NATIONAL REGISTER OF HISTORIC PLACES
HISTORIC CONTEXT AND EVALUATION
FOR
KIRTLAND AIR FORCE BASE
Albuquerque, New Mexico

U.S. AIR FORCE

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National Register of Historic Places
Historic Context and Evaluation
for
Kirtland Air Force Base

AIR FORCE MATERIEL COMMAND

ENVIRONMENTAL MANAGEMENT
PROTECT, PRESERVE, AND ENHANCE

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for
Kirtland Air Force Base
377th Civil Engineering Squadron
Environmental Flight Quality Section

EXECUTIVE SUMMARY

Van Citters: Historic Preservation, LLC completed this project under contract with AMEC Earth & Environmental, Inc. for the United States Air Force, Kirtland Air Force Base, Support Group/Environmental Flight Quality Section—under Contract No. GS-10F-0230J. The goal of the project was to assist Kirtland Air Force Base in meeting the requirements of Section 110 of the National Historic Preservation Act of 1966, as amended.

Van Citters: Historic Preservation, LLC developed a historic context and surveyed all real property on the installation that was constructed between 1930 and 1989 to identify properties eligible for the National Register of Historic Places. The identification of historic properties is the first step in the process to ensure that Kirtland Air Force Base is in compliance with the National Historic Preservation Act of 1966, as amended.

Kirtland Air Force Base has changed a great deal since its establishment as a United States Army airfield in 1941. It has evolved from a hastily constructed training and testing facility necessitated by the onset of World War II to an important United States Air Force center for Research and Development. Some of the important missions at the facility included nuclear weapons training, electromagnetic pulse testing, percussive shock tests, and the development of a airborne lasers. The base began as a 2,000-acre air base and grew into a 51,800-plus-acre facility, the third largest United States Air Force installation (frontispiece). The architecture that developed with the installation, for the most part, was functional in design with a focus on the mission for which it was constructed and little attention given to aesthetics. Thus the facilities that were constructed with specific design intent and styling tend to stand out. The architectural styles that were incorporated at KAFB include International Style, New Formalism, Territorial Style, and buildings with Southwestern detailing.

During the survey of the installation 86 properties and 3 historic districts (incorporating 27 of the properties) were recommended as eligible to the National Register of Historic Places by Van Citters: Historic Preservation, LLC and determined eligible by the State Historic Preservation Office (Table 1).

Table 1: PropertiesDetermined Eligible for the National Register of Historic Places

No.	Name	Date	Notes
Sandia School Historic District			
1900	Bienvenida	1936	Administration
1901	Jornada	1936	Classroom
1905	Yerba Buena	1936	Dormitory
1909	La Colmena	1936	Kitchen and servants quarters
1910	Garage	1936	Garage
34th Air Division Historic District			
907	Base Supply Equipment Warehouse	1970	Early Cold War Air Defense
909	Standardized Control Center	1952	Early Cold War Air Defense, ADCC building
910	Power station	1952	Early Cold War Air Defense
911	Storehouse	1952	Early Cold War Air Defense

No.	Name	Date	Notes
912	General Quarters	1952	Early Cold War Air Defense, Quarters
913	General Quarters	1952	Early Cold War Air Defense, Quarters
914	Nuclear Engineering Testing Building	1971	EMP laboratory
EMP Simulation Historic District			
20560	Electronic Research and Testing	1961	Equipment facility associated with HPD
20561	Horizontally Polarized Dipole	1974	HPD
20562	Research Equipment Storage	1976	Underground facility associated with VPD-II
20563	Research Equipment Storage	1976	VPD-II
20749	Electronic Research Laboratory	1975	Laboratory associated with ARES
20752	Electronic Equipment Facility	1970	ARES – underground facility
20753	Working Volume Test Area	1970	ARES – test volume
20754	Electronic Equipment Facility	1970	Laboratory associated with ARES
20789	Special Tower	1975	EMP testing support
20790	Special Tower	1975	EMP testing support
20792	Traffic Check House	1975	EMP testing support
20794	Water Tower	1975	EMP testing support
20796	Trestle	1975	Trestle
20797	Electronic Research Laboratory	1975	The Wedge
29000 Area – New Mexico Proving Ground			
29028	Storage Igloo	1943	World War II, Proximity Fuse
29029	Storage Igloo	1943	World War II, Proximity Fuse
29030	Storage Igloo	1943	World War II, Proximity Fuse
29031	Storage Igloo	1943	World War II, Proximity Fuse
29025	Storage Igloo	1944	World War II, Proximity Fuse
29026	Storage Igloo	1944	World War II, Proximity Fuse
29027	Storage Igloo	1944	World War II, Proximity Fuse
29051	Headquarters	1944	World War II, Proximity Fuse
29042	Guards Residence	1944	World War II, Proximity Fuse
29020	Storage Igloo	c. 1945	World War II, Proximity Fuse
29021	Storage Igloo	c. 1945	World War II, Proximity Fuse
29022	Storage Igloo	c. 1945	World War II, Proximity Fuse
29023	Storage Igloo	c. 1945	World War II, Proximity Fuse
600 Area			
626	Igloo	1942	EMP pulser storage
614	Ammunition Assembly	1944	World War II, Atomic Weapons
617	Base Supply Equipment Shed	1944	COIL Laboratory
622	Physics Laboratory, Dynamics Environmental	1964	ALECS
605 A	Electronic Laboratory	1971	VPD-I
625	Physics Science Laboratory	1980	Chemical laser laboratory
605 B	Electronic Laboratory	1986	HSI
Sandia Base Headquarters Area			
20200	Post Administration	1947	Early Sandia Base Headquarters
20201	Division Headquarters	1948	Early Sandia Base Headquarters
20202	Division Headquarters	1948	Early Sandia Base Headquarters
20203	Hospital	1948	Early Sandia Base Headquarters
20220	Division Headquarters	1950	Early Sandia Base Headquarters
20361	Enlisted Men’s Barracks	1951	Early Sandia Base Headquarters
20676	General Purpose Warehouse	1952	Early Sandia Base Headquarters
20685	Emergency Training Facility	1953	Early Sandia Base Headquarters
Shock Tube Test Annex			
57001	Soil Engineering Science Lab	1961	Largest test tube facility, tube dismantled

