaped roofs. Roof trusses provided an open work area without the need for interior supports. Shop and office areas were in lean-tos, flat- or shed-roofed sections on the side and/or rear, or in the hangar itself. Access to the hangar was provided by a vertical swinging

door or pairs of multi-panel, sliding doors, either on the same horizontal plane or accordion style. Tracks at the top and bottom guided the door sections into pockets on either side, or onto a cantilevered frame extending from the corner of the building. In gable and barrel-roofed variants, a centrally located panel above the doors could be opened to provide access for the tail of the aircraft (USAF 1999b:145–147).

The earliest hangars in the ANG inventory today were of the general maintenance type. They were constructed in the late 1930s with WPA program funding and labor. An earlier hangar in the ANG inventory today is at the Peoria ANGB and dates to 1933, but was constructed for a civilian airport and was later occupied by the ANG. The main hangars at Birmingham ANGB, constructed in 1937 and the Des Moines ANGB, completed in 1940, reflect the program requirements of NGB and combined support of the WPA program and military. The Birmingham example is the earliest design by the firm of Mills & Petticord in the ANG inventory.

FIGURE 6-1. GREATER PEORIA REGIONAL AIRPORT, ILLINOIS ANG, 1933. FORMER MUNICIPAL AIRPORT GENERAL MAINTENANCE HANGAR.

FIGURE 6-2. BIRMINGHAM ANGS, ALABAMA ANG, 1937. FORMER HANGAR, DOORS ON BOTH SIDES HAVE BEEN INFILLED.

FIGURE 6-3. LAMBERT IAP, MISSOURI ANG. FORMER NAVAL AIR STATION HANGAR, 1942.

FIGURE 6-4. GEIGER FIELD/SPOKANE IAP, WASHINGTON ANG. FORMER ARMY AIR CORPS HANGAR, CA. 1943.

There were several types of general maintenance hangars constructed during the Cold War. Wing, nose dock, and open bay hangars were designed by many different architectural firms throughout the era. The earliest plans were designed by the firms Mills & Petticord and Strobel & Salzman. Basic plans were modified as the type of aircraft and missions changed though general maintenance hangars remained similar from year to year. These general maintenance hangars are distinguished by their size and form, which is dictated by the type of aircraft and part or system of the aircraft to be serviced.

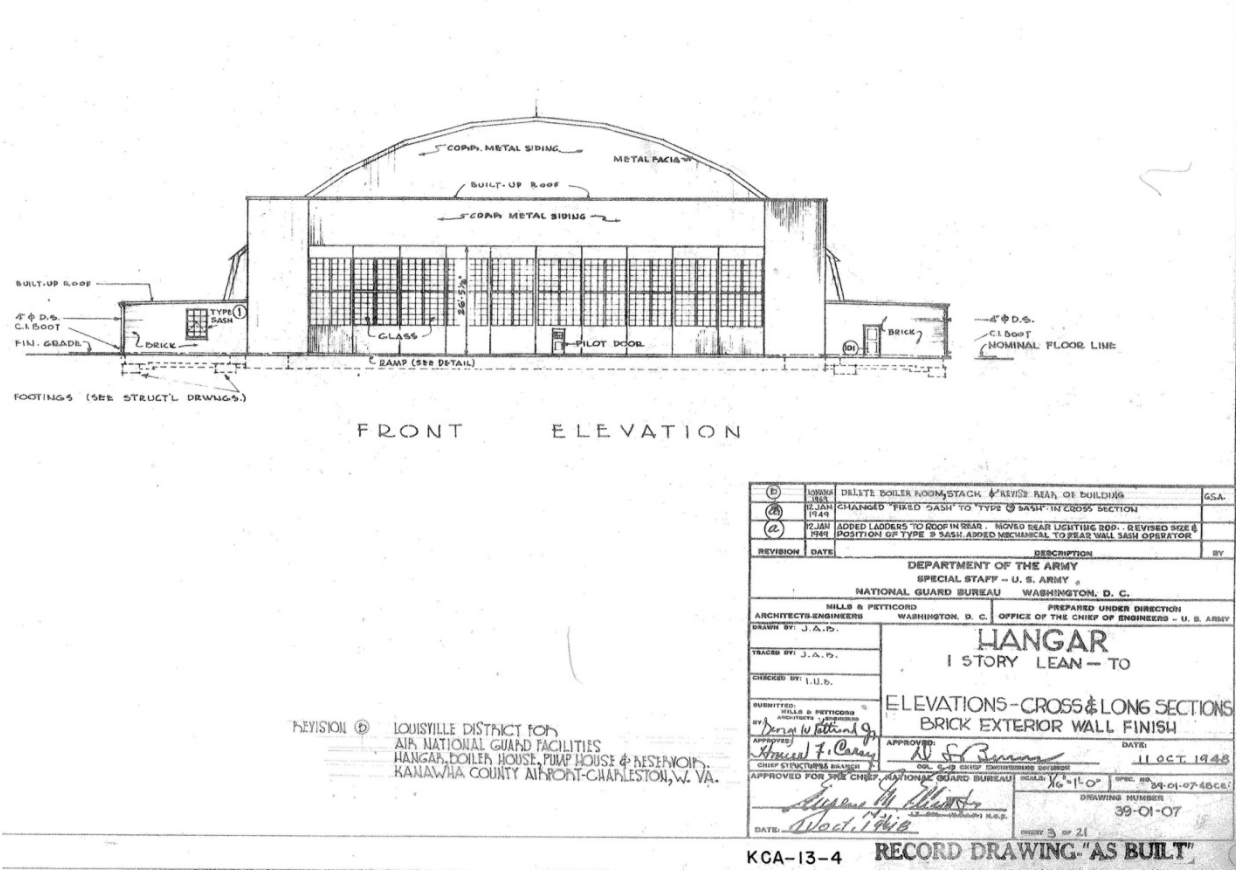


FIGURE 6-5. OPEN BAY MAINTENANCE HANGAR, 1948. YEAGER ANGB, WEST VIRGINIA. DRAWING 39-01-07

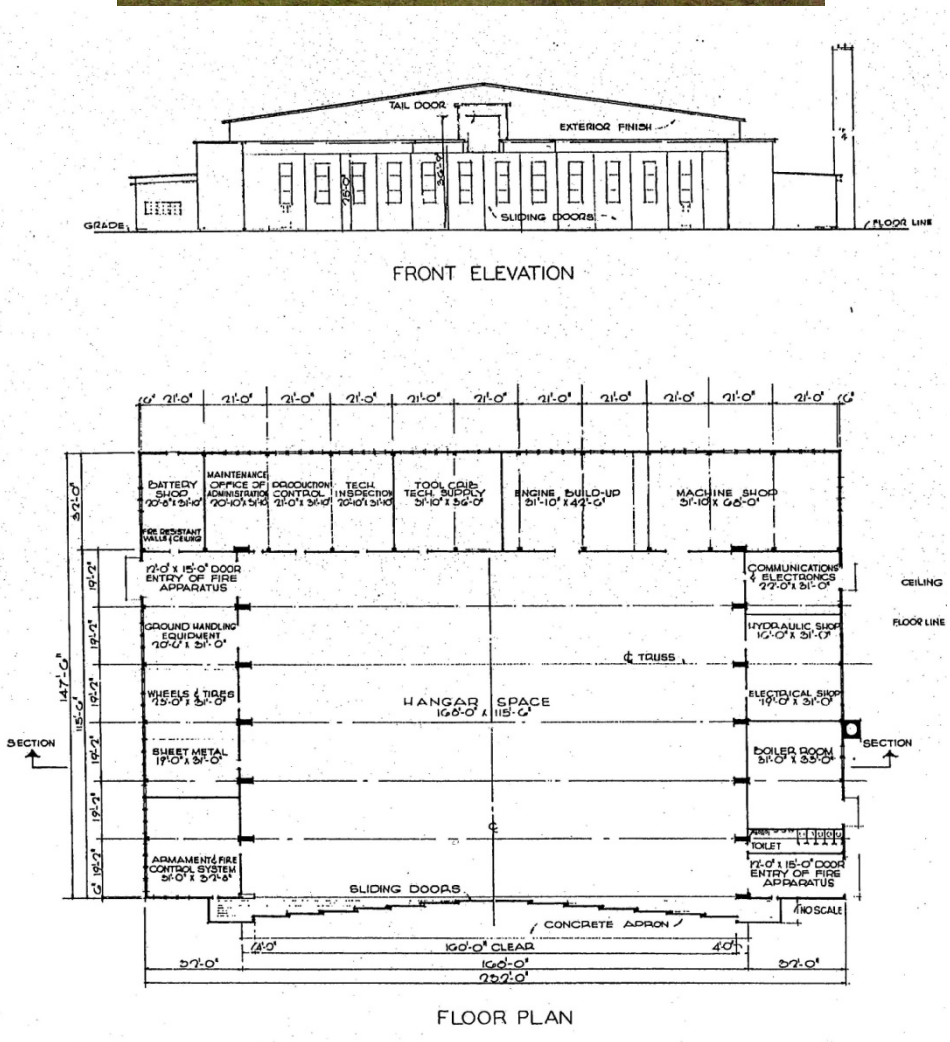


FIGURE 6-6. BRADLEY FIELD, CONNECTICUT ANG. GENERAL MAINTENANCE HANGAR WITH SHOPS, 1951. DRAWING DEF-39-01-41, AFM 88-2 CA. 1952.

The cover sheet from AFM 88-2 dated 1959 shows that four hangars (Hangar Without Shops, Shops Only Both Sides, Hangar With Shops One Side, and Hangar With Shops Both Sides) were depicted with a single drawing (AD-39-01-65, originally designed in July 1956).

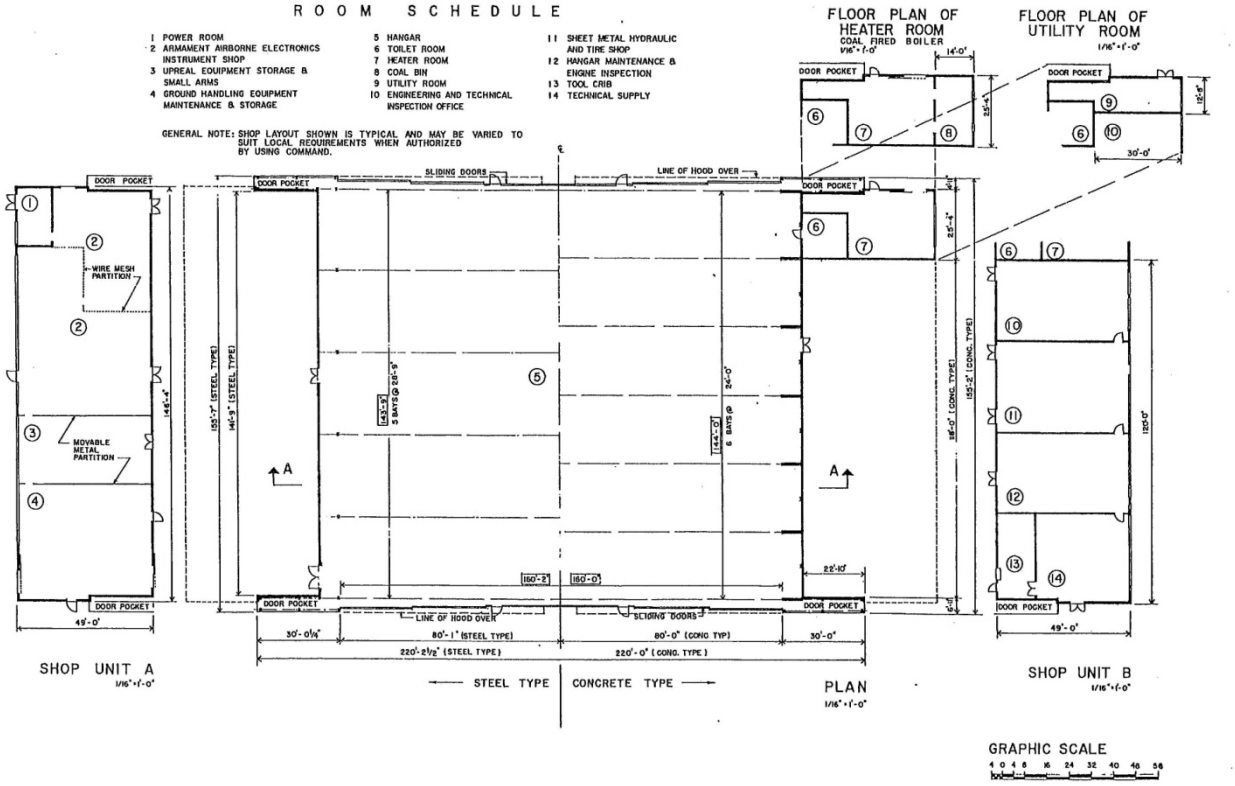


FIGURE 6-7. FLOOR PLAN OF DRAWING AD 39-01-65, 1956. AFM 88-2 1959.

These general maintenance hangars were conservative and functional in design. They remained nearly the same from early to the late Cold War era with few changes except for overall size and internal room configuration. The 1974 plans specific to the Air Force reserve components show the same layout as earlier maintenance hangars.

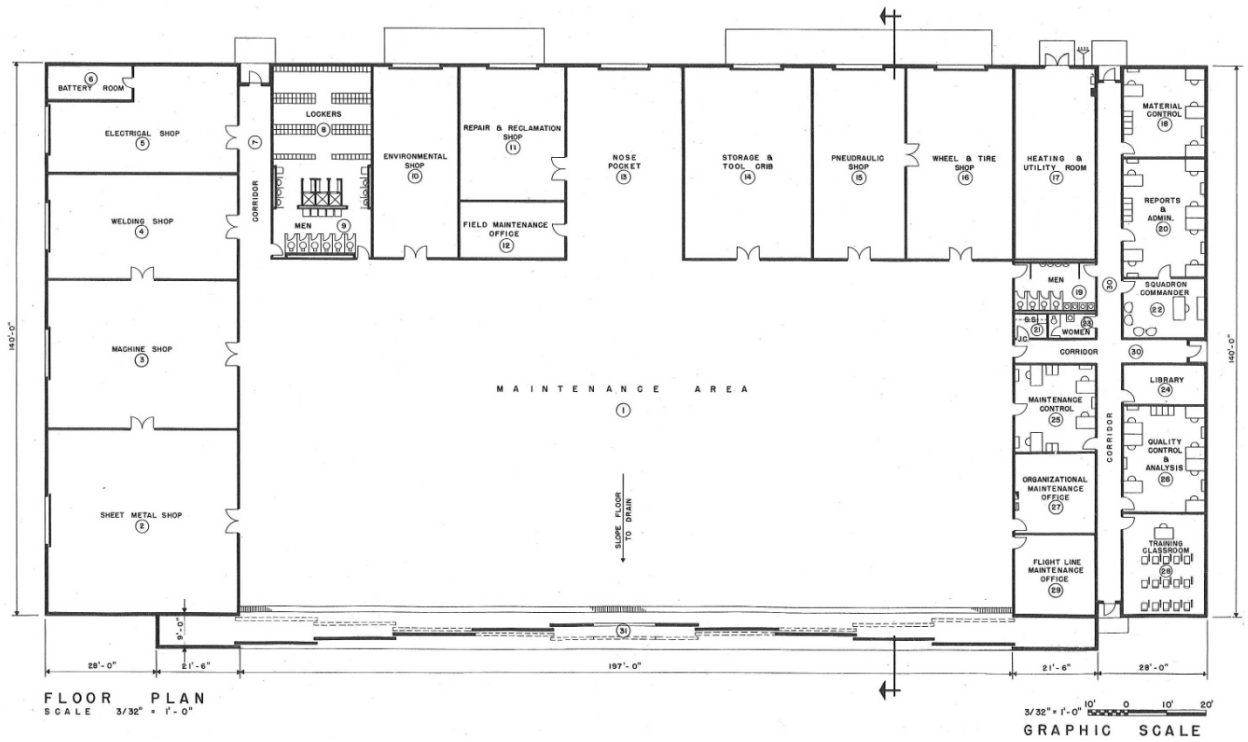


FIGURE 6-8. AIR RESERVE FORCES, MAINTENANCE DOCK, LARGE AIRCRAFT.
AD 39-05-26, 1974. AFM 88-2 1975.

Alternatives to the open bay hangar include the Double Cantilever hangar, the Double Unit hangar, and the Wing hangar.

Double-Cantilever Hangars. The Double Cantilever hangar was designed in three sizes: Basic (smallest), Medium, and Heavy. The design of these hangars offered a simple and yet ingenious solution to the increasing wing and tail length of the new jets. The trusses of the Double Cantilever hangar were turned on their side so that the distance spanned is from door to door or the depth of the open area rather than rather than the hangar's width. A double row of large columns supported the trusses, and aircraft could enter from either side and be positioned staggered style in the hangar. Mechanical shops up to three stories high could be built in the center of the hangar rather than on the sides, utilizing areas that would be wasted in older single-span hangars. Because of the large size of SAC bombers and air-refueling aircraft, these hangars are commonly associated with the Double-Cantilever type.

FIGURE 6-9. RICKENBACKER INTERNATIONAL AIRPORT, OHIO ANG. DOUBLE CANTILEVER HANGAR, MEDIUM BOMBER.

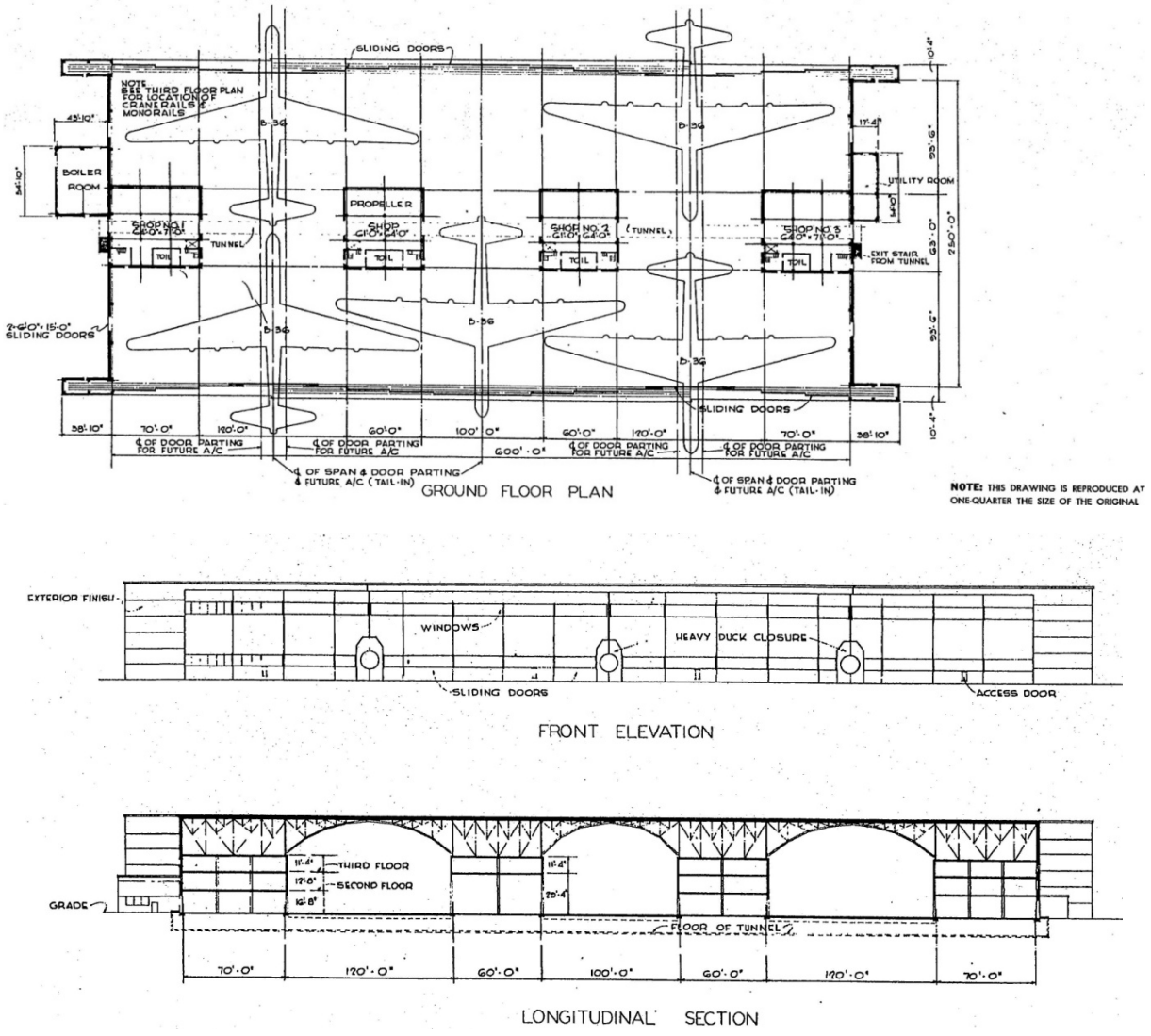


FIGURE 6-10. DOUBLE CANTILEVER HANGAR, HEAVY BOMBER. DEF 39-01-43, 1951. AFM 88-2 CA. 1952.

Double-Unit Hangars. The Double Unit hangar is a pair of open-bay hangar units with shops between them and connected internally at the back. One-story lean-tos with shops could be constructed on the rear and side façades. Interestingly, this type appears only in the Air Force definitive drawings for 1952 but ANG examples date to the 1980s.

FIGURE 6-11. BRADLEY FIELD, CONNECITCUT ANGB. DOUBLE UNIT HANGAR, 1983.

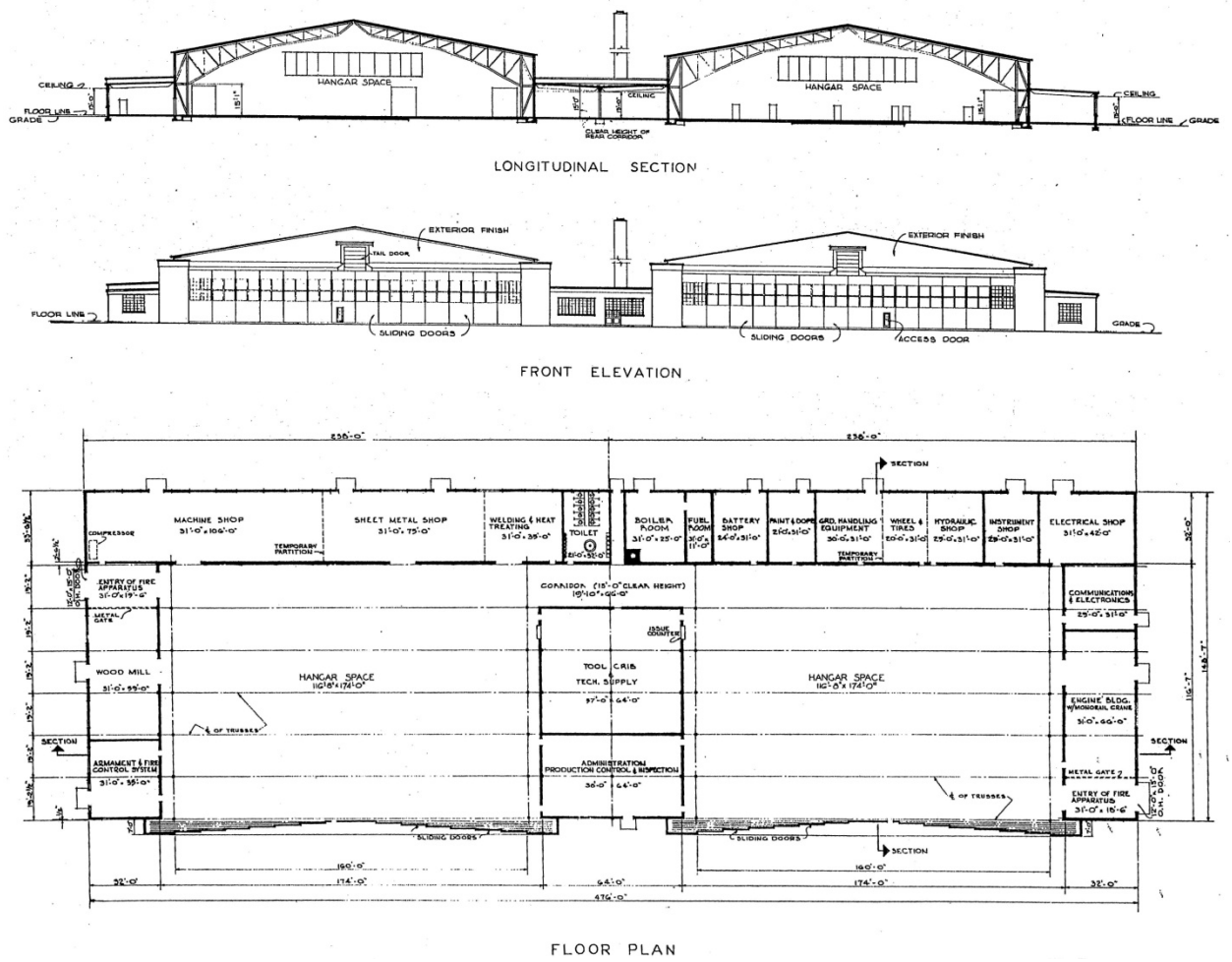


FIGURE 6-12. DOUBLE UNIT HANGAR, ARCH TYPE WITH SHOPS. DEF-39-01-49, 1952. AFM 88-2 CA. 1952.

Wing Hangar. The design of the Wing Hangar accommodated the wing and nose of medium and large aircraft; and though they were large structures, they left the aircraft tail protruding. The size of the hangars allowed for great variability in the type and size of the aircraft as well as the positioning of it as seen in the drawings below.

FIGURE 6-13. HARRISBURG INTERNATIONAL AIRPORT, PENNSYLVANIA ANG. WING HANGAR.

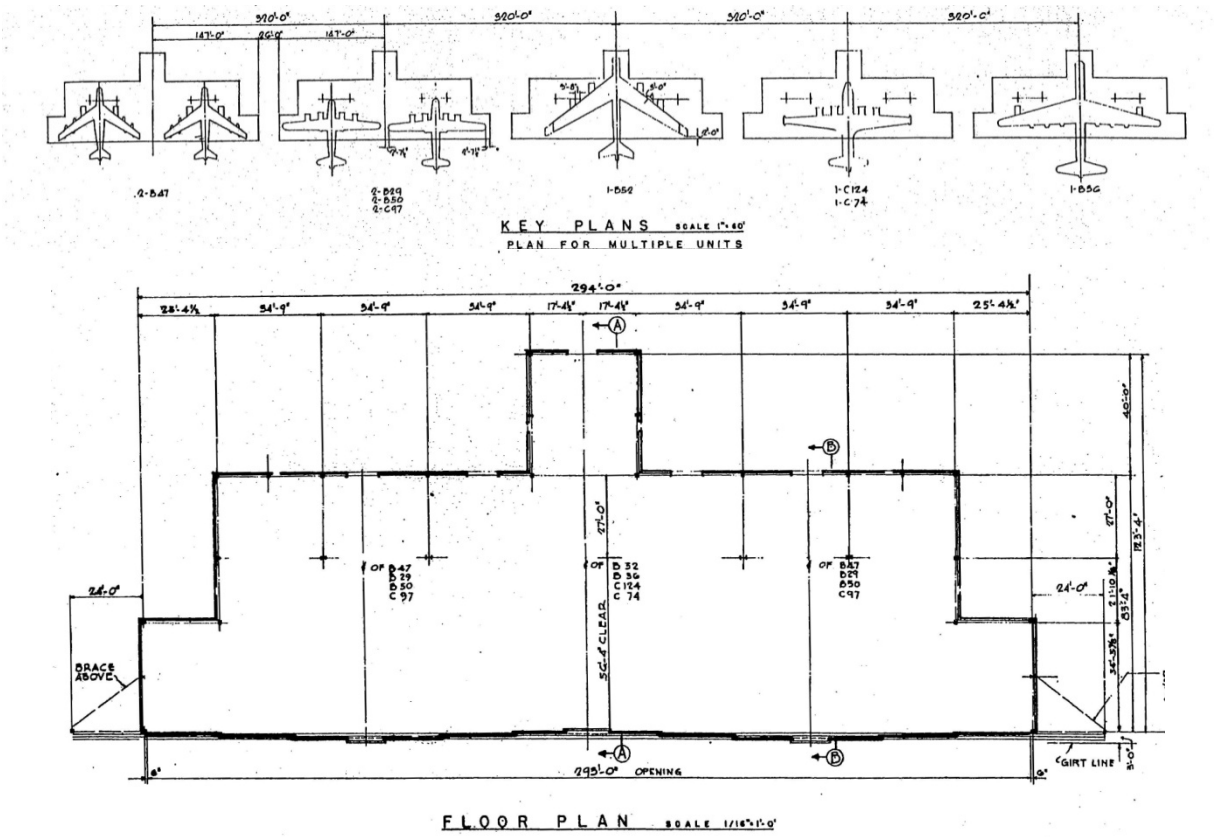


FIGURE 6-14. PLAN FOR WING HANGAR FOR MEDIUM AND HEAVY AIRCRAFT, DEF 39-01-48, 1951. AFM 88-2 CA. 1952.

Specialized Maintenance Hangars

As aircraft and missions evolved, so did the need for more specialized maintenance hangars. These included Air Force Reserve Training Maintenance Hangars, Weapons Calibration Shelters, Fuel System Maintenance Docks, and Aircraft Corrosion Control Hangars.

Reserve Training Maintenance Hangars. These hangars were similar to other open bay hangars except they included areas for training, housing, and dining. There were two types of these hangars designed for the 1959 Air Force Manual version. Type A had just a two-story lean-to and Type B included the lean-to as well as a two-story annex that was situated perpendicular to the hangar.

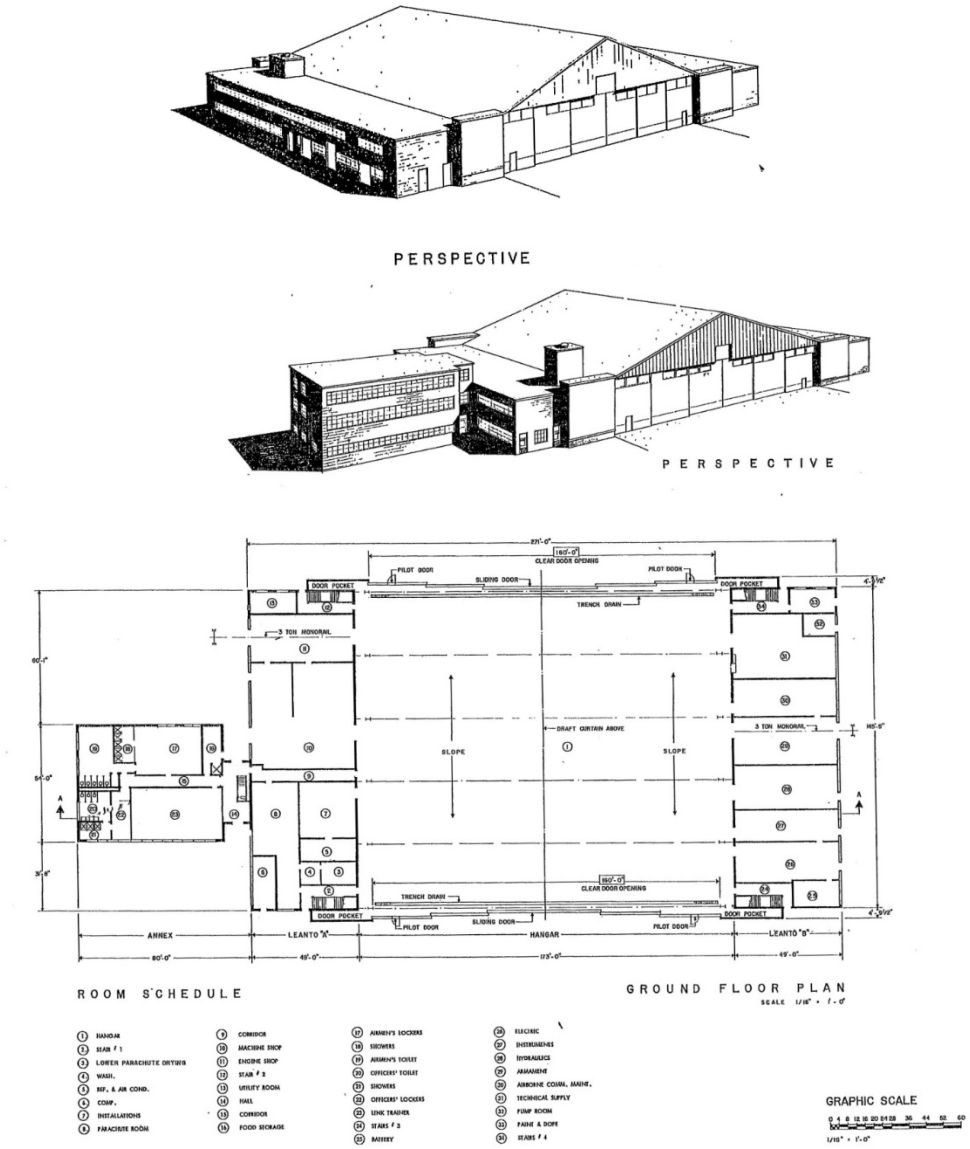


FIGURE 6-15. AIR RESERVE FORCES AIRCRAFT MAINTENANCE TRAINING HANGAR, TYPES A (UPPER) AND B (LOWER). AD 39-01-73, AD 39-01-74, 1957. AFM 88-2A 1959.

Weapons Calibration Shelters. Weapons Calibration Shelters came in open and closed facilities, and two types. Type A contained multiple bays and Type B was a single bay. Geographic location of the base would determine whether or not the structures were open or closed. The closed facility could be either Type A or Type B. The size of the installation would determine which type was built. ANG installations generally have the single unit, Type B.

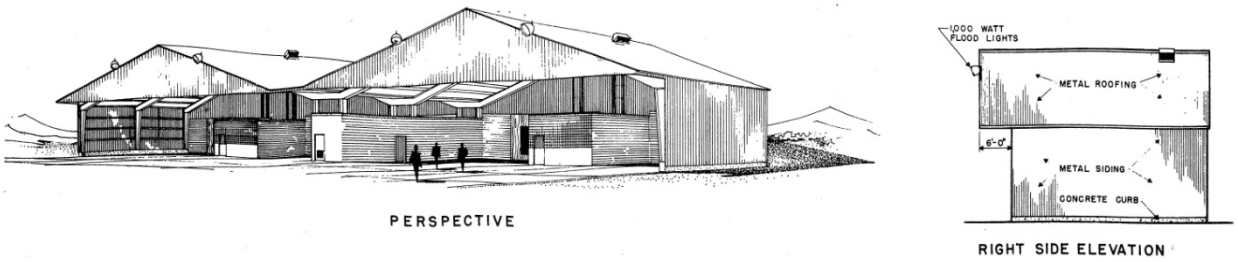


FIGURE 6-16. PERSPECTIVE OF OPEN WEAPONS CALIBRATION SHELTER. AD 39-01-86, 1965. AFM 88-2 1969.

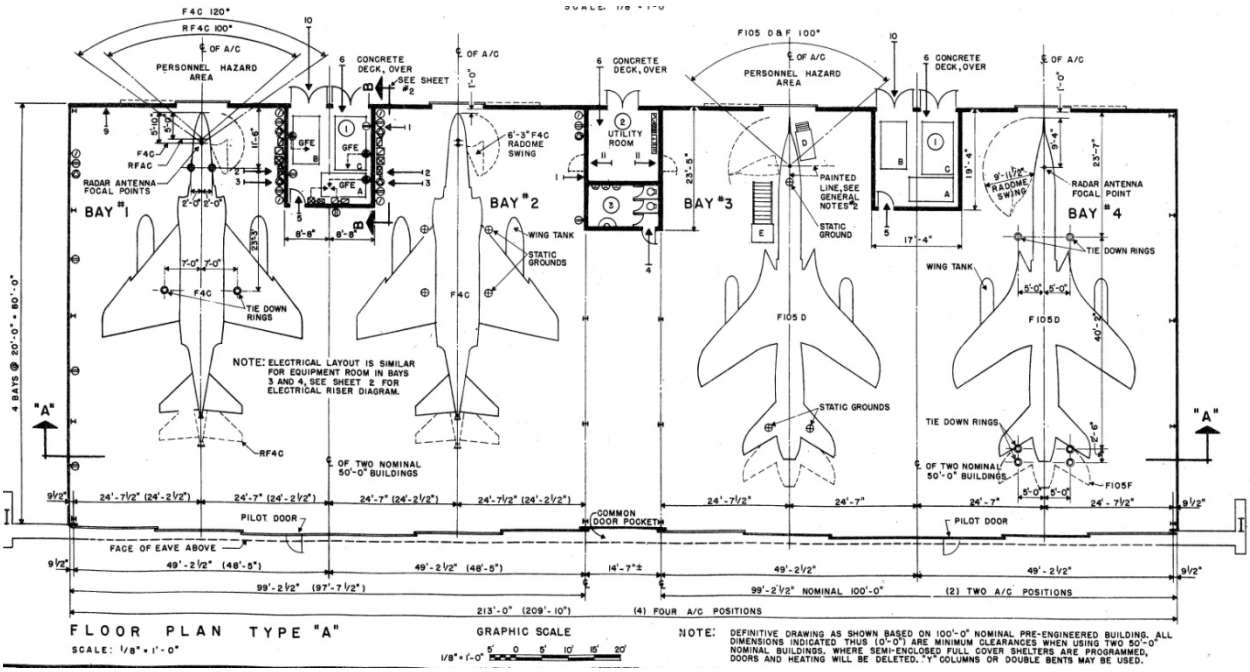


FIGURE 6-17. FLOOR PLAN OF CLOSED WEAPONS CALIBRATION SHELTER TYPE A. AD 39-01-87, 1965. AFM 88-2 1969.

FIGURE 6-18. JOSS FIELD, SOUTH DAKOTA ANG. WEAPONS CALIBRATION SHELTER, TYPE B.

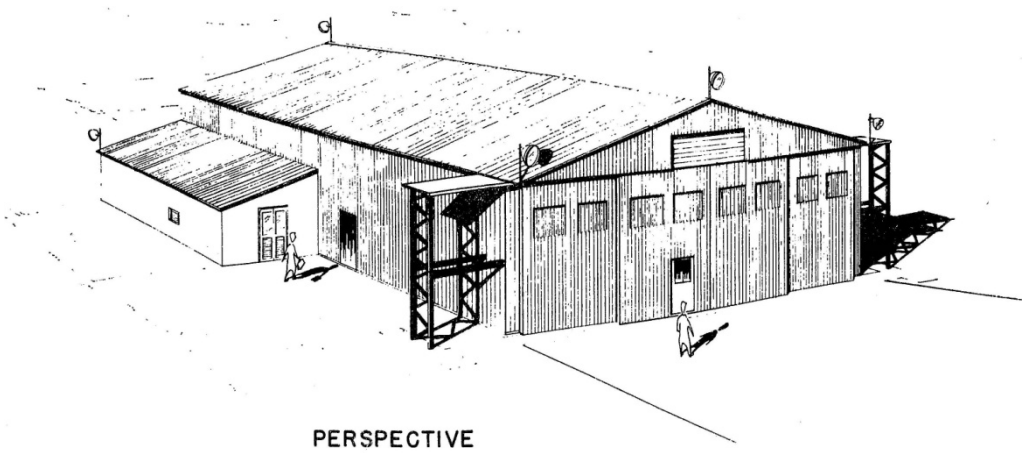


FIGURE 6-19. CLOSED WEAPONS CALIBRATION SHELTER, TYPE B. AD 39-01-87, 1965. AFM 88-2 1969.

Fuel System Maintenance Docks and Aircraft Corrosion Control Hangars. These hangar types are found in the Air Force manuals of definitive drawings as separate structures. However, in AFM 88-2 1975, the Air Reserve Forces drawing AD-36-36-17 includes these two structures combined into one facility. Fuel system maintenance structures for large aircraft often only allowed its nose and wings to dock, whereas fuel system maintenance structures for smaller aircraft resembled small hangars. Aircraft Corrosion Control hangers are used to apply corrosion preventative coatings to aircraft and so enclosed the entire aircraft. They are specifically built for good ventilation and had lifting platforms and overhead rails to facilitate the application of coatings and any other maintenance needed.

FIGURE 6-20. BIRMINGHAM ANGS, ALABAMA ANG. FORMER FUEL SYSTEMS MAINTENANCE DOCK AND CORROSION CONTROL HANGAR, CURRENTLY ENGINE SHOP.

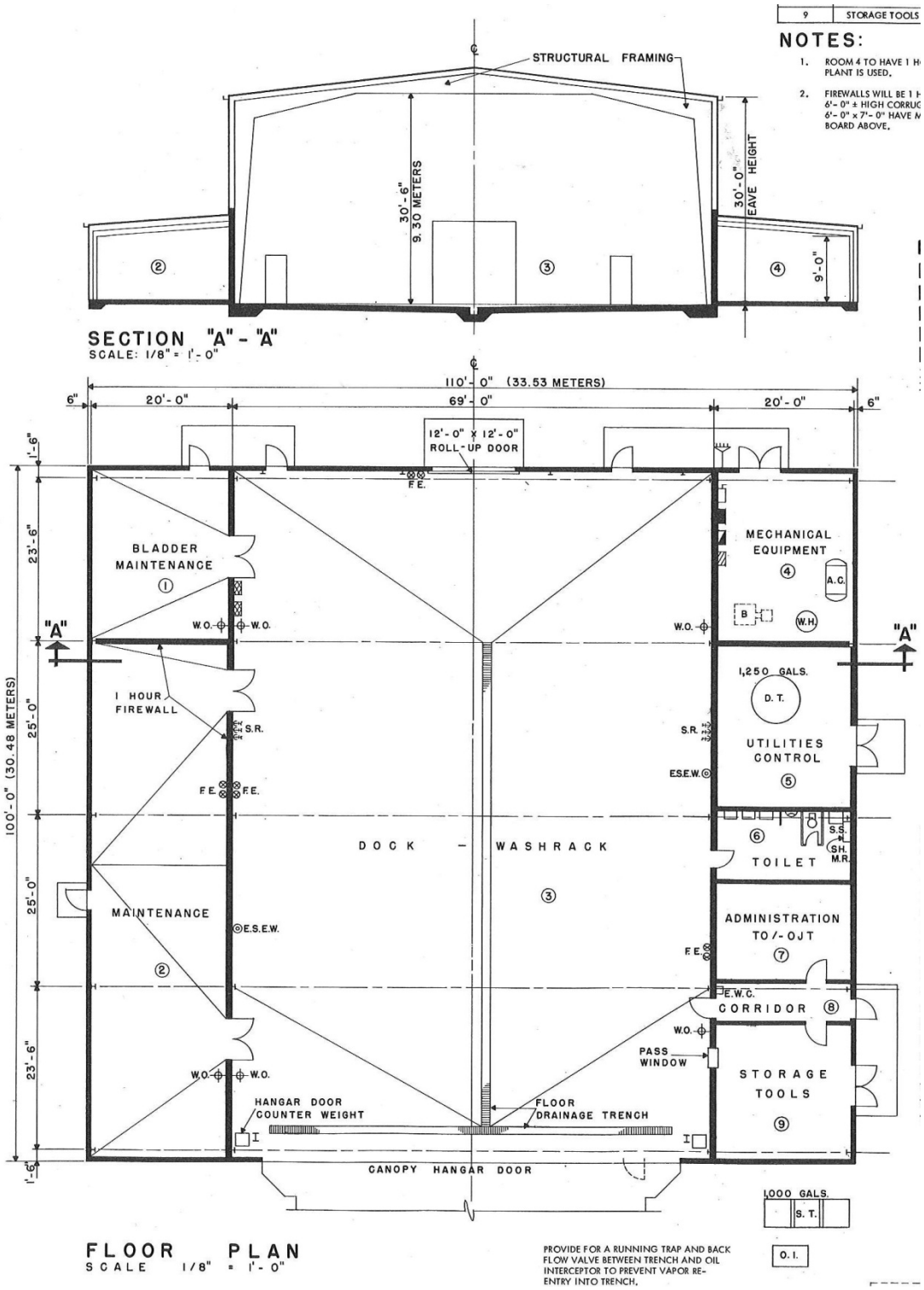


FIGURE 6-21. AIR RESERVE FORCES FUEL SYSTEM MAINTENANCE DOCK AND CORROSION CONTROL FACILITY. AD 36-36-17, 1974. AFM 88-2 1975.