No.	Name	Date	Notes
57004	Civil Engineering Science Lab	1963	Test tube facility, tube intact
57003	Soil Engineering Science Lab	1964	Small testing facility
57012	Civil Engineering Science Lab	1969	Small testing facility
Aircraft Hangars			
333	Aircraft Hangar	1942	World War II Bomber Training Building
1000	Hangar	1955	Air Force Special Weapons Center
1001	Science Laboratory, Outdoor Environment	1952	Constructed for the B-36, Air Force Special Weapons Center
1002	Maintenance Hangar	1955	Naval Air Special Weapons Facility hangar
1030	Alert Hangar	1952	Early Cold War Air Defense, Ready Alert
1043	Maintenance Hangar	1957	Air National Guard hangar
Air Force Weapons Laboratory			
243	Laser Science Laboratory	1970	Airborne Laser Laboratory Airborne Pointer Tracker development
400	Laser Science Laboratory	1968	New Formalism, laboratory
405	Armament Research Engineering	1966	New Formalism, laboratory
413	Nuclear Engineering Testing	1957	Designed by W.C. Krueger, laboratory
760	Armament Research Test Facility	1976	Airborne Laser Laboratory Hangar
765	Test Cell	1976	Airborne Laser Laboratory, equipment testing
2634	Dangerous Cargo Pad	1974	Airborne Laser Laboratory, aircraft loading
2635	Dangerous Cargo Pad	1974	Airborne Laser Laboratory, aircraft loading
776	Butt, Firing In	1974	Airborne Laser Laboratory, laser target
774	Storage, Research Equipment	1974	Airborne Laser Laboratory, laser target
66001	Laser Science Laboratory	1970	Sandia Optical Range, laser program
66015	Revetment Pre-Engineered	1973	Sandia Optical Range, laser target
66016	Revetment Pre-Engineered	1973	Sandia Optical Range, laser target
66019	Laser Science Laboratory	1973	Sandia Optical Range, laser program
66041	Laser Science Laboratory	1976	Sandia Optical Range, laser program
66042	Device Building	1976	Sandia Optical Range, laser program
66061	Revetment Pre-Engineered	1976	Sandia Optical Range, laser target
322	Dynamics Laboratory	1972	Pulsed power, SHIVA I
1550th ATTW			
955	Flight Simulator	1977	MH-53 and H-3 helicopters
956	Flight Simulator	1981	C-130P Hercules
1013	Heating Plant	1952	International Style

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ACRONYMS & ABBREVIATIONS

A&P	Atlantic & Pacific Railroad
AAB	Army Air Base
AAC	Army Air Corps
AAF	Army Air Force
AAF	Army Air Field
ABM	Antiballistic Missile
AC&W	Aircraft Control and Warning
ACHILLES	AFWL Characterization Interim Low Level EMP Simulator
ADC	Air Defense Command
ADCC	Air Defense Control Center
ADDC	Air Defense Direction Center
AEC	Atomic Energy Commission
AFB	Air Force Base
AFCMD	Air Force Contract Management Division
AFL	Air Force Laser
AFSC	Air Force Systems Command
AFSTC	Air Force Space Technology Center
AFSWC	Air Force Special Weapons Center
SWC	Air Force Special Weapons Command
AFSWP	Armed Forces Special Weapons Project
AFTEC	Air Force Test and Evaluation Center
AFOTEC	Air Force Operational Test and Evaluation Center
AFWL	Air Force Weapons Lab
ALECS	AFWL/LASL Electromagnetic Pulse Calibration and Simulation
ALL	Airborne Laser Laboratory
AMA	Air Materiel Area
AMC	Air Materiel Command
ANG	Air National Guard
APT	Airborne Pointing and Tracking
ARDC	Air Research and Development Command
ARES	AFWL RAND Electromagnetic Pulse Simulator
ASROC	Anti-Submarine Rocket
AT&SF	Atchison Topeka & Santa Fe Railroad
AT&T	American Telephone and Telegraph
ATC	Air Training Command
ATHAMAS	AFWL Terrestrial High Altitude EMP Alert Mode Aircraft Simulator
ATLAS	AFWL Transmission Line Aircraft Simulator [Trestle]
ATTW	Aircrew Training and Test Wing
AWACS	Airborne warning and control system
BCPO	Big Crow Program Office
CAF	Continental Air Forces
CAP	Civil Air Patrol

CERF	Civil Engineering Research Facility
CMU	concrete masonry unit
DASA	Defense Atomic Support Agency
DEER	Directed Energy Experimental Range
DIHEST	Direct Induced High Explosive Simulation Technique
DNA	Defense Nuclear Agency
DoD	Department of Defense
DOE	Department of Energy
EMP	Electromagnetic Pulse
EMPTAC	EMP Test Aircraft
ERDA	Energy Research and Development Administration
FC	Field Command
FC/DASA	Field Command, Defense Atomic Support Agency
FIS	Fighter Interceptor Squadron
FTT	Field Test Telescope
GDL	Gas Dynamic Laser
GOC	Ground Observer Corps
GWEN	Ground Wave Emergency Network
HELRATS	High Energy Laser Radar Acquisition and Tracking System
HEST	High Explosive Simulation Technique
HPD	Horizontally polarized dipole
HPD	State of New Mexico, Office of Cultural Affairs, Historic Preservation Division
HQ	Headquarters
ICBM	Intercontinental Ballistic Missile
IHARDS	Improved High Altitude Radiation Detection System
IRBM	Intermediate Range Ballistic Missile
JCS	Joint Chiefs of Staff
KAFB	Kirtland Air Force Base
laser	light amplification by simulated emission of radiation
LASL	Los Alamos Scientific Laboratory
LANL	Los Alamos National Laboratory
LLL	Lawrence Livermore Laboratory
LTBT	Limited Test Ban Treaty
MAC	Military Airlift Command
MAD	Mutually Assured Destruction
MATS	Military Air Transport Service
MIRV	Multiple Independently Targetable Reentry Vehicles
MIT	Massachusetts Institute of Technology
MP	Military Police
mV	megavolt
NASWF	Naval Air Special Weapons Facility
NCO	Non-Commissioned Officer
NDRC	National Defense Research Committee
NHPA	National Historic Preservation Act
NLF	National Liberation Front
NM ANG	New Mexico Air National Guard

NMER	New Mexico Experimental Range
NMERI	New Mexico Engineering Research Institute
NMPG	New Mexico Proving Ground
NORAD	North American Aerospace Defense Command
North Vietnam	Democratic Republic of Vietnam
NOTS	Naval Ordnance Test Station
NRHP	National Register of Historic Places
NSC	National Security Council
NSC-68	National Security Council Document No. 68
NWEF	Naval Weapons Evaluation Facility
OSRD	Office of Scientific Research and Development
psi	pounds per square inch
Pulserad	Pulserad 1590
PWA	Public Works Administration
R&D	Research & Development
RACHL	Rocketdyne Advanced Chemical Laser
RAMSTAT	Recovery Airfield Monitor and Status System
RCAT	Radio Controlled Aerial Target
RDF	Rapid Deployment Force
ROI	Region of influence
SAC	Strategic Air Command
SAGE	Semi-Automatic Ground Environment
SALT I	Strategic Arms Limitation Talks I
SALT II	Strategic Arms Limitation Talks II
SAMSO	Space and Missile Systems Organization
SDI	Strategic Defense Initiative
SHPO	State Historic Preservation Office
SOR	Sandia Optical Range [1971–1984; in 1988 it became Starfire Optical Range]
South Vietnam	Government of the Republic of Vietnam
SPS	Security Police Squadron
SPTG/CEVQ	Support Group/Environmental Flight Quality Section
START	Strategic Arms Reduction Talks
SUBROC	Submarine Launched Anti-Submarine Rocket
TandTLC	Tactical and Technical Liaison Committee
TAC	Tactical Air Command
TAT	Transcontinental Air Transport
TCP	Traditional cultural properties
Technical Area I	Tech Area I
Technical Area II	Tech Area II
TEM	Transverse electromagnetic wave
TO	Theater of operations
UN	United Nations
UNM	University of New Mexico
U.S.	United States
USAAF	United States Army Air Force
USACE	United States Army Corps of Engineers

USAF	United States Air Force
UST	Underground storage tank
VCHP	Van Citters: Historic Preservation, LLC
VPD	Vertically polarized dipole
V-1	Vergeltungswaffe (German World War II bombs)
VT	variable timing
WAC	Women's Air Corps
WAE	Western Air Express
Wedge	central ground plane wedge [at Trestle]
WPA	Works Progress Administration
WSMR	White Sands Missile Range

1.0 INTRODUCTION

Van Citters: Historic Preservation, LLC (VCHP) completed this project under contract with AMEC Earth & Environmental, Inc. (AMEC) for the United States Air Force, Kirtland Air Force Base (KAFB), Support Group/Environmental Flight Quality Section (SPTG/CEVQ)—under Contract No. GS-10F-0230J. The goal of the project was to assist KAFB in meeting the requirements of Section 110 of the National Historic Preservation Act of 1966, as amended (NHPA). To do so, VCHP surveyed the installation and identified properties eligible for the National Register of Historic Places (NRHP). The identification of historic properties was the first step in the process to ensure that KAFB complies with the NHPA.

Under the NHPA, federal agencies are responsible for identifying historic properties, i.e., properties that are eligible for the NRHP. In addition, undertakings that affect properties listed on or determined eligible for the NRHP must be reviewed for compliance with the federal regulations and guidelines governing federally owned historic properties. Prehistoric properties or sites that are not considered KAFB real property were not included in this effort. The purpose of this document is to identify historic architectural properties that are eligible for the NRHP.

Note: Manzano Base properties were surveyed under a separate project.

1.1 Project Methodology

1.1.1 Survey Form and Database

The task for VCHP was to survey the entire installation, i.e., all properties on the real property list. VCHP began with that list and the draft Programmatic Agreement (PA) between the State of New Mexico, Office of Cultural Affairs, Historic Preservation Division (HPD) and KAFB. The draft PA included a list of properties that KAFB and HPD both agreed were readily identifiable as not eligible to the NRHP. These properties were identified as "PA Exempt." The PA exempt items were:

1) Structures with minimal or no visible surface manifestations and no association with historic properties (e.g., pits, underground storage tanks, underground vaults, buried material disposal areas, septic tanks, underground pipelines, sewer lines, and steam, storm, water, acid, or electrical manholes).
2) Aboveground fuel tanks.
3) Wells and boreholes.
4) Roadblock barriers and siren poles.
5) Transformer and pressure-relief valve stations.
6) Mobile trailers and modular buildings that do not meet the National Register exceptional significance criteria.
7) Sidewalks, curbs, runways, and other non-structural real property.
8) Properties less than 50 years old that do not meet the exceptional importance requirement for National Register Criterion Consideration G.

VCHP entered all properties on the real property list into a Microsoft Excel spreadsheet with name, number, date of construction, and whether the property was PA exempt or had a previous NRHP determination made by HPD. AMEC then imported the list into a project database in Microsoft Access to serve as baseline information. AMEC added fields to this baseline data from a customized survey form that VCHP developed specifically for the KAFB inventory.

VCHP developed the survey form using the existing New Mexico Historic Building Inventory Form, the architectural survey form used by Holloman Air Force Base (AFB), and discussions with KAFB, HPD, and VCHP staff. The form is a three page document with the first page serving as a NRHP eligibility summary, the second including backup data about the history of the property, and the third documenting the integrity of the property. For properties that initially appeared to have a high possibility of NRHP eligibility, the history and integrity pages were filled out before completing the NRHP summary. Only the first page was printed for properties that were ineligible, although all three may have been filled out to produce eligibility recommendations. The form and instructions for filling out the survey form are reproduced in the Appendix.

AMEC used the KAFB/HPD-approved VCHP form (in Microsoft Word) to develop the fields in the Microsoft Access database, which in turn printed a report in the format of the approved survey form. VCHP intends this database to serve as a management tool for KAFB. If a property was recommended eligible, additional information about the character-defining features was entered. Character-defining features are those visual aspects and physical features that embody the architectural or historic significance of a building. If these features are lost, the integrity of the building may be lost, changing its NRHP eligibility status. When work orders for historic properties are to be reviewed, KAFB can quickly identify projects that will have an Adverse Effect on those properties by reviewing information in the database. To provide an additional management feature, AMEC tied the current KAFB tracking method for HPD correspondence into the survey database so that Section 106 compliance can be tracked using a single database.

1.1.2 Historic Context

As the form and database were being developed, VCHP began research to develop a historic context with which properties could be evaluated for NRHP eligibility. The historic context identifies important themes and events under which properties may be considered eligible for the NRHP. The process used by VCHP to evaluate properties at KAFB is that developed by the NRHP and set forth in *National Register Bulletin 15* and *Coming in from the Cold: Military Heritage in the Cold War.*

Because the KAFB installation is located on land that was used by homesteaders and mining operations, settlement and industry that were encouraged by acts of Congress, the history was researched back to the first Anglo influence in the Albuquerque area. And, because the civic leaders of Albuquerque were instrumental in securing the location of a military installation near the city, an effort was made to identify the context within which the municipal airport and Army base were developed. State, local, and KAFB archival resources were searched in an effort to gather the most comprehensive information, including historic photographs and maps, concerning the development of the base, its missions, and the facilities that were constructed to support those missions.

Maps summarizing the historical development of the base were produced by VCHP from a base map provided by AMEC and from historic maps located at the UNM Map and Geographic Information Center, KAFB Civil Engineering flat files (including base summary real estate maps), and past reports. Combining information from the available sources resulted in a series of map overlays illustrating East Mesa development and identifying the various airports and military installations during the different periods of land use on the acreage that became KAFB.