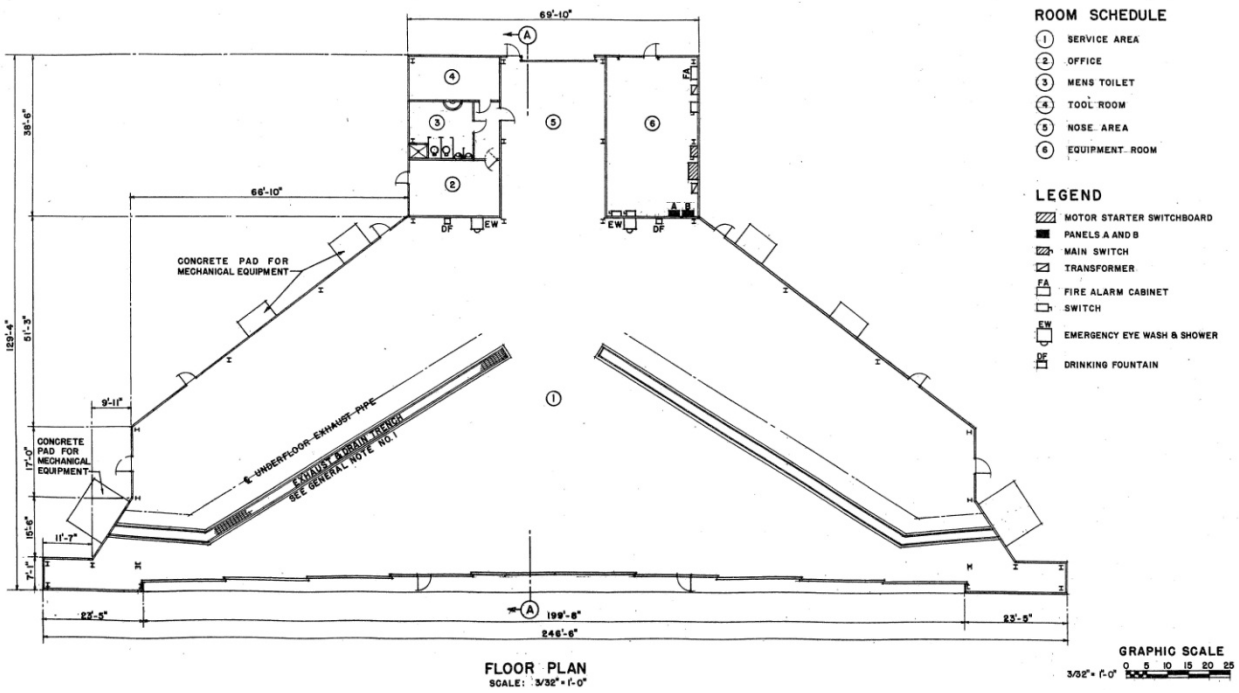


FIGURE 6-22. FUEL SYSTEM MAINTENANCE DOCK FOR LARGE AIRCRAFT. AD 39-01-13, 1963. AFM 88-2 1969.

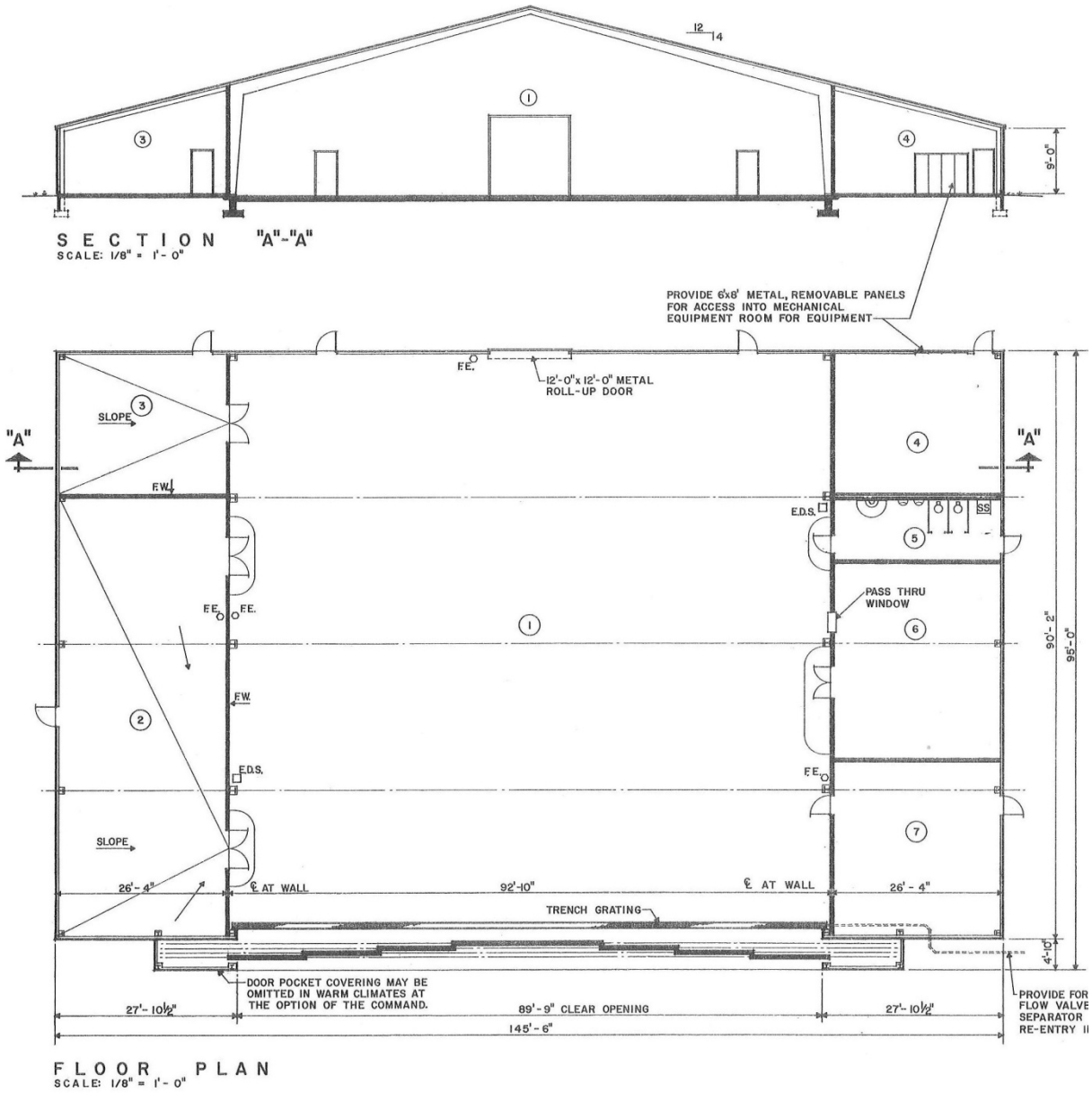


FIGURE 6-23. FUEL SYSTEM MAINTENANCE DOCK, SMALL AIRCRAFT. AD 39-05-15, 1970. AFM 88-2 1975.

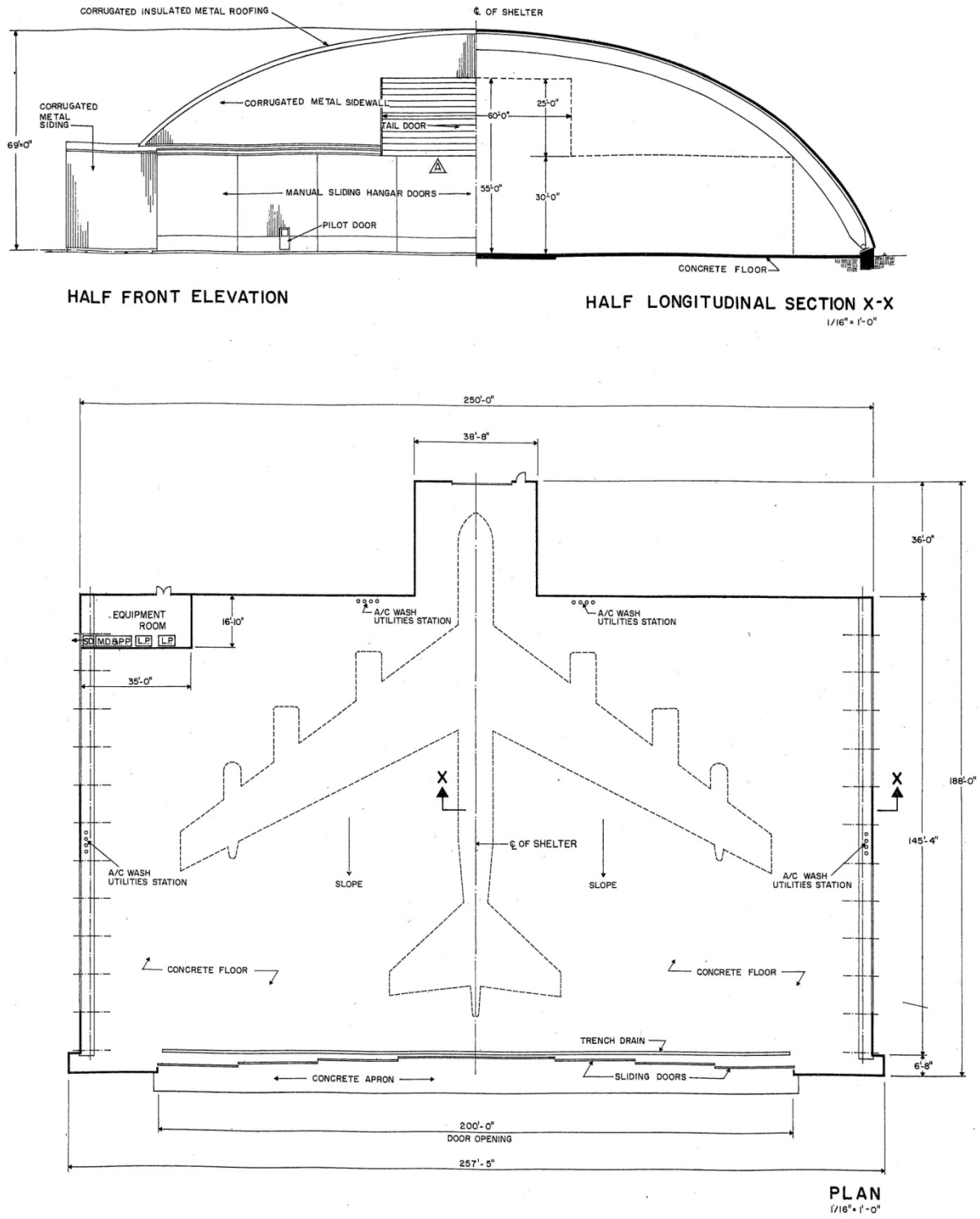


FIGURE 6-24. AIRCRAFT CORROSION CONTROL. AD 39-01-83 R-1, 1961. AFM 88-2 1969.

6.2.2. Alert Infrastructure

As has been discussed in the previous chapters, the alert mission was a signature program of the Cold War and the ANG. The gaining command for the ANG's fighter-inceptor runway alert program was ADC, with SAC for air refueling. The ANG's alert FIS were assigned to the ADC alert program although the rest of the ANG units were assigned to TAC generally. The earliest ANG alert missions at Hancock Field, New York, and Hayward, California, were carried out on an experimental basis and made use of existing facilities. As more ANG units were assigned the ADC alert mission, they gained ADC facilities, although not always uniformly. The definitive drawings in the Air Force manual 88-2 label some designs as "alert" for some building types and not others. It also should be noted that not all buildings constructed for the alert mission on ANG installations were associated with the ANG, as in many cases the ANG was a later occupant to the installation.

ADC Alert Hangars. The requirements of the alert mission meant that an entire new type of hangar needed to be designed. Fighter jets that were part of the alert mission had to be covered, warmed, and ready to take off at a moment's notice. There was no time to wheel the jets from the hangars so they required pockets for individual planes and quick opening front and back doors. The hangar itself would need to withstand the heat and blast from a jet taking off as well as protect the airmen from the same. Since airmen had to be ready at all times, accommodations for them were initially constructed as part of the hangar. These early designs called for four planes to be kept in alert hangars while others were in readiness hangars nearby. Plans for the first alert facilities were shown in the 1951-1952 Air Force definitive designs in the 1952 design manual and discussed in a 1952 issue of *Architectural Record*.

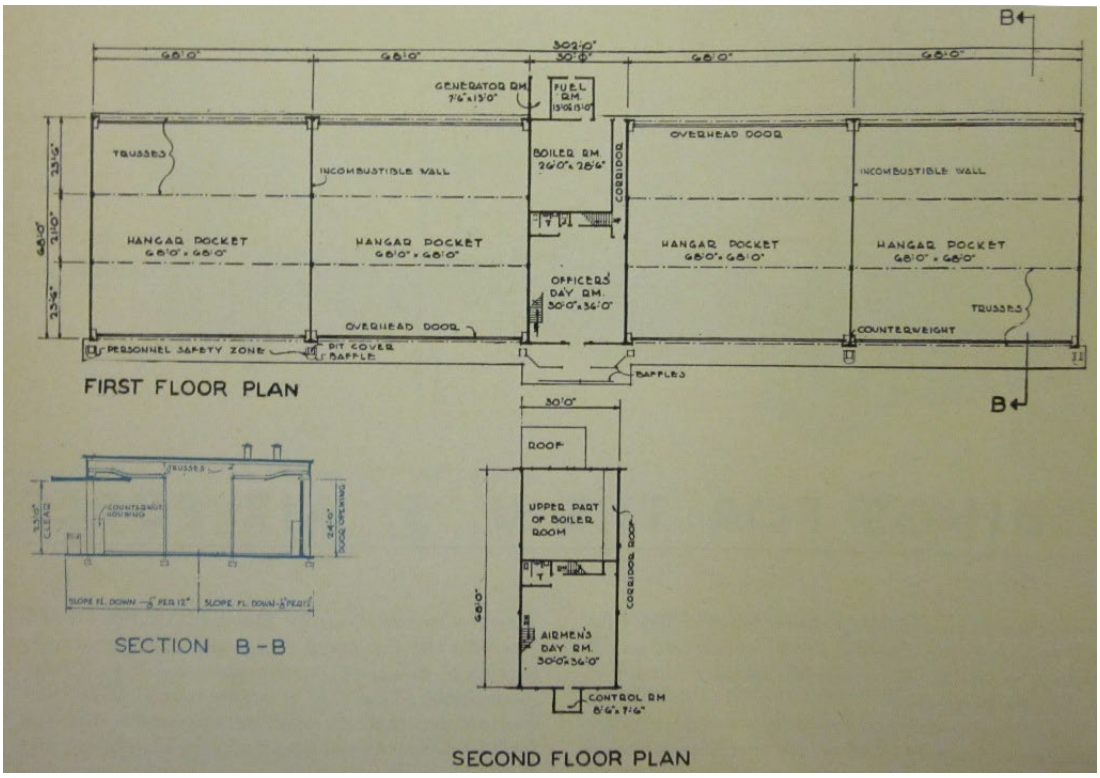


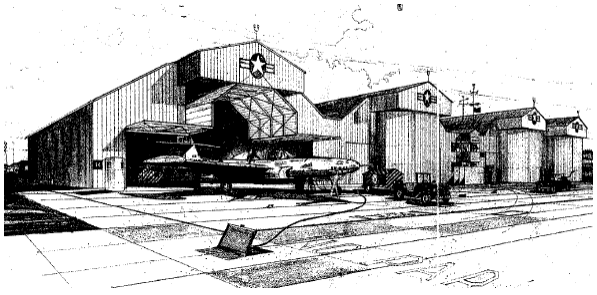
FIGURE 6-25. PLAN FOR ALERT HANGAR FROM 1952 ISSUE OF *ARCHITECTURAL RECORD*.

Generally, ADC alert hangars were located at the alert taxiway and apron angled 45 degrees at the end of the runway. ADC alert facilities generally consisted of an alert hangar with associated ancillary facilities including a readiness crew dormitory, squadron operations building, flight simulator, readiness/maintenance hangar, aircraft shelters, electronics shops and weapons, and munitions checkout, and assembly and storage structures (USAF 1999a). Because some ANG units gained the alert mission later and as an adjunct to its other missions, not all ANG installations had "official" ADC alert ancillary facilities and adapted existing TAC facilities. Where climate was warm, as is the case with Jacksonville ANGB's alert facilities, an installation might not house its aircraft in a hangar and instead parked them in open aircraft shelters or on the apron unsheltered. Generally, although not always, ANG alert facilities were segregated as secure compound. The crew and operations building would be a simple, one story building in a secure, dedicated area with secondary sheds.

Between 1951 and 1962, ADC commissioned the design of two generations of alert hangars: the first generation was constructed1951–1954 and the second generation during 1956–1962. Generally, there were four types of ADC alert hangars. Key characteristics among these types were two or four pockets for housing aircraft, a central alert crew quarters, and uplifting aircraft doors both front and back of each opening for fast egress of the aircraft. Two types were the most common: a quasi-mobilization design by

the Butler Company and a design by the firm of Strobel & Salzman. Both were plain steel structures bolted to the concrete pavement. The Butler Company design has four pockets for aircraft and a distinctive gambrel-type roofline in contrast to the flat- or nearly flat-roofed hangar with more rectangular profile by Strobel & Salzman. The latter design varied in overall dimensions, with four pocket types ranging 303–329 feet in width, 59–72 feet in depth, and 30–35 feet in height. A lesser used design by Luria Company had gable roofs and four aircraft pocket and alert crew quarters between the pocket pairs. Characteristic of this type are the front-facing gable roofs and large counter-weighted blister doors designed for the F-94 aircraft. It was of the same rectangular form with flat roof as the first generation but was slightly larger.

A. FIRST GENERATION ADC ALERT HANGAR, BUTLER COMPANY (FROM USAF 1999A: PLATE 20).



B. FIRST GENERATION ADC ALERT HANGAR, BUTLER COMPANY (FROM USAF 1999A: PLATE 20).

C. FIRST GENERATION ADC ALERT HANGAR, LURIA COMPANY, LANGLEY AFB (FROM USAF 1999A: PLATE 7).

D. FIRST GENERATION ADC ALERT HANGAR, STROBEL & SALZMAN, CHARLESTON AFB (FROM USAF 1999A: PLATE 12).

FIGURE 6-26. FIRST GENERATION ADC ALERT HANGARS.

A. SECOND GENERATION ADC ALERT HANGAR, STROBEL & SALZMAN, FORMER LORING AFB (FROM USAF 1999A: PLATE 38).

B. SECOND GENERATION ADC ALERT HANGAR, STROBEL & SALZMAN, DAVIS-MONTHAN AFB (FROM USAF 1999A: PLATE 39)

C. ADC ALERT HANGAR, LURIA COMPANY, LANGLEY AFB (FROM USAF 1999A: PLATE 7)

D. ADC ALERT HANGAR, STROBEL & SALTZMAN, CHARLESTON AFB (FROM USAF 1999A: PLATE 12)

FIGURE 6-27. SECOND GENERATION ADC ALERT HANGARS.

The list of character-defining features prepared by Weitze is comprehensive and addresses all of the hangar types; however, a given hangar would not be expected to have all of these features.

Figure 6-28 show a current view of the ADC alert hangar of the Butler design at the New Castle ANGB in Delaware (left) with original doors removed and openings infilled, and a circa 1960 view of the hangar with its original doors. Retention of door opening and doors are key elements of the hangars since their designs solved the need for the rapid egress of alert aircraft. Similar loss of integrity can be seen with the alert hangar at the Bradley ANGB (Figure 6-29).

FIGURE 6-28. NEW CASTLE ANGB, DELAWARE. BUILDING 2818, BUTLER TYPE-ALERT HANGAR ERECTED 1956.

Left photo shows hangar with changed doors. Right photo, ca.1960, shows original doors.

FIGURE 6-29. BRADLEY ANGB, CONNECTICUT.

Alert shelter in 2005 (left) and historic photo showing alert hangar's segregated location on the apron and readiness hangar in background.

Readiness Hangars. Readiness hangars were more than conventional hangars and are difficult to distinguish from other open-bay types from their exteriors only. Their uniqueness lies in their role in the alert program. The first stage of alert planes was "take off ready" in case of alert notification and a second "wave" or stage of alert planes was available in case they were needed. Planes in the second wave were sometimes housed in a Readiness hangar. The aircraft could be covered and kept warm but weren't "take off ready". These second planes would either be wheeled to a runway from which they could take off and form a second wave of fighters or would be moved into the Alert hangars. The Readiness hangars

designed in 1952 by the architectural firm of Mills & Petticord have simple rectangular plans with long span and open interiors. They had maintenance shops for minor repairs (Architectural Record 1952).

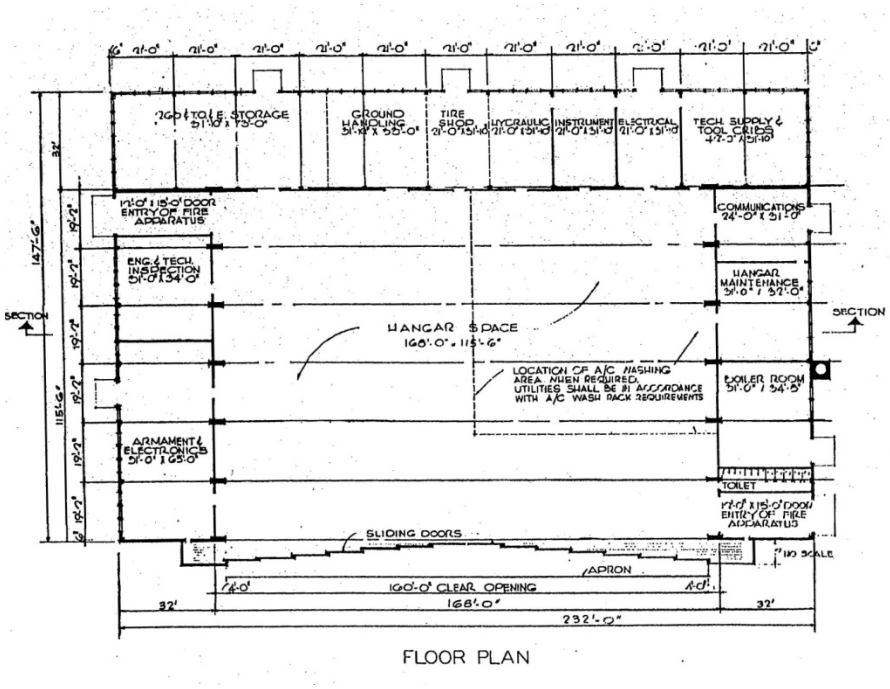


FIGURE 6-30. READINESS HANGAR WITH SHOPS. DEF 39-01-39, 1951. AFM 88-2 CA. 1952.

Alert Shelters. A later alternative to the Strobel & Salzman or Butler Company type alert hangars were the alert shelters. These first appear as definitive drawing 39-01-88 dated 1972 in AFM 88-2 1976, although extant examples date as early as 1966.The firm of Victor B. Spector and Associates of Falls Church, Virginia, prepared the 1972 drawing.

The alert shelters were a complex of four shelters placed on an apron. The complex was secure, fenced, lighted, and sited to have direct access to the taxiway or runway and to be accessed by roads. The rear of the shelters could be surrounded by an earthen berm. The shelters were placed in a row with 20 feet between structures and faced to the taxiway or runway. Each shelter was a simple rectangular structure dimensioned 80 by 50 feet with front-gable roof. Vertical lift bi-fold doors are externally mounted on the front and back of the shelter. Shelters without doors were a warm weather option. For colder climates, the shelters were insulated. The crew readiness building was the same size as the shelters and placed to the side and at the front of the shelters. No information is provided about the crew readiness building and no examples are discussed in the ANG cultural resources survey reports.

The alert shelters are common at ANG installations collocated at airports. They can be found at the Des Moines ANGB, Terre Haute ANGB, and Great Falls ANGB. The earliest of these examples dates to 1966.

FIGURE 6-31. ALERT SHELTERS, TERRE HAUTE AIRPORT ANGB (HULMAN FIELD), 1966.

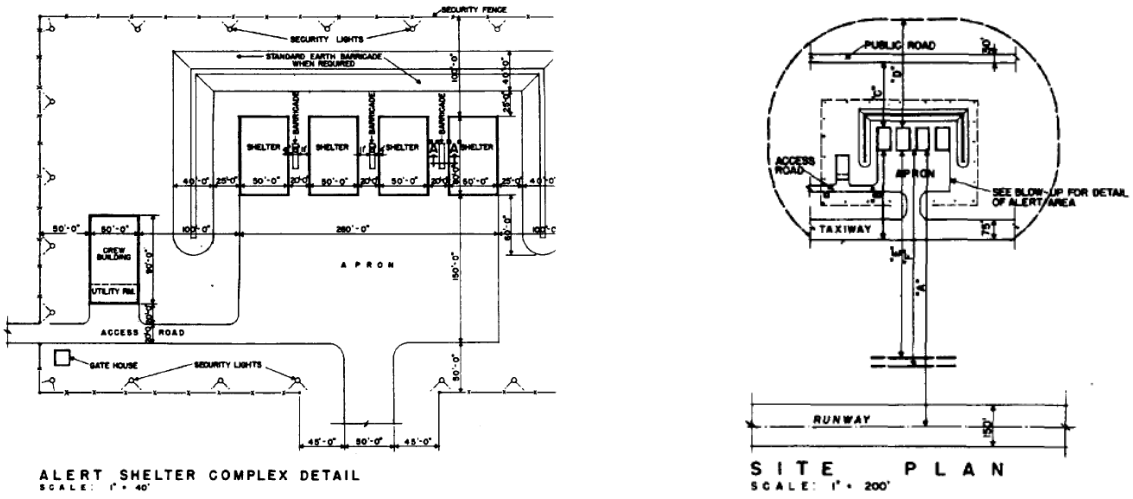


FIGURE 6-32. TWO SITE PLANS FOR ALERT SHELTERS, AD 39-01-88.

Note detached crew quarters.

SAC Alert Facilities. Initially SAC made use of existing facilities for its bomber-tanker alert program but by 1954 SAC began to establish specialized alert infrastructure. Military planners of 1957–1964 thought that the Soviets would attack with missiles first, and then a second wave of bombers. The alert infrastructure was designed to prevent and counter this second attack. At first SAC pursued the design of a single structure that combined alert hangar, maintenance hangar, and alert crew functions. This integrated alert structure did not come to fruition, and the Air Force turned its attention to the use or adaptation of existing infrastructure. In the early iteration, alert B-36s, B-47s, and B-52s were parked at the end of taxiways on dedicated aprons in secure, fenced, and lighted compounds. The alert crew was housed in existing airmen's dormitories near or at the flight line. When modifications to existing dormitories proved to be expensive, SAC purchased and placed rows of trailers for the airmen near the apron. Each installation to receive an alert mission was studied as to suitable housing facilities and the time necessary for airmen to transit from the dormitories to the apron.

After a number of experiments and refinements, SAC settled on apron schemes for the alert program. An initial stub-like apron configuration for its B-36s was followed by a later Christmas tree scheme for its B-52s. In the first scheme, eight to ten aprons were angled at 90 degrees off the taxiway in a stub-like configuration. This was followed by the Christmas tree scheme which had a series of aprons angled 45 degrees for B-52s. There were three design schemes of the Christmas tree configuration: a large-capacity apron; two nearly equal sized aprons angled toward a single taxiway; and two unequal size aprons (six- and four), also angled toward a taxiway. At some installations that had both alert bomber and tanker missions, alert bombers were parked on the aprons and tankers were nearby.

Designs for dedicated alert crew quarters were prepared by the firm of Leo A. Daley of Omaha and are dated April 1957. The two-story quarters were placed at the head of the alert apron. They were hardened with reinforced concrete and concrete masonry block and had spaces for dormitory, kitchen, lounge, and work areas. These structures were semi-subterrean with tunnels or ramps for quick egress and were nicknamed "moleholes." The structures came in three sizes: a 70-man, 100-man, and 150-aen version. By 1960, the final buildout, 65 moleholes had been constructed with 45 small, 10 medium, and 10 large-sized.

FIGURE 6-33. SAC ALERT READINESS QUARTERS, 150-MAN "MOLEHOLE," FORBES FIELD ANGB, KANSAS, COMPLETED 1960.

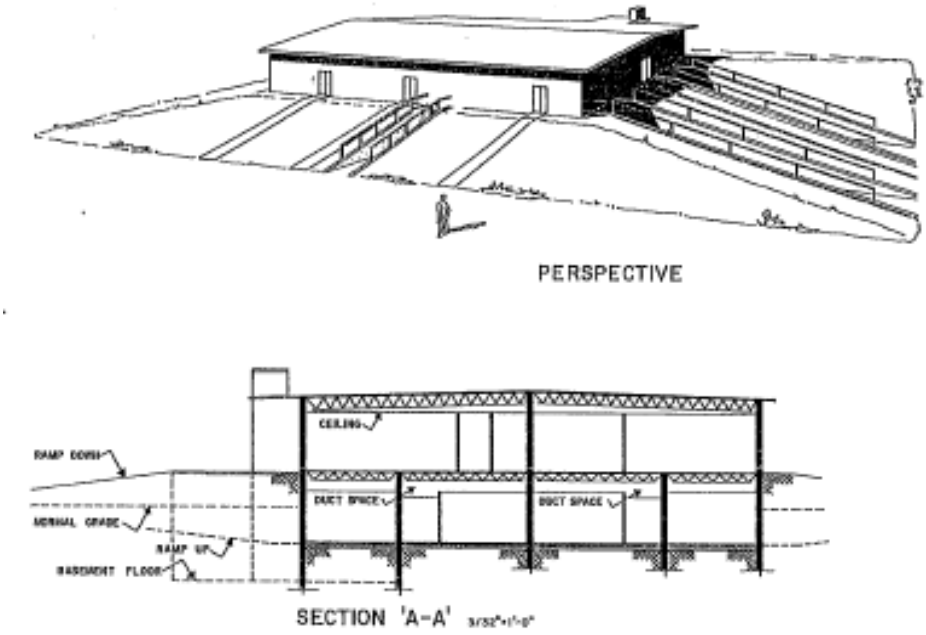


FIGURE 6-34. 70-MEN SAC "MOLEHOLE" ALERT CREW QUARTERS, FROM AD 30-11-12 DATED 1958, AFM 88-2, 1959.

Notes on the molehole definitive drawings indicate that it was possible to construct a crew readiness building at grade if sufficiently hardened. Situations such as high water table might prompt an at grade molehole.

FIGURE 6-35. ALERT CREW QUARTERS, GREAT FALLS INTERNATIONAL AIRPORT ANGB, 1968. BUILDING 44.
Note one story, low profile with at grade access. Windows are likely additions.

Three drawings for alert crew facilities are AFM 88-2 1959: the 11,750 square foot, 70-man version (AD 30-11-12), the 22,940 square foot 100-man version (AD 30-11-13), and the 31,880 square foot 150-man version. The moleholes were designed by the architectural and engineering firm of Daniel, Mann, Johnson, and Mendenhall of Los Angeles. The drawings superseded an earlier version from January 1958.

Key contributing elements of alert facilities are as follows:

- an alert apron configured for between four and 10 bombers (B-47s, B-58s, and B-52s);
- a taxiway angled at 45 degrees from the end of the primary (longest) runway;
- and a molehole for 70, 100, or 150 men.

Key character-defining features of the molehole include:

- two-story height, with the lower story either fully below ground, or bermed aboveground;
- egress tunnels from the underground story sheathed in corrugated metal with single-pane, wood-frame windows and blast-framed doors;
- and simple 1950s design detailing, including a nearly flat gable roof and windowless walls.

ADC facilities were more ephemeral and varied than SAC infrastructure. For example, rather than housing the alert crew in the "signature" molehole structures used by SAC, ADC readiness crew quarters were integrated into the alert hangars, or the alert pilots may have lived nearby in above-ground buildings, or even in trailers. Early ANG alert hangars were of Butler and Strobel & Salzman designs, but the later hangars constructed during the 1960s were alert shelters. It may have been that there was less investment

in the ANG alert program infrastructure as other air defense technologies came on line, that shelters were more affordable than the larger hangars, or that the substantial infrastructure was deemed less important for the ANG and aircraft shelters would suffice.

Crash and Fire Stations

Crash and fire stations are common at ANG installations. At airport-located installations they may serve the civilian airport as well as the ANG facility. Crash and Fire Stations served two purposes: to fight structural fires on the base and to fight aircraft crash fires that occurred on the flight line. The stations included sleeping quarters, bathrooms with showers, kitchen and dining areas, office space, and apparatus rooms. Early versions included a small tower for the drying of hoses but over time these disappeared from the drawings as firefighting technology produced hose racks that could be placed near the fire engines. Some fire station drawings included an optional observation tower.

Early on, the standardized plans have drawings for stand-alone structure and crash fire stations as well as a drawing for combined facilities. These combined facilities would often have two spatially separate apparatus rooms; one for the flight line and one for the base. This is often seen in slightly L-shaped buildings with two opposite façades containing overhead vehicle doors.

FIGURE 6-36. PEASE INTERNATIONAL TRADEPORT, NEW HAMPSHIRE ANG. COMBINED CRASH AND STRUCTURAL FIRE STATION.

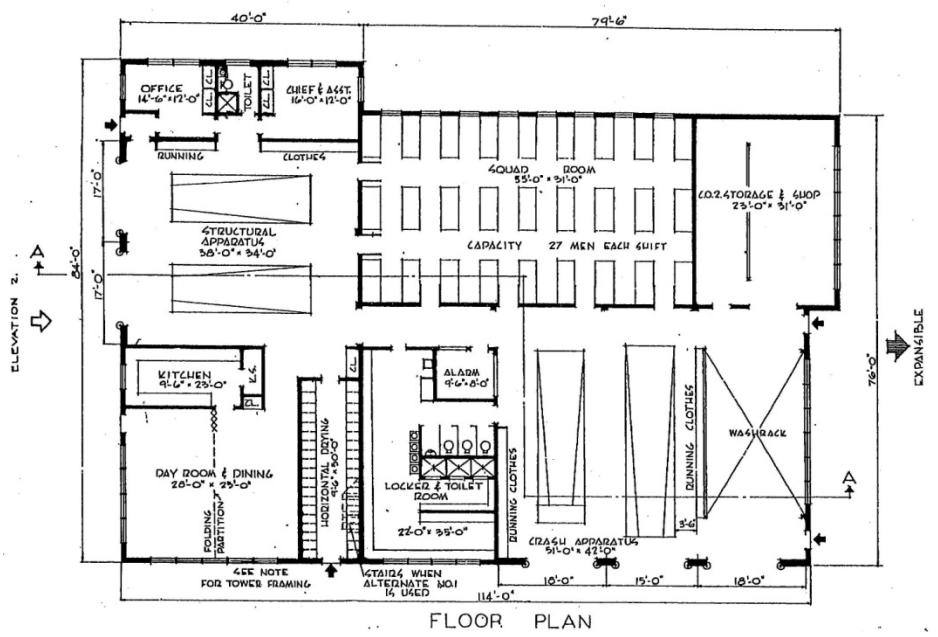


FIGURE 6-37. COMBINED CRASH AND STRUCTURAL FIRE STATION. DEF 36-30-01, 1951. AFM 88-2 CA. 1952.

By 1964, plans for combination flight line and base stations didn't demand such separation of apparatus. Drawing AD 36-30-09 dating to 1964 gives nine layout options including several that have a single apparatus room shared by base and flight line equipment.

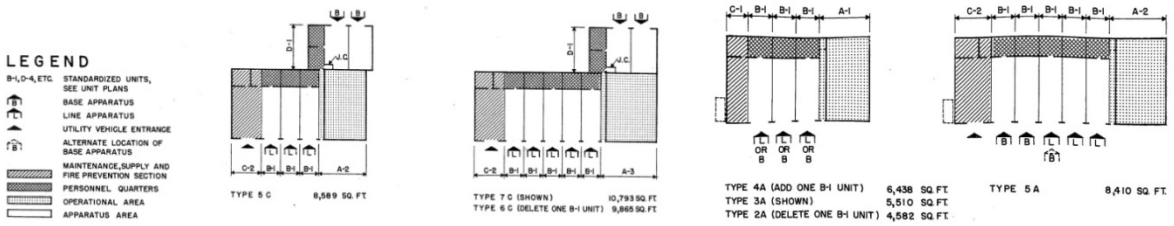


FIGURE 6-38. AD 36-30-09 SHOWING LAYOUT OF COMBINATION CRASH AND FIRE STATIONS, 1964. AFM 88-2 1969.

Definitive designs for air reserve components, when specified, were combination crash and fire stations. AFM 88-2 1975 contains two sizes of combined crash and base fire stations.

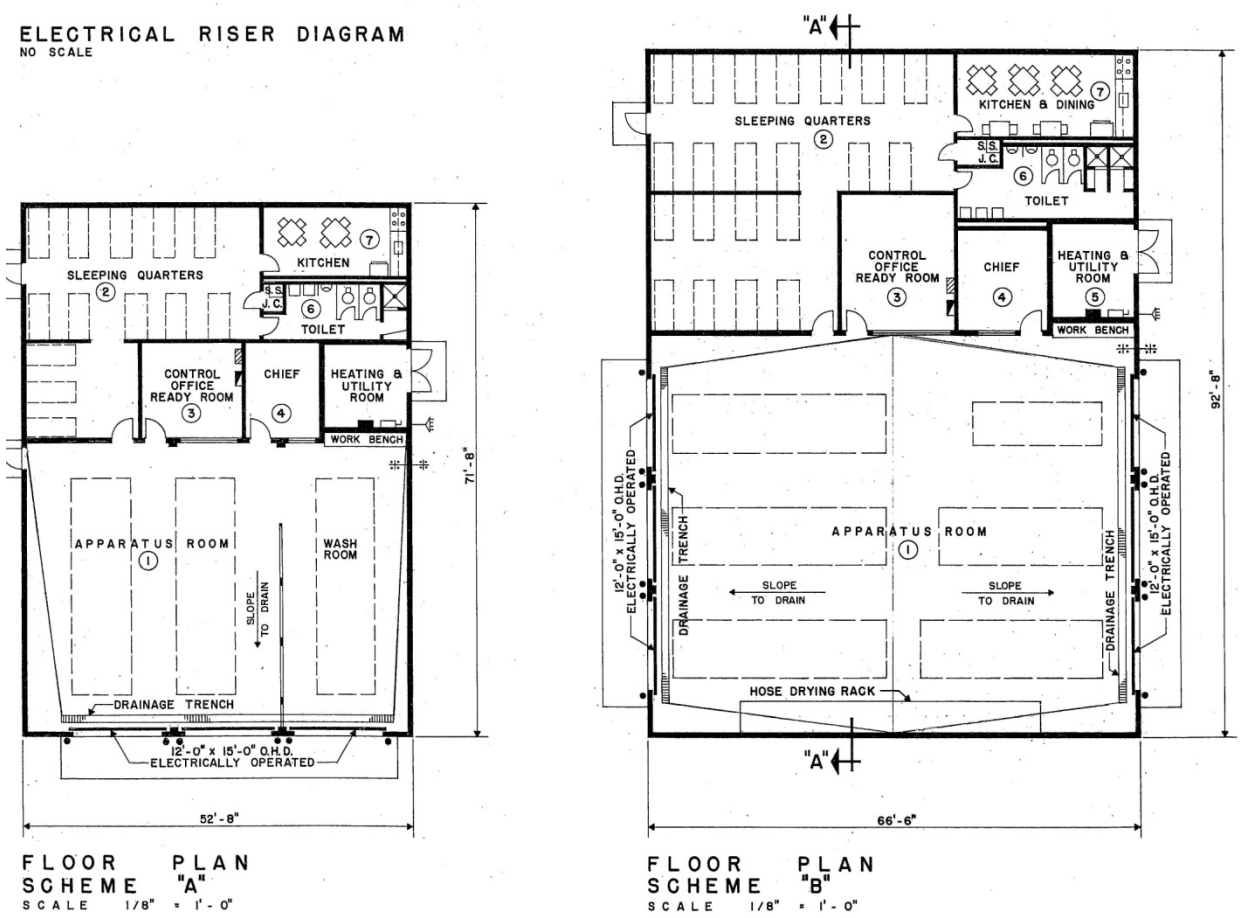


FIGURE 6-39. AIR RESERVE FORCES, FIRE STATIONS, SCHEMES A & B. AD 36-30-10 1974. AFM 88-2 1975.

6.2.3. Headquarters, Training, Operations

Headquarters

Headquarters buildings for Air Force bases and stations were designed as a major office facility for the installation commander and staff. Plans were specific to the size and level of the organization unit, e.g., wing versus squadron. In 1957, a design specific to the Air Reserve Forces shows that the Wing Administration Building (AD 30-01-54) with or without a dispensary. The structure was designed as a two-story building with a rectangular plan and central corridor. A perpendicular wing could house the dispensary or other office space.

Due to the great variability in installation missions, the Headquarters' size and layout could vary from base to base. The AFM 88-2 1969 acknowledges this with six types and subtypes of administration buildings. They vary in size, number of stories, overall configuration, and interior plan. Many ANG installations had administrative offices in simple, one-story rectangular or U-shaped plans. The

commander's office was at the corner or end of the corridor with anteroom for the secretary. Other headquarters buildings were two-story, for example, the Fort Wayne ANGB and Bradley Field. Researchers should consider if the headquarters buildings were originally designed for an active Air Force or other service branch such as the Navy since they would have been larger sized installations requiring more extensive headquarters facilities.

FIGURE 6-40. FORT WAYNE ANGB, INDIANA ANG. WING ADMINISTRATION BUILDING.

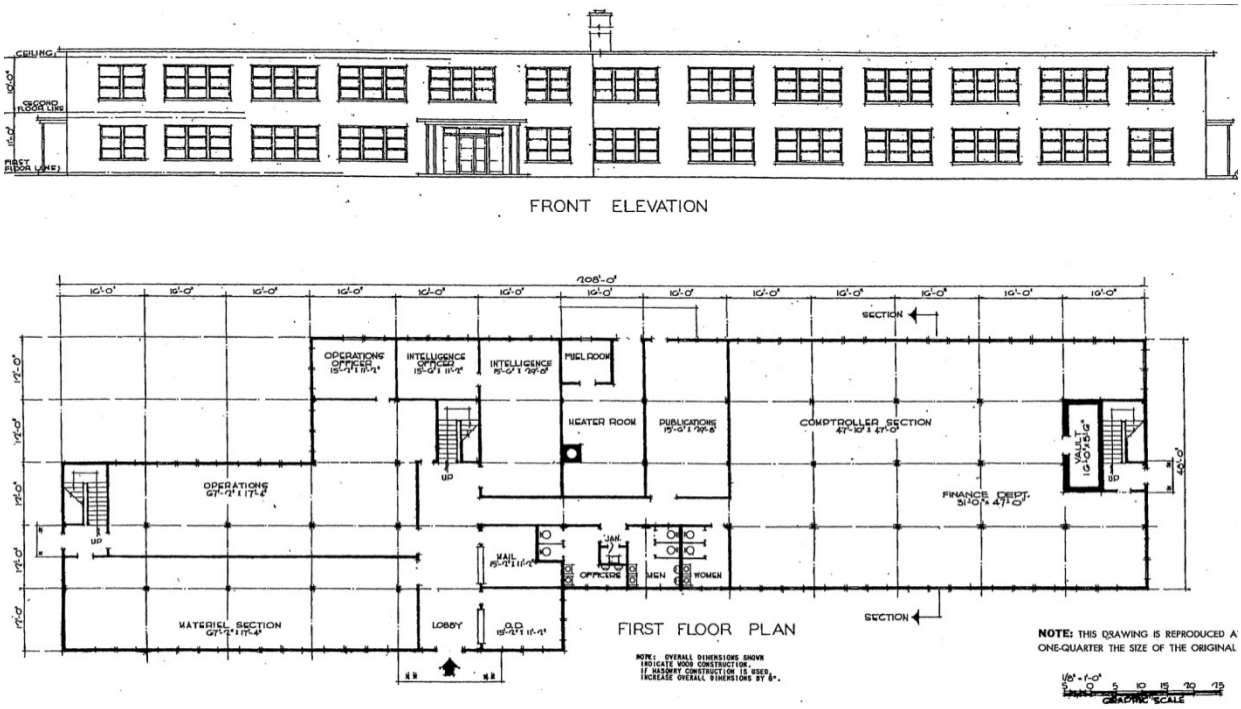


FIGURE 6-41. HEADQUARTERS ADMINISTRATION. DEF 30-02-33, 1952. AFM 88-2 CA. 1952.