The periods and phases of the historic context that aided in the evaluation of properties on the installation are as follows:

- 1880 – 1928 Early Albuquerque
- 1928 – 1939 Barnstormers to Bombardiers
- 1939 – 1945 WWII Bombers, Training and Testing
- 1945 – 1989 The Cold War
    - Phase I: Inception of the Cold War (July 1945 – April 1952)
    - Phase II: Nuclear Technology Escalation (April 1952 – April 1961)
    - Phase III: Détente (April 1961 – June 1977)
    - Phase IV: A New Deterrence (June 1977 – November 1989)

From the periods developed in the historic context, a list of NRHP areas of significance that related to KAFB was developed. This list was further subdivided into historic themes. From the historic themes, a list of property types was developed using known information about the themes, the historic context, and the current KAFB real estate list. These property types were updated as new types were discovered during survey. The lists of themes and property types are provided in Chapter 10.

During the course of the project, numerous resources were used to gather information about the history of KAFB. These archival resources included:

- Air Force Research Laboratory Phillips Research Site Historical Information Office
- Air Force Research Laboratory, Directed Energy Directorate, High Power Microwave Division
- Albuquerque Museum
- Albuquerque Public Library
- Amon Carter Museum
- City of Albuquerque Advanced Planning Library
- Kirtland Air Force Base, Environmental Section files (377th SPTG/CEVQ)
- Kirtland Air Force Base, Civil Engineering map room
- Kirtland Air Force Base, Real Property files
- Kirtland Air Force Base, 377th Air Base Wing History Office
- Kirtland Air Force Base Library
- National Atomic Museum

- New Mexico Cattlegrowers Association
- New Mexico Institute of Mining and Technology
- New Mexico State Records and Archive Center
- Sandia National Laboratories
- Los Alamos National Laboratory
- United States Geological Survey Photographic Library, Denver
- University of New Mexico
  - The Center for Southwest Research
  - Centennial Library (Engineering)
  - Map and Geological Information Center (MAGIC—map room at Centennial Library)
  - Zimmerman Library
  - Clark Field Archive

1.1.3 Field Survey

VCHP field-evaluated all properties that were not considered PA exempt. Fieldwork consisted of visiting each property, taking photographs, and noting architectural features and changes to the building. Photographs were taken both digitally (for use in the database) and with a traditional 35 mm camera (for archival storage). The traditional 35 mm photos were taken using black-and-white film, from which fiber contact sheets were made. The negatives, fiber contact sheets, and photo logs (on archival paper) were developed into a photo notebook and delivered to KAFB. An additional notebook with only contact sheets and photo logs was also delivered to KAFB.

1.1.4 NRHP Process

In order for a property to be eligible for the NRHP, it must be significant. It must represent an important part of history, architecture, archaeology, engineering, or culture and it must retain the characteristics that embody it as a representative property associated with such an aspect of the past. Five NRHP facets were used to determine whether a property is significant within a specific historic context. For purposes of this KAFB survey project, the first three facets, as they relate to the historic context that was developed for this project, are:

1) That the military history of KAFB is important on the state and national level;
2) That many of the activities at the installation have historic significance; and
3) That certain property types are important in illustrating the historic activities.

The remaining two facets were determined on a property-by-property basis, taking into consideration the historic context, the in-field evaluation, and data from additional research. These two remaining facets are:

4) How a property illustrates its historic significance; and
5) If that property retains the physical features necessary to convey that significance.

VCHP evaluated the latter two facets using the NRHP criteria for eligibility and seven aspects of integrity. The NRHP criteria are tools to aid in determining whether a property is significant by virtue of its association with important events or persons, its importance in design or construction or its potential to yield information. The following criteria are those that were most likely to be applicable to facilities at KAFB:

> Criterion A: Event
> A property that is "associated with events that have made a significant contribution to the broad patterns of our history" (National Park Service 1995).
> Criterion C: Design/Construction
> A property that embodies "the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction" (National Park Service 1995).
>
> Criteria Consideration G: Properties that have achieved significance within the past 50 years
> A property that "achieves significance within the past fifty years is eligible if it is of exceptional importance" (NRHP 1991:41).

In order for a property to convey its significance, it must retain integrity. There are seven aspects of integrity:

1) Location: place where a property was constructed.
2) Design: combination of elements that create the form of a property.
3) Setting: physical environment of the historic property.
4) Materials: the physical elements combined at a specific period in time in a specific configuration to form a historic property.
5) Workmanship: physical evidence of the crafts of a particular culture during a given period.
6) Feeling: expression of the historic sense of a particular period in time.
7) Association: direct link between an important event and the historic property.

Not all aspects of integrity are weighted equally for every property, but a property typically possesses several or most of the aspects of integrity in order to convey its significance. To determine whether a property retains its integrity, one must first identify the historic context and the character-defining features. These are the features that relay the property's historic and architectural or engineering significance. The property must retain these features in order to retain integrity and be considered eligible for the NRHP.

Each property at KAFB was evaluated with regard to the historic context—i.e., did it represent an important period/theme in the history of the installation and did important activities take place at the property. If a property appeared to be significant, VCHP evaluated it for integrity. Drawings and historic photographs were retrieved from archives to determine the extent of the architectural or physical changes that may have impacted the property's overall character and importance. Properties that could no longer illustrate their historic significance were recommended as "not eligible." Once VCHP collected and reviewed the data, the staff entered the information into the database. At the end of the project, AMEC installed the database on the SPTG/CEVQ computer at KAFB, and VCHP delivered this report (hard and electronic copy) and all data research notebooks.

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2.0 KIRTLAND HISTORIC CONTEXT TIMELINE

To serve as a resource for pinpointing important events at Kirtland Air Force Base, the historic context has been distilled into bulleted points on a timeline. This was intended for use during survey to enable quick identification of events, dates, missions, and the groups involved as a means to tie buildings to the history of the installation. In-depth information about these events is found in the narrative context that follows this chapter.

2.1 Albuquerque During the 1800s

This first phase of the Kirtland Air Force Base historic context traces the development of Albuquerque as the city that would eventually welcome the military base in the 1940s. Rapid growth of Albuquerque began with the arrival of the Atchison, Topeka and Santa Fe railroad in 1880. The railroad drew settlers, miners, tuberculosis sufferers or "healthseekers," and eventually tourists to the town, and established Albuquerque as a transportation and shipping center. On the East Mesa, the lands on which the military base would be built, homesteads and mining claims were established and there was an increase in livestock traffic across the mesa to the railroad. This phase also saw the introduction of aviation at Albuquerque. In the 1920s, the mesa became a showplace for stunt flyers or "barnstormers" who captured the public's fancy with air shows. This phase ends in 1928, on the eve of the building of the city's first airport—an event that produced dramatic changes for Albuquerque.

1880

- **Miners arrive**
  As a result of the 1872 Mining Act, which encouraged settlement of the West, miners begin to travel to Albuquerque via railroad and claims begin to be established in the Tijeras Canyon district.

1884

- **Livestock boom**
  After the arrival of the railroad in 1880, vast numbers of sheep and cattle are driven across the East Mesa to the stockyards and railhead at Albuquerque.

1886

- **Coyote Springs develops**
  Adolph Harsch develops Coyote Springs on the East Mesa by selling spring water through his Coyote Springs Bottling Plant in Albuquerque. Harsch also builds a house at the springs and rents rooms to tourists and healthseekers wanting mineral baths.

1902

- **St Joseph's is established**
  The Sisters of Charity build the St. Joseph's Sanitarium for tuberculosis patients seeking "The Cure" in Albuquerque. It is the first hospital in Albuquerque, preceding

Southwestern Presbyterian Sanatorium and Albuquerque Sanatorium, which open within the same decade to heal healthseekers.

1912

- **Homesteaders arrive**
  The first wave of homesteaders to the East Mesa begins and lasts until 1919. Under the Homestead Act of 1862, any citizen 21 years of age or older can claim and eventually own 160 acres of land. Two more waves follow in the 1920s and 1930s.

2.2 Barnstormers to Bombardiers

In 1928, Albuquerque homesteader Frank Speakman built the city's first airport on the East Mesa, prompting both Transcontinental Air Transport and Western Air Express airlines to offer service in Albuquerque. The city became a crossroads of Southwest air traffic. Shortly thereafter, the Great Depression led to work relief programs like the Public Works Administration and the Works Progress Administration. Clyde Tingley, who became governor in 1934, successfully sought federal aid for both the state and Albuquerque through those programs. This federal aid resulted in numerous building projects, including a new municipal airport on the East Mesa, which became division headquarters for Trans World Airlines, formed by the merger of Transcontinental Air Transport and Western Air Express. This phase ends with the opening of the new Albuquerque Municipal Airport in 1939.

1928

- **Albuquerque Airport**
  Homesteader Frank Speakman and a friend lease 140 acres of land on the East Mesa and build an airport. James Oxnard joins the venture in early summer and establishes Airport Holdings, Inc. The Albuquerque Airport opens in July.

1929

- **Transcontinental Air Transport and Western Air Express arrive**
  Commercial airlines Transcontinental Air Transport and Western Air Express set up operations at Albuquerque Airport.

1930

- **Trans World Airlines established**
  Transcontinental Air Transport and Western Air Express merge to form Trans World Airlines. Trans World Airlines operates out of a new airfield, which becomes known as Albuquerque Airport, on the West Mesa. Speakman's airport is renamed Oxnard Field, which provides services to general aviation and serves as a stop for air racing.

1932

- **Veterans Hospital**
  The East Mesa becomes home to a Veterans Hospital. Fifteen buildings sit on 516 acres.

1936

- **Sandia School**
  Former Congresswoman Ruth Hanna McCormick Simms builds the Sandia School for young girls on 126 undeveloped acres of East Mesa lands. The complex is built to house 80 students.

1939

- **Albuquerque Municipal Airport**
  A new Albuquerque Municipal Airport, constructed with funds from the Works Progress Administration, opens west of Oxnard Field. Trans World Airlines moves to the new airport.

- **War impending**
  Under Adolph Hitler's rule, Germany annexes the remainder of Czechoslovakia, and Italy seizes Albania. Great Britain and France establish alliances with Turkey, Greece, Romania, and Poland. Germany and Italy then sign a full military alliance. The Army Quartermaster General begins plans for construction of new military bases.

2.3 World War II Bombers, Training and Testing

The year 1939 saw the outbreak of World War II in Europe. In the United States, President Roosevelt called for an air force strong enough to defeat Hitler. The Army Air Corps needed bases across the United States. Albuquerque Municipal Airport was chosen as an Army Air Station and land adjacent to the airport was leased for an Army Air Corps base. During World War II, the new base was named Kirtland Field and functioned as a training center for bombardiers, pilots, and navigators. It also served as a transportation center for the scientists building the atomic bomb in Los Alamos, as well as for the actual bomb components in transit to the South Pacific for airdrops on Japan. Adjacent to Kirtland Field, the Army established a training station for aircraft mechanics, which was known as the Air Depot Training Station. This depot was later to become a convalescent center and then a bomber burial ground. South of the new base, on almost 50,000 acres of ranch lands, the New Mexico Proving Ground was developed for testing of the proximity fuze, which served the Allies well in combating German aircraft and bombs, including the V-1 buzz bomb. This phase ends in July 1945 just prior to the testing of the first atomic bomb at the Trinity site in southern New Mexico. World War II was about to end.

1939

- **Army Air Station**
  The United States War Department chooses Albuquerque Municipal Airport as an Army Air Station. Albuquerque's airport is one of only ten facilities in the United States to receive state-of-the-art radio landing equipment as part of a $7 million National Defense Program. The Army leases 2,000 acres adjacent to the Albuquerque Municipal Airport from the city. An Army Air Corps unit is dispatched to service transient military aircraft.

- **World War II**
  World War II begins when Germany invades Poland. Great Britain and France declare war on Germany.

1941

- **New base**
  Construction begins on base buildings. The firm of Morgan and Shufflebarger is contracted to build 110 buildings. The existing 5,000-foot, north-south airport runway is lengthened to 10,000 feet.

- **Albuquerque Army Air Base**
  Albuquerque Army Air Base is activated on 8 March as a training center under the Army Air Corps West Coast Training Center, one of three Army Air Corps training centers in the country.

- **19th Bombardment Group**
  The 19th Bombardment Group arrives on base in April to train air and ground crews for reconnaissance and bombing in the Philippine Islands. The group trains on B-17 Flying Fortresses and departs for the Pacific beginning in September.

- **Four-Engine School**
  The Air Corps Ferrying Command Four-Engine Transition School is established at the new base. Trans World Airlines is selected to train pilots to ferry B-24 bombers to the Royal Air Force in Great Britain. The Albuquerque base is chosen because of the length of its runway and ideal flying weather.

- **Army Air Forces**
  The United States Army Air Corps is redesignated the Army Air Forces. General Henry "Hap" Arnold is appointed commanding general of the new service.

- **Pearl Harbor**
  The United States declares war following the Japanese bombing of Pearl Harbor.

- **Bombardier School**
  The Army Air Forces Advanced Flying School is established on base with the departure of the 19th Bombardment Group. The nation's first permanent bombardier training school, it operates under the United States Army Air Forces Western Flying Training Command. Elements of the school begin to arrive after Pearl Harbor. Training begins on AT-11 Kansans and B-18A Bolos.

1942

- **Manhattan Project**
  The Manhattan Project, tasked to build an atomic bomb, sets up operations at Los Alamos, 100 miles north of Albuquerque. Physicist Robert Oppenheimer and United States Army Brigadier General Leslie Groves direct scientific and military activities there.