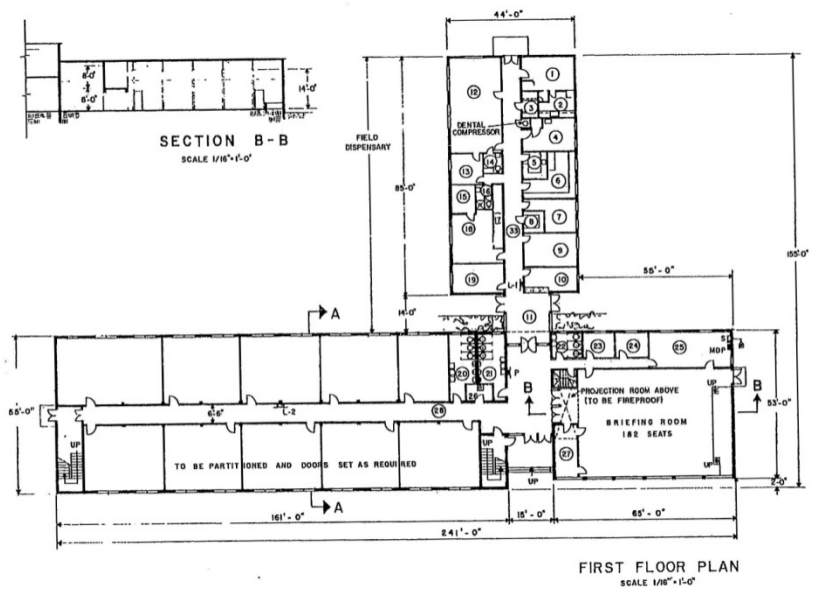


FIGURE 6-42. AIR RESERVE FORCES WING ADMINISTRATION BUILDING. AD 30-01-54, 1957. AFM 88-2 1959.

FIGURE 6-43. BRADLEY FIELD, CONNECTICUT ANG. HEADQUARTERS BUILDING.

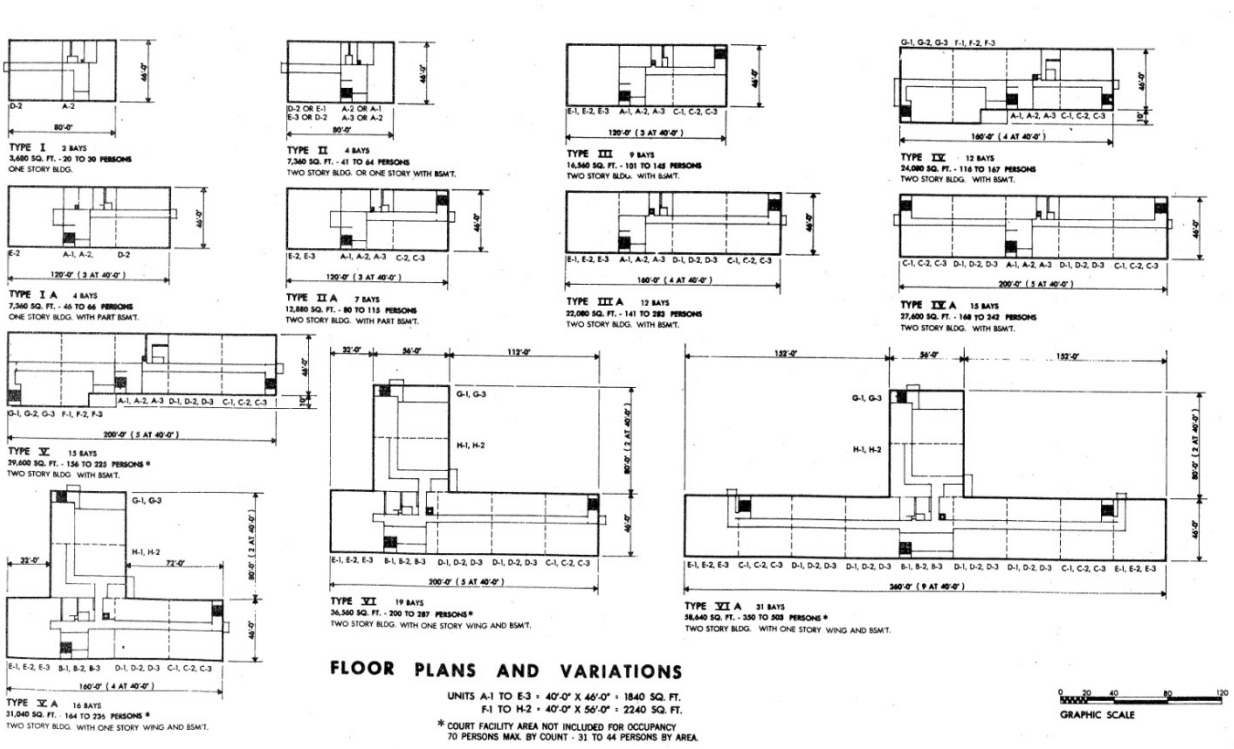


FIGURE 6-44. HEADQUARTERS BUILDINGS. AD 30-02-63, 1961. AFM 88-2 1969.

FIGURE 6-45. PEASE INTERNATIONAL TRADEPORT, NEW HAMPSHIRE ANG. ADMINISTRATION BUILDING. 1954.

FIGURE 6-46. FORT DODGE, IOWA ANG. ADMINISTRATION BUILDING 1959.

FIGURE 6-47. WILL ROGERS ANGB, OKLAHOMA ANG. WING ADMINISTRATION BUILDING. 1981.

Training

Training buildings often display specialized designs to suit specific needs. Flight simulators were specific to the type of aircraft, often requiring them to be housed in different sized structures and unique configurations. The configuration of these buildings was dependent on the type of simulator and its support equipment, including classrooms. Early flight simulators were housed in operations buildings but as ANG missions were changed and aircraft became more sophisticated, the size and complexity of facilities to train pilots required independent buildings. Often, the flight simulator required a taller wing or annex for the simulator equipment adjacent to classrooms or more traditional training facilities. The simulator structures varied in form, including one-story rectangular buildings and irregularly massed multi-story buildings with unusual roof forms. From the 1960s onward, rapidly evolving aircraft technology frequently made buildings outdated by the time an ANG unit received new aircraft. This resulted in the flight simulation training being relocated to a new building or to a regional ANG installation utilized by multiple units (R.C. Goodwin 2007:6-6).

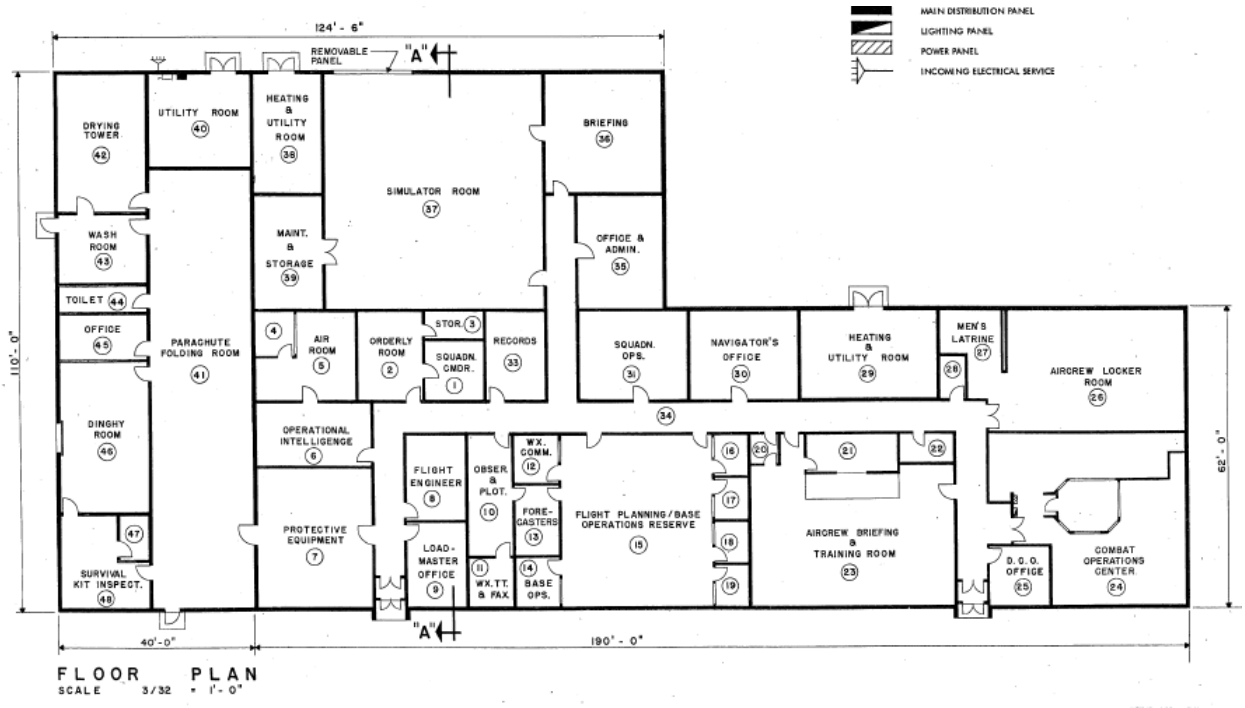


FIGURE 6-48. AIR RESERVE FORCES SQUADRON OPERATIONS COMBINED FACILITY FOR TACTICAL AIRLIFT SQUADRON C-130 AIRCRAFT. AD 30-10-25, 1974. AFM 88-2 1975.

Training facilities for non-flying installations, usually consisting of classrooms and lecture halls, were often located in other administrative buildings; however, the AFM 88-2 1959 includes an Air Reserve Forces drawing for a "Technical Training Building – Non-Flying."

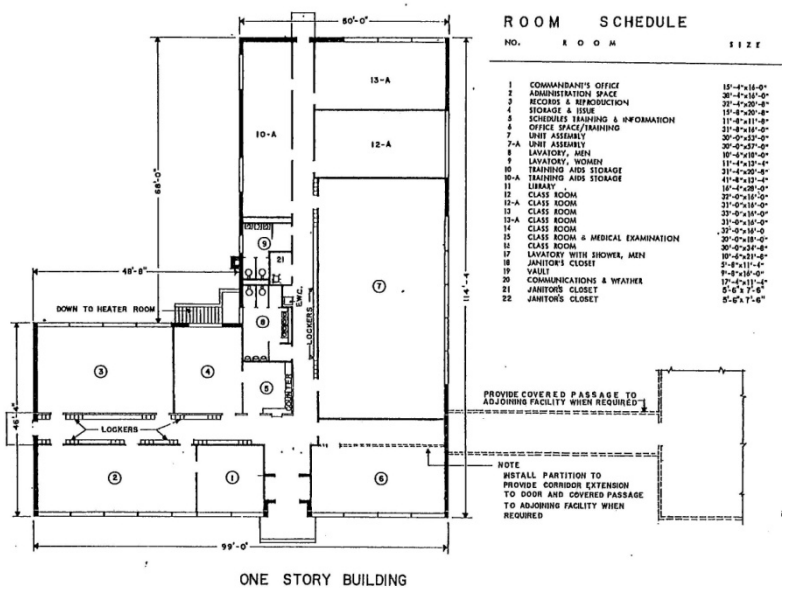


FIGURE 6-49. AIR RESERVE CENTER, TECHNICAL TRAINING BUILDING, NON-FLYING. AD 29-06-64, 1956. AFM 88-2 1959.

The earliest of training facilities might include octagonal or round celestial navigation training structures, "psychological high altitude training buildings," and traditional classrooms and flight simulators.

FIGURE 6-50. NEW CASTLE AIRPORT, DELAWARE ANG. FLIGHT SIMULATOR.

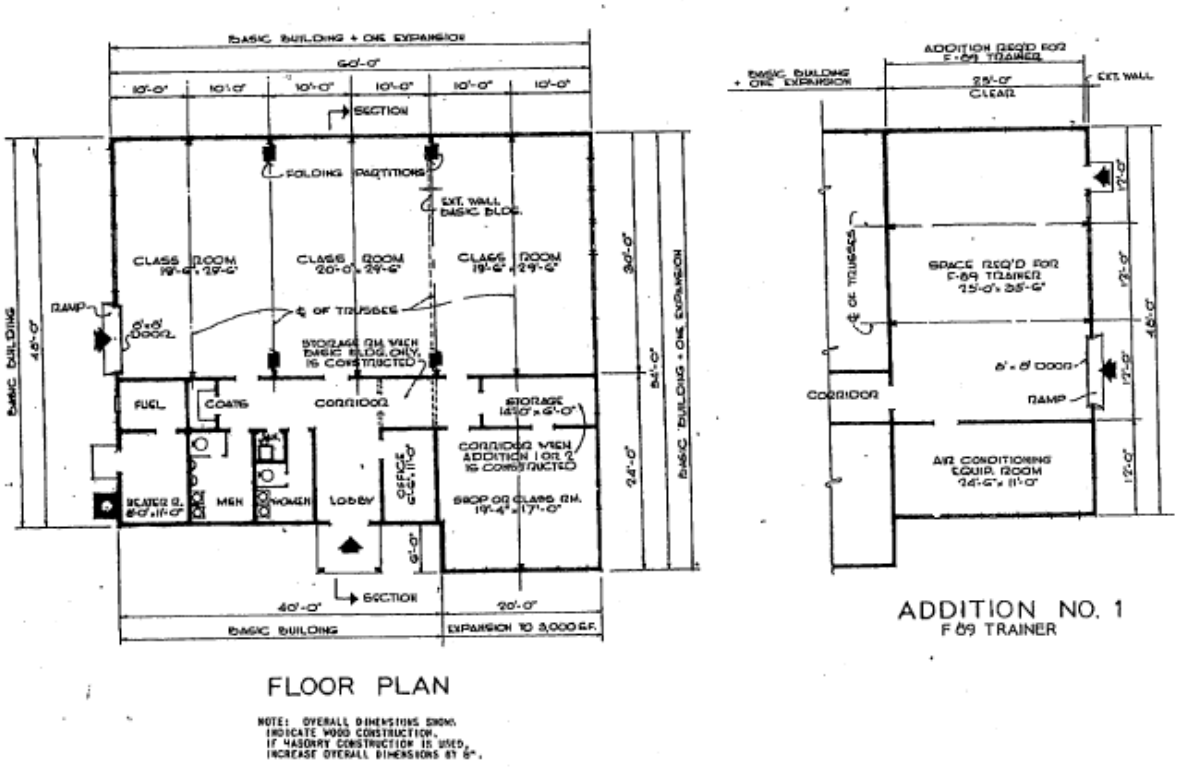


FIGURE 6-51. TECHNICAL TRAINING BUILDING AND FLIGHT SIMULATOR. DEF 28-14-03, 1952. AFM 88-2 CA. 1952.

FIGURE 6-52. BRADLEY FIELD, CONNECTICUT ANG. FLIGHT SIMULATOR.

FIGURE 6-53. KEY FIELD ANG STATION, MISSISSIPPI ANG. FLIGHT SIMULATOR (WITH PARACHUTE TOWER).

6.2.4. Other (Housing, Dining, World War II Chapels)

Housing

ANG installations do not generally have housing; however, World War II-troop housing exists on a few ANG installations, and reserve maintenance training and operations buildings sometimes contain limited quarters for visiting airmen or officials. Acknowledging that barracks and other housing sometimes already existed on the property, AFM 88-2 included designs and plans for retrofitting/updating existing barracks buildings for Air Reserve Forces. Housing constructed prior to the military assuming control could reflect any architectural style or type. Housing built by the military would follow standardized plans available at the time of construction. Since housing at ANG installations was often unnecessary, the ANG regularly converted residential buildings for storage, training, or other administration purposes.

FIGURE 6-54. GREAT FALLS ANGB, MONTANA ANG. FORMER COLD WAR BARRACKS.

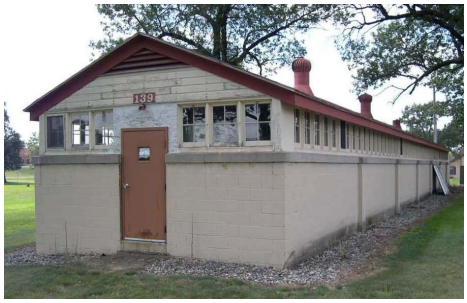


FIGURE 6-55. CHEYENNE FIELD, WYOMING ANG. FORMER COLD WAR BARRACKS, CURRENTLY VACANT

FIGURE 6-56. FORT INDIANTOWN GAP, PENNSYLVANIA ANG. FORMER WORLD WAR II BARRACKS.

FIGURE 6-57. PORTLAND ANGB, OREGON ANG. FORMER WORLD WAR II BARRACKS.

FIGURE 6-58. DES MOINES ANG BASE, IOWA ANG.
FORMER WORLD WAR II BARRACKS NOW USED FOR TRAINING.

Dining

Initially small ANG installations did not have facilities devoted to personnel support facilities. These were added later when the installation had grown to sufficient size and brought together guardsmen for group training. As a later occupant of an Air Force or other military installation, the ANG often found its installation with a dining hall that was built earlier. Today the former dining hall may be used by the ANG for another use. The 1952 Air Force definitive designs for dining facilities were the prototype for later mess halls. Most often they consisted of double cafeteria arrangements: two entrances, two serving areas, and a dishwashing area. The standard plans sat 500 but could be expanded to 750 without exceeding capacity. Larger plans could seat up to 1,200 people (Architectural Record 1952). On military bases, and subsequently on many ANG bases that occupied the area after the active military left, the dining hall was centered between clusters of barracks.

FIGURE 6-59. WESTFIELD-BARNES AIRPORT, MASSACHUSETTS ANG. FORMER DINING HALL, 1950.

FIGURE 6-60. FORBES FIELD, KANSAS ANG. DINING HALL 1978.

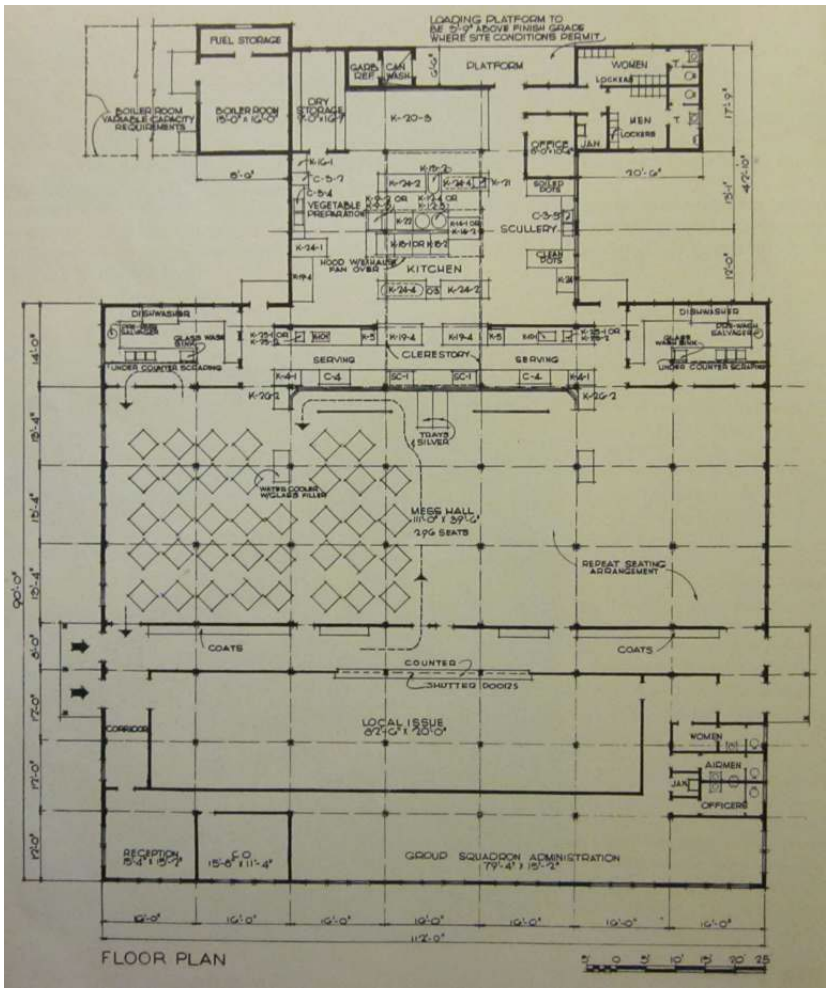


FIGURE 6-61. TYPICAL MESS HALL LAYOUT (ARCHITECTURAL RECORD 1952 :120).

World War II Chapels

Non-sectarian chapels were a requirement of Air Force installations during World War II and the Cold War. ANG installations do not generally have chapels or extensive facilities for morale or recreation. Air Force definitive designs of the 1950s and 60s included classroom wings for religious instruction that could be added later when funding could be secured. Several ANG bases have World War II chapels from their previous installations, many still retaining a high measure of integrity. These chapels were usually one-story wood frame buildings with a central entry into the vestibule. A wood-frame pyramidal steeple dominated the building's roofline.

FIGURE 6-62. PORTLAND ANGB, OREGON ANG. BASE CHAPEL, 1941.

FIGURE 6-63. BIRMINGHAM ANGS, ALABAMA ANG. BASE CHAPEL, CA. 1942.

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7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary Conclusions

7.1.1 ANG Contribution to the Cold War Effort

Between 1947 and the end of the Cold War era in 1989, the ANG transitioned from a dual state and federal reserve force of 12 wings that mostly flew fighter and bomber aircraft to a reserve of varied missions responsible for 100 percent of the nation's continental air defense. The ANG made substantial contributions to the Cold War effort in areas of missions, operations, and organization. Air defense was and remains the ANG's most enduring and significant mission. During the Korean War, ANG AC&W operators and ANG fighter-interceptor pilots served on alert duty to detect, intercept, and destroy incoming enemy aircraft both at home and overseas. Their success led to the ANG's involvement in air defense missions that continues today. Air defense was a major concern for the Cold War years 1957-1964 when the Soviets threat was assumed to be via first missiles and then with a second wave of bombers. Beginning first as an experiment involving two ANG fighter-interceptor squadrons in 1953, ANG fighter-interceptor squadrons contributed about half of ADC's alert fighter-alert force and by 1992 had taken over our nation's continental air defense. The ANG's alert mission was part of the overall early Cold War air defense system that responded to air-based threats through networks of land- and ship-based radar, citizen observers, fighter-interceptors on alert, and Nike and successor missile radar and control sites that sent information to BOMARC and then SAGE command and control systems. On alert at local civilian airports and military installations alike, the ANG provided ready response to enemy threat and represented a local and tangible link in the remote and esoteric defenses of our nation.

The ANG alert program also contributed to the Cold War reorganization of the U.S. military. With budgets devoted to building up the nuclear weapons inventory and military-industrial research and development, the ANG proved that the reserve forces could be counted on to carry out long-term, complicated missions and operations. Their credible showing in areas of AC&W and fighter and air refueling missions led to the acceptance of the Total Force policy and assignment of the reserves to gaining commands such as ADC or SAC. Adequately equipped and trained, the reserve forces made a solid contribution alongside the active forces.

Other ANG contributions to the Cold War were in the areas of aerial refueling, airlift, and special operations and communications. ANG received its first KC-97 tankers in 1961 and modified the aircraft as KC-97Ls to accept auxiliary jet engines for additional power against the load of its fuel. With initial success in Operation READY GO in response to the Berlin Crisis, the ANG undertook a wider refueling

operation with Operation CREEK PARTY in 1967 when the French pulled out of NATO complicating NATO use of air space and landing locations. The operation continued for 10 years. Beginning in 1976 contributed tankers to the SAC nuclear force.

The ANG contributed in the area of regional and specialized airlift, providing specialized airlift to provision remote DEW line radar stations in Alaska and Greenland and in Antarctica. They use specially fitted cargo aircraft (C-123Js and C-130s) that operate cold climate and rugged conditions that other aircraft could not operate. Beginning in 1988 the ANG at first on temporary basis then permanently since 1998 has taken responsibility for Operation DEEP FREEZE, which is the only military unit to serve the U.S. Antarctic Program. Also of note were the ANG's airlift operations to USSOUTHCOM with Operation VOLANT OAK and COVENANT COVE.

In the areas of special operations and communications, the ANG made contributions that made lasting effect on the Cold War geopolitics. Air guardsmen from the Alabama and Arkansas ANG were involved in the Bay of Pigs covert operation because of their knowledge and experience with outdated B-26 Invader aircraft, the same flown by the Cuban military. So secret was the operation that it could not be carried out as official ANG unit operation. The failure of the operation had enormous implications for U.S. relationships with Cuba and the public's perception of U.S. competency and actions to counter communism. It also demonstrated the extent to which maintaining "plausible deniability" undergirded military and political decisions but was unrealistic. The Oklahoma ANG made a significant contribution to military communications with its development and operation of the "Talking Bird" aircraft, a modified C-97E aircraft that enabled secure communications between the field and the White House. The aircraft was directly associated with President John Kennedy who personally used it for foreign travel. It was part of the lineage of Cold War-era military communications that included the SAC Looking Glass command aircraft.

7.1.2 Cultural Resources Summary

The ANG's inventory of approximately 178 installations is highly varied. It includes bases in every state and three U.S. territories that are variously collocated at civilian airports, on military installations, and at other locations. There have been many transitions in ownership and use of ANG facilities, past or current, by the military and non-military. The ANG's inventory includes nine installations that are present or former naval properties, approximately 25 current or former SAC Air Force installations, and approximately 25 current or former ADC Air Force installations. Former NIKE missile sites and radar sites are disappearing from the ANG's inventory. There are at least two former Nike sites currently

(Orange ANGS, N. Smithfield ANGS). However, Nike sites in Washington state, Illinois, California, and Rhode Island have been or are in the process of being transferred out of the ANG portfolio.

The Jefferson Barracks ANGB has the oldest built resources in the ANG inventory. Its Jefferson Barracks Historic District dates to the 1890s. There are three pre-World War II hangars in the ANG holdings: a hangar constructed in 1933 and associated with a commercial airline at the Cheyenne, WY airport, and two hangars supported by the WPA programs (Des Moines ANGB, Birmingham ANGB). There are a number of installations with World War II-era built resources including Portland IAP ANGB, Fresno ANGB, Klamath Falls ANGB, and Birmingham ANGB. World War II property types include former barracks, hangars, at least two chapels, ammunitions bunkers, and roads, runways and aprons.

The ANG's inventory of Cold War-era resources includes those constructed during or prior to World War II and that presumably were used during the Cold War as well as resources constructed during the Cold War. Property types run the full gamut from flightline resources (hangars and shelters, shops, fire and crash stations, aero ports and warehouses, alert crew facilities, aprons, taxiways, and runways) to off-flightline resources such as a sentry tower, administrative and training facilities (headquarters, offices and classrooms, operations, flight simulator, and personnel support (dining hall, chapel)). There is one special secure training facility, perhaps one of only three known to have been constructed worldwide at Alpena ANGB in Michigan, one large-size (150-men) molehole at Forbes ANGB that may be one of two or three in the Air Forces inventory, and many representations of both SAC and ADC hangars. Of ADC hangars, Butler and Strobel & Saltzman types are present, as well as groupings of four alert aircraft shelters.

7.2 Recommendations

7.2.1 Installation Historic Contexts

Installation historic contexts are the foundation for evaluation of resources for the NRHP. It is important that they be based on thorough articulation of all possible historic significance and be explicit about expected property types and historic integrity thresholds. Justifications for or against NRHP eligibility should be made relative to explicitly stated criteria. The quality and consistency of NRHP evaluations of ANG built resources could be improved if ANG installation historic contexts address three overarching historic themes, and develop subthemes related to the particular history of the ANG installation. The major themes are: state and local history, military history, and military architecture and engineering.

THEME 1: State and Local History and ANG Installations

An ANG installation historic context and evaluation of its built resources must consider both military and non-military significance. To this end, the historic context needs to be thorough it in its treatment of the

possible connections between the ANG and installation and local and state history. An explicit historic theme should be developed to address local and state history.

The historic context for an individual ANG installation should trace the history and establishment of the ANG installation and the pre-ANG history as well. Connections between the ANG installation and the development of the local community should be understood. Areas to be considered include the ANG's contributions to disaster response and relief, response to civil unrest, and community service. As an example, buildings on the base may have supported important non-military functions such as emergency relief to a major natural disaster that was significant in local history. Major events of significance to the local community may have occurred at the installation such as the arrival of an important dignitary who gave a notable speech, site of protest or violence, or other events.

Many ANG installations were developed in conjunction with local civilian airports and operate in common. Local leaders and the local community as well as politicians often lobbied for and in some cases assisted with the funding to establish the airport and the ANG installation. The relationship of the ANG installation and its facilities to the civilian and military air transportation in the area and state should be examined. Consideration should be given to whether the ANG installation is integral to or contributed to the operation of the airport, military base, or resources outside the current boundaries of the ANG installation. ANG facilities may have been part of the overall master plan for the airport. In the case of ANG installations at airports, the ANG installation and the airport may share facilities and have other relationships historically and currently that should be understood and considered.

THEME 2: Military History

The contribution of the ANG and installation and its resources to state and national military history should be examined in ANG installation historic contexts. Generally, installation historic contexts do have a recitation of the pertinent unit history; however, this history is not discussed in relation to the overall state national guard history, the history of the ANG, or significant events or broader themes of military history. Military history might include discussion of the history of the ANG unit organization and leadership, unit designations and reassignments, and the units' missions, gaining command, and participation in significant military operations. The installation's history and its resources must be understood in terms of its association with the ANG as well as all service branches associated with them. The participation of installation units in various operations should be related to major themes and events in military history. It is not sufficient to identify participation in an operation, but also is necessary to place the operation within the larger events or historical patterns. For example, the 10-year ANG refueling operation CREEK PARTY initiated in 1967 was notable as a solution to France's withdrawal from

NATO which necessitated the reshuffling of air space and U.S. landing rights in Europe at a time when refuelers were at a premium with the demands of Vietnam and Southeast Asia. Also ANG airfuelers performed so well that the operation was extended for 10 years and contributed to the credibility of the ANG and ultimately the implementation of the Total Force policy in 1970.

The connection of resources to important persons such as military leaders or groups of people such as the Tuskegee airmen needs to be examined. Although an important individual may have served at a particular ANG installation, his tenure at the installation needs to have been significant in terms of his overall career for the resource to be eligible for the NRHP under NPS guidance regarding applying evaluation criterion B. The same is true for a group of persons such as special unit or members of a particular program. It is also possible that a particular resource may be significant for having been associated with a certain rank of military personnel, such as a residence that housed successive commanders for many years.

The possibility of other missions at the installation should be considered such resources that were used for a Prisoner of War camp or a WPA or CCC regional or division office. In such cases, the context for evaluation of resources would be against other similar POW camps or WPA or CCC offices. Although a cultural resources survey focuses on the present ANG installation, ANG resources should be considered relative the broader resources outside the installation boundaries.

THEME 3: Military Architecture and Engineering

The ANG installation historic context should discuss the installation and its built resources in terms of military architecture and engineering. There exists a considerable body of literature about World War II and Cold War architecture and engineering including particular property types, architecture and engineering firms, and character-defining features. Most cultural resource survey reports evaluate World War II and Cold War resources as not significant architecturally because they are of standard design. In fact, the military's design guidance encourages the use of standard and pre-manufactured structures and materials. The infrastructure should be evaluated whether it is a good example of a type, style, or method of construction without regard to whether it is a standard building type. The examples of a given building type should be compared against each other and against other examples from other service branches. Character-defining features should be clearly articulated, and compromises to the historic integrity of a given example clearly stated. For example, it is only by comparing the 150-men SAC molehole at Forbes ANGB to other Air Force examples that we learn that the ANG example may be the best one in the Air Force and ANG inventory of the 10 that were constructed.

Studies of Air Force infrastructure by Weitze (USAF 1999a, b) have defined the evolution of aprons, hangars, and crew quarters and specific designs. Although ADC and SAC established their own architectural traditions during the Cold War with some cross-fertilization, the ANG's infrastructural tradition is less understood. Clarity is needed regarding the complicated past history of individual installations to properly assign past and extant built resources to the appropriate entity responsible for its construction and/or use. McGhee-Tyson ANGB in Knoxville is a case in point. Its 1952 Strobel & Salzman 8-pocket alert hangar was constructed for Air Force use in protecting Knoxville and nearby Oak Ridge prior to the arrival of the ANG in 1957. The ANG alert fighter-interceptor squadron subsequently used the hangar for its fighters that served in Operation STAIR STEP and other operations. Similarly, compilation of cultural resources studies suggests that the series of four alert shelters were a late ANG solution. All four examples of ANG alert shelters range in date 1966-1969. Without understanding the chronology of the installation, the alert hangar would be assigned to the ANG when it was a later occupant and user of the resources.

7.2.2 Additional Recommendations

The following are additional recommendations regarding the management of ANG Cold War built resources.

- Eliminate obviously minor support facilities from management such as open bay storage, open bay vehicular storage, and small-sized fuel related facilities. These types of resources will not be significant under any criteria and therefore not eligible for the NRHP. It is possible that a Section 106 program alternative could be developed that would not require survey, evaluation, or management of these and possibly other types of resources.
- Fully engage the rich data sources available to conduct thorough installation histories and historic contexts. ANG retirees make excellent oral history subjects and frequently remember surprising details about the missions, use of buildings, and changes to them. The ANG is a very personal organization, and its members and retirees know each other and keep in contact. They can be engaged as oral history subjects with great success. In an interview, the former commander of the Yeager AFB in West Virginia recalled the structural members for his arched truss hangar arriving 40 years earlier at the installation in a suitcase. Using the instructions, the base personnel assembled the structure of the hangar from the prefabricated members. This interview clarified an unclear notation on the "as built" drawings regarding the original location and construction of the hangar. There are other sources that should be taken full advantage of. The installation's anniversary scrapbooks and "as-built" drawings stored in the civil engineering drawings vault

provide substantial information about the establishment of the base and construction of the facilities. Real property accountability cards give a rapid overview of recent changes to the buildings.

8. REFERENCE LIST

Aaron, Jayne

2011 *Historic and Architectural Overview of Aircraft Hangars of the Reserves and National Guard Installations, World War I through Cold War*. Legacy Project 09-431.

Air Force Historical Research Agency

2008 "Air Defense Command." Fact Sheet. Posted 10 January 2008. http://www.afhra.af.mil/factsheets/factsheet.asp?id=10954

Air National Guard History Office

1984 History of the Air National Guard, January 1, 1982-December 31, 1982. October 1984. Office of National Guard History, Andrews AFB, Maryland.

Air National Guard Readiness Center

2002 *Final Report Cultural Resources Evaluation Alpena CRTC and Camp Grayling Weapons Range, Michigan Air National Guard*. December 2002.

2003 *Final Report Cultural Landscape Evaluation Des Moines Air National Guard Base, Des Moines, Iowa*. December 2003.

2005 *Cultural Resources Evaluation for Volk Field Combat Readiness Training Center and Hardwood Air-to-Ground Weapons Range*.

2006a *Draft Cultural Resources Survey Report 153rd Air Wing at Cheyenne Municipal Airport, Cheyenne, Wyoming*. November 2006.

2006b *Cultural Resources Survey of the 148th Fighter Wing Minnesota Air National Guard Duluth International Airport, Duluth, St. Louis County, Minnesota*. June 2006.

2006c *Cultural Resources Survey for Yeager Air National Guard Base and Beech Hill Drop Zone Parcel, West Virginia.* August 2006.

2006d *Final Cultural Resource Survey for the 144th Fighter Wing.* Prepared for California Air National Guard. November 2006.

2007a *Architectural Survey of Volk Field Combat Readiness Training Center, Juneau County, Wisconsin*. September 2007.

2007b *Draft Survey of the Architectural and Archaeological Cultural Resources at the Virginia Air National Guard Installations at the Richmond International Airport, Henrico County and the State Military Reservation, Camp Pendleton, City of Virginia Beach, Virginia*. April 2007.

2007c *Draft Cultural Resources Survey 105th Airlift Wing New York Air National Guard Stewart International Airport, Newburgh, New York*. February 2007.

2007d *Draft Final Cultural Resources Survey Report Montana Air National Guard 120th Fighter Wing at the Great Falls International Airport, Great Falls, Montana*. February 2007.

2007e *Cultural Resources Survey 185th Air Refueling Wing Iowa Air National Guard, Sioux City, Iowa*. February 2007.

2007f *Draft Final Phase I Cultural Resources Investigations at the Maryland Air National Guard (ANG) Facility at Martin State Airport, Baltimore County, Maryland*. January 2007.

2007g This Month in History: September. Entry regarding the Coronet Cove mission cited in text. From: http://www.ang.af.mil/history/HistSep.asp

2007h Real Property Records of ANG properties throughout the U.S. Records received from ANG Headquarters.

2008 *Final Integrated Cultural Resources Management Plan, Des Moines Air National Guard Base, Des Moines, Iowa*. May 2008.

AIA (American Institute of Architects)

1962 *American Architects Directory*. 2nd ed. New York: R. R. Bowker, L.L.C.

1970 *American Architects Directory.* 3rd ed. New York: R. R. Bowker, L.L.C.

Bowers, Ray L.

1999 *The United States Air Force in Southeast Asia Tactical Airlift*. Washington, D.C.: Government Printing Office.

Boyne, Walter J.

1999 "The Rise of Air Defense." Airforce-Magazine.com (online journal of the Air Force Association), December 1999, http://www.airforce-magazine.com/MagazineArchive/Pages/1999/December%201999/1299airdefense.aspx.

Brown, Cody M.

2008 *The National Security Council: A Legal History of the President's Most Powerful Legal Advisors*. Washington, D.C.: Project on National Security Reform, Center for the Study of the Presidency. http://www.pnsr.org/data/images/the%20national%20security%20council.pdf.

California State Military Museum

2008 Historic California Posts: Fresno Air National Guard Base, Fresno Army Air Base, Hammer Field. Posted 18 May 2008. http://www.militarymuseum.org/FresnoANGBase.html.

Chiles, James R.

2005 "Rings of Fire." *Air and Space*, June/July 2005: 33–39.

Churchill, Winston

1946 "Iron Curtain" (*Sinews of Peace)* speech presented at Westminster College in Fulton, Missouri, on 5 March 1946. Transcript available online at The History Guide, accessed April 2011, http://www.historyguide.org/europe/churchill.html.

De Longe, Merrill

1956 "Effects of Jet Aircraft on Air Base Planning." *The Military Engineer* 326 (November-December 1956): 420–422.

Department of Defense

1963 Data for Annual Report to DOD on Air Force Reserve as of 30 June 1963.

1965 Department of Defense Annual Report of the Secretary of Defense on Reserve Forces, Fiscal Year 1965.

1966 Department of Defense Annual Report of the Secretary of Defense on Reserve Forces, Fiscal Year 1966.

EADS (Eastern Air Defense Sector)

2009 "Eastern Air Defense Sector History." ANG Fact Sheet. Posted 28 August 2009. http://www.eads.ang.af.mil/resources/factsheets/factsheet.asp?id=14316.

Fairchild Air Force Base

2004 *Cultural Resource Evaluation/Assessment of Effect of Building 2050, Hangar Fairchild Air Force Base, Spokane, Washington*. January 2004.

Francillion, René.

1993 *The United States Air National Guard.* West Port, CT: Airtime Publishing.

French, Prentice

1946 "Survey of AAF Airport Designs." *Aero Digest*, April 1946: 46–47, 152–155.

Goodfellow, Susan, Marjorie Nowick, Chad Blackwell, Daniel Hart, Kathryn Plimpton.

2009 *Nationwide Context, Inventory, and Heritage Assessment of Works Progress Administration and Civilian Conservation Corps Resources on Department of Defense Installations*. Department of Defense Legacy Resource Program Project 07-357. Englewood, CO: engineering-environmental Management, Inc.

Gregory. Carrie J., and Martyn D. Tagg

2008 *Recording the Cold War: Identifying and Collecting Cold War Resource Data on Military Installations*. Legacy Project 07-285. Tucson, AZ: Statistical Research, Inc.

Gross, Charles J.

1985 *Prelude to the Total Force: The Air National Guard 1943–1969*. Washington, D.C.: Office of Air Force History, United States Air Force.

1994 *The Air National Guard: A Short History*. Arlington, VA.: National Guard Bureau.

1995 *The Air National Guard and the American Military Tradition*. Washington, D.C.: U.S. Government Printing Office.

1996 *Mobility Milestones An Air National Guard Chronology*. Washington, DC: National Guard Bureau.

1998 *Adapting the Force: Evolution of the Air National Guard's Air Mobility Mission*. Arlington, VA: National Guard Bureau.

1999 "Operation Creek Party, 1967–1977." *Air Power History* 46: 24–35.

2000 *Dumbo Factor*. Arlington, VA: National Guard Bureau.

2000 *Turning Point: The Air National Guard and the Korean War*. Arlington, VA: National Guard Bureau.

2007a "A Chronological History of the Air National Guard and Its Antecedents, 1908–2007." Accessed July 2008 http://www.ngb.army.mil/features/AF60th/ANG_CHRON_1908-2007.doc

2007b "Air National Guard Federal Funding." Accessed July 2008 http://www.ang.af.mil/shared/media/document/AFD-080210-014.pdf.

Gross, Charles J. and Gary A. Gualt.

2000 "Korean War Chronology: Air National Guard (ANG) 2000." Accessed January 2011. http://www.ang.af.mil/history/references.asp

HDR

2011 *Survey and Evaluation Report, Naval Air Station Fallon, Nevada*. HDR, Englewood, CO.

IBM

1965 *Introduction to AN/FSQ-7 Combat Direction Central and AN/FSQ-8 Combat Control Central*. Kingston, New York: International Business Machines Corporation Military Products Division. Manual posted online at http://ed-thelen.org/SageIntro.html.

JFK Library

2011 Cuban Missile Crisis. http://www.jfklibrary.org/JFK/JFK-in-History/Cuban-Missile-Crisis.aspx Accessed May 2011.

Jockel, J.T.

1987 *No Boundaries Upstairs: Canada, The United States, and the Origins of North American Air Defense, 1945–1958*.Vancourver BC: The University of British Columbia.

Kansas Air National Guard 184th ARW

1999 *The Cultural Legacy of the Smoky Hill Air National Guard Range, USAF ANG Smoky Hill Air National Guard Range, Salina*.

Kuranda, Kathryn M.

2001 *Historic Context for Army Fixed Airfields, 1903–1989*. Frederick, MD: R. Christopher Goodwin and Associates, Inc. Prepared for the U.S. Army Environmental Center.

Launius Roger D.

2011 Sputnick and the Origins of the Space Age. http://history.nasa.gov/sputnik/sputorig.html. Accessed May 2011.

Lewis, Karen, Katherine J. Roxlau, Lori E. Rhodes, Paul Boyer, and Joseph S. Murphey

1995 *Air Combat Command and the Legacy of the Cold War*. Albuquerque, NM: Mariah Associates. Prepared for Headquarters, Air Combat Command under contract DACA 63-92-D-0011, Delivery Order number 0015.

Lippmann, Walter

1947 *The Cold War: A Study in U.S. Foreign Policy*. Harper, New York.

Listman, John W., Jr.

2010 "Remembering the Air Guard in Vietnam." *The On Guard* [monthly publication of the National Guard]. Available online at http://www.ang.af.mil/shared/media/document/AFD-091124-037.pdf.

Lloyd, Alwyn T.

1999 *A Cold War Legacy: A Tribute to Strategic Air Command 1946-1992*. Missoula, MT: Pictorial Histories Publishing Company, Inc.

Lonnquest, John C. and David F. Winkler

1996 *To Defend and Deter: The Legacy of the United States Cold War Missile Program*. DoD Legacy Program, Project 94-1264. Fort Belvoir, VA: Fort Belvoir Defense Technical Information Center.

McKinley, Craig R., Brig. General.

2001 "The Air National Guard's Contribution to the Total Force." Article prepared for AU-24, *Concepts for Air Force Leadership.* Available online at http://www.au.af.mil/au/awc/awcgate/au-24/mckinley.pdf.

McMullen, Richard

n.d. *A History of Air Defense Weapons*. ADC Historical Study 14. n.p.: Headquarters, Air Defense Command Historical Division, Office of Information.

1972 A Bombsite for a Freight Train: The Air National Guard, Air Defense, and Federalization, 1946–1950. Master's Thesis, Ohio State University, 1972.

Murdock, Scott D.

2002 "The Use in 1995 of World War II Army Airfields in the United States." Last modified 11 August 2002. http://www.airforcebase.net/aaf/grphtml.html.

Narducci, Henry M.

1988 *Strategic Air Command and the Alert Program: A Brief History.* Offutt Air Force Base: Strategic Air Command Office of the Historian.

NGB (National Guard Bureau)

1949 Summary: 21 March 1949. The Air National Guard. Prepared by Air Plans Group, Air Force Division, National Guard Bureau, 419.101-66 v. 1 in USAF Collection, AFHRA.

1955 The Air National Guard Summary, Fiscal Year 1955 as of 30 June, 1955. National Guard Bureau, Air Force Division, Comptroller, Washington, D.C.

1956 The Air National Guard Summary, Fiscal Year 1956 as of 30 June, 1956. National Guard Bureau, Air Force Division, Comptroller, Washington, D.C.

1957 The Air National Guard Summary, Fiscal Year 1957 as of 30 June, 1957. National Guard Bureau, Air Force Division, Comptroller, Washington, D.C.

1958a The Air National Guard Summary, Fiscal Year 1958 as of 30 June, 1958. National Guard Bureau, Air Comptroller Division, Washington, D.C.

1958b Air National Guard Progress Analysis, Fiscal Year 1959, 31 December 1958, Department of the Air Force, National Guard Bureau.

1959 The Air National Guard Summary, Fiscal Year 1959 as of 30 June, 1959. National Guard Bureau, Air Comptroller Division, Washington, D.C.

1960 The Air National Guard Summary, Fiscal Year 1960, as of 30 June, 1960. National Guard Bureau, Air Comptroller Division, Washington, D.C.

1969 National Guard Bureau Fact Sheet. October 1969.

1971 Annual Report, Fiscal Year 1971, Chief, National Guard Bureau. Departments of the Army and Air Force National Guard Bureau, Washington, D.C.

1972 Annual Report, Fiscal Year 1972, Chief, National Guard Bureau. Departments of the Army and Air Force National Guard Bureau, Washington, D.C.

1986 Annual Review of the Chief, National Guard Bureau, 1986. Departments of the Army and Air Force National Guard Bureau, Washington, D.C.

1988 Chief, National Guard Bureau Annual Review, Fiscal Year 1988. Departments of the Army and Air Force, National Guard Bureau.

1989 Chief, National Guard Bureau Annual Review, Fiscal Year 1989. Departments of the Army and Air Force, National Guard Bureau.

National Museum of the Air Force.

2009 Tactical Air Command. ANG Fact Sheet. Posted 21 January 2009. http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=1850.

2010a "Factsheet Boeing KB-29M and B-29MR." Accessed May 18. http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=374

2010b "Factsheet Boeing KC-97L Stratofreighter." Accessed May 18. http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=2554

NPS (National Park Service)

2011a Secretary of the Interior's Standards for Preservation Planning, Standard 1: Preservation Planning Establishes Historic Contexts. (annotated version of standards and guidelines available at http://www.nps.gov/history/local-law/arch_stnds_1.htm#dev, accessed May 2011).

2011b Secretary of the Interior's Guidelines for Preservation Planning, Developing Historic Contexts. (annotated version of standards and guidelines available at http://www.nps.gov/history/local-law/arch_stnds_1.htm#dev, accessed May 2011).

New York Times

1912 "Drops from Biplane With a Parachute." 2 March 1912.

Norvell, John M.

1961 "Base Construction for BOMARC." *The Military Engineer* 352 (March-April 1961): 129–131.

Peebles, Curtis

1997 *High Frontier: The United States Air Force and the Military Space Program*. Air Force History and Museums Program, U.S. Government Printing Office: Washington D.C. 1997

R.C. Goodwin and Associates

2008 Ammunition and Explosives Storage for the Navy (1939–1989) and the Air Force (1946–1989). Prepared by R.C. Goodwin and Associates for the Naval Facilities Engineering Command, Washington Navy Yard, D.C.

Rutter, William

2011 Summary of history of Selfridge ANGB. Email personal communication to Marjorie Nowick. April 2011.

Schaffel, Kenneth.

1991 *The Emerging Shield: The Air Force and the Evolution of Continental Air Defense 1945–1960*. Washington, D.C.: Office of Air Force History USAF.

Smith, Richard K.

1998 *Seventy-Five Years of Inflight Refueling Highlights, 1923–1998*. Washington, D.C.: Air Force History and Museums Program.

Speed, Joseph B.

2006 *Forgotten Heroes-U.S. ANG Fighter Squadrons of Vietnam*. Research report, Maxwell Air Force Base. http://www.ang.af.mil/shared/media/document/AFD-100324-046.pdf Accessed 4 May 2010.

Tillman, Barrett

2003 *Alpha Bravo Delta Guide to the U.S. Air Force*. Alpha Bravo Delta Guides. New York: Alpha Books.

Trest, Warren A. and Donald B. Dodd

2001 *Wings of Denial: The Alabama Air National Guard's Covert Role at the Bay of Pigs*. Montgomery, AL: New South Inc.

Troop Carrier/Tactical Airlift Association.

2010 "History." Accessed 20 May 2010 http://www.troopcarrier.org/history.html.

USAF (United States Air Force)

1949 Annual Report of Activities for Fiscal Year 1949. Historical Division Office of the Adjutant General Continental Air Command, Mitchell Air Force Base, New York.
Notes: Air Force info, not ANG.

1954 Semiannual Report, The Air Force Reserve Forces Plans and Programs for the Period 1 July to 31 December, 1954.

1955a Semiannual Report, The Air Force Reserve Forces Plans and Programs for the Period 1 January to 20 June 1955.

1955b Semiannual Report, The Air Force Reserve Forces Plans and Programs for the Period 1 July to 31 December, 1955.

1956a Semiannual Report, The Air Force Reserve Forces Plans and Programs for the Period 1 January to 30 June 1956.

1956b Supplement to Semiannual Report, The Air Force Reserve Forces Plans and Programs for the Period 1 January to 30 June 1956.

1957 Semiannual Report, The Air Force Reserve Forces Plans and Programs for the Period 1 January to 30 June 1957.

1962 "Headquarters Air Defense Command, Background Information: Air National Guard Defense. Office of Information, Ent AFB, Colorado Springs, Colorado." USAF Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

1963 "Air Guard Units Receive Air Commando Designations. Air Force News Service, Office of Information, Release Number 7-5-63-463." USAF Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

1966a "ANG Observes 12th Anniversary of 24-hour Runway Alert. News Release, United States Air Force, Air Defense Command Office of Information, Ent AFB, Colorado." USAF Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

1966b Air Reserve Forces Annual Report of the Secretary of the Air Force, 1 July 1965-30 June 1966.

1967 Annual Report, Reserve Components (ANG-AFRes) Department of the Air Force, FY 1967.

1968a "Air National Guard Unit Deploys to Phan Rang Air Base. News Release, United States Air Force, Directorate of Information, Headquarters Seventh Air Force, Tan Son Nhut Air Base, Republic of Vietnam." USAF Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

1968b "Department of the Air Force Staff Summary Sheet, Subject: Palace Alert. 14 June 1968." USAF Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

1968c "News Release, United States Air Force, Directorate of Information, Headquarters Seventh Air Force, Tan Son Nhut Air Base, Republic of Vietnam. Release number 7-19-68469." USAF Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

1968d "ANG Pilots Fly F-102s at Bien Hoa. News Release, United States Air Force, Directorate of Information, Headquarters Seventh Air Force, Tan Son Nhut Air Base, Republic of Vietnam." USAF Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

1968e "News Release, United States Air Force, Directorate of Information, Headquarters Seventh Air Force, Tan Son Nhut Air Base, Republic of Vietnam. Release Number 3-1-69-143." USAF Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

1970 HQ 136th Air Refueling Wing (Tex ANG) Coronal Harvest Report, Sept. 1970.

1975 Air Force Design Manual, Definitive Designs of Air Force Structures. Collection of design plans from 1952-1975. Washington, D.C.

1990 United States Army Construction Engineering Research Laboratory (CERL) World War II Temporary Military Buildings A Brief History of the Architecture and Planning of Cantonments and Training Stations in the United States.

1999a "Cold War Infrastructure for Air Defense: The Fighter and Command Missions." United States Air Force Headquarters, Air Combat Command.

1999b "Cold War Infrastructure for Strategic Air Command: The Bomber Mission United States Air Force Headquarters, Air Combat Command.

1999c United States Army Construction Engineering Research Laboratory (CERL)1999 (Revised 2001) Historical and Architectural Overview of Military Aircraft Hangars. A General History, Thematic Typology, and Inventory of Aircraft Hangars Constructed on Department of Defense Installations. Prepared for United States Air Force Headquarters, Air Combat Command.

Washbourne, Lee B.

1953 "Effect of Jet Conversion Program on Air Installations." *The Military Engineer* 45, no. 306 (July-August 1953): 256–258.

Weaver, Michael E.

2007 "Making a Difference: The Tennessee Air National Guard during the Berlin Crisis, 1961–1962." *The Journal of East Tennessee History,* no. 79 (2007): 1–19.

Webster, Julie

1998 *Historic and Architectural Overview of Aircraft Hangars: A General History, Thematic Typology, and Inventory of Aircraft Constructed on Department of Defense Installations*. U.S. Air Force Air Combat Command.

Weitze, Karen

2003 Keeping the Edge: Air Force Materiel Command Cold War Context 1945–1991. Volumes 1 through 3.

Winkler, David

1997 *Searching the Skies: The Legacy of the United States Cold War Defense Radar Program*. Langley Air Force Base, VA: Air Combat Command Headquarters.

Wolk, Herman S.

1984 *Planning and Organizing the Postwar Air Force 1943-1947*. Office of Air Force History, U.S. Air Force, Washington D.C.

Appendix A: Mission and Mobilization Tables

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Mission and Mobilization Tables

1. Alert Mission

Alert Units as of 1962 (USAF 1962)			
Unit	**State Affiliation**	**Aircraft**	**Location**
Fighter Squadrons			
111	Oklahoma	F-102	Ellington AFB
116	Washington	F-89J	Spokane IAP
118	Connecticut	F-100	Bradley Field
122	Louisiana	F-100	New Orleans Naval Air Station
123	Oregon	F-89J	Portland International Airport
124	Iowa	F-89J	Des Moines International Airport
132	Maine	F-89J	Dow AFB, Maine
134	Vermont	F-89J	Burlington MAP
146	Pennsylvania	F-102	Greater Pittsburg Airport
151	Tennessee	F-104	McGhee-Tyson, Knoxville
152	Arizona	F-100	Tucson MAP
157	South Carolina	F-104	McEntire ANGB, Congaree SC
159	Florida	F-102	Imeson MSP, Jacksonville
173	Nebraska	F-86L	Lincoln AFB
175	South Dakota	F-102	Joe Foss Field, Sioux Falls
176	Wisconsin	F-89J	Truax Field
178	North Dakota	F-89J	Hector Field, Fargo
179	Minnesota	F-89J	Duluth MAP
181	Texas	F-86L	Dallas Naval Air Station
182	Texas	F-102	Kelly AFB
186	Montana	F-89J	Great Falls International Airport
188	New Mexico	F-100	Kirtland AFB
190	Idaho	F-86L	Boise
194	California	F-86L	Fresno
196	California	F-86L	Ontario
198	Puerto Rico	F-86H	Puerto Rico International Airport, San Juan
AC&W squadrons			
130	Utah	n/a	Salt Lake City
138	Colorado	n/a	Buckley ANGB
140	Puerto Rico	n/a	Punta Salinas

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Appendix B: Installation and Cold War Resource Rating Table

(Key: 1-highly significant, 2-likely significant, 3-low possibility of significance, 4-no possibility of significance)

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State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
AK	Eielson AFB	168th Air Refueling Wing	X	X	AFB	SAC			
AK	Joint Base Elmendorf and Richardson	176th Airlift Wing	X	X	AF/Army	SAC	none needed, new buildings	4	176 AW 2011 moved from Kulis to Elmendorf. Prior to move, 176 maintained a handful of new buildings, additional constructed for relocation.
AK	Kulis ANGB (Ted Stevens IAP)			x	Airport		Yes		176 AW moved to Elmendorf; NRHP eligible CW hangar - NR eligible under A for association with DEW Line and 1964 earthquake; under C for unusual engineering and architectural hangar type.
AL	Birmingham IAP	117th Air Refueling Wing		X	Airport		Yes		Members of unit participated in Bay of Pigs. CRS evaluated hangar as not sufficiently associated with event to merit NRHP eligible status.
AL	Montgomery Regional Airport (Dannelly Field)	187th Fighter Wing		X	Airport		Yes		
AL	Dothan Regional Airport	280th Combat Communications Squadron			Airport		Yes		
AL	Montgomery Absont AGS	226th Combat Communication Group			Airport		Yes		
AR	Fort Smith Municipal Airport (Ebing ANGB)	188th Fighter Wing		X	Airport		Yes		
AR	Little Rock AFB	189th Airlift Wing	X	X	AFB	SAC			Lost SAC in Aug 1987-Titan II missiles
AR	Fort Chaffee Maneuver Training Center	ANG Training							
AZ	Phoenix Sky Harbor IAP	161st Air Refueling Wing		X	Airport	SAC	Yes		
AZ	Tucson IAP	162nd Fighter Wing + ANG AFRC Command Test Center		X	Airport				Former alert mission
AZ	Davis-Monthan AFB	214th Reconnaissance Group	X		AFB	SAC			
AZ	Luke AFB	107 Air Control Squadron	X		AFB				
AZ	Fort Huachuca	Western Division of the Advanced Airlift Tactics Training Center (see 139th Airlift Wing, Rosecrans Air National Guard Base, St. Joseph Missouri)	X	X	Army				Fort Huachuca is home to the western division of the AATTC. This is operated by the 139th Airlift Wing, at Rosecrans Air National Guard Base, in St. Joseph Missouri
CA	Moffett Federal Airfield	129th Rescue Wing		X	Navy/NASA				
CA	Fresno Yosemite IAP (Fresno ANGB)	144th Fighter Wing		X	Airport		Yes	3	Large former WWII AAF base; 144th moved from Hayward ANGB; alert mission
CA	Channel Islands ANGS Port Hueneme	146th Airlift Wing	x	X	Navy				

State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
CA	Hayward ANGS, Hayward Municipal Airport			x	Airport		Yes	2	1st alert experiment. Being transferred to Airport Authority.
CA	North Highlands ANGS, Sacramento	162nd Compact Communications Group					Yes		
CA	March ARB	163rd Reconnaissance Wing	X	X	Air Reserve	SAC			Lost SAC in May 1992-Refueling; HQ for SAC 15th Air Force
CA	Beale AFB	234th Intelligence Squadron	X		AFB	SAC			Lost SAC in May 1992-Refueling, Reconnaissance; HQ for SAC 2d Airforce
CA	Sepulveda ANGS, Miramar NAS, Vandenburg AFB	261st Combat Communications Squadron	X		Navy/AF	Nike	yes		Los Angeles Nike Site LA-96L, This Nike base was active from approximately 1955 to the early 1970s. Vandenburg was SAC., Closed.
CO	Buckley AFB	140th Wing	X	X	AFB	Navy/ANG	Yes		Former NAS Buckley, former ANGB (host), former alert mission, Denver type thin shell reinforced concrete hangar and 2nd hangar NRHP eligible
CO	Greeley ANGS	137th Space Warning Squadron							
CO	Peterson AFB	200th Airlift Squadron	x	X	AFB	SAC			
CT	Bradley IAP (Bradley ANGB)	103rd Airlift Wing		X	Airport		Yes		Former alert mission, 1969 2-pocket alert hangar on segregated apron.
CT	New Haven, Orange ANGS	103rd Air Control Squadron				Nike	Yes		Bridgeport Nike Site BR-15C This Nike facility was operational from approximately 1956 to 1961
DC	JB Andrews AFB	113th Wing Group, 121st Fighter Squadron, 201 AS, 121 WF, 231 CBCS	X	x	Joint base/AF	Air Force/ SAC	Yes		Air Force, Air Force Reserve, ANG, Naval Air Facility, Army and Marine Corps Detachments are all located at Joint Base Andrews. Unsure if the ANG has tenant status here.
DE	New Castle County Airport	166th Airlift Wing		X	Airport		Yes		Former alert mission. 1956 Butler –type alert hangar.
FL	Jacksonville IAP	125th Fighter Wing			Airport		Yes	4	Former alert mission. Apron, arched aircraft shelters, 1-story crew quarters in segregated area near taxiway. Former alert facilities have no historic integrity.
FL	Tyndall AFB	148th Fighter Wing, 701 ADS. 702 CSS	X		AFB				
FL	Camp Blanding Joint Training Center	159th Weather Flight and 202nd Red Horse Squadron							
FL	MacDill AFB	290th Joint Communications Support Squadron	x		AFB	ACC/SAC			
FL	Patrick AFB	114th Range Operations Squadron	x		AFB				
GA	Warner Robbins AFB	116th Air Control Wing	X	X	AFB	SAC			
GA	Savannah/Hilton Head IAP	165th Airlift Wing// 117th Air Control Sqd		X	Airport		Yes		
GA	Dobbins ARB	283rd Combat Communications Squadron	X		Air Reserve				

State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
GA	Lewis B. Wilson Airport (Macon)	202nd Engineering Installation Squadron			Airport		Yes		This ANG station is at a civilian airport, unable to determine which one.
GA	Glynco Jetport Airport	165th Air Support Operations Squadron/224th Joint Communication Support Sqd			Airport				
GA	Hunter Army Airfield Coast Guard Air Station Savannah (Hunter Air National Guard Station NO 2)	117th Tactical Control Squadron	X		Army / Coast Guard	SAC			Called Hunter A
GA	Townsend Bombing Range	GA ANG							Near Savannah, used by all services. Part of GAANGs Combat Readiness Training Center in Savannah.
GA	Savannah Combat Training Readiness Center	GA ANG			x?		Yes		Located at Savannah IAP it is listed separately in NGB table and here.
GU	Andersen AFB	254th Air Base Group	X		AFB	SAC			Lost SAC in Sep 1990-Bomber, Refueling
HI	Joint Base Pearl Harbor-Hickam	154th Wing	X	X	Navy/AF	SAC	In progress		Lost SAC in May 1992
HI	Keaukaha Military Reservation (Hilo- Hawaii)	291st Combat Communications Squadron					In progress		Part of the 201st Combat Comm Group based at Hickam. One of 5 units on Hawaiian islands.
HI	Kahului Communication Station (Maui)	292nd Combat Communications Squadron					In progress		Part of the 201st Combat Comm Group based at Hickam. One of 5 units on Hawaiian islands.
HI	Pacific Missile Range Facility (Barking Sands-Oahu)	293rd Combat Communication Squadron	X		Navy		In progress		Part of the 201st Combat Comm Group based at Hickam. One of 5 units on Hawaiian islands.
HI	Kalaeola (Barbers Point)	297th Air Traffic Control Squadron					In progress		
IA	Des Moines IAP	132nd Fighter Wing		X	Airport		Yes		WPA WWII art deco hangar-office-armory NRHP Eligible, former alert mission. 1969 four alert shelters & alert apron. Possible use of WWII temporary building for crew quarters.
IA	Fort Dodge	133 TS (Training Squadron)			ARNG	ARNG	Yes		
IA	Sioux Gateway Airport / Colonel Bud Day Field	185th Air Refueling Wing		X	Airport		Yes		Former alert mission. 1953 Strobel & Salzman 4-pocket alert hangar.
ID	Boise Air Terminal / Gowen Field	124th Wing		X	Airport		Yes		Former alert mission.
ID	Mountain Home AFB	266 Range Squadron (RANS)	X		AFB	SAC			
IL	Abraham Lincoln Capital Airport	183rd Fighter Wing		X	Airport		Yes		
IL	General Wayne A. Downing Peoria IAP	182nd Airlift Wing		X	Airport		Yes		
IL	Scott AFB	126th Air Refueling Wing	X	X	AFB				
IN	Fort Wayne IAP	122nd Fighter Wing		X	Airport		Yes		

State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
IN	ATTERBURY	Camp Atterbury Joint Maneuver Training Center							Not sure what ANG has here
IN	Terre Haute IAP / Hulman Field	181st Intelligence Wing			Airport		Yes		
IN	Jefferson Proving Grounds, Madison	Jefferson Proving Ground							This is an Army installation that has been BRAC'd. 1966 four alert shelters.
KS	Forbes Field ANGB	19th Air Refueling Wing		X		SAC	Yes		Lost SAC in May 1992-Refueling. 1957 double-cantilevered medium bomber hangars, wing hangars & nose docks, 1958 150-men crew "molehole" – good integrity.
KS	McConnell AFB	184th Intelligence Wing	X	X	AFB	SAC			Lost SAC in Aug 1986-Titan II missiles, Jun 1987-Refueling, May 1992-Bomber, Refueling
KS	Smoky Hill ANG Range	184th Bomb Group				WWII	Yes		The 184th Bomb group part of the ANG at McConnell operate this range for ANG and others.
KY	Louisville IAP	123rd Airlift Wing		X	Airport				
LA	Camp Beauregard ARNG	122nd Air Support Operations Squadron							Camp Beauregard in a ARNG installation. As the facility is run by the LA National Guard, unsure if the ANG has a tenant status here.
LA	Alexandria, Esler Airport	259th Air Traffic Control Squadron			Airport				
LA	Hammond Municipal Airport	236th Combat Communication Squadron			Airport				
LA	Jackson Barracks				ARNG				
LA	NAS Joint Reserve Base New Orleans	159th Fighter Wing	X	X	Navy				Also home to Louisiana ANG HQ and 214th Engineering and Installation Squadron, former alert mission
MA	Milford								
MA	Barnes Municipal Airport / Barnes ANGB	104th Fighter Wing		X	Airport				
MA	Otis ANGB	102nd Intelligence Wing		X		Otis AFB/ SAC	Yes		ANG assumed responsibility for operating the flying field at Otis AFB.
MD	Camp Fretterd	104 WF		X					
MD	Martin State Airport / Warfield ANGB	175th Wing		X	Airport		Yes		Baltimore
ME	Bangor IAP / Bangor ANGB	101st Air Refueling Wing, 132		X	Airport	SAC	Yes		Lost SAC in May 1992-Refueling, former DOW AFB, former alert mission
ME	South Portland ANGS	243 EIS, 265 CBCS			?		Yes		
MI	W. K. Kellog Airport / Battle Creek ANGB	110th Airlift Wing		X	?				The base lost their A-10s during 2009 and went from a FW to an AW.

State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
MI	Camp Grayling	National Guard training site							Not sure what MI ANG has at camp grayling so unsure if they have tenant status. Camp Grayling is the largest military installation east of the Mississippi. Largest NG training site.
MI	Alpena County Regional Airport, ANG CRTC	ANG CRTC			x	SAC	Yes	1	Important CW-protection
MI	Selfridge ANGB	127th Wing		X		Nike, Selfridge AFB, SAC	Yes		Early base to 1917, rebuilt 1920s-1930s, then WWII, and then SAC, Joint base with other services. Detroit Nike Site D-14C/D-16C, a dual-battery control site, on the southern part of AFB, was operational ca.1955 - 1971. Detroit Nike Site D-14L, This Nike launcher site (Ajax only), located east of D-14C/16C on Selfridge AFB, operational approximately 1955 - 1963. Detroit Nike Site D-16L, This Nike launcher site (Ajax, then Hercules), located west of D-14C/16C on Selfridge AFB, operational approximately 1955 - 1971.
MN	Duluth IAP	184th Fighter Wing		X	Airport		Yes		Former alert mission. WPA shacks, alert quarters, 1952 alert hangar.
MN	Minneapolis-Saint Paul IAP	133rd Airlift Wing		X	Airport				
MO	Cannon Range at Ft. Leonard Wood	131st Bomb Wing Support Ops							Unsure if ANG has tenant status
MO	Jefferson Barracks ANGS	157 AOG, 121 ACS, 218 EIS					Yes		Early historic buildings, NR district.
MO	Whiteman AFB	131st Bomb Wing	X		AFB	SAC			Formerly Sedalia AFB
MO	Rosecrans Memorial Airport / Rosecrans ANGB	139th Airlift Wing		X	Airport				
MO	Lambert-St. Louis IAP	131st Fighter Wing, 110 FS, 231 CEF, 239 CBCS, 571 BAND, 110 WF		X	Airport				
MS	Camp Shelby Joint Forces Training Center	Training for 172nd Airlift Wing			x?		Yes		Unsure if ANG has tenant status.
MS	Gulport-Biloxi IAP	ANG Gulfport Combat Readiness Training Center			Airport	Army Air Force, Air Force	In progress		1942 AAF training airfield, AFB, 1949 closed & transferred to city, since 1953 high-tech CRTC and joint-use wit city civilian airport. 1949 closed & transferred to City of Gulfport. beginning in the early 1950s.
MS	HQ MISSISSIPPI						In progress		
MS	Jackson IAP / Allen C. Thompson Field ANGB	172nd Airlift Wing		X	Airport		In progress		
MS	Key Field	186th Air Refueling Wing		X		SAC	Yes		Lost SAC in May 1992-Refueling
MT	Great Falls IAP	120th Fighter Wing		X	Airport		Yes		Former alert mission. 1968 four alert shelters, 1-story crew readiness building – altered.
NC	Badin ANGS	118th Air Support Squadron, 263rd Combat Communications Squadron					In progress		
NC	Charlotte Douglas IAP	145th Airlift Wing		X	Airport		In progress		

State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
NC	Stanly County Airport				Airport		In progress		
ND	Hector IAP (Fargo)	119th Wing		X	Airport		Yes		Former alert mission.
ND	Minot AFB	219th Security Forces Squadron	X		AFB	SAC			Lost SAC in May 1992-Bomber, Refueling, Minuteman III, Peacekeeper
NE	Lincoln Municipal Airport	155th Air Refueling Wing		X	Airport	SAC			Former alert mission. Former AFB.
NE	Offutt AFB	170 GP, 170 OSS, 238 CTS	X		AFB	SAC			
NH	Pease International Tradeport / Pease ANGB	157th Air Refueling Wing		X	?	SAC	Yes		Lost SAC in Sep 1990-Strike and Bomber, Refueling
NJ	Atlantic City IAP	177th Fighter Wing		X	Airport		Yes		
NJ	Warren Grove Range	ANG Training					Yes		
NJ	McGuire AFB	108th Air Refueling Wing	X	X	AFB	SAC			Lost SAC in May 1992-Refueling
NM	Kirtland AFB	150th Fighter Wing	X	X	AFB	SAC			Former alert mission.
NV	Reno Tahoe IAP	152nd Airlift Wing		X	Airport		Yes		
NV	Creech AFB	Not sure what ANG unit is here	X		AFB				
NY	FORT DRUM								
NY	Griffiss IAP	Eastern Air Defense Sector			Airport	SAC			Formerly Griffiss AFB (fighter interceptors, electronic research, installation, and support activities, aerial refueling, and bombers), NEADS
NY	Syracuse Hancock IAP / Hancock Field ANG	174th Fighter wing		X			In Progress		
NY	Niagara Falls IAP Niagara Falls ARB	107th Airlift Wing		X	Airport				Unsure if ANG has tenant status
NY	Schenectady County Airport	109th Airlift Wing		X	Airport		Yes		
NY	Stewart IAP	105th Airlift Wing		X	Airport	Stewart AFB	Yes		Stewart AFB until 1969, NYANG acquired in 1970.
NY	West Hampton Beach, Francis S. Gabreski Airport	106th Rescue Wing		X	Airport				
OH	Rickenbacker ANGS, Columbus IAP	121st Air Refueling Wing		X	Airport	Lockbourne AFB/ SAC	Yes		Activated in 1942, originally Lockbourne AFB, renames Rickenbacker in 1974, Base transferred from SAC to ANG April 1 1980. Lost SAC in May 1992. 1954 two double-cantilevered medium bomber hangars.
OH	Zanesville	220th Engineering Installation Squadron					Yes		
OH	Mansfield Lahm Regional Airport	179th Airlift Wing		X	Airport		Yes		
OH	Blue Ash Airport	123rd Air Control Squadron							

State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
OH	Springfield Beckley Municipal Airport	178th Fighter Wing		X	Airport		Yes		
OH	Ft. Clinton, Camp Perry NG training Facility	200th Red Horse Civil Engineering Squadron			ARNG	Possible SAC	Yes		Unsure if ANG has tenant status
OH	Toledo Express Airport	180th Fighter Wing		X	Airport				
OK	Tulsa IAP	138th Fighter Wing		X	Airport		Yes		
OK	Will Rogers World Airport / Will Rogers ANGB	137th Air Refueling Wing			Airport		Yes		Hangar associated with Talking Bird aircraft, NRHP eligible under criterion A.
OR	Klamath Falls IAP (Kingsley Field)	173rd Fighter Wing		X		Former Navy	Yes		1956 Strobel & Salzman 4-pocket alert hangar
OR	Camp Rilea	116th Air Control Squadron							NG training site.
OR	Portland IAP	142nd Fighter Wing		X	Airport		Yes		Former alert mission.
PA	John Murth Johnstown-Cambria County Airport	258th Air Traffic Control Squadron			Airport				
PA	Pittsburgh IAP	171st Air Refueling Wing		X	Airport	SAC			Lost SAC in May 1992-Refueling; former alert mission.
PA	Ft. Indiantown Gap	193rd Special Operations Wing				ARNG	Yes		EC-130J Commando Solo, psyops missions.
PA	State College ANGS	112th Air Operations Squadron							
PA	Harrisburg IAP	193 SOW, 193 SOS, 193 RSG, 271 CBCS, 553 BAND		X	Airport				
PA	Willow Grove ARB	111th Fighter Wing	X	X*					
PR	Punta Borinquen Radar Site	141st Air Control Squadron				USAF (all buildings gone)	Yes		
PR	Luis Munoz Marin IAP / Munoz ANGB	156th Airlift Wing		X	Airport		Yes		Former alert mission. 1981 nationalist terrorist attack, largest against USAF.
PR	Punta Salinas Radar Site	140th Air Defense Squadron				Former WWI Army costal defenses	Yes		Former alert mission, former WWII Army coastal defenses, test site for Patrick AFB missiles.
RI	Coventry	102 IWS				Former Nike Missile	ICRMP		Providence Nike Site PR-69C, Used approximately 1958-1963. 1975 designated Coventry ANG station.
RI	North Smithfield ANGS	281st Combat Communication Group				US Army / Nike	ICRMP/ CRS In progress		From the 1950s to 1972, the U.S. Army maintained a Nike missile radar control facility on the property. Providence Nike Site PR-58C, Providence Nike Site PR-99C (This had a radar, but was Coventry the Nike Missile Site it was close to North Smithfield), Providence Nike site PR-58C, active from 1956 to 1963. Providence Nike Site PR-99 operational from 1956 to 1971-Jul 1971 designated North Smithfield ANG

State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
RI	Quonset State Airport / Quonset ANGB	143rd Airlift Wing		X	Airport	Navy	Yes		
SC	McEntire Joint National Guard Base	169th Fighter Wing		X			Yes		Former alert mission.
SD	Joe Foss Field	114th Fighter Wing		X	Airport		Yes		Municipal civil airport, became AAF with WWII triangular airfield, also known as Joe Foss Field, honoring Brig. Gen. Joseph J. Foss, a former WWII ace pilot, Governor, and founder of the South Dakota Air National Guard (SDANG). ANG at south end of field.
TN	Nashville IAP	118th Airlift Wing		X	Airport		Yes	4	Airlift mission.
TN	Lovell Field								
TN	McGhee Tyson Airport / McGhee Tyson ANGB	134th Air Refueling Wing		X	Airport	SAC-refueling, fighters	Yes		Former AFB to protect Oak Ridge until 1956, ANG arrived 1957, lost SAC in May 1992-Refueling; ANG fighters to Berlin Crisis; Home of ANG Officers Prepatory Academy (later renamed Academy of Military Science) at ANG Professional Military Education Center at McGhee Tyson ANGB. Academy serves as a commissioning source for ANG Officers, former alert mission. 1952 Strobel & Salzman 8-pocket alert hangar
TN	Memphis IAP	164th Airlift Wing		X	Airport		No need	N/A	All new buildings
TN	Chattanooga Lovell Field ANG Comm Site	241 EIS			Airport				
TX	Camp Mabry	209 WF			ARNG				State Military Reserve
TX	Ft. Bliss, Biggs Aux Airfield	206th Security Forces Squadron	X		Army	SAC			Biggs AFB was SAC
TX	Fort Worth. NAS Joint Reserve Base at Carswell Field	136th Airlift Wing	X	X	Joint Base-Navy	SAC-bomber	Yes		Lost SAC in May 1992-Bomber
TX	Garland ANGS	254th Combat Communications Group							
TX	Ellington Field	147th Reconnaissance Wing		X	Airport		Yes		Former alert mission
TX	La Porte ANGS	272 EIS							
TX	Kelly Field Annex (to Lackland AFB)	149th Fighter Wing	X	X	AFB				Former alert mission.
UT	Ogden, Hill AFB (Francis Peak)	299th Range Control Squadron	X			Radar Site	In Progress		Hill AFB was SAC
UT	Salt Lake City IAP	152nd Air Refueling Wing		X	Airport	SAC-refueling	In Progress		Lost SAC in May 1992-Refueling
VA	Langley AFB	192nd Fighter Wing	X	X	AFB				
VA	Camp Pendleton	203rd Red Horse Squadron Civil Engineering	X		Marines				
VI	St Croix ANGS	285th Combat Communications Squadron					Yes	4	
VT	Burlington IAP	158th Fighter Wing		X	Airport	AFB	Yes		Former Ethan Allen AFB. Former alert mission.

State	Installation Name	ANG Unit	Tenant	Flying Unit	Airport or Military Base	Prior Military Installation	CRS/ICRMP?	Cold War Resource Rating	Notes
WA	Camp Murray	194th Regional Support Wing			ARNG	ARNG TAG house	Yes	1	
WA	Joint Base Lewis-McChord AFB	62nd Airlift Wing; Western Air Defense Sector	X	X	Joint Base-Army/AF	SAC	Yes		
WA	Paine Field	215th Engineering Installation Squadron					Yes		
WA	Seattle ANGB Boeing Field	143rd Combat Communications Squadron					Yes		
WA	Fairchild AFB	141st Air Refueling Wing	X	X	AFB	ACC/SAC	Yes		Lost SAC in May 1992-Bomber, Refueling
WA	Four Lakes Communication Station	256th Combat Communications Squadron				Former Nike Missile site	Yes		Battery B, also known as Nike Site F-37, south of Fairchild AFB and NE of Cheney Washington. Active as a Nike Ajax missile installation from 1957-1961.
WA	Spokane IAP / Gieger Field	242nd Combat Communications Squadron			Airport	WWII, AAF?	Yes		Established as WWII Training facility in 1941, in 1950s housed TAC units and Fairchild Nike Missile batteries (including four lakes) were staffed by a unit at Geiger Field. Former alert mission.
WI	General Mitchell IAP	128th Air Refueling Wing		X	Airport	SAC	Yes		Lost SAC in May 1992-Refueling, former alert mission.
WI	Dane County Regional Airport (Traux Field Madison)	115th Fighter Wing		X	Airport	AAF	Yes		Activated in 1942 as AAF base, taken over by WIANG April 1968.
WI	Hardwood Range	ANG Training					Yes		Former alert mission
WI	Volk Field ANGB	Volk Field, Combat Readiness Training Center	X		ARNG	ARNG	Yes		WPA troop housing.
WV	Yeager Airport	130th Airlift Wing		X	Airport		Yes		Hangar, 1948 Mills & Petticord design.
WV	East West Virginia Regional Airport / Shepherd Field	167th Airlift Wing		X	Airport		Yes		
WY	Cheyenne Municipal Airport	153rd Airlift Wing		X	Airport	SAC	Yes		1933 hangar from commercial airport, altered.
WY	F.E. Warren AFB	153 CACS	X		AFB				

Appendix C: Chapter 6 Definitive Drawings

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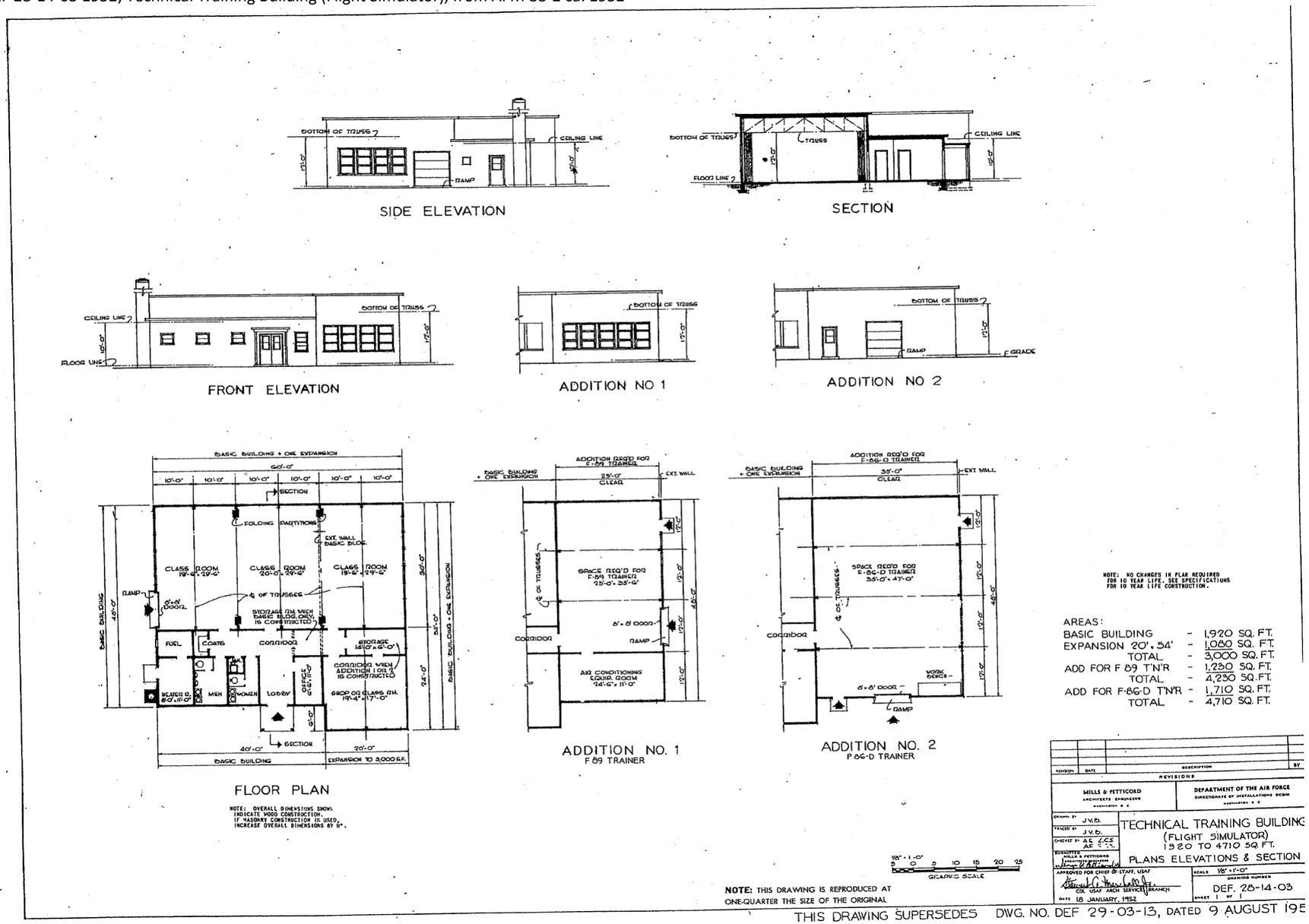
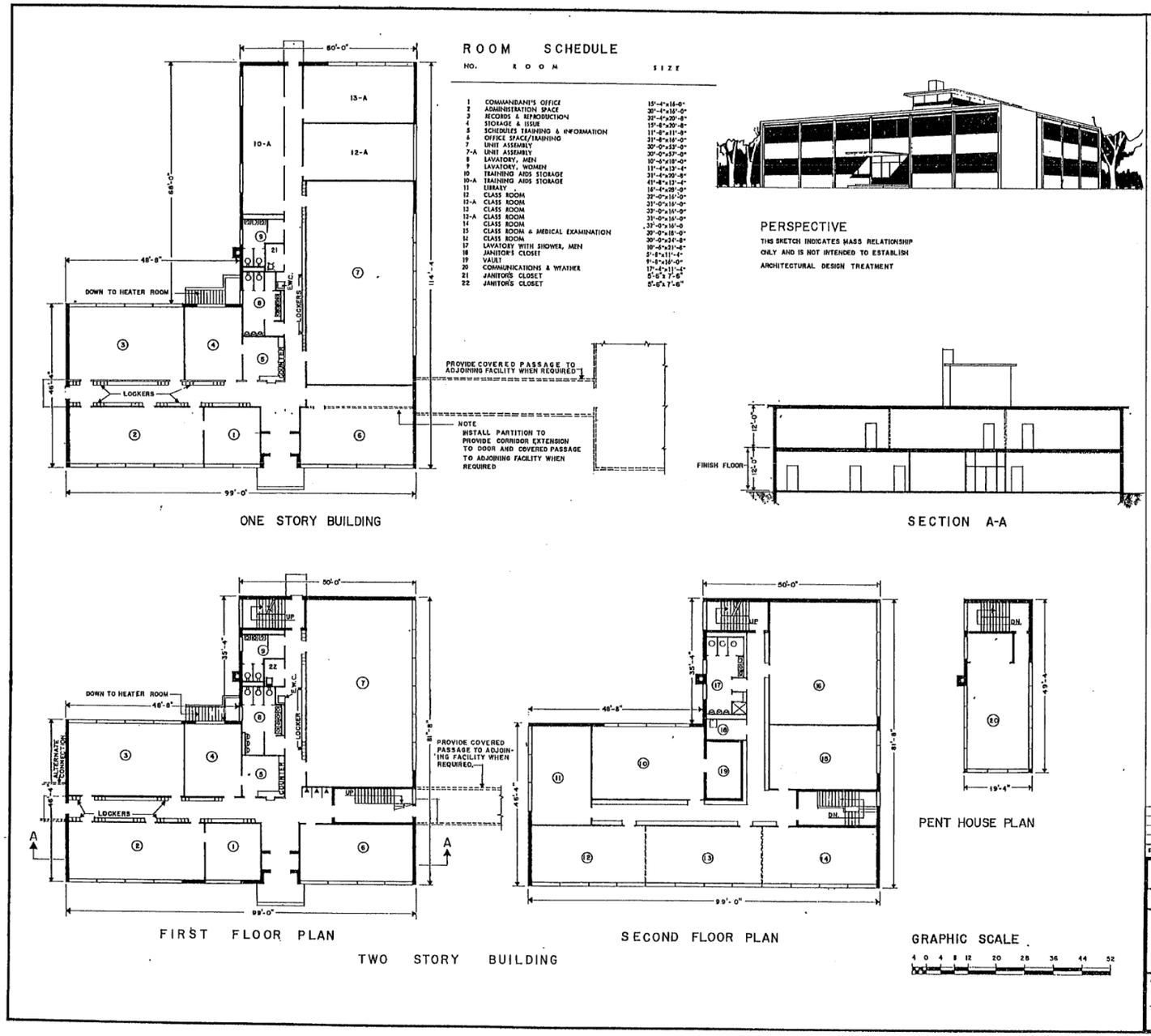
DEF 28-14-03 1952; Technical Training Building (Flight Simulator), from AFM 88-2 ca. 1952



AD 29-06-64 1956; Air Reserve Center Technical Training Bldg. Non-Flying, from AFM 88-2 1959