- **New Mexico Proving Ground**
  University of New Mexico physicist Jack Workman begins acquiring lands on the East Mesa to form the New Mexico Proving Ground for the National Defense Research Committee. The National Defense Research Committee contracts with the University of New Mexico to administer the site. The proving ground is planned for tests of the proximity fuze for antiaircraft artillery.

- **Kirtland Field**
  On the recommendation of General Arnold, Albuquerque Army Air Base is renamed Kirtland Field for Colonel Roy C. Kirtland, a pioneer Army aviator.

- **Bomb ranges**
  Military and Works Progress Administration employees lay out bomb ranges for bombardier training west and southwest of Albuquerque.

- **First graduates**
  The Advanced Flying School graduates its first class of 61 bombardiers.

- **Glider training**
  The Glider Replacement Center, a ground school for glider pilots, is established at Kirtland Field. It serves as a temporary training area for glider pilots waiting for vacancies at permanent glider schools.

- **Combat Crew Training School**
  The Four-Engine Transition School is transferred from Trans World Airlines to the Army Air Forces and redesignated the Combat Crew Training School. The school transfers from Albuquerque to Tennessee in July.

- **Air Depot Training Station**
  The Army acquires 1,100 acres of land on the East Mesa and establishes the Albuquerque Air Depot Training Station, a training center for aircraft mechanics. Included in the 1,100 acres is the purchase of Oxnard Field from Airport Holdings, Inc. The station is activated in May.

1943

- **Glider school closes**
  The Glider Replacement Center at Kirtland Field is disestablished.

- **Women's contingent**
  A Women's Army Auxiliary Corps contingent is established at Kirtland Field. A total of 45 women arrive on base.

- **B-24 pilot training**
  Kirtland Field becomes host to an Army Air Forces B-24 Pilot Transition School designed to train airplane commanders. Transition training is the final step after

completion of advanced flying school. The new program is specifically for B-24 Liberator bomber pilots.

- **38th Flying Training Wing**
  Headquarters of the 38th Flying Training Wing moves to Kirtland Field from Roswell, New Mexico. The 38th holds jurisdiction over Kirtland Field as well as the Hobbs, Roswell, and Carlsbad Army air fields in New Mexico; Williams Field in Arizona; and Victorville Air Field in California.

- **Proximity fuze testing**
  Jack Workman and his crew begin testing prototypes of the proximity fuze at the New Mexico Proving Ground.

- **Air Depot Training Station closes**
  After training four Air Base Groups at the Air Depot Training Station, the Army closes the station in October. It is renamed the Albuquerque Army Air Field.

- **Hospital**
  The Army Air Forces begin leasing the former Sandia School complex for use as a hospital. This is in keeping with the War Department's policy to utilize existing buildings when facilities are required.

1944

- **509th Composite Group**
  The Army Air Forces activates the 509th Composite Group, a top-secret unit formed to deliver atomic bombs. The 509th Composite Group sets up operations at Wendover Army Air Base in Utah and begins training on B-29 Silverplate bombers, reconfigured specifically to carry the bombs.

- **Proving grounds**
  Jack Workman secured rights to more than 30,000 acres of land on the East Mesa for the New Mexico Proving Ground. These lands, formerly used for ranching and mining, extend from the southern end of the Manzano Mountains south to Isleta Pueblo. The proximity fuze proves victorious against German V-1 buzz bombs and causes a sensation in the press.

- **Convalescent Center**
  The Albuquerque Army Air Field is redesignated an Army Air Forces Convalescent Center, under the Air Service Command, for wounded pilots and aircrew recovering from surgery. Barracks and support facilities are used for quarters in conjunction with the hospital at the former Sandia School. The Convalescent Center offers occupational therapy, ranging from classes in Spanish and business to celestial navigation and simulated flight training. The first patients arrive in April.

1945

- **School deactivates**
  The 38th Flying Training Wing departs Kirtland Field for Williams Field in Arizona, and the Advanced Flying School is deactivated.

- **Superfortress base**
  Kirtland Field is assigned to the Second Air Force and begins serving as a B-29 Superfortress base in support of the Manhattan Project and the incendiary bombing raids on Japan. B-29 crews arrive for training in April.

- **Convalescent Center closes**
  The Army Air Forces Convalescent Center closes in April, as the need for its services is no longer pressing. The base again becomes the Albuquerque Army Air Field.

- **Bomber burial ground**
  The Reconstruction Finance Corporation begins using the Albuquerque Army Air Field as a storage area for aircraft awaiting disposal. Aircraft not sold to the public or bought at auction are chopped into sections and reduced in a smelter located near the old Oxnard Field hangars.

- **Germany surrenders**
  Germany surrenders to the Allies on 7 May.

2.4 Phase I: Inception of the Cold War

The first phase of Kirtland Air Force Base Cold War history begins in July 1945 with the testing of the first atomic bomb at Trinity Site, Alamogordo Bombing Range. After the bombing of Japan and the close of World War II, this new weapon becomes the means for deterrence of a third world war as both the United States and the Soviet Union entered the Cold War and immediately focus on the development of warheads. During this phase, the United States military and scientific communities struggle to set up a framework for researching and developing nuclear weapons. Situated under the umbrella of the Air Research and Development Command, and because of its proximity to the newly established Sandia Laboratory and the Armed Forces Special Weapons Project, the military installation at Albuquerque became the center of United States Air Force nuclear research and testing. Phase I of the Cold War era ends in April 1952 with the establishment of the Air Force Special Weapons Center at Kirtland Air Force Base. The Air Force Special Weapons Center is a fully organized group dedicated to working with Sandia and Los Alamos laboratories on aircraft and weapon marriages.

1945

- **Trinity Site**
  After three years of top-secret research and development, Manhattan Project scientists explode the world’s first atomic bomb in the pre-dawn hours of 16 July. “The Gadget,” as it was called, is detonated atop a 100-foot tower at the north end of Alamogordo Bombing Range.

- **Hiroshima and Nagasaki**
  The 509th Composite Group drops atomic bombs on Hiroshima on 6 August and Nagasaki on 9 August.

- **World War II ends**
  A defeated Japan announces its surrender on 14 August.

- **Change in command**
  Kirtland Field's tenure as a Superfortress Base ends in October, but the base remains under the jurisdiction of the Second Air Force.

- **Sandia Base established and Z Division moves in**
  At the Manhattan Project site in Los Alamos, the Z Division is organized to improve, test, and produce ordnance for new generations of atomic bombs and to work on the assembly of a nuclear stockpile from existing components. Z Division moves to the Albuquerque Army Air Field to relieve space constraints at Los Alamos, and in order to work closely with the military at Kirtland Field. The site assumes the name "Sandia Base." Tech Area 1 is established for the Z Division classified operations.