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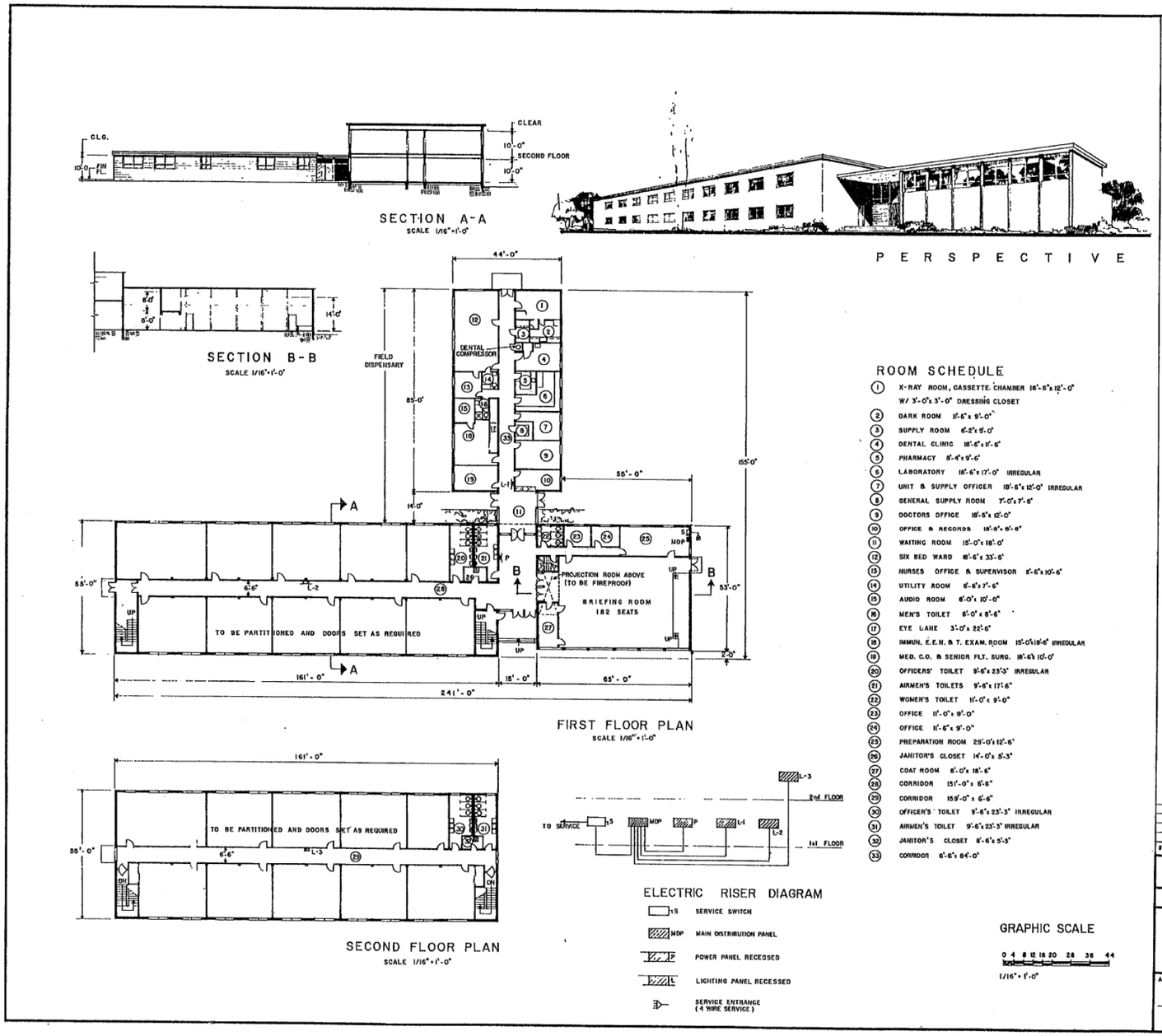
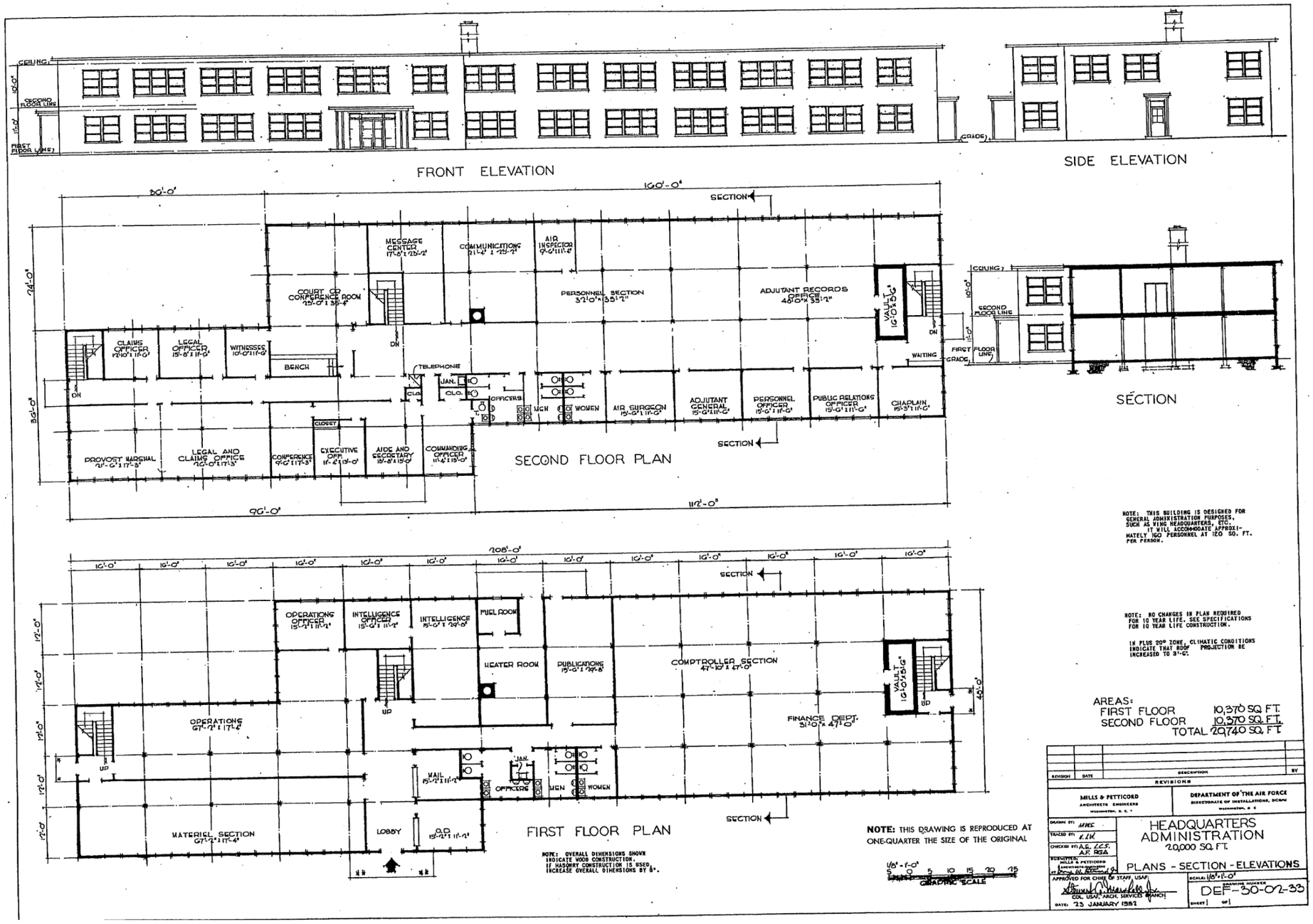
AD 30-01-54 1957; Air Reserve Forces Wing Administration Building (with Field Dispensary) from AFM 88-2 1959



DEF 30-02-33 1952; Headquarters Administration, from AFM 88-2 ca. 1952



AD 30-02-63 1961; Headquarters Buildings, Basic Plan Units & Analysis, from AFM 88-2 1969

AREA OCCUPANCY ANALYSIS

UNIT	FLOOR	GROSS AREA	WALLS & PARTITIONS	UNIT FUNCTIONS					NET FLOOR AREA	COURT FACILITY	OCCUPANCY	
				LOBBY	CORRIDORS	STAIRS	TOILETS	HEATER & UTILITY			115 SF/PERSON	80 SF/PERSON
A - 1	BASEMENT	1840	140	110	210	120	180 *	400	680		6	9
A - 2	FIRST	1840	125	405	120	120	220 *	NONE	850		7	11
A - 3	SECOND	1840	115	110	210	120	185 *		1160		10	14
B - 1	BASEMENT	1840	135	155	255	120	275 *	190	710		6	9
B - 2	FIRST	1840	135	630	220	140	385 *		330		3	4
B - 3	SECOND	1840	110	200	120	280	270		1020		9	13
C - 1	BASEMENT	1840	165	NONE	205	130	NONE	NONE	1340		12	17
C - 2	FIRST	1840	130		185	175			1350		12	17
C - 3	SECOND	1840	130		185	175			1350		12	17
D - 1	BASEMENT	1840	110	NONE	240	NONE	NONE	NONE	1490		13	19
D - 2	FIRST	1840	80		240				1520		13	19
D - 3	SECOND	1840	80		240				1520		13	19
E - 1	BASEMENT	1840	115	75	NONE	NONE	NONE	NONE	1688		14	20
E - 2	FIRST	1840	85	75					1650		14	20
E - 3	SECOND	1840	85	75					1650		14	20
F - 1	BASEMENT	2040	130	NONE	240	NONE	NONE	NONE	1670		15	21
F - 2	FIRST	2040	100	350	140				1450		13	18
F - 3	SECOND	2240	100	NONE	390				300	1480	3	4
G - 1	BASEMENT	2240	140	NONE	340	NONE	NONE	670	1190		10	15
G - 2	FIRST	2240	110	NONE	510	NONE	NONE	NONE	130	1490	1	2
H - 1	BASEMENT	2240	180	NONE	235	145	NONE	NONE	1680		15	21
H - 2	FIRST	2240	140	NONE	200	170	NONE	NONE	1730		15	22
H - 3	SECOND	2240		NONE	NONE	260	NONE	NONE		1980		

REMARKS

WHEN PLAN UNITS A-2, B-2, C-2 AND G-2 ARE USED IN SINGLE STORY BUILDINGS, THE AREA NORMALLY USED FOR STAIRS MAY BE USED FOR OFFICE SPACE.

PLAN UNITS A-1, A-2, B-1, B-2, F-2, AND H-1, THE OCCUPANCY OF THESE UNITS VARY DEPENDING ON THE SIZE OF LOBBY AND/OR UTILITY & HEATER ROOM.

* THIS AREA INCLUDES PARTITIONS AND JANITORS CLOSET.

ALL PUBLIC CORRIDORS ARE 6'-0" WIDE AND ALL STAIR PASSAGES ARE 4'-0" WIDE.

COURT FACILITY OCCUPANCY — 70.

ALL FIGURES ARE IN SQUARE FEET.

BASIC PLAN UNITS

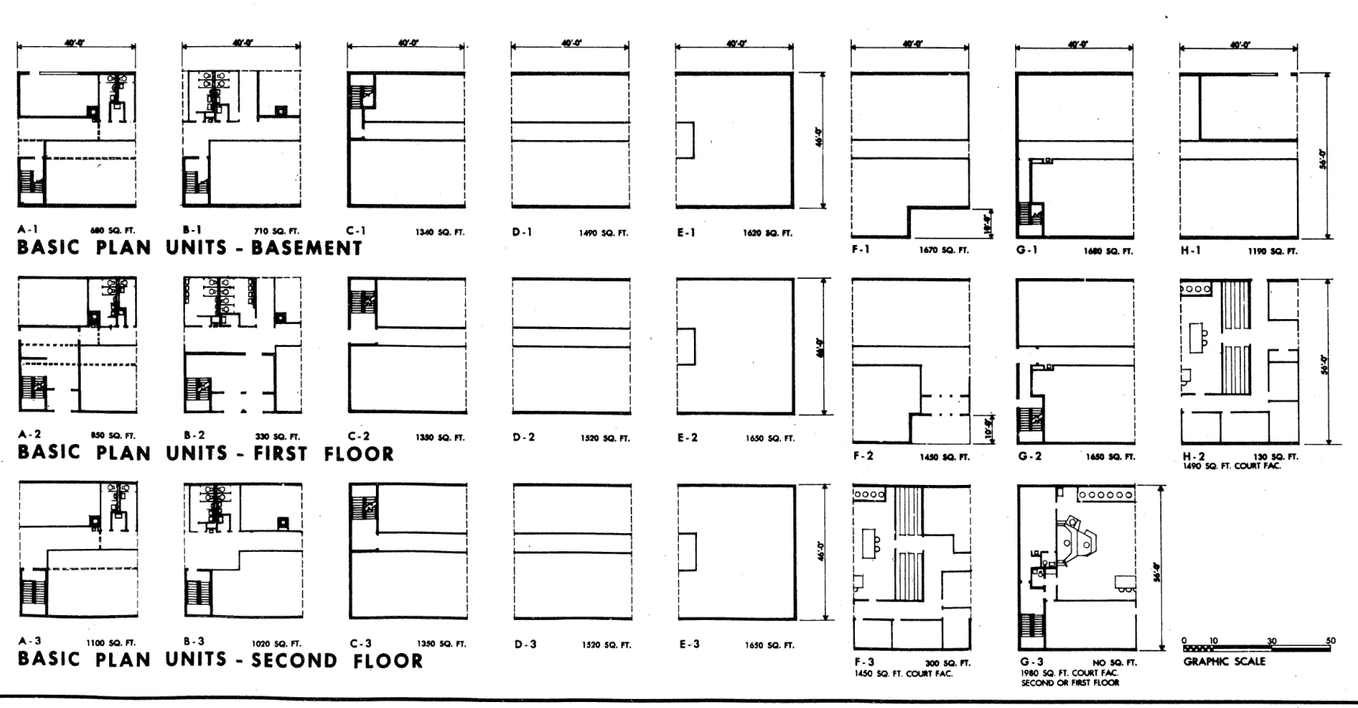
THE HEADQUARTERS BUILDINGS ARE MADE UP OF BASIC PLAN UNITS. THESE PLAN UNITS ARE FIXED AREA INCREMENTS AND EACH UNIT HAS A BASIC FUNCTION IN THE DESIGN OF AN ADMINISTRATIVE TYPE OF FACILITY AS FOLLOWS:

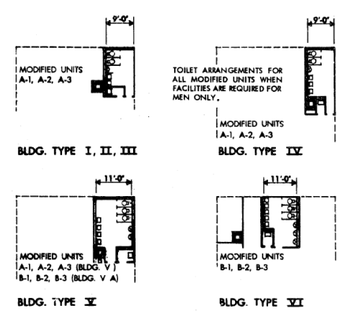
A-2 AND B-2 ARE LOBBY, CORRIDOR, TOILET ROOM AND OFFICE AREA UNITS. A-1, A-3, B-1 AND B-3 ARE BASEMENT AND SECOND FLOOR COUNTER PARTS OF FIRST FLOOR UNITS WITH TOILET ROOMS AND UTILITY CORES.

C-2 AND G-2 ARE OFFICE AREA, CORRIDOR AND STAIR UNITS. D-2 AND E-2 ARE OFFICE AREA AND CORRIDOR UNITS. F-2 IS A LOBBY, CORRIDOR AND OFFICE AREA UNIT. C-1, C-3, D-1, D-3, E-1, E-3 AND F-1 ARE BASEMENT AND SECOND FLOOR COUNTER PARTS OF FIRST FLOOR UNITS.

F-3, G-3, AND H-2 ARE COURT FACILITY UNITS.

THESE BASIC PLAN UNITS ALLOW COMPLETE FLEXIBILITY AND UNLIMITED VARIATION IN PLAN ARRANGEMENT. ALTHOUGH ONE AND TWO STORY BUILDINGS WITH BASEMENTS ARE SHOWN, MULTI-STORY SCHEMES CAN BE DEVELOPED. NO ATTEMPT HAS BEEN MADE TO SHOW OFFICE PARTITIONS SINCE THEIR LOCATION WILL BE DETERMINED BY THE USING AGENCY. THE OCCUPANCY VARIATION OF PLAN UNITS NOTED UNDER REMARKS HAS BEEN TAKEN INTO ACCOUNT IN TABULATING THE OCCUPANCY FOR HEADQUARTER BUILDINGS ON SHEET 2 OF 6, PLAN VARIATIONS ON THIS SHEET SHOW INTERMEDIATE AREAS THAT CAN BE DEVELOPED BY MODIFICATION OF THE STANDARD HEADQUARTERS BUILDINGS USING THE BASIC OR MODIFIED PLAN UNITS.
TOILET AREAS ARE TO BE ARRANGED TO ACCOMODATE THE NUMBER OF PLUMBING FIXTURES REQUIRED TO SUIT THE OCCUPANCY OF THE PROPOSED FACILITY.





UNITS A-1 TO E-3 = 40'-0" X 46'-0" = 1840 SQ. FT.
F-1 TO H-2 = 40'-0" X 56'-0" = 2240 SQ. FT.
NET OFFICE FLOOR AREA IS SHOWN.

SYMBOL	REVISION-DESCRIPTION	DATE	APPROVED

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
McGAUGHAN AND JOHNSON
ARCHITECTS—ENGINEERS WASHINGTON, D. C.

HEADQUARTERS BUILDINGS

BASIC PLAN UNITS & ANALYSIS

APPROVED: APO84
FOR CHIEF OF STAFF USAF

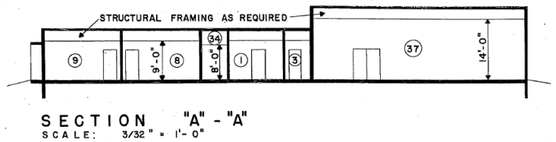
AD 30-02-63

SCALE 1/16" - 1'-0"
DATE 20 MARCH 1961
SHEET 3 OF 6

AD 30-10-25 1974; Air Reserve Forces Squadron Operations Combines Facility for Tactical Airlift Squadron C-130 Aircraft, from AFM 88-2 1975

120/208V-3Ø S/N SERVICE

ELECTRICAL RISER DIAGRAM
NO SCALE



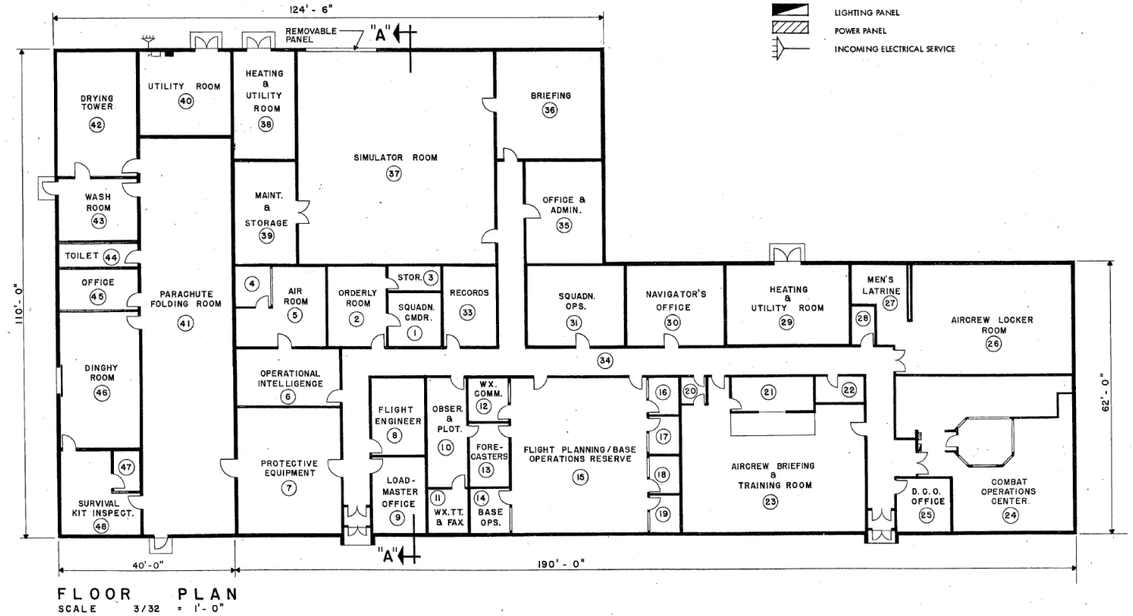
SECTION "A" - "A"
SCALE: 3/32" = 1'-0"

ROOM SCHEDULE

RM. NO.	DESCRIPTION	DIMENSIONS	AREA, SQ. FT.
1	COMMANDER'S OFFICE	12'- 6" x 12'- 6"	156
2	ORDERLY ROOM	12'- 6" x 19'-10"	248
3	STORAGE ROOM	12'- 6" x 7'- 4"	92
4	INTELLIGENCE OFFICER	8'- 0" x 10'- 0"	80
5	AIR ROOM		330
6	OPERATIONAL INTELLIGENCE	23'-10" x 13'- 2"	344
7	PROTECTIVE EQUIPMENT	23'-10" x 29'- 0"	749
8	FLIGHT ENGINEER'S OFFICE	12'- 4" x 17'- 6"	216
9	LOADMASTER'S OFFICE	12'- 4" x 18'- 4"	226
10	OBSERVERS & PLOTTERS	9'- 4" x 24'-10"	232
11	WEATHER, TELETYPE & THERMOFAX EQUIP.	9'- 4" x 11'- 0"	103
12	WEATHER COMMUNICATIONS	9'- 4" x 10'-10"	101
13	FORECASTERS	9'- 4" x 14'- 0"	131
14	BASE OPERATIONS	9'- 4" x 11'- 0"	103
15	FLIGHT PLANNING/BASE OPERATIONS RESERVE	30'-10" x 35'-10"	1,104
16	FLIGHT LEADER OFFICE	7'- 6" x 8'-10"	66
17	FLIGHT LEADER OFFICE	7'- 6" x 8'-10"	66
18	FLIGHT LEADER OFFICE	7'- 6" x 8'-10"	66
19	FLIGHT LEADER OFFICE	7'- 6" x 9'- 2"	69
20	COFFEE UNIT	5'- 0" x 6'- 0"	30
21	REAR PROJECTION ROOM	20'- 0" x 8'- 0"	170
22	JANITOR'S CLOSET	11'- 6" x 6'- 0"	69
23	AIRCREW BRIEFING/TRAINING ROOM		1,229
24	COMBAT OPERATIONS CENTER		1,297
25	D.C.O. OFFICE	12'- 6" x 12'-10"	160
26	AIRCREW LOCKER ROOM		1,026
27	MEN'S LATRINE		167
28	LADIES TOILET	5'- 8" x 9'- 0"	51
29	HEATING & UTILITY ROOM	29'- 8" x 19'-10"	569
30	NAVIGATOR'S OFFICE	23'- 0" x 19'-10"	457
31	SQUADRON OPERATIONS ADMINISTRATION OFFICE	22'- 2" x 19'-10"	440
32			
33	RECORDS ROOM	12'- 8" x 19'-10"	251
34	CORRIDOR	6'- 4" WIDE	1,512
35	OFFICE & ADMINISTRATION	18'- 6" x 23'- 6"	430
36	BRIEFING	24'-10" x 24'- 6"	608
37	SIMULATOR ROOM	65'- 0" x 48'- 0"	2,160
38	HEATING & UTILITY ROOM	14'- 8" x 24'- 6"	359
39	MAINTENANCE & STORAGE	14'- 8" x 23'- 6"	345
40	UTILITY ROOM	22'- 0" x 15'- 0"	341
41	PARACHUTE FOLDING ROOM	22'- 0" x 94'- 6"	2,079
42	DRYING TOWER	18'- 0" x 29'- 0"	522
43	WASH ROOM	18'- 0" x 14'- 4"	258
44	TOILET	18'- 0" x 5'- 8"	102
45	OFFICE	18'- 0" x 10'- 0"	180
46	DINGHY ROOM	18'- 0" x 34'- 0"	612
47	SURVIVAL KIT STORAGE	6'- 6" x 9'- 6"	62
48	SURVIVAL KIT INSPECTION & REPAIR	14'- 6" x 17'- 0"	244
	TOTAL		20,236

ELECTRICAL LEGEND

- SERVICE SWITCH
- MAIN DISTRIBUTION PANEL
- LIGHTING PANEL
- POWER PANEL
- INCOMING ELECTRICAL SERVICE



FLOOR PLAN
SCALE 3/32 = 1'-0"

NOTE
FOR SEPARATE COMPONENT DEFINITIVE DETAILS REFER TO THE FOLLOWING DRAWINGS;

1.	SQUADRON OPERATIONS	AD 30-10-24
2.	FLIGHT SIMULATOR FACILITY	AD 28-13-113
3.	PARACHUTE & DINGHY SHOP	AD 36-33-12

3/32" = 1'-0" 10' 0 10' 20'
GRAPHIC SCALE

STRUCTURAL

LIVE LOADS WILL BE IN ACCORDANCE WITH AFM 88-3, CHAPTER 1, "LOAD ASSUMPTIONS FOR BUILDINGS".

ELECTRICAL

LIGHTING LEVELS SHALL BE IN ACCORDANCE WITH AFM 88-15 FOR EACH AREA SERVED. CONVENIENCE OUTLETS FOR CONVENTIONAL USE IN OFFICE OR SIMILAR AREAS TO BE IN ACCORDANCE WITH N.E.C.

CONVENIENCE OUTLETS IN OTHER AREAS TO BE LOCATED BY USING AGENCY. ELECTRICAL PANELS WILL BE LOCATED AS INDICATED. OUTLETS FOR EQUIPMENT WILL BE LOCATED BY THE DESIGN AGENCY IN ACCORDANCE WITH THE EQUIPMENT POSITIONS. PROVIDE DISCONNECT DEVICES IN ACCORDANCE WITH THE N.E.C. SECTION 422-20 THRU 430-113.

PROVIDE EMERGENCY LIGHTING SYSTEM IN ACCORDANCE WITH AFM 88-15 AND N.F.P.A. BUILDING EXITS CODE NO. 101.

PROVIDE FIRE ALARM SYSTEM IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

PROVIDE PUBLIC ADDRESS SYSTEM AS REQUIRED BY USING AGENCY.

PROVIDE POWER OUTLETS AS REQUIRED FOR ALL PORTABLE EQUIPMENT.

PROVIDE STANDBY ELECTRICAL POWER IN ACCORDANCE WITH AFR 91-4 AS REQUIRED.

MECHANICAL

HEATING, AIR CONDITIONING, EVAPORATIVE COOLING AND MECHANICAL VENTILATION SHALL BE IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

WHEN A COMPLETE MECHANICAL EQUIPMENT ROOM IS NOT REQUIRED, THE SURPLUS SPACE MAY BE ASSORBED BY OTHER FUNCTIONS OF THE FACILITY.

PLUMBING

PLUMBING WILL BE IN ACCORDANCE WITH AFM 88-8, CHAPTER 4 AND AFM 88-15.

PROGRAMMING AND PLANNING GUIDES

SPECIFICATIONS

FOR ACCEPTABLE CONSTRUCTION MATERIALS AND DESIGN CRITERIA SEE CURRENT AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

GENERAL NOTE

THE REQUIREMENTS GIVEN BELOW ARE FOR ESTIMATING PURPOSES AND APPLY TO THIS SIZE FACILITY ONLY.

UTILITY REQUIREMENTS

ELECTRICITY	(KW)	REFRIG.	LIGHTING	POWER	TOTAL
CONNECTED LOAD		65.0	81.0	61.0	207.0
ESTIMATED DEMAND		65.0	78.0	55.0	198.0
WATER	(GPM)				
HOT	6				
COLD	61				
TOTAL	64				
TOTAL	(GPD) 9,750				
SEWAGE	(GPD) 6,500				

HEATING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE 0° F
M/BTU/HR = 809.0

AIR CONDITIONING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE 95° F.D.B. & 78° F.W.B.
TONS OF REFRIGERATION 65

AREA FOR PROGRAMMING GROSS AREA

20,236 SQ. FT.

DESIGN GUIDES

ARCHITECTURAL

THE SECTION INDICATED IN THIS DEFINITIVE DRAWING IS NOT INTENDED TO ESTABLISH AN ARCHITECTURAL DESIGN TREATMENT NOR USE OF SPECIFIC MATERIALS. CAREFUL USE OF MATERIALS AND COLOR CAN ENHANCE THE APPEARANCE OF THIS FACILITY WITHOUT INVOLVING ADDITIONAL COST. IT IS NOT INTENDED THAT EXTREME DESIGN OR UNTRIED MATERIALS BE INCORPORATED. MATERIALS USED WILL BE IN ACCORDANCE WITH APPLICABLE CRITERIA FOR THIS FACILITY.

CONSIDERATION SHALL BE GIVEN TO FENESTRATION BASED ON GEOGRAPHIC LOCATION AND ORIENTATION OF THE FACILITY.

PRE-ENGINEERED STRUCTURES MAY BE USED AS PROVIDED IN STANDARD OUTLINE SPECIFICATIONS FOR AIR FORCE FACILITIES, AFM 88-15.

PLAN DIMENSIONS ARE NOMINAL AND MAY BE ADJUSTED TO CONFORM TO THE STOCK DIMENSIONS AND DETAILING OF AVAILABLE PRE-ENGINEERED STRUCTURES, AND TO ACCOMMODATE THE THICKNESS OF MATERIALS SELECTED FOR THE FINAL DESIGN.

FIRE PROTECTION SHALL BE IN ACCORDANCE WITH AFM 88-15.

CATEGORY CODE NO. 141-451, 141-453, 141-753, 171-212, 218-852

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

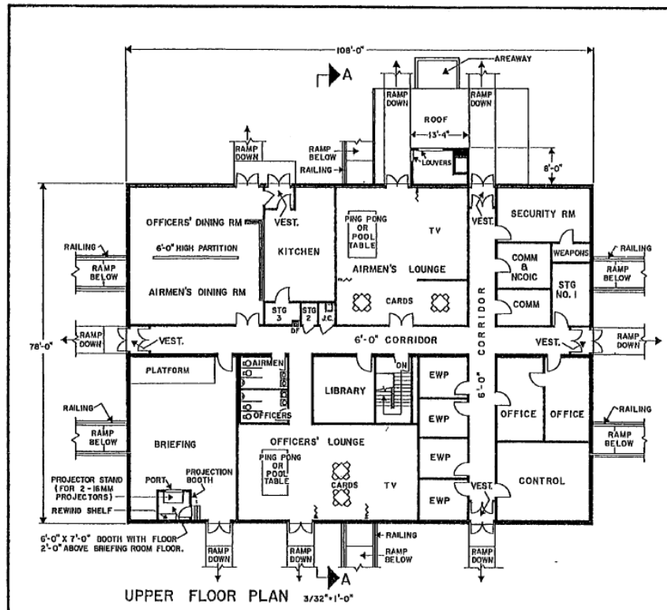
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
SPECTOR, PEAKE AND HOWELL
ARCHITECTS-ENGINEERS • FALLS CHURCH, VIRGINIA

AIR RESERVE FORCES
SQUADRON OPERATIONS
COMBINED FACILITY FOR TACTICAL AIRLIFT SQUADRON C-130 AIRCRAFT
PLAN & SECTION

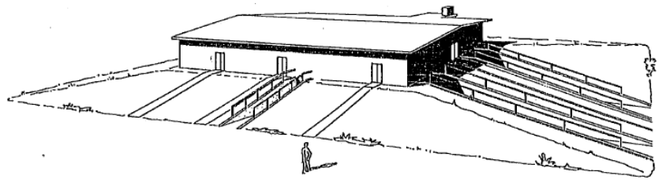
APPROVED
George L. Rutledge Jr.
FOR CHIEF OF STAFF USAF

AD 30-10-25
SCALE: 3/32" = 1'-0"
DATE: 6 Nov. 1974
SHEET 1 OF 1

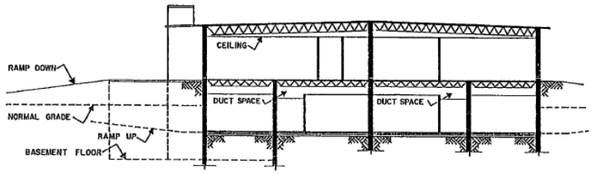
AD 30-11-12 1958; Readiness Crew Building (SAC), from AFM 88-2 1959



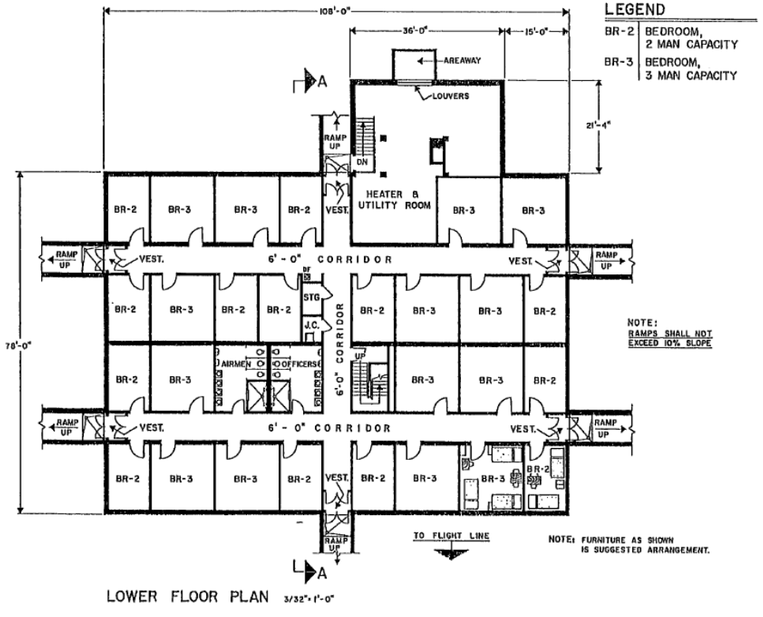
UPPER FLOOR PLAN 3/32"=1'-0"



PERSPECTIVE



SECTION 'A-A' 3/32"=1'-0"



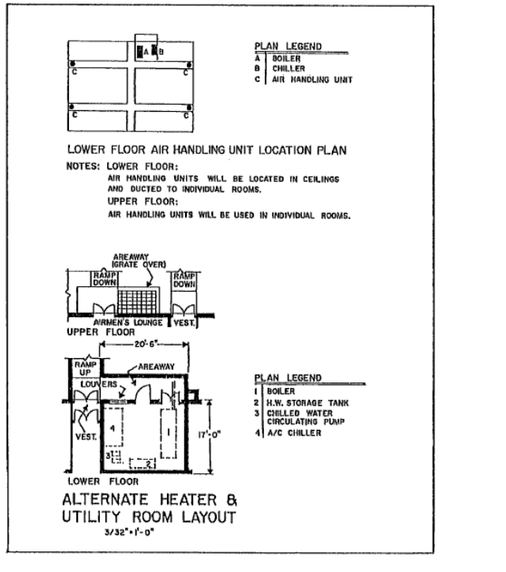
LOWER FLOOR PLAN 3/32"=1'-0"

LEGEND

BR-2	BEDROOM, 2 MAN CAPACITY
BR-3	BEDROOM, 3 MAN CAPACITY

NOTE: RAMPS SHALL NOT EXCEED 10% SLOPE

NOTE: FURNITURE AS SHOWN IS SUGGESTED ARRANGEMENT.



LOWER FLOOR AIR HANDLING UNIT LOCATION PLAN

NOTES: LOWER FLOOR:
AIR HANDLING UNITS WILL BE LOCATED IN CEILINGS AND DUCTED TO INDIVIDUAL ROOMS.
UPPER FLOOR:
AIR HANDLING UNITS WILL BE USED IN INDIVIDUAL ROOMS.

ALTERNATE HEATER & UTILITY ROOM LAYOUT
3/32"=1'-0"

3/32"=1'-0" 5' 0 5' 10' 15' 30' 45'
GRAPHIC SCALE

PROGRAMMING AND MASTER PLANNING GUIDES

THIS DRAWING WILL BE UTILIZED FOR PROGRAMMING AND MASTER PLANNING PURPOSES ONLY. FOR DESIGN AND CONSTRUCTION, USE STANDARD WORKING DRAWINGS NO. AW 30-11-12.

SPECIFICATIONS TYPE "N" CONSTRUCTION (UNPROTECTED NONCOMBUSTIBLE)

FOR ACCEPTABLE MATERIALS SEE AFM 88-15 AND IECM'S. COVERED WALKS (RAMPS) WILL BE PROVIDED FOR ICE AND SNOW PROTECTION AT LOCATIONS APPROVED BY HQ USAF. CONSIDERATIONS SHOULD BE GIVEN TO THE USE OF RADIANT HEAT COILS IN THE RAMP SLABS, IN LIEU OF COVERED WALKS, WHERE ECONOMICALLY FEASIBLE. PROVIDE MANUAL FIRE AND EVACUATION ALARM SYSTEM.

UTILITY REQUIREMENTS

		LIGHTING	POWER	TOTAL
ELECTRICITY *	(KW)			
CONNECTED LOAD		60	25	85
ESTIMATED DEMAND		55	20	75
WATER	(GPM)			
HOT		16		
COLD		72		
TOTAL		88		
WATER	(GPD)			
TOTAL		6000		
SEWAGE	(GPD)			
TOTAL		6000		
GAS *	(THERMS/DAY)			
TOTAL		17.5		
STEAM *	(LBS/HR)			
TOTAL		155		

* (EXCLUDING HEATING)

HEATING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE	0°F
(M BTU/HR)	450

AIR CONDITIONING REQUIREMENTS

(FOR 95°DRY BULB AND 78° WET BULB EXPRESSED IN TONS OF REFRIGERATION)

TOTAL . 20

AREA FOR PROGRAMMING

GROSS AREA* 17,725 SQ FT

*NOTE: GROSS AREA INCLUDES 1,225 SQ FT FOR HEATER & UTILITY ROOM. THIS AREA IS BASED ON A CENTRAL AIR HANDLING SYSTEM IN ACCORDANCE WITH DESIGN PROVIDED BY STANDARD WORKING DRAWINGS AW 30-11-12. DISPERSED AIR HANDLING SYSTEM AS SHOWN ON ALTERNATE HEATER & UTILITY ROOM LAYOUT, SHOULD BE CONSIDERED IF DEEMED ECONOMICALLY FEASIBLE. IF ALTERNATE HEATER & UTILITY ROOM IS USED, GROSS AREA FOR PROGRAMMING WILL BE REDUCED TO 16,850 SQ FT, WHICH INCLUDES 350 SQ FT FOR HEATER & UTILITY ROOM.

THIS DRAWING SUPERSEDES DEFINITIVE DWG NO. S-106, DATED 16 JANUARY 1958.

AIR FORCE CONTROL NO. 141-A59-02

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

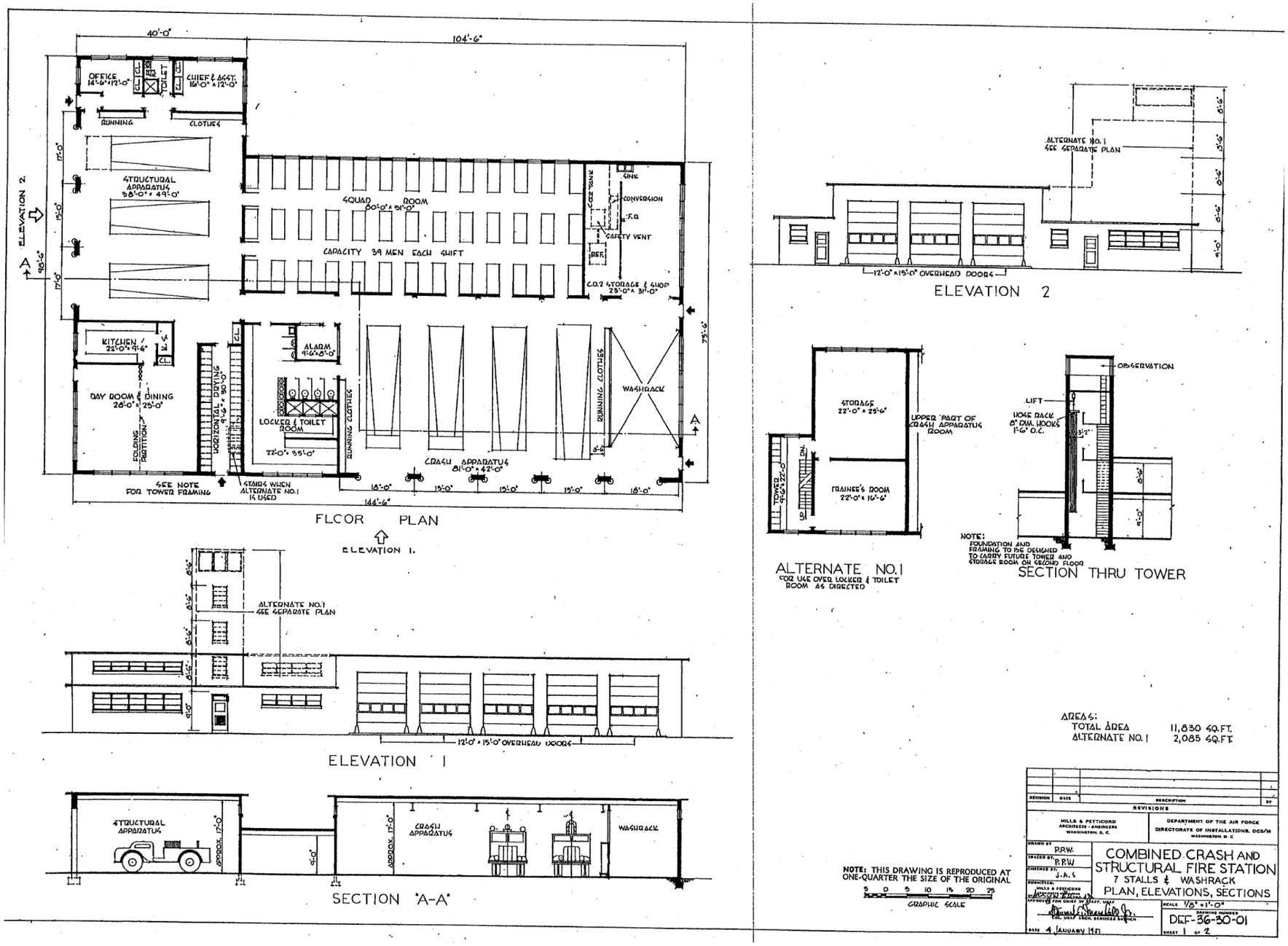
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
DANIEL · MANN · JOHNSON & MENDENHALL
ARCHITECTS - ENGINEERS - LOS ANGELES, CALIFORNIA

READINESS CREW BUILDING
(SAC)
70 MEN

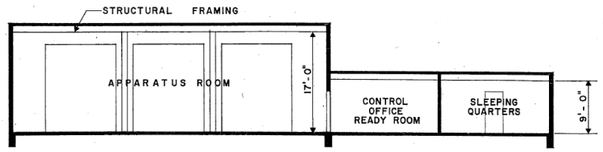
APPROVED
FOR CHIEF OF STAFF USAF
AFOIE

AD 30-11-12
SCALE: 3/32"=1'-0"
DATE: 2 JUNE 1958
SHEET | OF |

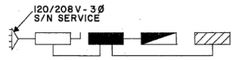
DEF 36-30-01 1951; Combined Crash and Structural Fire Station, from AFM 88-2 ca. 1952



AD 36-30-10 1974; Air Reserve Forces Fire Stations Schemes A & B, from AFM 88-2 1975



SECTION "A" - "A"
SCALE 1/8" = 1'-0"



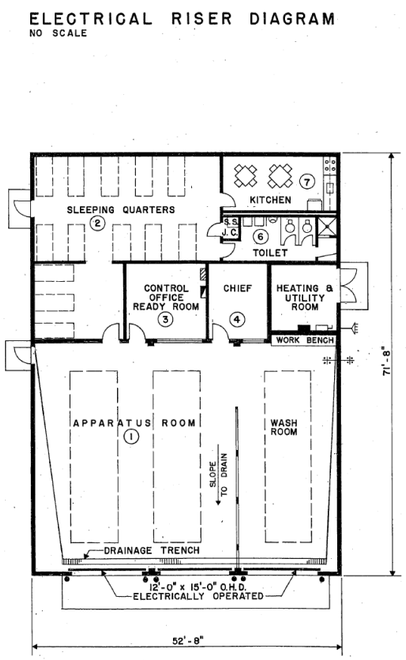
ELECTRICAL RISER DIAGRAM
NO SCALE

ELECTRICAL LEGEND

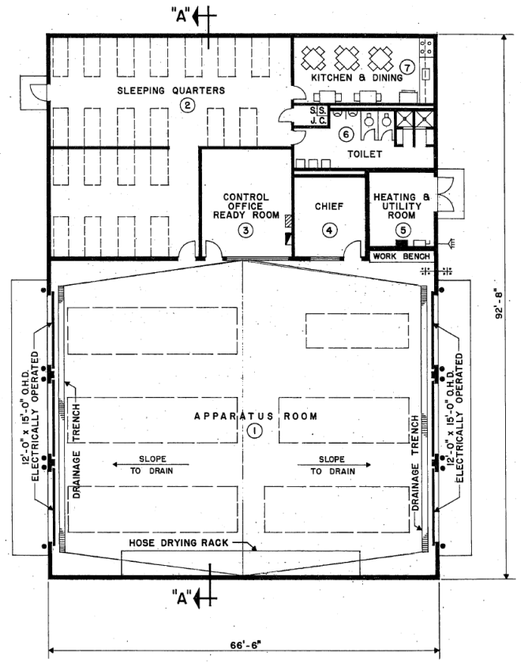
- SERVICE SWITCH
- MAIN DISTRIBUTION PANEL
- LIGHTING PANEL
- POWER PANEL
- INCOMING ELECTRICAL SERVICE

LEGEND

S.S.	SERVICE SINK
J.C.	JANITOR'S CLOSET
●	PIPE BUMPERS
⊣⊢	HOSE BIB



FLOOR PLAN
SCHEME "A"
SCALE 1/8" = 1'-0"



FLOOR PLAN
SCHEME "B"
SCALE 1/8" = 1'-0"

STRUCTURAL

LIVE LOADS WILL BE IN ACCORDANCE WITH AFM 88-3, CHAPTER 1.

ELECTRICAL

LIGHTING LEVELS SHALL BE IN ACCORDANCE WITH AFM 88-15 FOR EACH AREA SERVED. CONVENIENCE OUTLETS FOR CONVENTIONAL USE IN OFFICE OR SIMILAR AREAS TO BE IN ACCORDANCE WITH N.E.C.

CONVENIENCE OUTLETS IN OTHER AREAS TO BE LOCATED BY USING AGENCY. ELECTRICAL PANELS WILL BE LOCATED AS INDICATED. OUTLETS FOR EQUIPMENT WILL BE LOCATED BY THE DESIGN AGENCY IN ACCORDANCE WITH THE EQUIPMENT POSITIONS. PROVIDE DISCONNECT DEVICES IN ACCORDANCE WITH THE N.E.C. SECTION 422-20 THRU 430-113.

PROVIDE EMERGENCY LIGHTING SYSTEM IN ACCORDANCE WITH AFM 88-15 AND N.F.P.A. BUILDING EXITS CODE NO. 101.

PROVIDE FIRE ALARM SYSTEM IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS. PROVIDE MANUAL FIRE ALARM SYSTEM FOR ALL BUILDINGS.

PROVIDE PUBLIC ADDRESS SYSTEM AS REQUIRED BY USING AGENCY.

PROVIDE POWER OUTLETS AS REQUIRED FOR ALL PORTABLE EQUIPMENT.

PROVIDE STANDBY ELECTRICAL POWER IN ACCORDANCE WITH AFR 91-4 AS REQUIRED.

MECHANICAL

HEATING, AIR CONDITIONING, EVAPORATIVE COOLING AND MECHANICAL VENTILATION SHALL BE IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

WHEN A COMPLETE MECHANICAL EQUIPMENT ROOM IS NOT REQUIRED, THE SURPLUS SPACE MAY BE ABSORBED BY OTHER FUNCTIONS OF THE FACILITY.

PLUMBING

PLUMBING WILL BE IN ACCORDANCE WITH AFM 88-8, CHAPTER 4 AND AFM 88-15.

ROOM SCHEDULE SCHEME "A"

ROOM NO.	DIMENSIONS	GROSS AREA, SQ. FT.
1	52'-8" x 39'-8"	2,088
2	32'-0" x 26'-0"	832
3	14'-0" x 13'-6"	190
4	10'-8" x 13'-6"	144
5	12'-0" x 12'-0"	144
6	8'-4" x 20'-0"	166
7	10'-6" x 20'-0"	210
	TOTAL	3,774

ROOM SCHEDULE SCHEME "B"

ROOM NO.	DIMENSIONS	GROSS AREA, SQ. FT.
1	66'-6" x 54'-6"	3,624
2	37'-6" x 35'-0"	1,316
3	16'-0" x 19'-0"	304
4	14'-8" x 12'-6"	183
5	12'-0" x 15'-0"	180
6	10'-8" x 24'-6"	261
7	12'-0" x 24'-6"	295
	TOTAL	6,163

1/8" = 1'-0" 5' 0 5' 10' 15'
GRAPHIC SCALE

PROGRAMMING AND PLANNING GUIDES

SPECIFICATIONS

FOR ACCEPTABLE CONSTRUCTION MATERIALS AND DESIGN CRITERIA SEE CURRENT AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

GENERAL NOTE

THE REQUIREMENTS GIVEN BELOW ARE FOR ESTIMATING PURPOSES AND APPLY TO THIS SIZE FACILITY ONLY.

UTILITY REQUIREMENTS

ELECTRICITY (KW)	SCHEME A LIGHTING	SCHEME A POWER	SCHEME B LIGHTING	SCHEME B POWER
CONNECTED LOAD	7.6	11.6	12.3	17.3
ESTIMATED DEMAND	5.7	9.7	9.2	14.2

WATER	SCHEME A (GPM)	SCHEME B (GPM)
HOT	7	10
COLD	44	48
TOTAL	46	50
TOTAL	(GPD)	(GPD)
	3,000	4,500
SEWAGE	(GPD)	(GPD)
	2,000	3,000

HEATING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE 0° F.

M/BTU/HR	
SCHEME A	270
SCHEME B	391
TOTAL	661

AIR CONDITIONING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE 95° F. DB & 78° F. WB

TONS OF REFRIGERATION

SCHEME A	4
SCHEME B	5

AREA FOR PROGRAMMING GROSS AREA

SCHEME "A" 3,777 SQ. FT.
SCHEME "B" 6,163 SQ. FT.

DESIGN GUIDES

ARCHITECTURAL

THE SECTION INDICATED IN THIS DEFINITIVE DRAWING IS NOT INTENDED TO ESTABLISH AN ARCHITECTURAL DESIGN TREATMENT NOR USE OF SPECIFIC MATERIALS. CAREFUL USE OF MATERIALS AND COLOR CAN ENHANCE THE APPEARANCE OF THIS FACILITY WITHOUT INVOLVING ADDITIONAL COST. IT IS NOT INTENDED THAT EXTREME DESIGN OR UNTRIED MATERIALS BE INCORPORATED. MATERIALS USED WILL BE IN ACCORDANCE WITH APPLICABLE CRITERIA FOR THIS FACILITY.

CONSIDERATION SHALL BE GIVEN TO FENESTRATION BASED ON GEOGRAPHIC LOCATION AND ORIENTATION OF THE FACILITY.

PRE-ENGINEERED STRUCTURES MAY BE USED AS PROVIDED IN STANDARD OUTLINE SPECIFICATIONS FOR AIR FORCE FACILITIES, AFM 88-15.

PLAN DIMENSIONS ARE NOMINAL AND MAY BE ADJUSTED TO CONFORM TO THE STOCK DIMENSIONS AND DETAILING OF AVAILABLE PRE-ENGINEERED STRUCTURES, AND TO ACCOMMODATE THE THICKNESS OF MATERIALS SELECTED FOR THE FINAL DESIGN.

FIRE PROTECTION SHALL BE IN ACCORDANCE WITH AFM 88-15.

CATEGORY CODE NO. 141-142

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
SPECTOR, PEAKE AND HOWELL
ARCHITECTS-ENGINEERS • FALLS CHURCH, VIRGINIA

AIR RESERVE FORCES

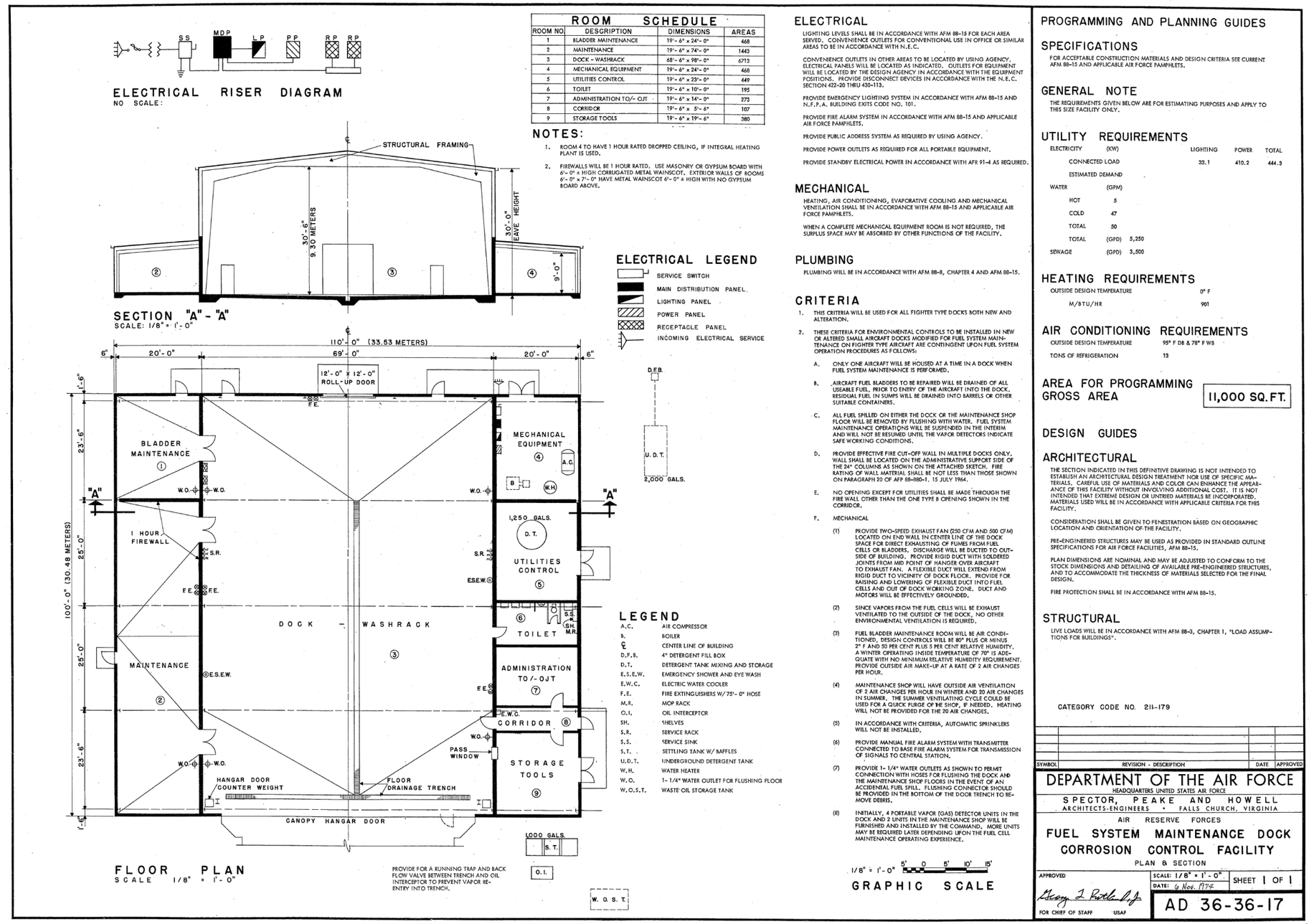
FIRE STATIONS
SCHEMES A&B

PLANS & SECTION

APPROVED
George J. Pritchard
FOR CHIEF OF STAFF USAF

AD 36 - 30 - 10
SCALE: AS SHOWN
DATE: 6 Nov. 1974
SHEET 1 OF 1

AD 36-36-17 1974; Air Reserve Forces Fuel System Maintenance Dock Corrosion Control Facility, from AFM 88-2 1975



ROOM SCHEDULE

ROOM NO.	DESCRIPTION	DIMENSIONS	AREAS
1	BLADDER MAINTENANCE	19'-6" x 24'-0"	468
2	MAINTENANCE	19'-6" x 74'-0"	1443
3	DOCK - WASHRACK	68'-6" x 98'-0"	6713
4	MECHANICAL EQUIPMENT	19'-6" x 24'-0"	468
5	UTILITIES CONTROL	19'-6" x 23'-0"	449
6	TOILET	19'-6" x 10'-0"	195
7	ADMINISTRATION TO/-OUT	19'-6" x 14'-0"	273
8	CORRIDOR	19'-6" x 5'-6"	107
9	STORAGE TOOLS	19'-6" x 19'-6"	380

NOTES:

1. ROOM 4 TO HAVE 1 HOUR RATED DROPPED CEILING, IF INTEGRAL HEATING PLANT IS USED.
2. FIREWALLS WILL BE 1 HOUR RATED. USE MASONRY OR GYPSUM BOARD WITH 6'-0" ± HIGH CORRUGATED METAL WAINSCOT. EXTERIOR WALLS OF ROOMS 6'-0" x 7'-0" HAVE METAL WAINSCOT 6'-0" ± HIGH WITH NO GYPSUM BOARD ABOVE.

ELECTRICAL LEGEND

- SERVICE SWITCH
- MAIN DISTRIBUTION PANEL.
- LIGHTING PANEL
- POWER PANEL
- RECEPTACLE PANEL
- INCOMING ELECTRICAL SERVICE

LEGEND

A.C.	AIR COMPRESSOR
B.	BOILER
℄	CENTER LINE OF BUILDING
D.F.B.	4" DETERGENT FILL BOX
D.T.	DETERGENT TANK MIXING AND STORAGE
E.S.E.W.	EMERGENCY SHOWER AND EYE WASH
E.W.C.	ELECTRIC WATER COOLER
F.E.	FIRE EXTINGUISHERS W/ 75'-0" HOSE
M.R.	MOP RACK
O.I.	OIL INTERCEPTOR
SH.	SHELVES
S.R.	SERVICE RACK
S.S.	SERVICE SINK
S.T.	SETTLING TANK W/ BAFFLES
U.D.T.	UNDERGROUND DETERGENT TANK
W.H.	WATER HEATER
W.O.	1- 1/4" WATER OUTLET FOR FLUSHING FLOOR
W.O.S.T.	WASTE OIL STORAGE TANK

ELECTRICAL

LIGHTING LEVELS SHALL BE IN ACCORDANCE WITH AFM 88-15 FOR EACH AREA SERVED. CONVENIENCE OUTLETS FOR CONVENTIONAL USE IN OFFICE OR SIMILAR AREAS TO BE IN ACCORDANCE WITH N.E.C.

CONVENIENCE OUTLETS IN OTHER AREAS TO BE LOCATED BY USING AGENCY. ELECTRICAL PANELS WILL BE LOCATED AS INDICATED. OUTLETS FOR EQUIPMENT WILL BE LOCATED BY THE DESIGN AGENCY IN ACCORDANCE WITH THE EQUIPMENT POSITIONS. PROVIDE DISCONNECT DEVICES IN ACCORDANCE WITH THE N.E.C. SECTION 422-20 THRU 430-113.

PROVIDE EMERGENCY LIGHTING SYSTEM IN ACCORDANCE WITH AFM 88-15 AND N.F.P.A. BUILDING EXITS CODE NO. 101.

PROVIDE FIRE ALARM SYSTEM IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

PROVIDE PUBLIC ADDRESS SYSTEM AS REQUIRED BY USING AGENCY.

PROVIDE POWER OUTLETS AS REQUIRED FOR ALL PORTABLE EQUIPMENT.

PROVIDE STANDBY ELECTRICAL POWER IN ACCORDANCE WITH AFR 91-4 AS REQUIRED.

MECHANICAL

HEATING, AIR CONDITIONING, EVAPORATIVE COOLING AND MECHANICAL VENTILATION SHALL BE IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

WHEN A COMPLETE MECHANICAL EQUIPMENT ROOM IS NOT REQUIRED, THE SURPLUS SPACE MAY BE ABSORBED BY OTHER FUNCTIONS OF THE FACILITY.

PLUMBING

PLUMBING WILL BE IN ACCORDANCE WITH AFM 88-8, CHAPTER 4 AND AFM 88-15.

CRITERIA

1. THIS CRITERIA WILL BE USED FOR ALL FIGHTER TYPE DOCKS BOTH NEW AND ALTERATION.
2. THESE CRITERIA FOR ENVIRONMENTAL CONTROLS TO BE INSTALLED IN NEW OR ALTERED SMALL AIRCRAFT DOCKS MODIFIED FOR FUEL SYSTEM MAINTENANCE ON FIGHTER TYPE AIRCRAFT ARE CONTINGENT UPON FUEL SYSTEM OPERATION PROCEDURES AS FOLLOWS:
   - A. ONLY ONE AIRCRAFT WILL BE HOUSED AT A TIME IN A DOCK WHEN FUEL SYSTEM MAINTENANCE IS PERFORMED.
   - B. AIRCRAFT FUEL BLADDERS TO BE REPAIRED WILL BE DRAINED OF ALL USEABLE FUEL PRIOR TO ENTRY OF THE AIRCRAFT INTO THE DOCK. RESIDUAL FUEL IN SUMPS WILL BE DRAINED INTO BARRELS OR OTHER SUITABLE CONTAINERS.
   - C. ALL FUEL SPILLED ON EITHER THE DOCK OR THE MAINTENANCE SHOP FLOOR WILL BE REMOVED BY FLUSHING WITH WATER. FUEL SYSTEM MAINTENANCE OPERATIONS WILL BE SUSPENDED IN THE INTERIM AND WILL NOT BE RESUMED UNTIL THE VAPOR DETECTORS INDICATE SAFE WORKING CONDITIONS.
   - D. PROVIDE EFFECTIVE FIRE CUT-OFF WALL IN MULTIPLE DOCKS ONLY. WALL SHALL BE LOCATED ON THE ADMINISTRATIVE SUPPORT SIDE OF THE 24" COLUMNS AS SHOWN ON THE ATTACHED SKETCH. FIRE RATING OF WALL MATERIAL SHALL BE NOT LESS THAN THOSE SHOWN ON PARAGRAPH 20 OF AFP 88-88B-1, 15 JULY 1964.
   - E. NO OPENING EXCEPT FOR UTILITIES SHALL BE MADE THROUGH THE FIRE WALL OTHER THAN THE ONE TYPE B OPENING SHOWN IN THE CORRIDOR.
   - F. MECHANICAL
     - (1) PROVIDE TWO-SPEED EXHAUST FAN (250 CFM AND 500 CFM) LOCATED ON END WALL IN CENTER LINE OF THE DOCK SPACE FOR DIRECT EXHAUSTING OF FUMES FROM FUEL CELLS OR BLADDERS. DISCHARGE WILL BE DUCTED TO OUTSIDE OF BUILDING. PROVIDE RIGID DUCT WITH SOLDERED JOINTS FROM MID POINT OF HANGER OVER AIRCRAFT TO EXHAUST FAN. A FLEXIBLE DUCT WILL EXTEND FROM RIGID DUCT TO VICINITY OF DOCK FLOOR. PROVIDE FOR RAISING AND LOWERING OF FLEXIBLE DUCT INTO FUEL CELLS AND OUT OF DOCK WORKING ZONE. DUCT AND MOTORS WILL BE EFFECTIVELY GROUNDED.
     - (2) SINCE VAPORS FROM THE FUEL CELLS WILL BE EXHAUST VENTILATED TO THE OUTSIDE OF THE DOCK, NO OTHER ENVIRONMENTAL VENTILATION IS REQUIRED.
     - (3) FUEL BLADDER MAINTENANCE ROOM WILL BE AIR CONDITIONED, DESIGN CONTROLS WILL BE 80° PLUS OR MINUS 2° F AND 50 PER CENT PLUS 5 PER CENT RELATIVE HUMIDITY. A WINTER OPERATING INSIDE TEMPERATURE OF 70° IS ADEQUATE WITH NO MINIMUM RELATIVE HUMIDITY REQUIREMENT. PROVIDE OUTSIDE AIR MAKE-UP AT A RATE OF 2 AIR CHANGES PER HOUR.
     - (4) MAINTENANCE SHOP WILL HAVE OUTSIDE AIR VENTILATION OF 2 AIR CHANGES PER HOUR IN WINTER AND 20 AIR CHANGES IN SUMMER. THE SUMMER VENTILATING CYCLE COULD BE USED FOR A QUICK PURGE OF THE SHOP, IF NEEDED. HEATING WILL NOT BE PROVIDED FOR THE 20 AIR CHANGES.
     - (5) IN ACCORDANCE WITH CRITERIA, AUTOMATIC SPRINKLERS WILL NOT BE INSTALLED.
     - (6) PROVIDE MANUAL FIRE ALARM SYSTEM WITH TRANSMITTER CONNECTED TO BASE FIRE ALARM SYSTEM FOR TRANSMISSION OF SIGNALS TO CENTRAL STATION.
     - (7) PROVIDE 1- 1/4" WATER OUTLETS AS SHOWN TO PERMIT CONNECTION WITH HOSES FOR FLUSHING THE DOCK AND THE MAINTENANCE SHOP FLOORS IN THE EVENT OF AN ACCIDENTAL FUEL SPILL. FLUSHING CONNECTOR SHOULD BE PROVIDED IN THE BOTTOM OF THE DOOR TRENCH TO REMOVE DEBRIS.
     - (8) INITIALLY, 4 PORTABLE VAPOR (GAS) DETECTOR UNITS IN THE DOCK AND 2 UNITS IN THE MAINTENANCE SHOP WILL BE FURNISHED AND INSTALLED BY THE COMMAND. MORE UNITS MAY BE REQUIRED LATER DEPENDING UPON THE FUEL CELL MAINTENANCE OPERATING EXPERIENCE.

1/8" = 1'-0" 5' 0 5' 10' 15'

GRAPHIC SCALE

PROGRAMMING AND PLANNING GUIDES

SPECIFICATIONS

FOR ACCEPTABLE CONSTRUCTION MATERIALS AND DESIGN CRITERIA SEE CURRENT AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

GENERAL NOTE

THE REQUIREMENTS GIVEN BELOW ARE FOR ESTIMATING PURPOSES AND APPLY TO THIS SIZE FACILITY ONLY.

UTILITY REQUIREMENTS

ELECTRICITY	(KW)	LIGHTING	POWER	TOTAL
CONNECTED LOAD		33.1	410.2	444.3
ESTIMATED DEMAND				
WATER	(GPM)			
HOT	5			
COLD	47			
TOTAL	50			
TOTAL	(GPD) 5,250			
SEWAGE	(GPD) 3,500			

HEATING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE	0° F
M/BTU/HR	901

AIR CONDITIONING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE	95° F DB & 78° F WB
TONS OF REFRIGERATION	13

AREA FOR PROGRAMMING GROSS AREA

11,000 SQ. FT.

DESIGN GUIDES

ARCHITECTURAL

THE SECTION INDICATED IN THIS DEFINITIVE DRAWING IS NOT INTENDED TO ESTABLISH AN ARCHITECTURAL DESIGN TREATMENT NOR USE OF SPECIFIC MATERIALS. CAREFUL USE OF MATERIALS AND COLOR CAN ENHANCE THE APPEARANCE OF THIS FACILITY WITHOUT INVOLVING ADDITIONAL COST. IT IS NOT INTENDED THAT EXTREME DESIGN OR UNTRIED MATERIALS BE INCORPORATED. MATERIALS USED WILL BE IN ACCORDANCE WITH APPLICABLE CRITERIA FOR THIS FACILITY.

CONSIDERATION SHALL BE GIVEN TO FENESTRATION BASED ON GEOGRAPHIC LOCATION AND ORIENTATION OF THE FACILITY.

PRE-ENGINEERED STRUCTURES MAY BE USED AS PROVIDED IN STANDARD OUTLINE SPECIFICATIONS FOR AIR FORCE FACILITIES, AFM 88-15.

PLAN DIMENSIONS ARE NOMINAL AND MAY BE ADJUSTED TO CONFORM TO THE STOCK DIMENSIONS AND DETAILING OF AVAILABLE PRE-ENGINEERED STRUCTURES, AND TO ACCOMMODATE THE THICKNESS OF MATERIALS SELECTED FOR THE FINAL DESIGN.

FIRE PROTECTION SHALL BE IN ACCORDANCE WITH AFM 88-15.

STRUCTURAL

LIVE LOADS WILL BE IN ACCORDANCE WITH AFM 88-3, CHAPTER 1, "LOAD ASSUMPTIONS FOR BUILDINGS".

CATEGORY CODE NO. 211-179

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
SPECTOR, PEAKE AND HOWELL
ARCHITECTS-ENGINEERS • FALLS CHURCH, VIRGINIA
AIR RESERVE FORCES

FUEL SYSTEM MAINTENANCE DOCK CORROSION CONTROL FACILITY

PLAN & SECTION

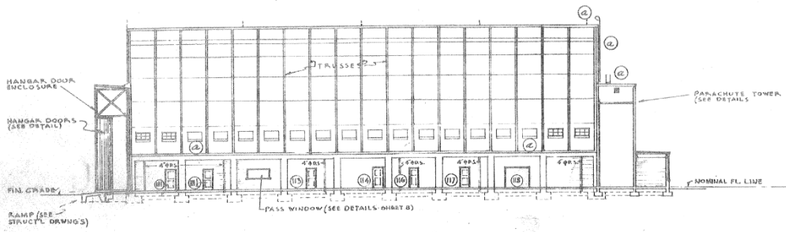
APPROVED
George L. Rutler Jr.
FOR CHIEF OF STAFF USAF

SCALE: 1/8" = 1'-0"
DATE: 6 Nov. 1974
SHEET 1 OF 1

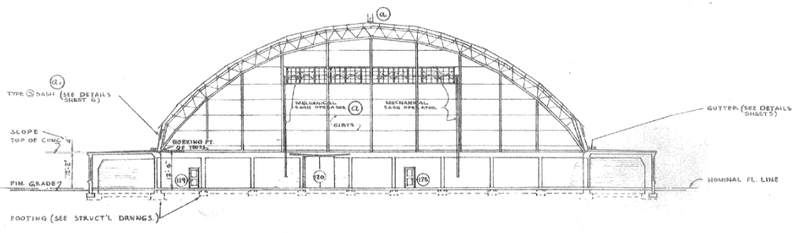
AD 36-36-17

39-01-07 1948; Hangar 1-story Lean-To, from West Virginia Air ANG Yeager ANGB 2007 Drawings Index

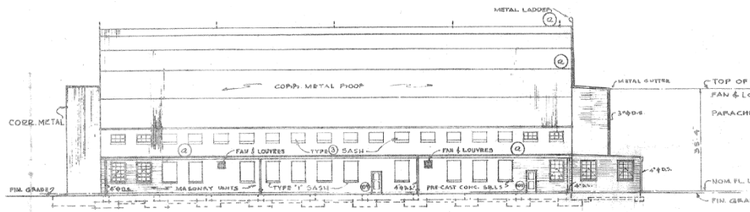
CORPS OF ENGINEERS — U. S. ARMY



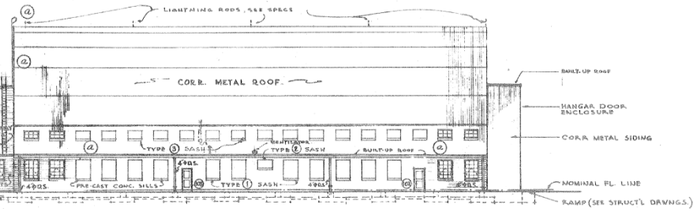
LONGITUDINAL SECTION



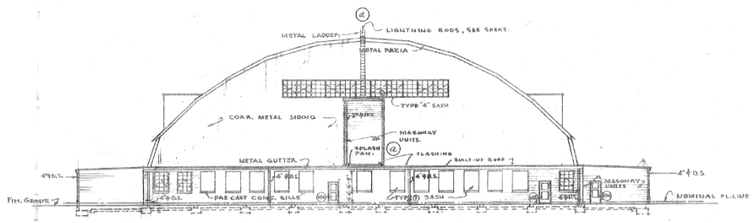
CROSS SECTION



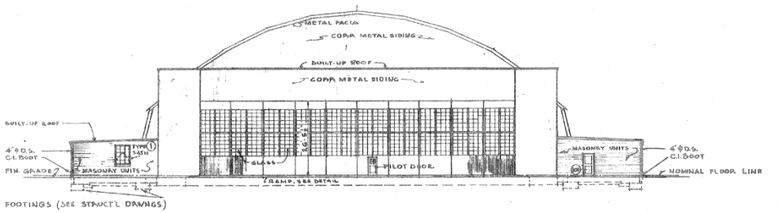
RIGHT SIDE ELEVATION



LEFT SIDE ELEVATION



REAR ELEVATION



FRONT ELEVATION

REVISION	DATE	OPERATOR	DESCRIPTION	BY
(b)	10 MAR 1951		DELETED BOILER ROOM, STACK & REVISED REAR OF BLDG	M.A.P.
(a)	27 JAN 1948		CHANGED FIXED SASH TO TYPE ① SASH IN CROSS SECTION	
(a)	22 JAN 1948		ADDED LADDERS TO ROOF INCLUDE - MOVED REAR LIGHTING POD.	

DEPARTMENT OF THE AIR FORCE
SPECIAL STAFF — U. S. ARMY
NATIONAL GUARD BUREAU WASHINGTON, D. C.

MILLS & PETTICORD, ARCHITECTS-ENGINEERS, WASHINGTON, D. C.
PREPARED UNDER DIRECTION OF THE CHIEF OF ENGINEERS — U. S. ARMY

DRAWN BY: J.A.S.
TRACED BY: L.A.H.
CHECKED BY: L.E.B.
RECOMMENDED BY: [signature]
APPROVED: [signature] CHIEF OF ENGINEERS
APPROVED FOR THE CHIEF, NATIONAL GUARD BUREAU: [signature]
DATE: 1 MAR 1948

HANGAR
1 STORY LEAN-TO

ELEVATIONS - CROSS & LONG SECTIONS
MASONRY UNITS EXTERIOR WALL FINISH

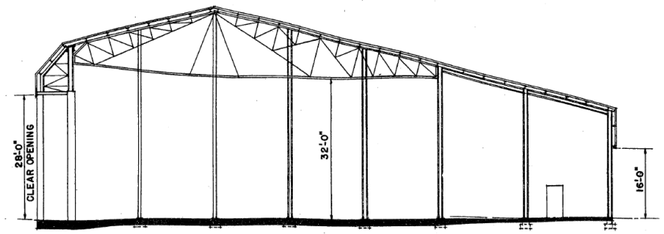
APPROVED: [signature] Chief, U. S. Army Engineering Advisors
DATE: 11 OCT. 1948
SCALE: 1/16 = 1'-0" SPEC. NO. 39-01-02-4808
DRAWING NUMBER 39-01-07
SHEET 2 OF 21

REVISION (B) LOUISVILLE DISTRICT FOR
AIR NATIONAL GUARD FACILITIES
HANGAR, BOILER HOUSE, PUMP HOUSE & RESERVOIR
KANAWHA COUNTY AIRPORT - CHARLESTON, W. VA.

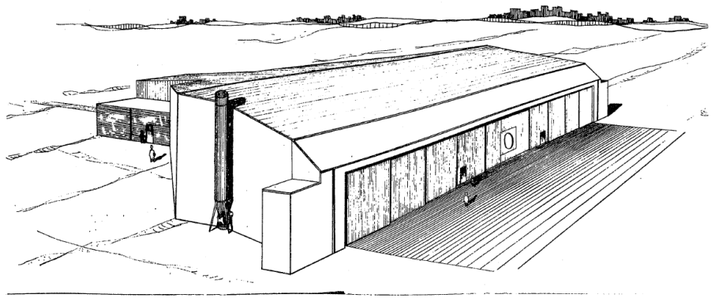
KCA-13-3 RECORD DRAWING "AS BUILT" (3)

WVANG-YANGB-2007-37

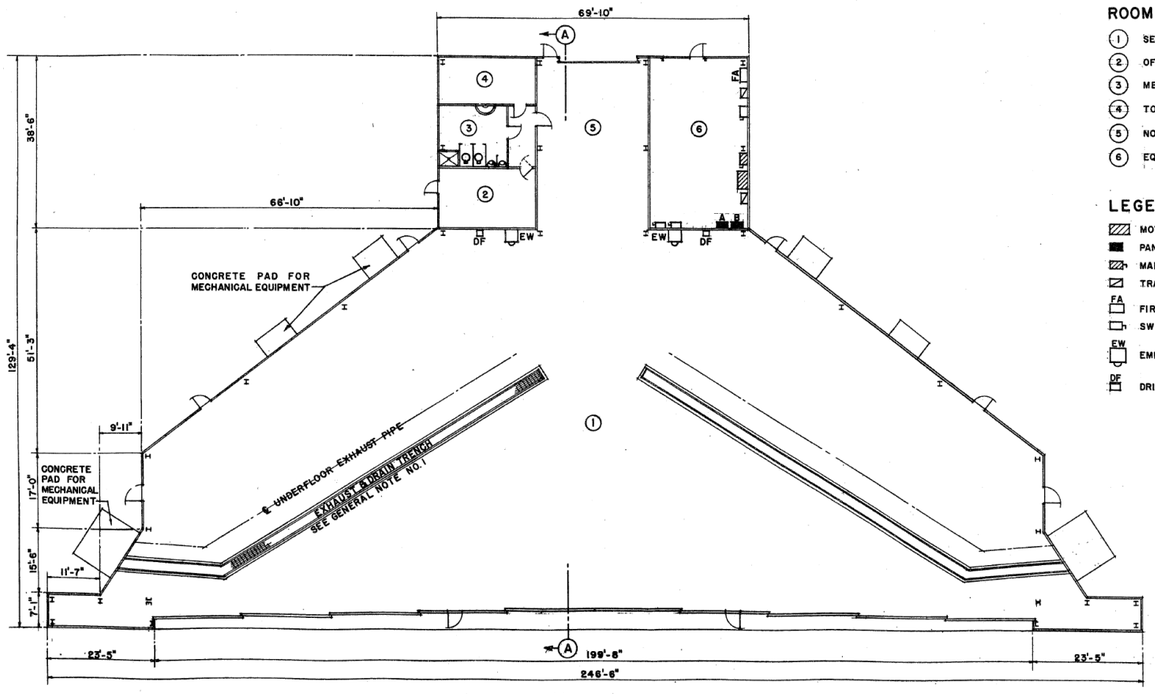
AD 39-01-13 1963; Dock Aircraft Fuel System Maintenance Large Aircraft, from AFM 88-2 1969



SECTION A-A
SCALE: 3/32" = 1'-0"



PERSPECTIVE



FLOOR PLAN
SCALE: 3/32" = 1'-0"

ROOM SCHEDULE

1. SERVICE AREA
2. OFFICE
3. MENS TOILET
4. TOOL ROOM
5. NOSE AREA
6. EQUIPMENT ROOM

LEGEND

- MOTOR STARTER SWITCHBOARD
- PANELS A AND B
- MAIN SWITCH
- TRANSFORMER
- FA — FIRE ALARM CABINET
- SWITCH
- EW — EMERGENCY EYE WASH & SHOWER
- DF — DRINKING FOUNTAIN

GRAPHIC SCALE
3/32" = 1'-0" 0 5 10 15 20 25

PROGRAMMING AND PLANNING GUIDES

THE FOLLOWING INFORMATION IS FOR PROGRAMMING AND MASTER PLANNING ONLY.

SPECIFICATIONS

CONSTRUCTION MATERIALS WILL BE IN ACCORDANCE WITH CURRENT AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS. TYPE OF CONSTRUCTION WILL BE MODIFIED STANDARD.

GENERAL NOTES

1. EXHAUST TRENCHES WILL BE LOCATED TO ACCOMMODATE THE TYPE OF AIRCRAFT FOR WHICH THE DOCK IS PROGRAMMED.

UTILITY REQUIREMENTS

ELECTRICITY	(KW)	LIGHTING	POWER	TOTAL
CONNECTED LOAD		65.0	673.4	738.4
ESTIMATED DEMAND		65.0	471.4	536.4
WATER	(GPM)			
HOT	3			
COLD	65			
TOTAL	68			
WATER	(GPD) 6,750			
SEWAGE	(GPD) 6,750			

HEATING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE 0°F
M/BTU/HR 358

AREA

GROSS AREA 17,580 SQ.FT.

THIS DEFINITIVE IS FOR PROGRAMMING AND PLANNING ONLY. FOR CONSTRUCTION, SITE ADAPT STANDARD WORKING DRAWINGS AW-39-01-13.

AIR FORCE CONTROL NO. 211-174

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

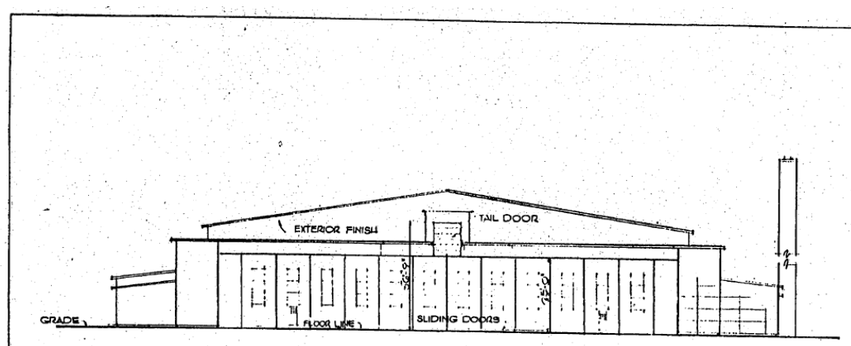
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
VICTOR B. SPECTOR AND ASSOCIATES
ARCHITECTS-ENGINEERS - FALLS CHURCH, VIRGINIA

DOCK
AIRCRAFT FUEL SYSTEM MAINTENANCE
LARGE AIRCRAFT

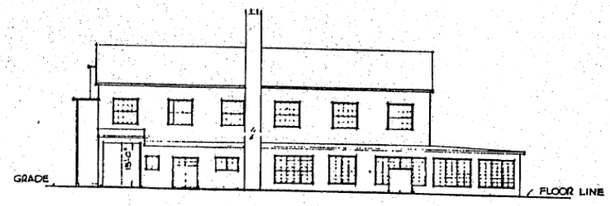
APPROVED
FOR CHIEF OF STAFF USAF AFOCE

AD 39-01-13
SCALE: AS NOTED
DATE: 18 APRIL 1963
SHEET 1 OF 1

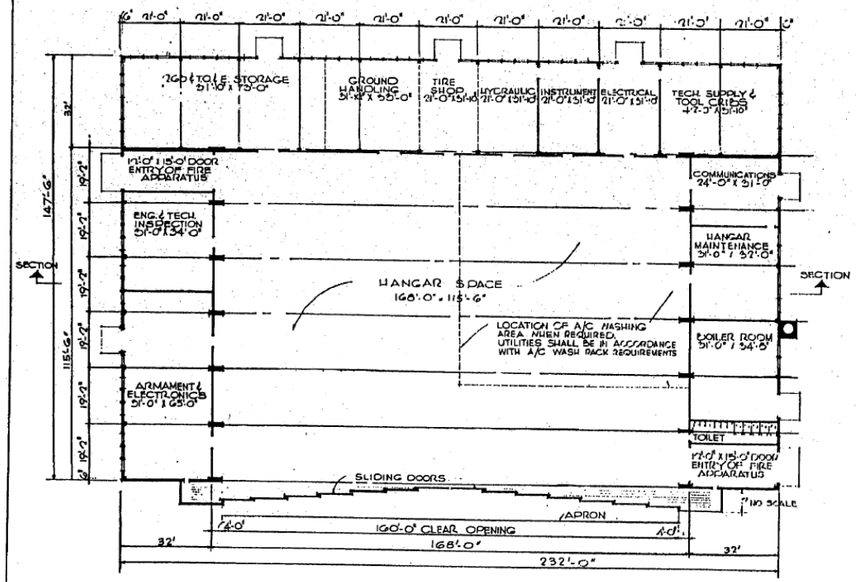
DEF 39-01-39 1951; Hangar-Readiness with Shops, from AFM 88-2 ca. 1952



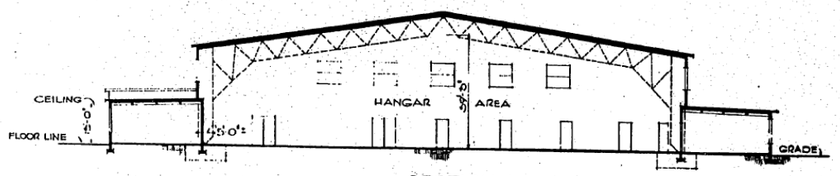
FRONT ELEVATION



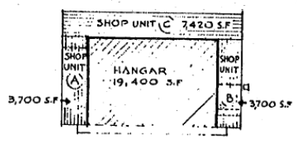
RIGHT SIDE ELEVATION



FLOOR PLAN



SECTION



AREA DIAGRAM

AREA :

HANGAR	(115.5'x168')	19,400. S.F
SHOP UNIT (A)	(115.5'x 32') INCL. ENTRY	3,700 S.F
SHOP UNIT (B)	(115.5'x32') SHOP AREA = 2,700 S.F BOILER RM = 1,000	3,700 *
SHOP UNIT (C)	(232' x 32')	7,420
TOTAL SHOP AREA W/ BOILER RM.		14,820
GRAND TOTAL		34,220. S.F

* TOTAL SHOP AREA FOR UNIT (D) WHEN BOILER RM IS NOT REQUIRED = 3700 S.F.

1/8"=1'-0"
0 10 20 30 40 50
GRAPHIC SCALE

NOTE: THIS DRAWING IS REPRODUCED AT ONE-QUARTER THE SIZE OF THE ORIGINAL

REVISION	DATE	DESCRIPTION	BY
		REVISIONS	

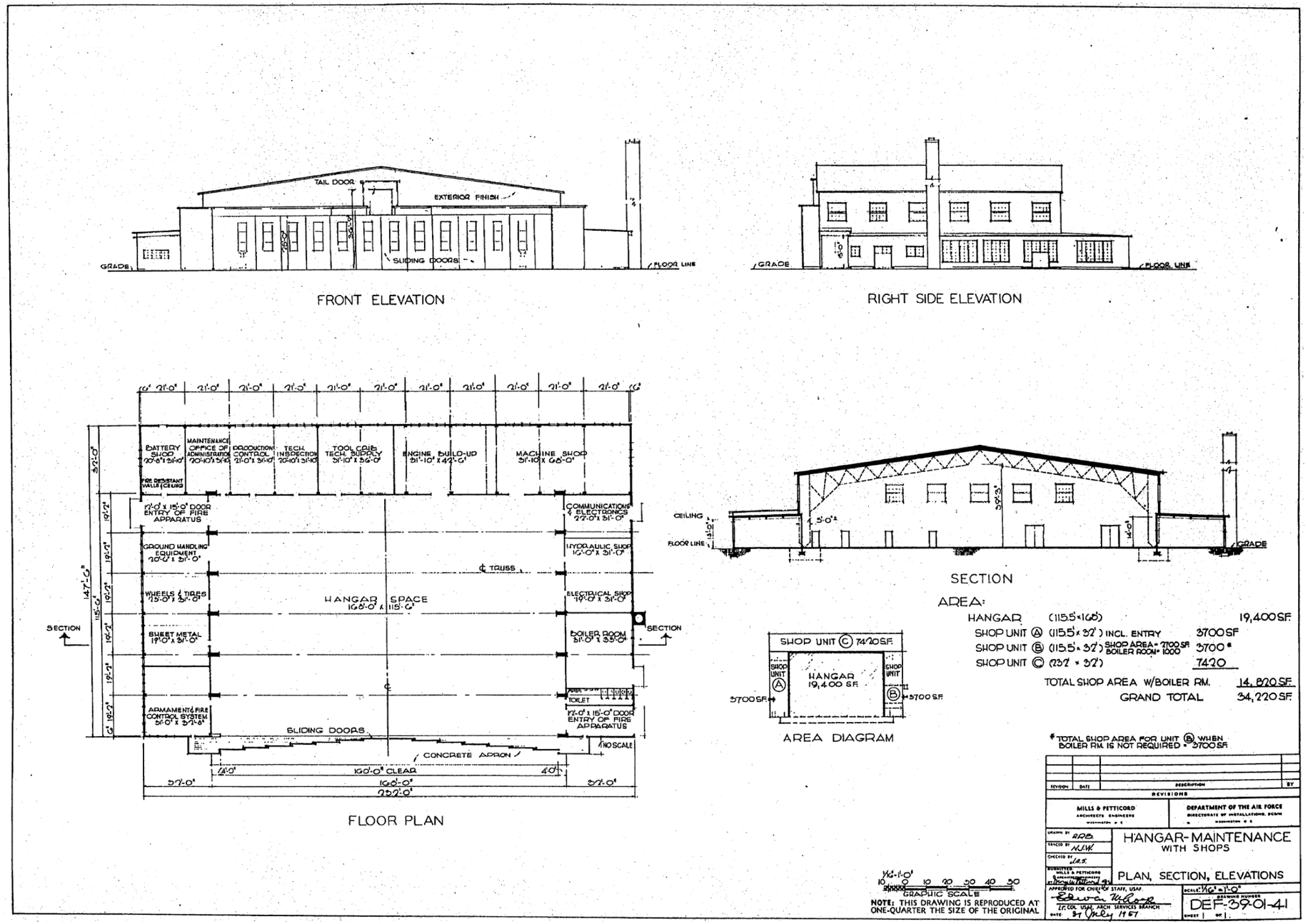
MILLS & PETTICORD, ARCHITECTS - ENGINEERS, WASHINGTON, D. C.
DEPARTMENT OF THE AIR FORCE, DIRECTORATE OF INSTALLATIONS DESIGN, WASHINGTON, D. C.