1946

- **Command changes**
  Kirtland Field transfers from the Second Air Force to the Fourth Air Force in January, and then to the Fifteenth Air Force in March.

- **New Mexico Proving Ground is transferred to New Mexico School of Mines**
  The New Mexico Proving Ground authority transfers from the University of New Mexico to the New Mexico School of Mines. The proving ground remains near Albuquerque but is renamed the New Mexico Experimental Range and its staff moves into the former Sandia School complex.

- **2761st Engineer Battalion (Special) established**
  The Manhattan Engineering District sends Colonel Gilbert Dorland to command Sandia Base and organize the 2761st Engineer Battalion (Special), intending to manage the postwar nuclear weapon ordnance program. The battalion is in charge of base housekeeping and security and begins bomb assembly training.

- **W-47 Project moves to Albuquerque**
  The W-47 Project—the wartime training of the 509th Composite Group to drop bombs on Hiroshima and Nagasaki—moves from Wendover Army Air Base to Kirtland Field and Sandia Base. Elements of the 509th Composite Group set up at the Albuquerque installation to continue work on bomb assemblies, and bomb and aircraft marriages.

- **Ground Training Program at Kirtland Field**
  Postwar base operations increase in the summer with the organizing of a Ground Training Program at Kirtland Field. New units and aircraft arrive on base. Training begins in

navigation, bombing, chemical warfare, physical training, and use of the gunnery range. The servicemen are being readied for Operation CROSSROADS.

- **Operation CROSSROADS**
  The first postwar atmospheric test series, the second and third tests of atomic bombs (Able and Baker), take place in the Pacific. A Joint Task Force oversees the proceedings. Los Alamos scientists and representatives of each military service take part in the tests. The mission is to learn how to maximize the effects of the bombs, gather information about the post-explosion environment, and observe their effects on human beings and military equipment.

- **Armstrong Committee**
  A small group of Army Air Force officers at Kirtland Field forms the Armstrong Committee. The committee's goal is to develop training programs to teach Army Air Force personnel to handle nuclear weapons. Reports are written on strategic application of the bomb, and the organization and types of military units that should handle the new weapons.

- **Atomic Energy Act passed**
  In an effort to determine United States policies concerning nuclear weapons, the Atomic Energy Act of 1946 includes the provision for the Atomic Energy Commission: a full-time, five-member civilian federal agency designed to oversee American nuclear policies and practices. The Atomic Energy Commission is to take jurisdiction over nuclear research and development from the military and become responsible for the development, manufacture, and custody of atomic weapons.

- **Military Liaison Committee**
  While the Atomic Energy Commission has control over atomic weapons, the United States president has the authority to transfer or delegate the functions to the military. The Military Liaison Committee is established as a liaison between the military and the civilian committee. The head of the Armed Forces Special Weapons Project and his deputy serve as members of the Military Liaison Committee.

- **Civil Air Patrol at Kirtland Field**
  The Civil Air Patrol operates a unit at Kirtland Field. A volunteer network of pilots and aviators established during World War II, the unit performs coastal patrol for enemy submarines, search and rescue missions throughout the country, and cargo and courier flights to transport materials and personnel.

- **Change in command**
  Kirtland Field is assigned to the Air Materiel Command's San Antonio Air Materiel Area, a command that lasts three years.

1947

- **Tactical and Technical Liaison Committee established**
  A new organization titled the Tactical and Technical Liaison Committee, developed from the Armstrong Committee, is established at Kirtland Field to provide a formal liaison between the Armed Forces Special Weapons Project and Sandia Base. In the same year, the committee is redesignated the Special Weapons Group, Deputy Chief of Staff, Materiel, Headquarters, United States Air Force.

- **Kirtland officially becomes the Army Air Force atomic weapons facility**
  Air Materiel Command establishes Kirtland Field as the Army Air Forces nuclear weapons facility to work on ballistics, handling equipment, aircraft modification, and development testing for existing and proposed atomic bombs.

- **United States Air Force established**
  The National Security Act of 1947 establishes the United States Air Force as a separate branch of the armed forces, as well as the office of the Secretary of Defense, the Joint Chiefs of Staff, the National Security Council and the Central Intelligence Agency.

- **New Mexico Air National Guard assigned to Kirtland Field**
  The New Mexico Air National Guard is assigned to Kirtland Field and federally recognized as the 188th Fighter Bomber Squadron.

- **Truman Doctrine**
  The Truman Doctrine calls for economic aid to Europe after economic depression causes the British to stop aid to Greece and Turkey. It offers an economic recovery plan to all European countries for rebuilding and strengthening the independence of countries not under Soviet influence. The Truman Doctrine marks the beginning of the United States containment policy to curtail Soviet influence in Europe.

- **Atomic Energy Commission established**
  The Atomic Energy Commission is formally established to oversee American nuclear policies and practices, as provided for in the Atomic Energy Act. The panel includes a military liaison to ensure a smooth transition from the development and storage of weapons to their use.

- **Armed Forces Special Weapons Project established**
  The Armed Forces Special Weapons Project is established to administer all military functions relating to atomic energy in coordination with the Atomic Energy Commission. The Armed Forces Special Weapons Project assumes all Manhattan Engineering District functions not relegated to the Atomic Energy Commission and focuses on readiness by training for both offensive and defensive warfare, studying the effects of these new weapons, and supporting postwar national defense planning.

- **B-36 arrives at Kirtland Field**
  The 3170th Special Weapons squadron at Kirtland Field receives the Convair B-36

aircraft, a state-of-the-art bomber weighing 300,000 pounds. Only a small number of installations with runways long enough to accommodate the B-36 receive the aircraft. At Kirtland Field, the B-36 is modified to carry atomic weapons. The XB-47 jet arrives for modifications shortly after the B-36.

1948

- **Kirtland Field renamed Kirtland Air Force Base**
  In January, Kirtland Field is renamed Kirtland Air Force Base to respond to the 1947 establishment of the United States Air Force.

- **Operation SANDSTONE**
  Operation SANDSTONE takes place in the Marshall Islands to test the first new weapons designs produced at Los Alamos since the war. It differs from Operation CROSSROADS in that the Atomic Energy Commission organizes it with the armed forces providing support. The operation demonstrates the feasibility of a lightweight bomb. A new core design allows the weapon to be prefabricated, thus marking the change from a laboratory device to a production weapon.

- **Tech Area II established**
  Z Division operations at Sandia Base expand, necessitating the building of Tech Area II. It is designed as a weapons assembly facility. Between 1948 and 1952, Tech Area II is the primary assembly site for America's nuclear weapons.