DRAWN BY V.D.L.
TRACED BY N.W.
CHECKED BY J.A.S.
SUBMITTED MILLS & PETTICORD
APPROVED FOR CHIEF OF STAFF, USAF:
LT.COL. USAF, ARCH. SERVICES BRANCH
DATE: 31 July 1957

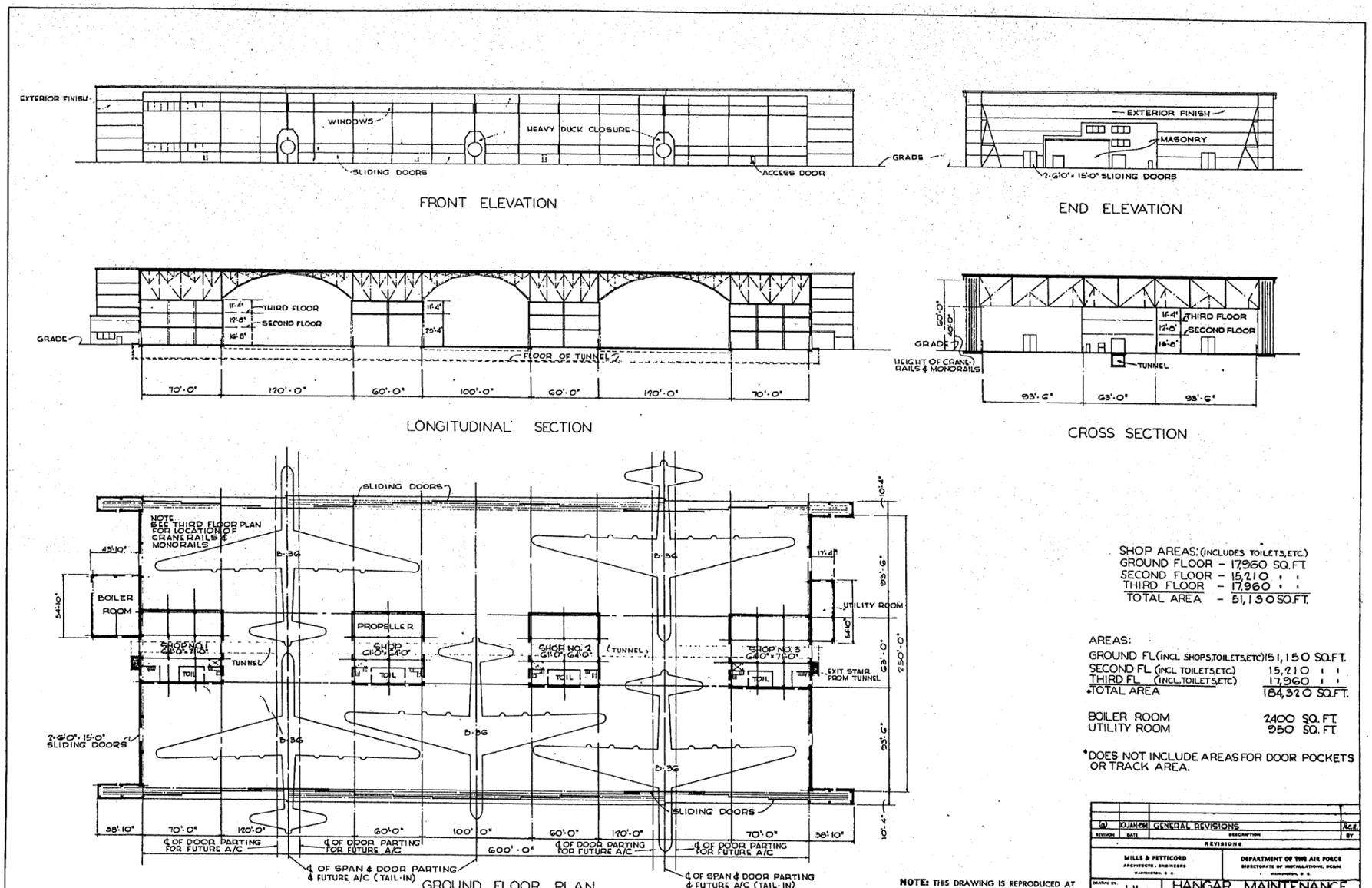
HANGAR-READINESS WITH SHOPS
PLAN-SECTION-ELEVATIONS
SCALE 1/8"=1'-0"
DRAWING NUMBER DEF-39-01-39
SHEET 1 OF 1

THIS DRAWING SUPERSEDES DWG. NO. DEF-39-01-33 3 SHEETS, DATED 8 JANUARY, 1951

DEF 39-01-41 1951; Hangar-Maintenance with Shops, from AFM 88-2 ca. 1952



DEF 39-01-43 1951; Hangar-Maintenance Heavy Bomber A/C Double Cantilever, from AFM 88-2 ca. 1952



SHOP AREAS: (INCLUDES TOILETS, ETC.)
GROUND FLOOR – 17,960 SQ. FT.
SECOND FLOOR – 15,210 " "
THIRD FLOOR – 17,960 " "
TOTAL AREA – 51,130 SQ. FT.

AREAS:

GROUND FL (INCL SHOPS, TOILETS, ETC)	151,150 SQ. FT.
SECOND FL (INCL TOILETS, ETC)	15,210 " "
THIRD FL (INCL. TOILETS, ETC)	17,960 " "
*TOTAL AREA	184,320 SQ. FT.
BOILER ROOM	2400 SQ. FT.
UTILITY ROOM	950 SQ. FT.

*DOES NOT INCLUDE AREAS FOR DOOR POCKETS OR TRACK AREA.

NOTE: THIS DRAWING IS REPRODUCED AT ONE-QUARTER THE SIZE OF THE ORIGINAL

SCALE: 1/32" = 1'-0"
0 10 0 10 20 30 40 50 60 70 80 90 100
GRAPHIC SCALE

REVISION	DATE	DESCRIPTION	BY
2	10 JAN 1951	GENERAL REVISIONS	ACE

REVISIONS

MILLS & PETTICORD, ARCHITECTS - ENGINEERS, WASHINGTON, D. C.

DEPARTMENT OF THE AIR FORCE, DIRECTORATE OF INSTALLATIONS, DCS/M, WASHINGTON, D. C.

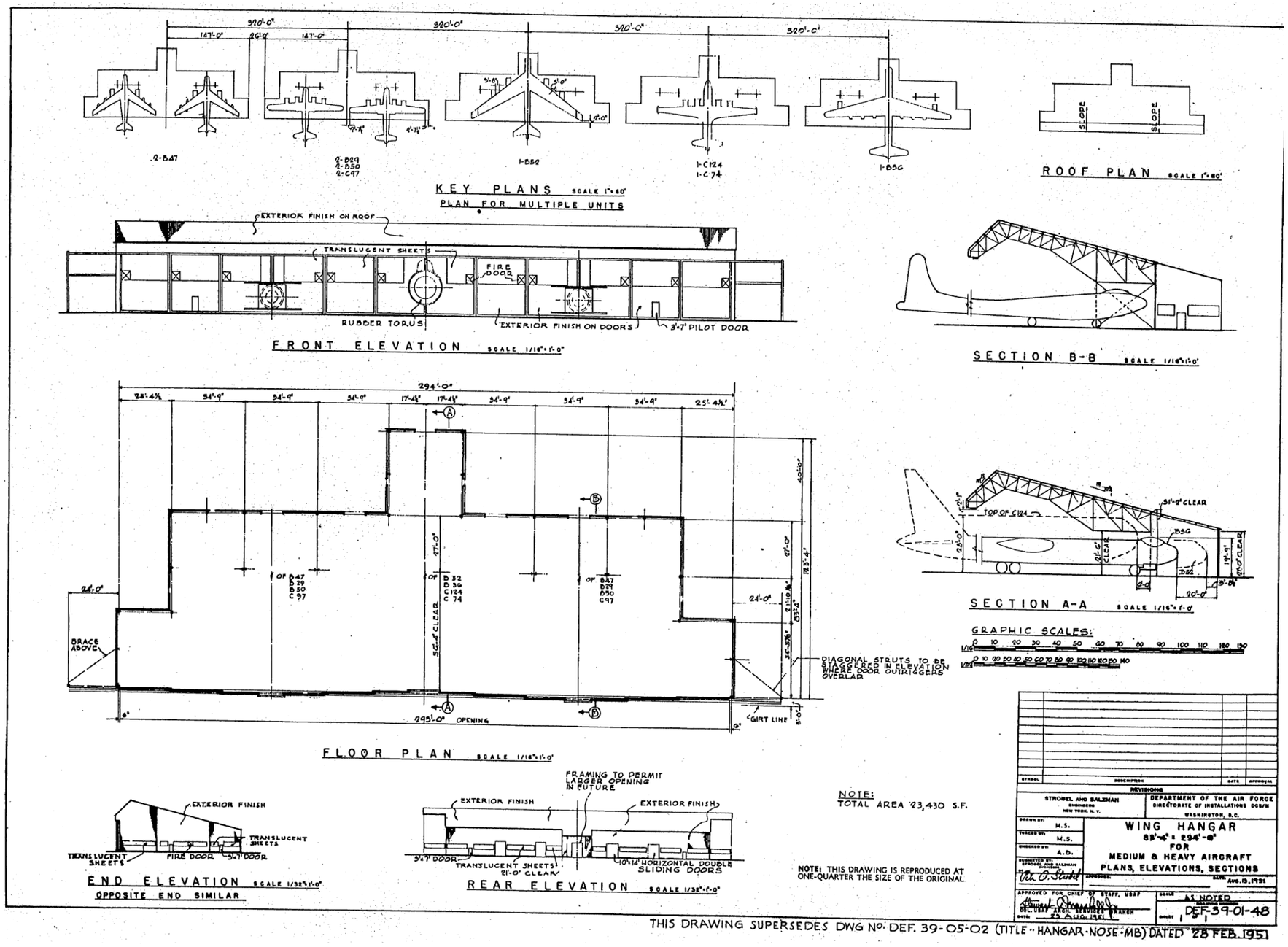
DRAWN BY: L.M.
TRACED BY: L.M.
CHECKED BY: A.E. LCK, A.F. A.C.H.
SUBMITTED: MILLS & PETTICORD
APPROVED FOR CHIEF OF STAFF, USAF: Samuel C. Marshall, COL. USAF, ARCH. SERVICES BRANCH
DATE: 24 AUG. 1951

HANGAR MAINTENANCE
HEAVY BOMBER A/C
DOUBLE CANTILEVER
600FT x 250 FT.
GROUND FLOOR PLAN
ELEVATIONS AND SECTIONS

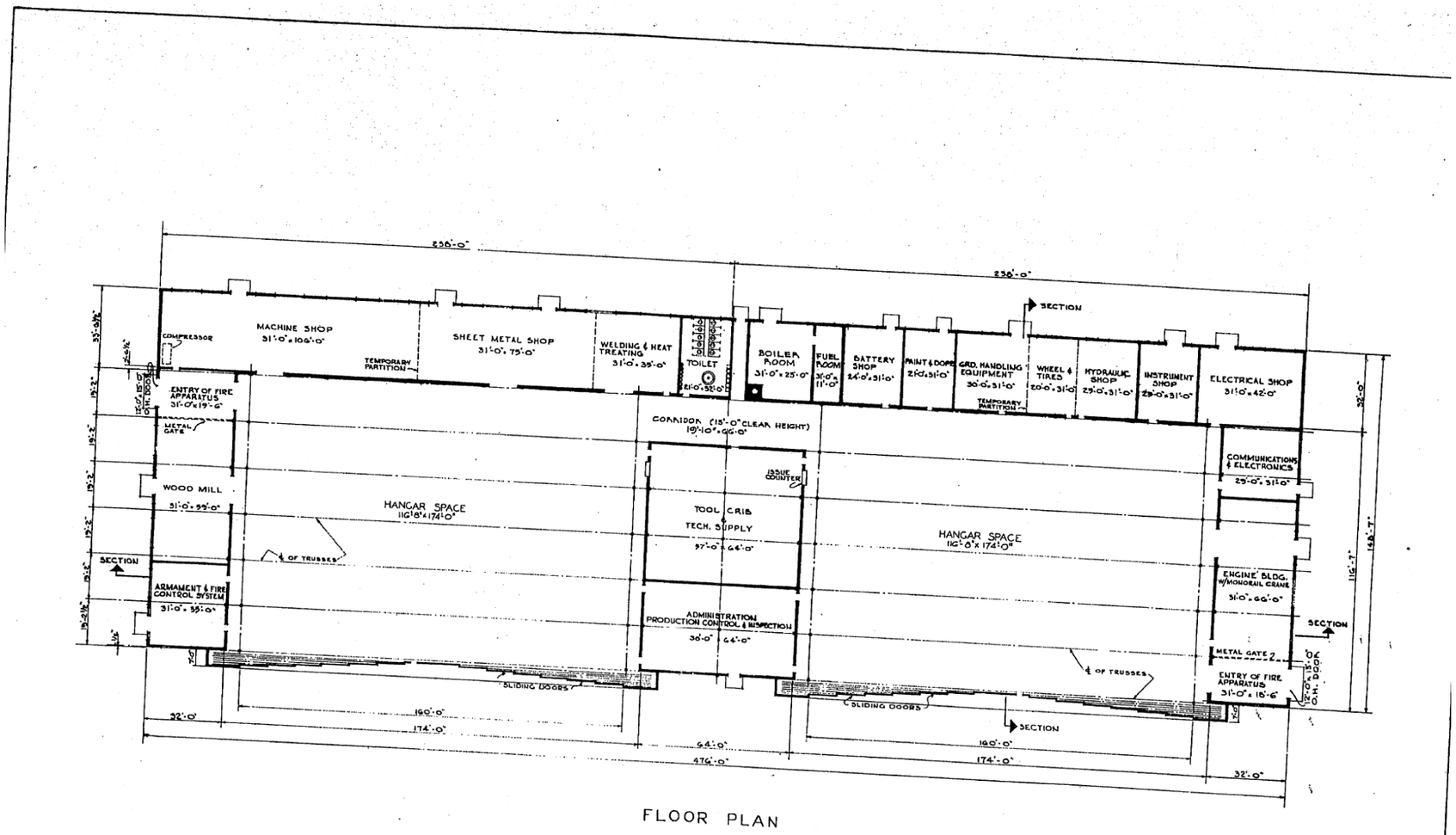
SCALE: 1/32" = 1'-0"
DRAWING NUMBER: DEF-39-01-43

THIS DRAWING SUPERSEDES DWG NO. DEF-39-01-27 DATED 13 FEBRUARY 1951

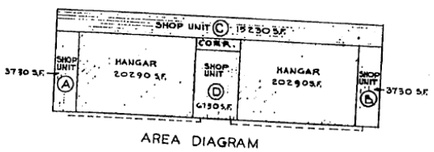
DEF 39-01-48 1951; Wing Hangar for Medium and Heavy Aircraft, from AFM 88-2 ca.1952



DEF 39-01-49 1952; Hangar-Maintenance Double Unity Arch Type (with shops), from AFM 88-2 ca. 1952



FLOOR PLAN



AREA DIAGRAM

AREA:

* HANGARS 2 @ 20,290 SQ. FT		40,580 SQ. FT
SHOP UNIT Ⓐ INCL. ENTRY	3,730 SQ. FT.	
SHOP UNIT Ⓑ INCL. ENTRY	3,730	
SHOP UNIT Ⓒ INCL. BOILER RM.	15,230	
SHOP UNIT Ⓓ	6,150	
CORRIDOR	1,300	
TOTAL	30140 SQ. FT.	
* GRAND TOTAL	70,720 SQ. FT.	

* DOES NOT INCLUDE AREAS FOR DOOR POCKETS OR TRACK AREA.

NOTE: THIS DRAWING IS REPRODUCED AT ONE-QUARTER THE SIZE OF THE ORIGINAL

1/16" = 1'-0"
10 0 10 20 30 40 50
GRAPHIC SCALE

NOTE:
REFER TO STANDARD WORKING DRAWINGS Nº. 39-01-41 AND MODIFY.

REVISION	DATE	DESCRIPTION	BY
		REVISIONS	

MILLS & PETTICORD
ARCHITECTS - ENGINEERS
WASHINGTON, D. C.

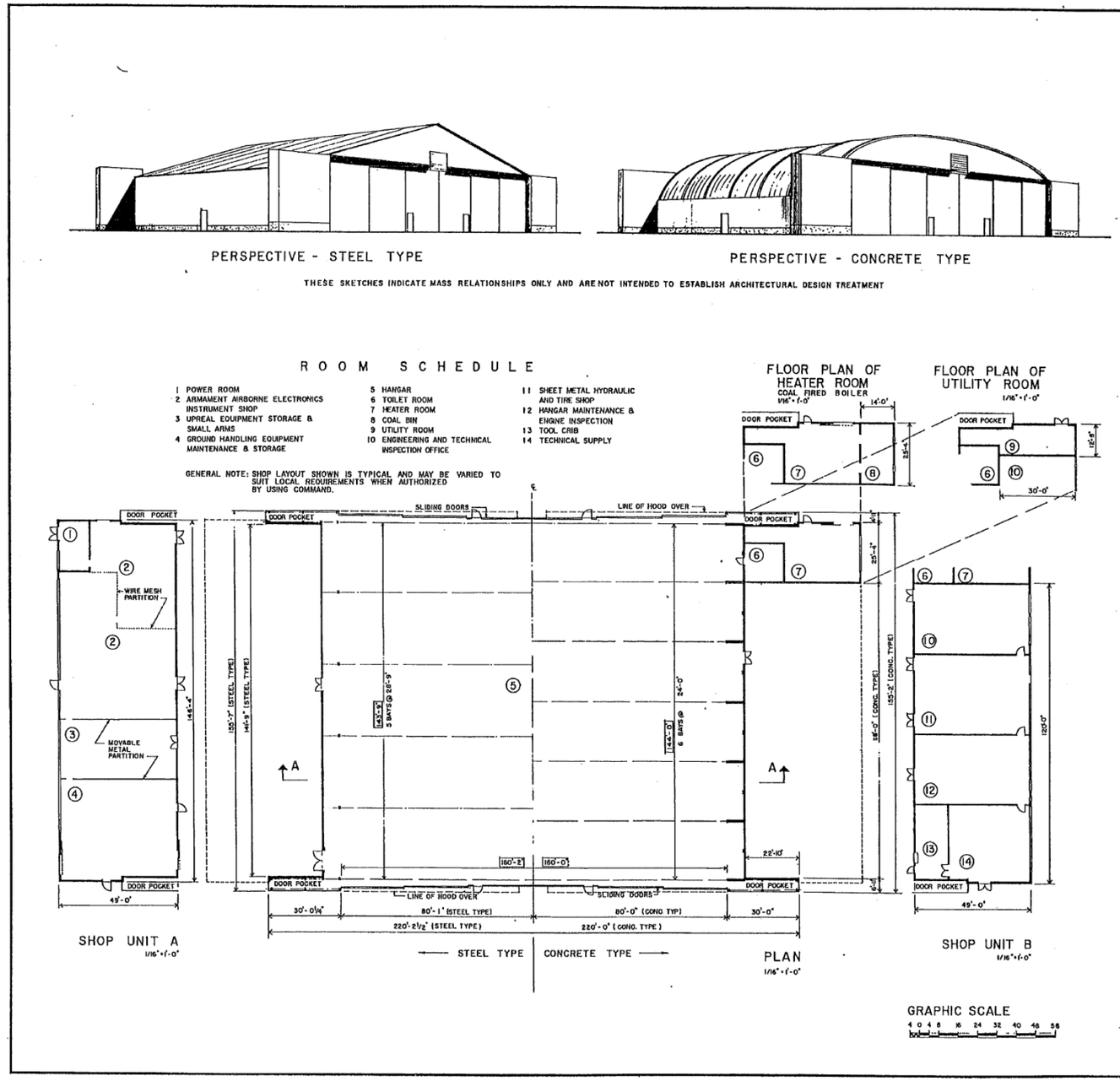
DEPARTMENT OF THE AIR FORCE
DIRECTORATE OF INSTALLATIONS, DCAS
WASHINGTON, D. C.

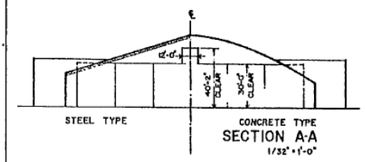
DRAWN BY: R.F.W.
TRACED BY: R.F.W.
CHECKED BY: A.E. C.E.S. A.F. M.C.R.
SUBMITTED: MILLS & PETTICORD
APPROVED FOR CHIEF OF STAFF, USAF:
COL. USAF, ARCH. SERVICES BRANCH
DATE: 4 FEBRUARY, 1952

HANGAR MAINTENANCE
DOUBLE UNIT ARCH TYPE
(WITH SHOPS)
FLOOR PLAN

SCALE: 1/16" = 1'-0"
DRAWING NUMBER
DEF-39-01-49
SHEET 1 OF 2

AD 39-01-65 1956; Hangar-A/C Maintenance (organizational pull-thru), from AFM 88-2 1959





PROGRAMMING AND MASTER PLANNING GUIDES

THE FOLLOWING INFORMATION IS FOR GUIDANCE IN PROGRAMMING AND MASTER PLANNING.

SPECIFICATIONS
FOR ACCEPTABLE MATERIALS SEE AFM 88-15 AND AACM. FOR INTERIOR AND EXTERIOR COLOR SCHEMES SEE AFR 89-8.

UTILITY REQUIREMENTS

ELECTRICITY (KW)
CONNECTED LOAD: 887.5
ESTIMATED DEMAND: 456.8

WATER (GPM)
HOT: 5
COLD: 54
TOTAL 59*
* DOES NOT INCLUDE 3000 GPM @ 45 MIN. PERIOD FOR FIRE PROTECTION.

WATER (GPD)
TOTAL: 4500

SEWAGE (GPD): 4500
GAS (THERMS/DAY): NONE (EXCLUDING HEATING)
STEAM (LBS/HR): NONE (EXCLUDING HEATING)

NOTE: SOME ITEMS OF EQUIPMENT OPERATE ON EITHER ELECTRICITY, GAS OR STEAM, EACH TOTAL ABOVE IS BASED ON USE OF ALL POSSIBLE EQUIPMENT BEING OPERATED BY THAT PARTICULAR UTILITY.

HEATING REQUIREMENTS (NET)

OUTSIDE DESIGN TEMPERATURES	-30°F	0°F	+20°F
M BTU/HR:			
WITHOUT SHOPS	4842	3036	1816
WITH SHOPS	6570	4106	1464

HEATING PLANT

OUTSIDE DESIGN TEMPERATURES:	-30°F	0°F	+20°F
STEAM CAPACITY (LBS/HR):			
WITHOUT SHOPS	5760	3600	2160
WITH SHOPS	7260	4600	2760
GAS (THERMS/HR):			
WITHOUT SHOPS	646	402	248
WITH SHOPS	874	546	328
ELECTRICITY (KW) (FOR PUMPS)	30	45	40
HEATER ROOM AREA (SQ. FT.):	800		

AREA ANALYSIS (SQ. FT.)
HANGAR AREA, POCKET AREA, TOILET AREA, HEATER ROOM: 28,913
SHOP A: 6,952
SHOP B: 5,464
TOTAL SHOPS A & B: 12,416

GROSS AREA	SQ. FT.
GROSS AREA HANGAR	28,913
GROSS AREA HANGAR W/SHOP UNIT 'A'	35,865
GROSS AREA HANGAR W/SHOP UNITS 'A' & 'B'	41,329

THE ABOVE AREAS ARE BASED ON THE STEEL TYPE HANGAR DESIGN. THEY INCLUDE THE DOOR POCKET, TOILET AND HEATER ROOM AREAS.

COMPLETE WORKING DRAWINGS NUMBERED AW 39-01-65 AND AW 39-01-66 ARE AVAILABLE IN FULL SIZE REPRODUCIBLES. THIS DRAWING IS AVAILABLE IN ONE HALF AND FULL SIZE REPRODUCIBLES.

SYMBOL	REVISIONS — DESCRIPTION	DATE	APPROVAL

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE

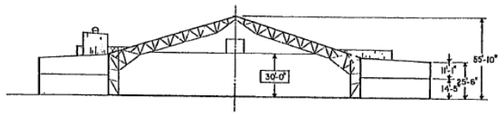
JOHN HANS GRAHAM & ASSOCIATES
MILTON SCHWARTZ—ALBERT GOENNER
ARCHITECTS - ENGINEERS
WASHINGTON, D. C.

HANGAR, A/C MAINTENANCE
(ORGANIZATIONAL PULL-THRU)

APPROVED:
AFCIE-E
FOR CHIEF OF STAFF, USAF

AD 39-01-65
SCALE AS NOTED
DATE 5 JULY 1956
SHEET 1 OF 1

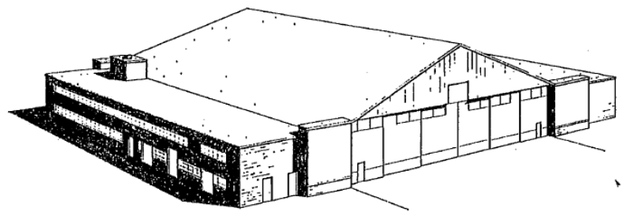
AD 39-01-73 1957; Air Reserve Forces Hangar-A/C Maintenance Reserve Training-Type A, from AFM 88-2 1959



SECTION A-A
1/32" = 1'-0"

ROOM SCHEDULE

1 HANGAR	17 COMPRESSOR ROOM	32 EXAMINATION ROOM	48 FOOD SERVICE
2 PUMP ROOM	18 UTILITY ROOM	33 EXAMINATION ROOM	49 MECHANICAL EQUIPMENT RM
3 STAIR NO. 2	19 TEACHICAL SUPPLY	34 OFFICE	50 MECHANICAL EQUIPMENT RM.
4 LINK TRAINER	20 INSPECTION	35 EXAMINATION ROOM	51 PROJECTION ROOM
5 PARACHUTE WASHING	21 LIBRARY	36 E. E. & T.	52 STORAGE
6 PARACHUTE DRYING	22 AIRMEN'S TOILET	37 PARACHUTE DRYING	53 BRIEFING AND ASSEMBLY
7 PARACHUTE ROOM	23 MAINTENANCE OFFICE	38 WAITING	54 OPERATIONS
8 INSTALLATION	24 CORRIDOR	39 AIRMEN'S TOILET	55 PRODUCTION CONTROL
9 CORRIDOR	25 AIRBORNE COMMUNI. MAINTENANCE	40 OFFICERS' TOILET	56 PERSONNEL EQUIPMENT
10 MACHINE SHOP		41 WOMEN'S TOILET	57 FLYING PERSONNEL LOCKERS
11 ENGINE SHOP	26 PROPELLER SHOP	42 REST ROOM	58 AIRMEN'S TOILET
12 PAINT AND DOPE	27 HYDRAULIC SHOP	43 H.Q. SQUADRON	59 OFFICERS' TOILET
13 FABRIC	28 INSTRUMENT SHOP	44 H.Q. SQUADRON	60 AIRMEN'S LOCKERS
14 FOOD STORAGE	29 ELECTRIC SHOP	45 CLASSROOM	61 AIR CONDITIONING EQUIPT.
15 STAIR NO. 1	30 STAIR NO. 4	46 CLASSROOM	62 AIR CONDITIONING EQUIPT.
16 STAIR NO. 3	31 BATTERY ROOM	47 CLASSROOM	



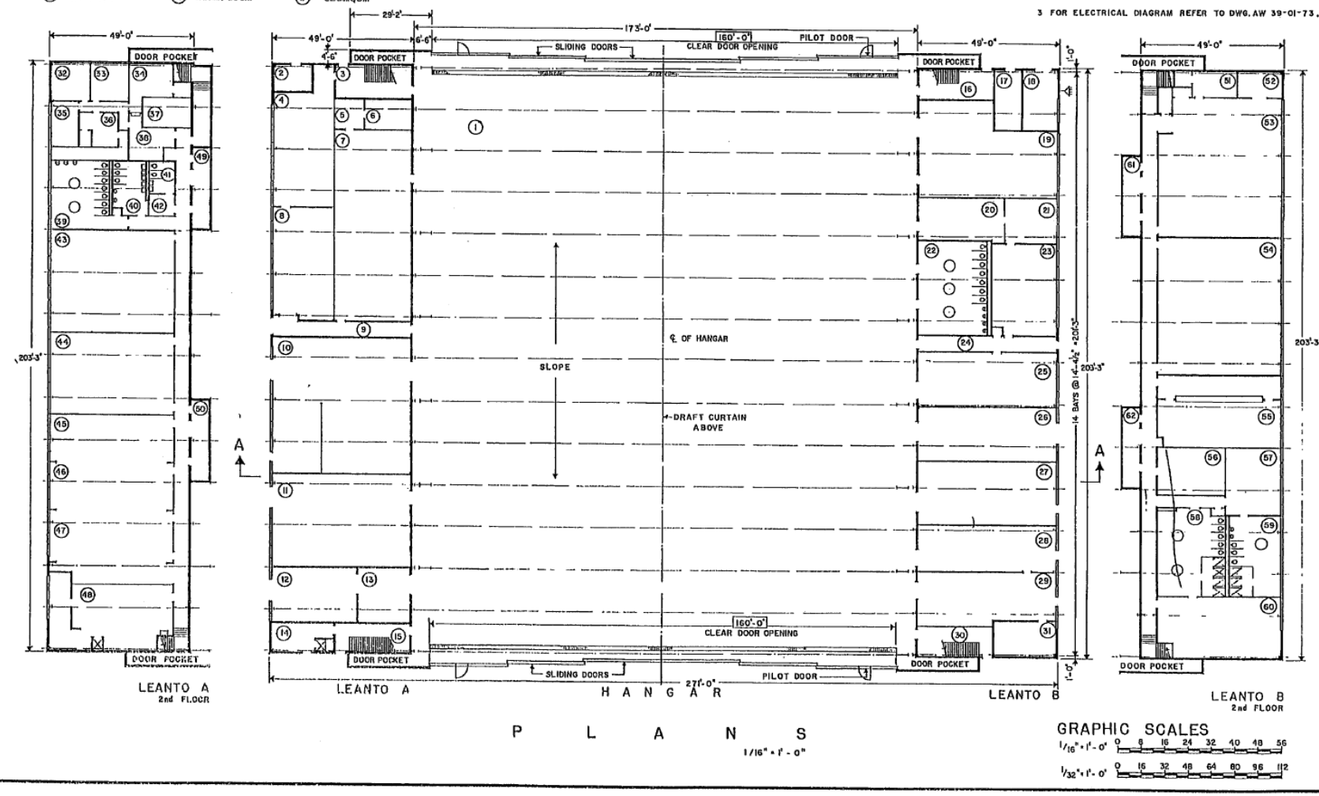
PERSPECTIVE

GENERAL NOTES

1 DELUGE SPRINKLER SYSTEM IN HANGAR CLOSED HEAD WET PIPE SYSTEM OTHER AREAS.

2. AIR CONDITIONING & VENTILATION SHALL BE PROVIDED IN ACCORDANCE WITH AFM 88-15.

3 FOR ELECTRICAL DIAGRAM REFER TO DWG. AW 39-01-73.



P L A N S
1/16" = 1'-0"

GRAPHIC SCALES
1/16" = 1'-0" 0 8 16 24 32 40 48 56
1/32" = 1'-0" 0 16 32 48 64 80 96 112

PROGRAMMING AND MASTER PLANNING GUIDES

THE FOLLOWING INFORMATION IS FOR GUIDANCE IN PROGRAMMING AND MASTER PLANNING.

SPECIFICATIONS

FOR ACCEPTABLE MATERIALS SEE AFM 88-15 AND IECM. FOR INTERIOR AND EXTERIOR COLOR SCHEMES SEE AFR 89-8.

UTILITY REQUIREMENTS

ELECTRICITY (KW)
CONNECTED LOAD: REFER TO SHEET NO 40, DWG. AW 39-01-73
ESTIMATED DEMAND:

WATER (GPM)
HOT: 50
COLD: 120
TOTAL: 165 *
* DOES NOT INCLUDE 3000 GPM @ 45 MIN. PERIOD FOR FIRE PROTECTION.

WATER (GPD)
TOTAL: 40,000

SEWAGE (GPD): 40,000
GAS (THERMS/DAY): NONE (EXCLUDING HEATING)
STEAM (LBS/HR): NONE (EXCLUDING HEATING)

NOTE: SOME ITEMS OF EQUIPMENT OPERATE ON EITHER ELECTRICITY, GAS, OR STEAM. EACH TOTAL ABOVE IS BASED ON USE OF ALL POSSIBLE EQUIPMENT BEING OPERATED BY THAT PARTICULAR UTILITY.

HEATING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURES 0° F
H. HEU/HR:
WITHOUT SHOPS 2000
WITH SHOPS 4500

AREA FOR PROGRAMMING

TOTAL GROSS AREA * 78,220 SQ.FT.

GROSS AREA INCLUDES:

HANGAR	37,340	SQ.FT.
1st FLOOR LEAN-TO TYPE "A"	9,960	SQ.FT.
2nd FLOOR LEAN-TO TYPE "A"	10,600	SQ.FT.
1st FLOOR LEAN-TO TYPE "B"	9,560	SQ.FT.
2nd FLOOR LEAN-TO TYPE "B"	10,260	SQ.FT.

* WHEN THE SCOPE OF THE HANGAR IS REDUCED BELOW THE FIGURE INDICATED, DEDUCT THE AREAS ASSIGNED TO THE ELEMENTS OMITTED TO ACHIEVE THE REDUCED SCOPE PROGRAM AREA.

FOR CONSTRUCTION USE. WORKING DRAWING AW 39-01-73

AIR FORCE CONTROL NO. 211-H9-01

SYMBOL	REVISIONS — DESCRIPTION	DATE	APPROVAL

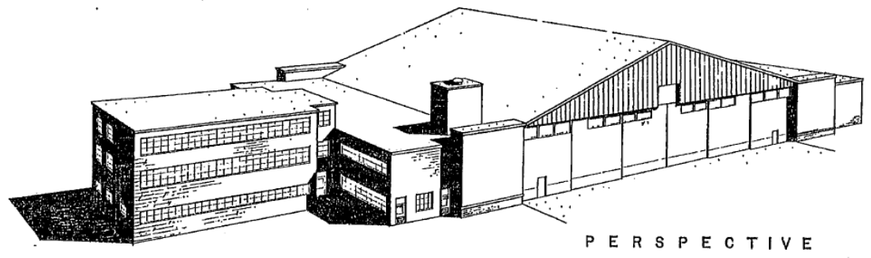
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
ALBERT GOENNER & ASSOCIATES
ARCHITECTS - ENGINEERS WASHINGTON, D. C.

AIR RESERVE FORCES
HANGAR, A/C MAINTENANCE
RESERVE TRAINING - TYPE A

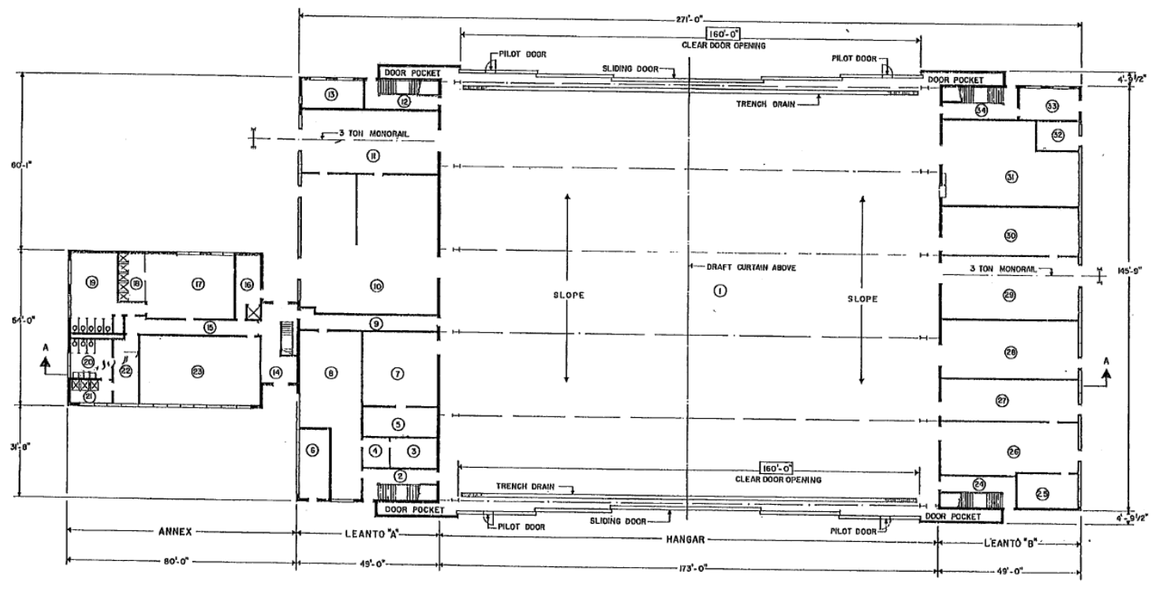
APPROVED: AFOE-E
FOR CHIEF OF STAFF, USAF

AD 39-01-73
SCALE AS NOTED
DATE 4 OCT 1957
SHEET | OF |

AD 39-01-74 1957; Air Reserve Forces Hangar-A/C Maintenance Reserve Training-Type B, from AFM 88-2 1959



PERSPECTIVE



ROOM SCHEDULE

1. HANGAR
2. STAIR # 1
3. LOWER PARACHUTE DRYING
4. WASH.
5. REF. & AIR COND.
6. COMP.
7. INSTALLATIONS
8. PARACHUTE ROOM
9. CORRIDOR
10. MACHINE SHOP
11. ENGINE SHOP
12. STAIR # 2
13. UTILITY ROOM
14. HALL
15. CORRIDOR
16. FOOD STORAGE
17. AIRMEN'S LOCKERS
18. SHOWERS
19. AIRMEN'S TOILET
20. OFFICERS' TOILET
21. SHOWERS
22. OFFICERS' LOCKERS
23. LINK TRAINER
24. STAIRS # 3
25. BATTERY
26. ELECTRIC
27. INSTRUMENTS
28. HYDRAULICS
29. ARMAMENT
30. AIRBORNE COMM. MAINT.
31. TECHNICAL SUPPLY
32. PUMP ROOM
33. PAINT & DOPE
34. STAIRS # 4

GROUND FLOOR PLAN
SCALE 1/16" = 1'-0"

GRAPHIC SCALE
0 4 8 12 16 20 24 28 36 44 52 60
1/16" = 1'-0"

PROGRAMMING AND MASTER PLANNING GUIDES

THE FOLLOWING INFORMATION IS FOR GUIDANCE IN PROGRAMMING AND MASTER PLANNING.

SPECIFICATIONS

FOR ACCEPTABLE MATERIALS SEE AFM 88-15 AND IECM4. FOR INTERIOR AND EXTERIOR COLOR SCHEMES SEE AFR 89-8.

UTILITY REQUIREMENTS

ELECTRICITY (KW)
CONNECTED LOAD: REFER TO SHEET NO. 48
ESTIMATED DEMAND: DWG. AW 39-01-74.

WATER (GPM)
HOT: 40
COLD: 120
TOTAL: 160 *
* DOES NOT INCLUDE 2000 GPM @ 45 MIN. PERIOD FOR FIRE PROTECTION.

WATER (GPD)
TOTAL: 42,000

SEWAGE (GPD): 42,000
GAS (THERMS/DAY): (EXCLUDING HEATING)
STEAM (LBS/HR): (EXCLUDING HEATING)

NOTE: SOME ITEMS OF EQUIPMENT OPERATE ON EITHER ELECTRICITY, GAS, OR STEAM. EACH TOTAL ABOVE IS BASED ON USE OF ALL POSSIBLE EQUIPMENT BEING OPERATED BY THAT PARTICULAR UTILITY.

HEATING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURES	0° F
M BTU/HR:	
WITHOUT LEANTO'S & ANNEX	1510
WITH LEANTO'S & ANNEX	4027

AREA FOR PROGRAMMING

TOTAL GROSS AREA * 68,915 SQ.FT.

GROSS AREA INCLUDES

HANGAR	27,390 SQ.FT.
1 ST FLOOR LEAN-TO "A"	7,142 SQ.FT.
2 ND FLOOR LEAN-TO "A"	7,746 SQ.FT.
1 ST FLOOR LEAN-TO "B"	7,143 SQ.FT.
2ND FLOOR LEANTO "B"	7,343 SQ.FT.
ANNEX 1 ST FLOOR	4,050 SQ.FT.
ANNEX 2 ND FLOOR	4,050 SQ.FT.
ANNEX 3 RD FLOOR	4,050 SQ.FT.

* WHEN THE SCOPE OF THE HANGAR IS REDUCED BELOW THE FIGURE INDICATED, DEDUCT THE AREAS ASSIGNED TO THE ELEMENTS OMITTED TO ACHIEVE THE REDUCED SCOPE PROGRAM AREA.

FOR CONSTRUCTION USE WORKING DRAWING AW 39-01-74

AIR FORCE CONTROL NO 211-119-02

SYMBOL	REVISIONS — DESCRIPTION	DATE	APPROVAL

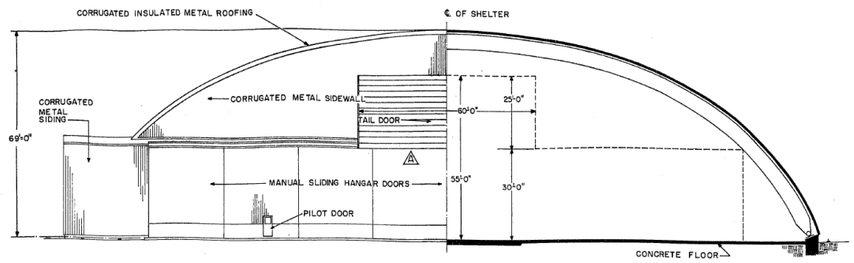
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
ALBERT GOENNER & ASSOCIATES
ARCHITECTS - ENGINEERS WASHINGTON, D. C.

AIR RESERVE FORCES
HANGAR, A/C MAINTENANCE
RESERVE TRAINING - TYPE B

APPROVED: ATDE-E
FOR CHIEF OF STAFF, USAF

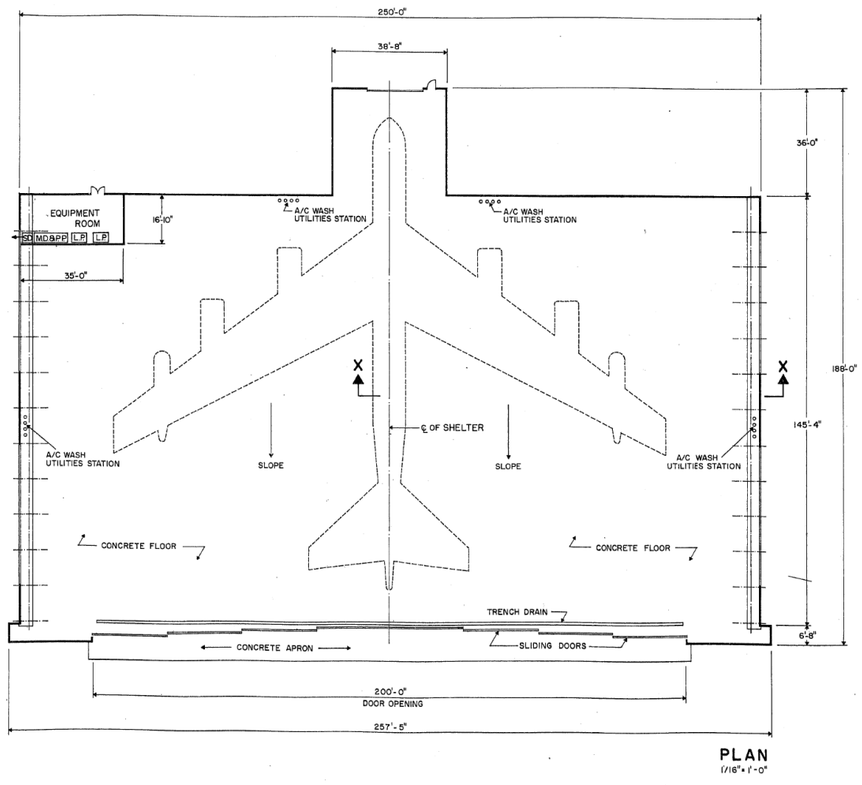
AD 39-01-74
SCALE AS SHOWN
DATE 4 OCT 1957
SHEET 1 OF 2

AD 39-01-83 R-1 1961; A/C Corrosion Control Covered, from AFM 88-2 1969

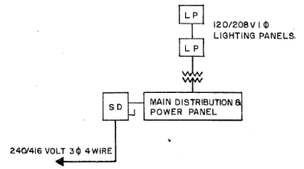


HALF FRONT ELEVATION

HALF LONGITUDINAL SECTION X-X
1/16" = 1'-0"



PLAN
1/16" = 1'-0"



ELECTRICAL RISER DIAGRAM

LEGEND

L.P.	LIGHTING PANEL
M.D.&P.P.	MAIN DISTRIBUTION & POWER PANEL
	TRANSFORMER
S.D.	SERVICE DISCONNECT

NOTES

1. THE ENTIRE MAIN AREA AND REAR LEAN-TO IS CLASSIFIED AS A WET AREA.
2. ALL EQUIPMENT AND WIRING WITHIN 4'-0" OF THE FLOOR IN THE MAIN AREA AND REAR LEAN-TO SHALL BE SUITABLE FOR CLASS I, DIVISION 1, GROUP D, USE.
3. ALL SWITCHES AND RECEPTACLES IN MAIN AREA AND REAR LEAN TO SHALL BE MOUNTED 5'-0" FROM BOTTOM TO FINISHED FLOOR.

0 4 12 20 28 36 44 52 60
GRAPHIC SCALE
1/16" = 1'-0"

PROGRAMMING AND PLANNING GUIDES

SPECIFICATIONS

FOR ACCEPTABLE CONSTRUCTION MATERIALS AND FIRE PROTECTION REQUIREMENTS, SEE CURRENT AFM 88-15.

UTILITY REQUIREMENTS

ELECTRICITY (KVA)	LIGHTS	POWER	TOTAL
CONNECTED LOAD	80	86	166
ESTIMATED DEMAND	78	77	155

WATER (GPM)	
COLD	30
TOTAL	30
WATER (GPD)	
TOTAL	5,000
WASTE WATER (GPD) (UNTREATED)	5,000

HEATING REQUIREMENTS

OUTSIDE DESIGN TEMPERATURE	0°F
M BTU/HR	2,906

GROSS AREA 38,190 S.F.

FOR CONSTRUCTION UTILIZE STANDARD WORKING DRAWINGS A W 39-01-83.

CAT. CODE NO. 211-159

SYMBOL	REVISIONS — DESCRIPTION	DATE	APPROVAL
1	ENLARGE TAIL DOOR, DELETE PERSPECTIVE	8-29-61	

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE

ALBERT GOENNER & ASSOCIATES
ARCHITECTS - ENGINEERS WASHINGTON, D. C.

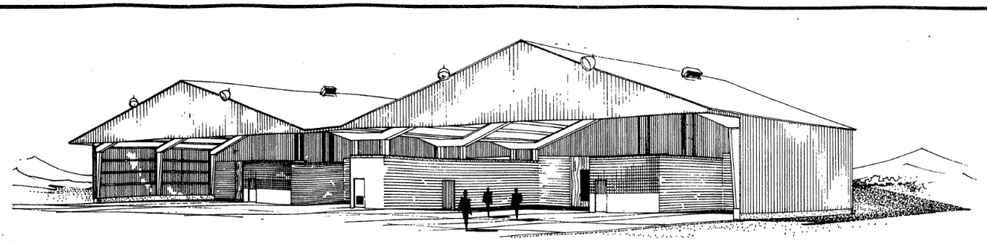
A/C CORROSION CONTROL COVERED

APPROVED: [signature] AFOCE-E
FOR CHIEF OF STAFF, USAF

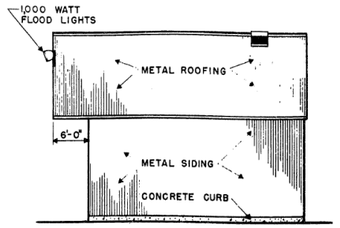
AD 39-01-83 R-1

SCALE 1/16" = 1'-0" SHEET 1 OF 1
DATE 29 DEC. 1961

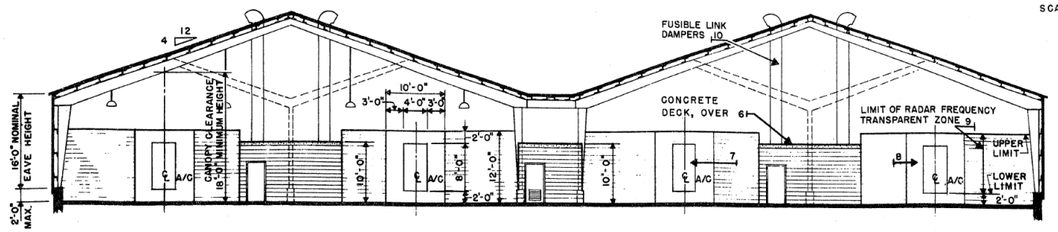
AD 39-01-86 1965; Shelter Aircraft Weapons Calibration (open facility), from AFM 88-2 1969



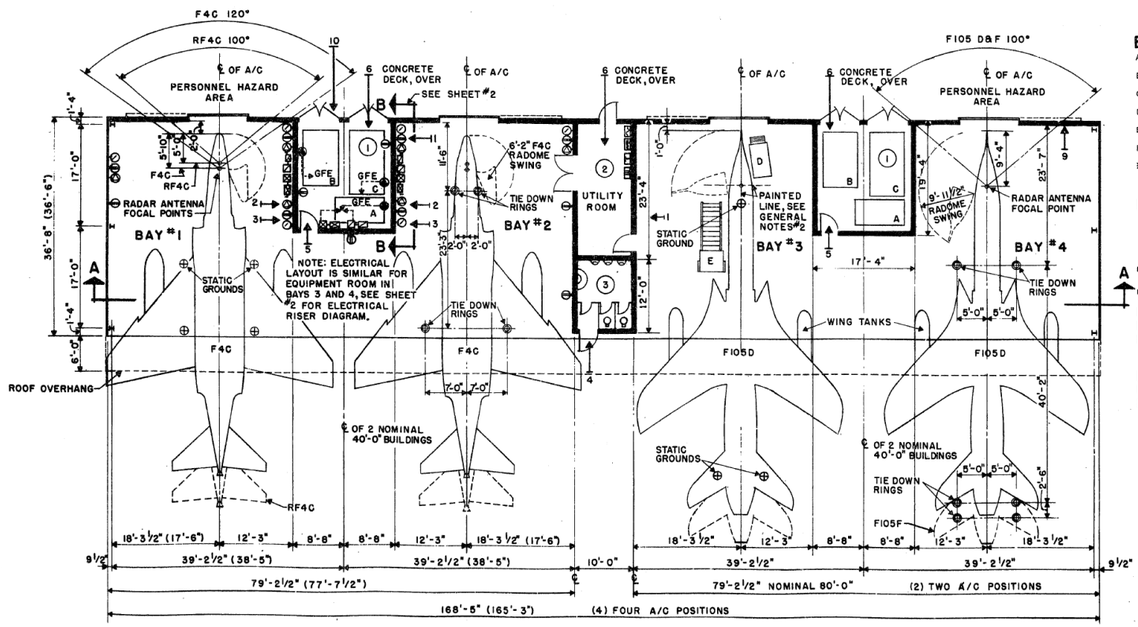
PERSPECTIVE



RIGHT SIDE ELEVATION
SCALE: 1/8" = 1'-0"



SECTION "A-A"
SCALE: 1/8" = 1'-0"



FLOOR PLAN (OPEN FACILITY)
SCALE: 1/8" = 1'-0"

NOTE: DEFINITIVE DRAWING AS SHOWN BASED ON 80'-0" NOMINAL PRE-ENGINEERED METAL BUILDING. ALL DIMENSIONS INDICATED THUS (0'-0") ARE MINIMUM CLEARANCES WHEN USING TWO 40'-0" NOMINAL BUILDINGS. "X" COLUMNS OR DOUBLE BENTS MAY BE USED.

ROOM SCHEDULE

1. EQUIPMENT ROOM
2. UTILITY OR STORAGE
3. TOILET

EQUIPMENT SCHEDULE *

A	MC-1 GENERATOR
B	MK-3A HYDRAULIC TEST
C	AIR CONDITIONER, MOBILE MA-7
D	MAINTENANCE PLATFORM TYPE B-4A
E	MAINTENANCE PLATFORM TYPE B-1
F	MD-3A GENERATOR (NOT SHOWN, OPTIONAL)
*	ALL ITEMS GFE

LEGEND

- 416V, 3ϕ, 4W, 60CY 100 AMP RECEPTACLE MOUNTED 5' ABOVE THE FLOOR.
- 120/208V, 3ϕ 4 POLE, 30 AMP 400CY RECEPTACLE.
- 28VDC, 2 POLE 30 AMP RECEPTACLE.
- SPECIAL AIR FORCE RECEPTACLE 28V P/N - AN - 2552 - 3A AND DISCONNECT SWITCH.
- SPECIAL AIR FORCE RECEPTACLE 208V, 400 CYCLE P/N AN - 3114 - 2A, AND DISCONNECT SWITCH.
- MAIN 28VDC CB DIST PANEL.
- MAIN 208V 400CY 3ϕ CB DIST PANEL.
- MAIN 120/208V 60CY CB DIST PANEL.
- 115V 60CY 3 POLE DUPLEX 20 AMP CONVENIENCE RECEPTACLE.
- FUSED MAIN SWITCH 60CY 416V.
- MAIN 60CY CB DIST PANEL 240/416V.
- DRY TYPE TRANSFORMER.
- TIE DOWN RINGS (FLUSH TYPE)
- STATIC GROUND (25 OHM)
- GFE GOVERNMENT FURNISHED EQUIPMENT

1/8" = 1'-0" 5' 0 5' 10' 15' 20'
GRAPHIC SCALE

PROGRAMMING AND PLANNING GUIDES

THE FOLLOWING INFORMATION IS FOR GUIDANCE IN PROGRAMMING AND PLANNING.

SPECIFICATIONS

CONSTRUCTION MATERIALS WILL BE IN ACCORDANCE WITH CURRENT AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS PERTAINING TO STANDARD PRE-ENGINEERED METAL BUILDINGS. A METAL BUILDING, STANDARD WITH THE METAL BUILDING INDUSTRY IS RECOMMENDED. SNOW AND WIND LOAD DESIGN SHALL CONFORM TO LOCAL CRITERIA

GENERAL NOTES

1. TOILETS WILL NOT BE PROVIDED IF AVAILABLE WITHIN 500 FEET. WHEN TOILET FACILITIES ARE NOT AVAILABLE, THE FOLLOWING SHOULD BE CONSIDERED:
   - A. PROVIDE A SEPTIC TANK OR CONNECT TO EXISTING WATER AND SEWER LINES IF ECONOMICALLY FEASIBLE.
   - B. PROVIDE A CHEMICAL TOILET IF WATER AND SEWER CONNECTIONS ARE NOT ECONOMICALLY FEASIBLE AND IF SURFACE DRAINAGE PROBLEMS PRECLUDE SEPTIC TANK INSTALLATION.
2. PAINT LINE ON FLOOR TO INDICATE POSITIONING OF FOCAL POINT OF AIRCRAFT ANTENNA FROM INSIDE FACE OF FRONT WALL.
3. CONSULT WITH USING SERVICE PRIOR TO REMOVAL OF OBSTRUCTIONS IN CLEAR AREAS.
4. LIGHTING - NON-EXPLOSION PROOF TYPE LIGHTING FIXTURES AND GENERAL PURPOSE WIRING ARE APPROVED FOR THIS FACILITY APPROXIMATELY 16'-0" ABOVE FLOOR. OFFSET FIXTURES FROM CENTER LINE OF AIRCRAFT TO AVOID OPEN CANOPY.

SPECIAL NOTES

1. ENCLOSING WALLS FOR TOILET, UTILITY AND EQUIPMENT ROOMS SHALL BE SOLID MASONRY.
2. PROVIDE 12" X 8" OPENINGS FOR PASS THROUGH OF HYDRAULIC LINES. INSTALL SLEEVES WITH SMOOTH ROUNDED EDGES. A TOP-HINGED INTERIOR TYPE CLOSURE DOOR (ONE EACH SIDE OF WALL) SHALL BE PROVIDED.
3. PROVIDE 12" X 12" OPENINGS FOR PASS THROUGH OF FLEXIBLE AIR CONDITIONING DUCTS. INSTALL SLEEVES WITH SMOOTH ROUNDED EDGES. A TOP-HINGED INTERIOR TYPE CLOSURE DOOR (ONE EACH SIDE OF WALL) SHALL BE PROVIDED.
4. 2'-6" LOUVERED TOILET DOOR.
5. 3'-0" X 7'-0" WEATHERSTRIPPED METAL DOOR.
6. CONCRETE DECK OVER.
7. A RIGID TRANSPARENT WINDOW OF GLASS OR PLEXIGLASS, 1/2" THICK, 4'-0" WIDE X 8'-0" HIGH, 2'-0" ABOVE FLOOR SHALL NOT CONTAIN MULLIONS OR CROSSBARS AND SHALL NOT CONTAIN METALLIC MATERIALS.
8. PROVIDE AN OPENING FOR TUG EXIT DOOR, 10'-0" WIDE X 12'-0" HIGH WITHOUT A CURB OR SILL, AT FLOOR LEVEL. LOWER AND UPPER PARTS OF DOOR OUTSIDE RADIATION ZONE MAY CONTAIN METAL. THE PORTION OF THE DOOR WITHIN THE RADIATION ZONE SHALL BE NON-METALLIC MATERIAL.
9. THE RADAR FREQUENCY TRANSPARENT ZONE, AS SHOWN, FULL END OF REAR WALL, SHALL BE OF NONCONDUCTIVE MATERIALS. CONCRETE MASONRY UNITS WITH NON-CONDUCTIVE REINFORCING DOWELS MAY BE USED. SEE SECTION THIS SHEET FOR END WALL DESIGN.
10. PROVIDE FOUR 3'-6" X 7'-0" LOUVERED METAL DOORS AT REAR OF EQUIPMENT ROOMS. PROVIDE FUSIBLE LINK DAMPERS IN EXHAUST DUCTS, IN EQUIPMENT ROOMS.

UTILITY REQUIREMENTS

		2 A/C POSITIONS	4 A/C POSITIONS
ELECTRICITY	(KW)		
CONNECTED LOAD		300	500
ESTIMATED DEMAND		250	400
WATER	(GPM)		
	HOT	0	0
	COLD	60	70
	TOTAL	60	70
WATER	(GPD)	600	600
SEWAGE	(GPD)	600	600

AREAS: GROSS AREAS (SQ. FT.) *

1 A/C	POSITION	1,990
2 A/C	POSITIONS	3,530
3 A/C	POSITIONS	5,290
4 A/C	POSITIONS	6,695

* UTILITY ROOM INCLUDED

THIS DEFINITIVE SUPERSEDES DRAWING AD 39-01-75-83 DATED 6 DEC. 1963.

CATEGORY CODE NO. 211-147.

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
VICTOR B. SPECTOR AND ASSOCIATES
ARCHITECTS-ENGINEERS • FALLS CHURCH, VIRGINIA

SHELTER
AIRCRAFT WEAPONS CALIBRATION
(OPEN FACILITY)

APPROVED
FOR CHIEF OF STAFF USAF

AD 39-01-86
SCALE: 1/8" = 1'-0"
DATE: 5 FEB. 65
SHEET 1 OF 2

AD 39-01-87 1965; Shelter Aircraft Weapons Calibration Type A (closed facility), from AFM 88-2 1969

LEGEND

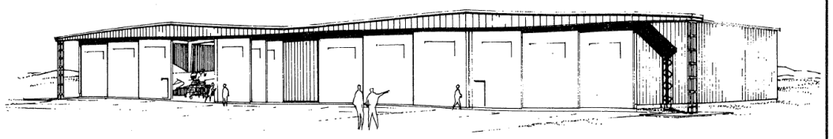
- 416Y, 3ϕ, 4W, 60CY 100 AMP RECEPTACLE MOUNTED 5' ABOVE THE FLOOR.
- 120/208V, 3ϕ 4 POLE, 30 AMP 400CY RECEPTACLE.
- 28VDC, 2 POLE 30 AMP RECEPTACLE.
- SPECIAL AIR FORCE RECEPTACLE 28V P/N - AN - 2552 - 3A AND DISCONNECT SWITCH.
- SPECIAL AIR FORCE RECEPTACLE 208V, 400 CYCLE P/N AN - 3114 - 2A, AND DISCONNECT SWITCH.
- MAIN 28VDC CB DIST PANEL.
- MAIN 208V 400CY 3ϕ CB DIST PANEL.
- MAIN 120/208V 60CY CB DIST PANEL.
- 115V 60CY 3 POLE DUPLEX 20 AMP CONVENIENCE RECEPTACLE.
- FUSED MAIN SWITCH 60CY 416Y.
- MAIN 60CY CB DIST PANEL 240/416Y.
- DRY TYPE TRANSFORMER.
- TIE DOWN RINGS (FLUSH TYPE)
- STATIC GROUND (25 OHM)
- GFE GOVERNMENT FURNISHED EQUIPMENT

EQUIPMENT SCHEDULE *

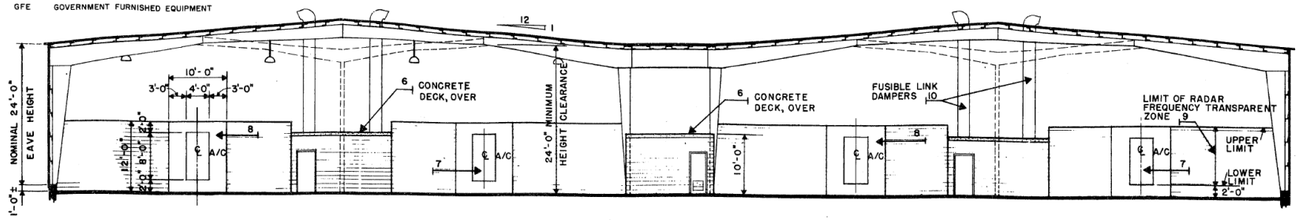
A	MC-1 GENERATOR
B	MC-3A HYDRAULIC TEST
C	AIR CONDITIONER, MOBILE MA-7
D	MAINTENANCE PLATFORM TYPE B-4A
E	MAINTENANCE PLATFORM TYPE B-1
F	MD-3A GENERATOR (NOT SHOWN, OPTIONAL)
*	ALL ITEMS GFE

ROOM SCHEDULE

1. EQUIPMENT ROOM
2. UTILITY OR STORAGE
3. TOILET

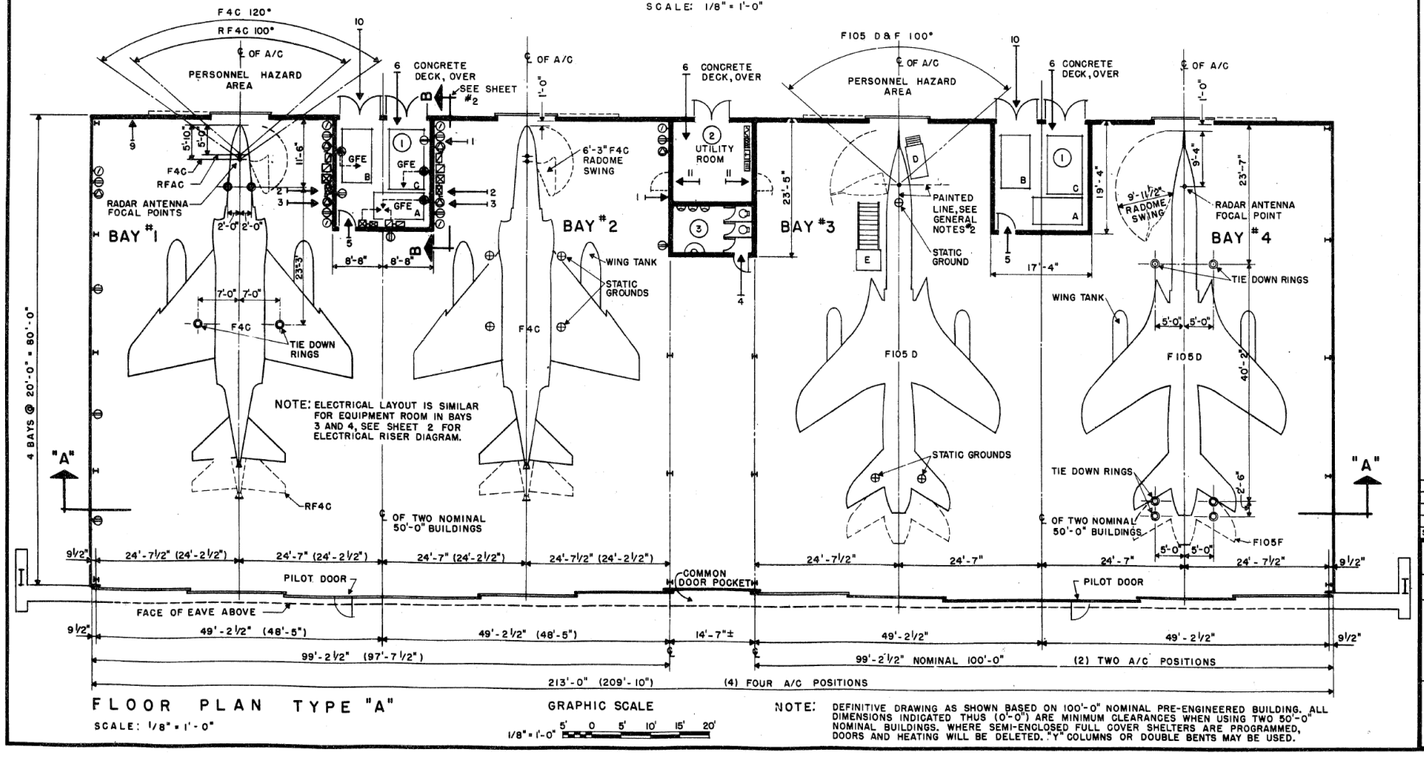


PERSPECTIVE



SECTION "A-A"

SCALE: 1/8" = 1'-0"



FLOOR PLAN TYPE "A"

SCALE: 1/8" = 1'-0"

GRAPHIC SCALE

1/8" = 1'-0" 5' 0 5' 10' 15' 20'

NOTE: DEFINITIVE DRAWING AS SHOWN BASED ON 100'-0" NOMINAL PRE-ENGINEERED BUILDING. ALL DIMENSIONS INDICATED THUS (0'-0") ARE MINIMUM CLEARANCES WHEN USING TWO 50'-0" NOMINAL BUILDINGS. WHERE SEMI-ENCLOSED FULL COVER SHELTERS ARE PROGRAMMED, DOORS AND HEATING WILL BE DELETED. "Y" COLUMNS OR DOUBLE BENTS MAY BE USED.

PROGRAMMING AND PLANNING GUIDES

THE FOLLOWING INFORMATION IS FOR GUIDANCE IN PROGRAMMING AND PLANNING

SPECIFICATIONS

CONSTRUCTION MATERIALS WILL BE IN ACCORDANCE WITH CURRENT AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS PERTAINING TO STANDARD PRE-ENGINEERED METAL BUILDINGS. A METAL BUILDING, STANDARD WITH THE METAL BUILDING INDUSTRY IS RECOMMENDED. SNOW AND WIND LOAD DESIGN SHALL CONFORM TO LOCAL CRITERIA.

GENERAL NOTES

1. TOILETS WILL NOT BE PROVIDED IF AVAILABLE WITHIN 500 FEET. WHEN TOILET FACILITIES ARE NOT AVAILABLE, THE FOLLOWING SHOULD BE CONSIDERED:
   - A. PROVIDE A SEPTIC TANK OR CONNECT TO EXISTING WATER AND SEWER LINES IF ECONOMICALLY FEASIBLE.
   - B. PROVIDE A CHEMICAL TOILET IF WATER AND SEWER CONNECTIONS ARE NOT ECONOMICALLY FEASIBLE AND IF SURFACE DRAINAGE PROBLEMS PRECLUDE SEPTIC TANK INSTALLATION.
2. PAINT LINE ON FLOOR TO INDICATE POSITIONING OF FOCAL POINT OF AIRCRAFT ANTENNA FROM INSIDE FACE OF FRONT WALL.
3. CONSULT WITH USING SERVICE PRIOR TO REMOVAL OF OBSTRUCTIONS IN CLEAR AREAS.
4. LIGHTING - NON-EXPLOSION PROOF TYPE LIGHTING FIXTURES AND GENERAL PURPOSE WIRING ARE APPROVED FOR THIS FACILITY APPROXIMATELY 22' - 0" ABOVE FLOOR. OFFSET FIXTURES FROM CENTER LINE OF AIRCRAFT TO AVOID OPEN CANOPY AND A/C TAIL.

SPECIAL NOTES

1. ENCLOSING WALLS FOR TOILET, UTILITY AND EQUIPMENT ROOMS SHALL BE SOLID MASONRY.
2. PROVIDE 12" X 8" OPENINGS FOR PASS THROUGH OF HYDRAULIC LINES. INSTALL SLEEVES WITH SMOOTH ROUNDED EDGES. A TOP-HINGED INTERIOR TYPE CLOSURE DOOR (ONE EACH SIDE OF WALL) SHALL BE PROVIDED.
3. PROVIDE 12" X 12" OPENINGS FOR PASS THROUGH OF FLEXIBLE AIR CONDITIONING DUCTS. INSTALL SLEEVES WITH SMOOTH ROUNDED EDGES. A TOP-HINGED INTERIOR TYPE CLOSURE DOOR (ONE EACH SIDE OF WALL) SHALL BE PROVIDED.
4. 2' - 6" LOUVERED TOILET DOOR, LOCATION TO VARY WITH NUMBER OF BAYS.
5. 3' - 0" X 7' - 0" WEATHERSTRIPPED METAL DOOR.
6. CONCRETE DECK OVER.
7. A RIGID TRANSPARENT WINDOW OF GLASS OR PLEXIGLASS, 1/2" THICK, 4' - 0" WIDE X 8' - 0" HIGH, 2' - 0" ABOVE FLOOR SHALL NOT CONTAIN MULLIONS OR CROSSBARS AND SHALL NOT CONTAIN METALLIC MATERIALS.
8. PROVIDE AN OPENING FOR TUG EXIT DOOR, 10' - 0" WIDE X 12' - 0" HIGH WITHOUT A CURB OR SILL, AT FLOOR LEVEL. LOWER AND UPPER PARTS OF DOOR OUTSIDE RADIATION ZONE MAY CONTAIN METAL. THE PORTION OF THE DOOR WITHIN THE RADIATION ZONE SHALL BE NON-METALLIC MATERIAL.
9. THE RADAR FREQUENCY TRANSPARENT ZONE, AS SHOWN, FULL END OF REAR WALL, SHALL BE OF NONCONDUCTIVE MATERIALS. CONCRETE MASONRY UNITS WITH NON-CONDUCTIVE REINFORCING DOWELS MAY BE USED. SEE SECTION THIS SHEET FOR END WALL DESIGN.
10. PROVIDE FOUR 3'-6" X 7'-0" LOUVERED METAL DOORS AT REAR OF EQUIPMENT ROOMS. PROVIDE FUSIBLE LINK DAMPERS IN EXHAUST DUCTS IN EQUIPMENT ROOMS.
11. PROVIDE INTERIOR DOORS WHEN UTILITY ROOM IS USED FOR STORAGE ONLY.

UTILITY REQUIREMENTS

		2 A/C POSITIONS	4 A/C POSITIONS
ELECTRICITY	(KW)		
CONNECTED LOAD		300	500
ESTIMATED DEMAND		250	400
WATER	(GPM)		
HOT		0	0
COLD		60	70
TOTAL		60	70
WATER	(GPD)	600	600
SEWAGE	(GPD)	600	600

AREAS: GROSS AREAS (SQ. FT.) *

	TYPE "A"	TYPE "B"
1 A/C POSITION	4,520	4,630
2 A/C POSITIONS	8,355	8,740
3 A/C POSITIONS	13,265	
4 A/C POSITIONS	17,040	

* UTILITY ROOM INCLUDED

THIS DEFINITIVE SUPERSEDES DRAWING AD 39-01-75-R3 DATED 6 DEC. 1963.

CATEGORY CODE NO. 211-147.

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS UNITED STATES AIR FORCE

VICTOR B. SPECTOR AND ASSOCIATES
ARCHITECTS-ENGINEERS · FALLS CHURCH, VIRGINIA

SHELTER
AIRCRAFT WEAPONS CALIBRATION
TYPE "A"
(CLOSED FACILITY)

APPROVED

FOR CHIEF OF STAFF USAF

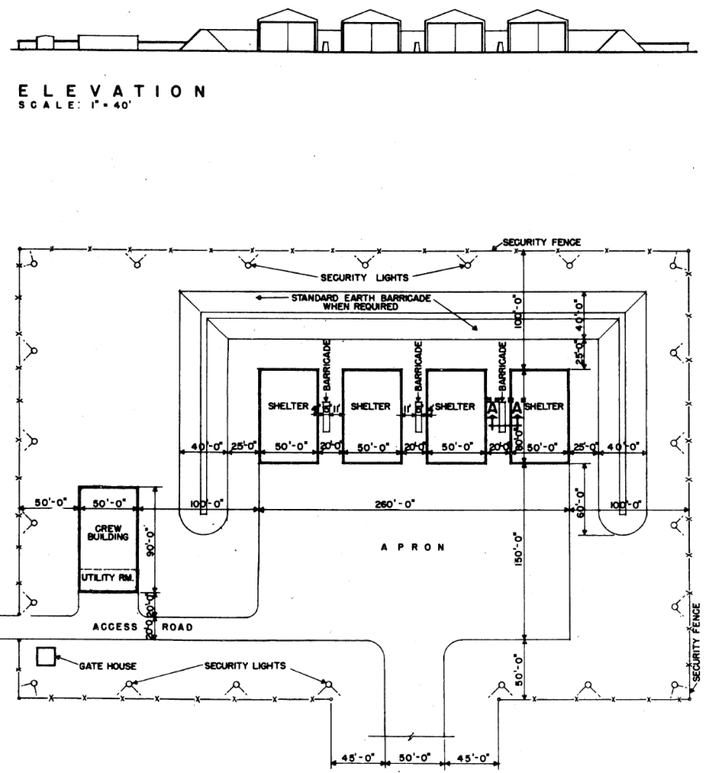
AD 39-01-87

SCALE: 1/8" = 1'-0"

DATE: 5 FEB. 65

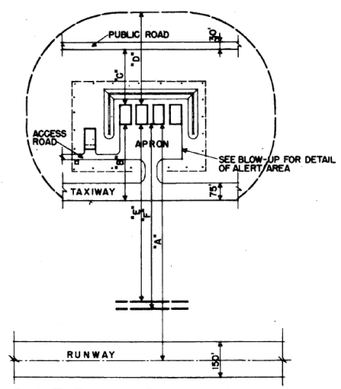
SHEET 1 OF 3

AD 39-01-88 1972, Air Reserve Forces Alert Shelter Complex Typical Site, from AFM 88-2 1975



ALERT SHELTER COMPLEX DETAIL
SCALE: 1" = 40'

ELEVATION
SCALE: 1" = 40'



SITE PLAN
SCALE: 1" = 200'

1/4" = 1' 5' 0' 5'
1" = 200' 200' 100' 0' 200' 400'
1" = 40' 20' 0' 50' 100'

GRAPHIC SCALES

PROGRAMMING AND PLANNING GUIDES
(SEE SHEET NUMBER 2 FOR ALERT SHELTER DATA)

NOTES:

1. LIGHTING POSITIONS SHALL BE ACCOMPLISHED FROM SHELTERS AND/OR POLES AND SHALL BE IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.
2. REFER TO DRAWING AD 30-11-17 FOR DETAILS ON READY CREW BUILDING.
3. REFER TO AFM 127-100 FOR QUANTITY - DISTANCE CRITERIA, AND AFM 207-1.

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

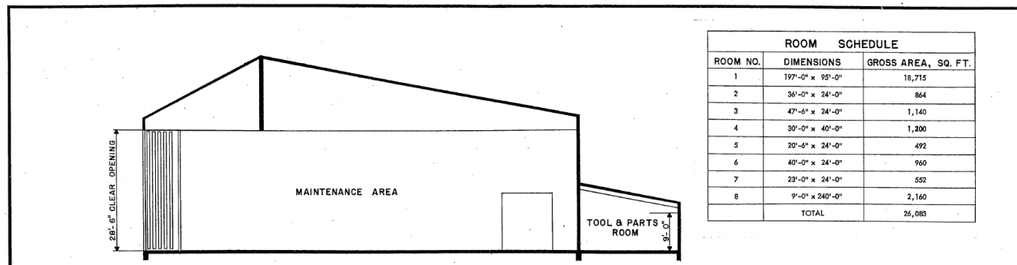
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
VICTOR B. SPECTOR AND ASSOCIATES
ARCHITECTS-ENGINEERS · FALLS CHURCH, VIRGINIA

AIR RESERVE FORCES
ALERT SHELTER COMPLEX
TYPICAL SITE
SITE PLAN & DETAIL

APPROVED
FOR CHIEF OF STAFF USAF

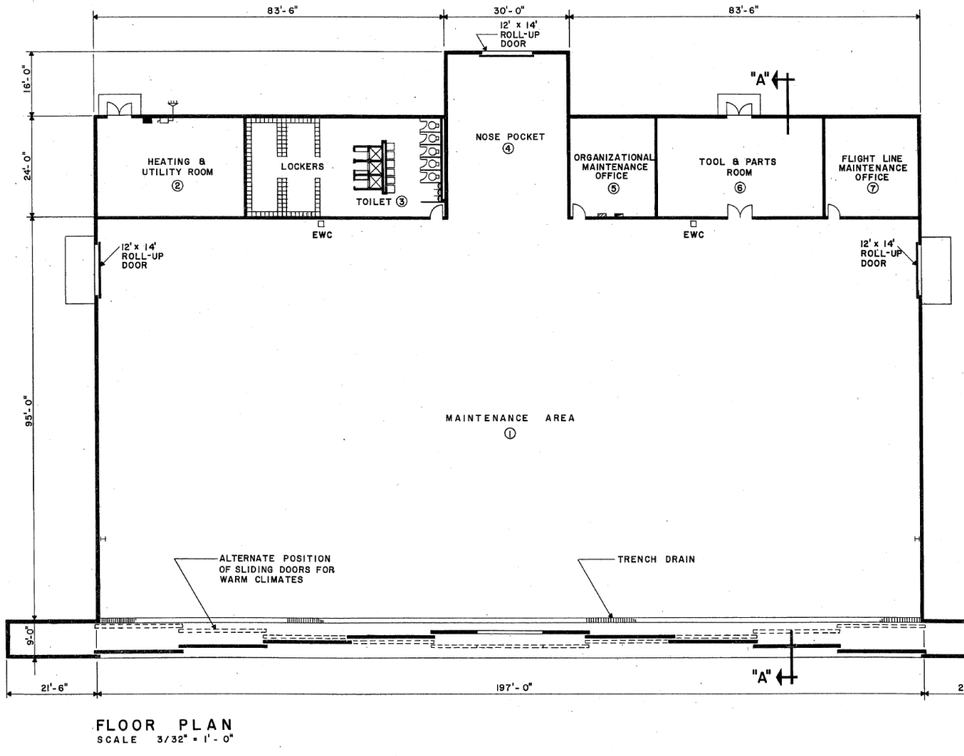
AD 39-01-88
SCALE: AS SHOWN
DATE: 10 MARCH 1972
SHEET 1 OF 2

AD 39-05-26 1974; Air Reserve Forces Maintenance Dock Large Aircraft Type A, from AFM 88-2 1975



SECTION "A" - "A"
SCALE 3/32" = 1'-0"

ROOM SCHEDULE		
ROOM NO.	DIMENSIONS	GROSS AREA, SQ. FT.
1	197'-0" x 95'-0"	18,715
2	36'-0" x 24'-0"	864
3	47'-6" x 24'-0"	1,140
4	30'-0" x 40'-0"	1,200
5	20'-6" x 24'-0"	492
6	40'-0" x 24'-0"	960
7	23'-0" x 24'-0"	552
8	9'-0" x 240'-0"	2,160
	TOTAL	26,083



FLOOR PLAN
SCALE 3/32" = 1'-0"

DESIGN GUIDES

ARCHITECTURAL
THE SECTION INDICATED IN THIS DEFINITIVE DRAWING IS NOT INTENDED TO ESTABLISH AN ARCHITECTURAL DESIGN TREATMENT NOR USE OF SPECIFIC MATERIALS. CAREFUL USE OF MATERIALS AND COLOR CAN ENHANCE THE APPEARANCE OF THIS FACILITY WITHOUT INVOLVING ADDITIONAL COST. IT IS NOT INTENDED THAT EXTREME DESIGN OR UNTRIED MATERIALS BE INCORPORATED. MATERIALS USED WILL BE IN ACCORDANCE WITH APPLICABLE CRITERIA FOR THIS FACILITY.

CONSIDERATION SHALL BE GIVEN TO FENESTRATION BASED ON GEOGRAPHIC LOCATION AND ORIENTATION OF THE FACILITY.

PRE-ENGINEERED STRUCTURES MAY BE USED AS PROVIDED IN STANDARD OUTLINE SPECIFICATIONS FOR AIR FORCE FACILITIES, AFM 88-15.

PLAN DIMENSIONS ARE NOMINAL AND MAY BE ADJUSTED TO CONFORM TO THE STOCK DIMENSIONS AND DETAILING OF AVAILABLE PRE-ENGINEERED STRUCTURES, AND TO ACCOMMODATE THE THICKNESS OF MATERIALS SELECTED FOR THE FINAL DESIGN.

FIRE PROTECTION SHALL BE IN ACCORDANCE WITH AFM 88-15. MATERIAL STORAGE AND SHOP BUILDINGS WILL HAVE AUTOMATIC SPRINKLER, CLOSED HEAD SYSTEMS.

STRUCTURAL
LIVE LOADS WILL BE IN ACCORDANCE WITH AFM 88-3, CHAPTER 1.

ELECTRICAL
LIGHTING LEVELS SHALL BE IN ACCORDANCE WITH AFM 88-15 FOR EACH AREA SERVED. CONVENIENCE OUTLETS FOR CONVENTIONAL USE IN OFFICE OR SIMILAR AREAS TO BE IN ACCORDANCE WITH N.E.C.

CONVENIENCE OUTLETS IN OTHER AREAS TO BE LOCATED BY USING AGENCY. ELECTRICAL PANELS WILL BE LOCATED AS INDICATED. OUTLETS FOR EQUIPMENT WILL BE LOCATED BY THE DESIGN AGENCY IN ACCORDANCE WITH THE EQUIPMENT POSITIONS. PROVIDE DISCONNECT DEVICES IN ACCORDANCE WITH THE N.E.C. SECTION 422-20 THRU 430-113.

PROVIDE EMERGENCY LIGHTING SYSTEM IN ACCORDANCE WITH AFM 88-15 AND N.F.P.A. BUILDING EXITS CODE NO. 101.

PROVIDE FIRE ALARM SYSTEM IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS. PROVIDE MANUAL FIRE ALARM SYSTEM FOR ALL BUILDINGS.

PROVIDE PUBLIC ADDRESS SYSTEM AS REQUIRED BY USING AGENCY.

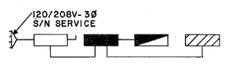
PROVIDE POWER OUTLETS AS REQUIRED FOR ALL PORTABLE EQUIPMENT.

PROVIDE STANDBY ELECTRICAL POWER IN ACCORDANCE WITH AFR 91-4 AS REQUIRED.

MECHANICAL
HEATING, AIR CONDITIONING, EVAPORATIVE COOLING AND MECHANICAL VENTILATION SHALL BE IN ACCORDANCE WITH AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

WHEN A COMPLETE MECHANICAL EQUIPMENT ROOM IS NOT REQUIRED, THE SURPLUS SPACE MAY BE ABSORBED BY OTHER FUNCTIONS OF THE FACILITY.

PLUMBING
PLUMBING WILL BE IN ACCORDANCE WITH AFM 88-8, CHAPTER 4 AND AFM 88-15.



ELECTRICAL RISER DIAGRAM
NO SCALE

LEGEND
- SERVICE SWITCH
- MAIN DISTRIBUTION PANEL
- LIGHTING PANEL
- POWER PANEL
- INCOMING ELECTRICAL SERVICE
- E.W.C. ELECTRIC WATER COOLER

3/32"=1'-0" 10' 0 10' 20'
GRAPHIC SCALE

PROGRAMMING AND PLANNING GUIDES

SPECIFICATIONS
FOR ACCEPTABLE CONSTRUCTION MATERIALS AND DESIGN CRITERIA SEE CURRENT AFM 88-15 AND APPLICABLE AIR FORCE PAMPHLETS.

GENERAL NOTE
THE REQUIREMENTS GIVEN BELOW ARE FOR ESTIMATING PURPOSES AND APPLY TO THIS SIZE FACILITY ONLY.

UTILITY REQUIREMENTS

ELECTRICITY	(KW)	LIGHTING	POWER	TOTAL
CONNECTED LOAD		122.0	97.6	219.6
ESTIMATED DEMAND		116.0	78.0	194.0
WATER	(GPM)			
HOT	16			
COLD	64			
TOTAL	68			
TOTAL	(GPD)	11,250		
SEWAGE	(GPD)	7,500		

HEATING REQUIREMENTS
OUTSIDE DESIGN TEMPERATURE °F

M/BTU/HR 1,548

AIR CONDITIONING REQUIREMENTS
OUTSIDE DESIGN TEMPERATURE

TONS OF REFRIGERATION NONE

AREA FOR PROGRAMMING
GROSS AREA

26,083 SQ. FT.

CATEGORY CODE NO. 211-173

SYMBOL	REVISION - DESCRIPTION	DATE	APPROVED

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
SPECTOR, PEAKE AND HOWELL
ARCHITECTS-ENGINEERS • FALLS CHURCH, VIRGINIA

AIR RESERVE FORCES
MAINTENANCE DOCK
LARGE AIRCRAFT
TYPE A
PLAN & SECTION

APPROVED
George D. Ruthell Jr.
FOR CHIEF OF STAFF USAF

AD 39-05-26
SCALE 3/32" = 1'-0"
DATE 6 Nov. 1974
SHEET 1 OF 2