- **Z Division renamed Sandia Laboratory**
  Z Division is renamed Sandia Laboratory, a separate branch of the University of California's Los Alamos Scientific Laboratory. There is a concerted effort to recruit and employee numbers jump.

- **Project Water Supply**
  The United States Army Corps of Engineers under the supervision of Sandia Laboratory begins Project Water Supply – the design and construction of underground storage sites for nuclear weapons. Designs are completed for three sites – Site Able near KAFB and Sandia Base, site Baker at Killeen Base, Texas, and Site Charlie on Clarksville Base, Kentucky.

- **Berlin Crisis**
  The Soviets blockade all land routes leading into West Berlin through East Germany. Cold War tensions between the United States and Soviet Union greatly increase.

- **Atomic Energy Commission buys Experimental Range properties**
  Jack Workman is informed that the Atomic Energy Commission wants the nearly 50,000-acre New Mexico Experimental Range and the Sandia School for its own purposes. Workman persuades the state to exercise its right to buy the Sandia School for $300,000. The state sells the school to the Atomic Energy Commission for $640,000. Workman is allowed to use the profits from the sale to construct new laboratory facilities at the New Mexico School of Mines in Socorro.

1949

- **Site Able opened**
  Site Able east of Sandia Base and Kirtland Air Force Base opens for weapons storage. The Armed Forces Special Weapons Project, 8460th Special Weapons Group operates the facilities. Sandia Corporation stations staff at the site to monitor, maintain, and assemble the weapons with military assistance. The weapons and nuclear cores remain in the custody of the Atomic Energy Commission.

- **Naval Air Detachment**
  Interested in developing its own nuclear capabilities, the Department of the Navy establishes a Naval Air Detachment at Kirtland Air Force Base in order to provide a liaison with the Armed Forces Special Weapons Project. Its mission is to provide specific naval aircraft with nuclear bomb carriage and delivery capability.

- **Soviet detonation of atomic weapon**
  The Soviets detonate their first atomic bomb in August, causing the United States to reevaluate its foreign policy and defense strategies. President Truman authorizes the development of the hydrogen bomb, rapid deployment of long-range bombers, and enacting additional reconnaissance.

- **United States enters the North Atlantic Treaty Organization**
  The North Atlantic Treaty Organization is formed to defend 10 nations of western Europe located in an arc from Norway to Italy. The United States joins to bolster the positive effects of the Marshall Plan.

- **Air Force Special Weapons Command established**
  The Air Force Special Weapons Command is established and headquartered at Kirtland Air Force Base as a separate command of the United States Air Force equal to the Air Materiel Command, Strategic Air Command, and Tactical Air Command. Assuming all functions of the Tactical and Technical Liaison Committee, its mission is to provide an organization for the development and testing of special weapons.

- **81st Fighter Interceptor Wing located at Kirtland Air Force Base**
  Kirtland Air Force Base hosts the 81st Fighter Interceptor Wing, one of the earliest alert Air Defense Command fighter interceptor wings created for air defense of the United States. It remains on constant alert.

- **Workman's proving ground moves**
  Jack Workman establishes the New Mexico Experimental Range at Socorro, New Mexico. Sandia Base takes over the 50,000 acres vacated by the range near Albuquerque.

1950

- **National Security Council Document No. 68**
  National Security Council Document No. 68 concludes that the Soviet Union is set on world domination and will neutralize the United States' atomic advantage by 1954. It

urges a build up of conventional military capabilities and the development and production of a thermonuclear hydrogen bomb.

- **Air Research and Development Command established**
  The Air Research and Development Command is established in September as a separate military command devoted to research and development with a focus on technical innovation to develop superior weaponry. The command gains responsibility for the overall special weapons program—atomic, biological, and chemical systems with an emphasis on developing warheads for missiles.

- **Albuquerque Air Defense Area Established**
  Kirtland Air Force Base becomes headquarters for the Albuquerque Air Defense Area, considered a high air-defense priority owing to the proximity of Sandia Laboratory, Los Alamos Scientific Laboratory, and the nuclear weapons stockpile.

- **4925th Special Weapons Group established**
  The 4925th Special Weapons Group is established under the Air Force Special Weapons Command at Kirtland Air Force Base. The group is tasked with testing all aircraft in the United States inventory for nuclear weapons delivery capability.

- **Korean War begins**
  The Communists invade South Korea in June, dispelling the notion that atomic superiority alone will deter military aggression. The United States' response, under President Truman, is to renew efforts in weapons development and production, with particular emphasis on offensive weapons.

1951

- **Military Weapons Effects Program**
  The ongoing series of full-scale nuclear tests in the Pacific, which began with Operation CROSSROADS and continued throughout the 1950s, is named the Military Weapons Effects Program. These survivability tests are critical for the design of United States offensive and defensive weapons systems.

- **Armed Forces Special Weapons Project Test Command**
  Armed Forces Special Weapons Project Test Command is established to plan for future full-scale nuclear tests.

- **34th Air Division (Defense) established at Kirtland Air Force Base**
  Kirtland Air Force Base becomes headquarters for the Air Defense Command's 34th Air Division (Defense). An Air Defense Direction Center is built at Kirtland Air Force Base to direct air surveillance activities in the area, considered a high priority because of the nuclear activities at Kirtland Air Force Base, Sandia Base, and Los Alamos Scientific Laboratory. It is one of the first established in the United States.

2.5 Phase II: Nuclear Technology Escalation

The establishment of the Air Force Special Weapons Center in April 1952 provided a framework for interaction between the United States Air Force and scientific laboratories. At the national level, Dwight Eisenhower begins his presidency in 1952 by implementing a "New Look" policy, which focused on maximum military power using nuclear weapons. Because of this focus on United States nuclear capabilities, the 1950s produced constant collaboration amongst the Air Force Special Weapons Center, Sandia Base, and Los Alamos Scientific Laboratory (LASL) concerning the development of new weapons and aircraft to carry them. The Navy soon followed the United States Air Force in establishing its own nuclear warfare capability test center, the Naval Air Special Weapons Facility, at Kirtland Air Force Base. The decade saw the invention of the thermonuclear bomb and the first long-range missiles, and the atmospheric testing of nuclear weapons. Phase II ends with a reorganization of priorities at the base when Kirtland transferred from the Air Research and Development Command to the Air Force Systems Command in April 1961.

1952

- **"New Look" Strategy**
  The Eisenhower Administration's New Look strategy focuses on maximum weapon effectiveness at minimum cost: It encourages the use of nuclear weapons, which are less expensive than conventional weapons. New Look also encourages the threat of massive retaliation to thwart Communist aggression.

- **Site Able renamed Manzano Base**
  Site Able, renamed Manzano Base, becomes separate from Sandia Base and reports to United States Air Force Field Command, Armed Forces Special Weapons Project. New facilities, administrative and storage, are added at the installation throughout the 1950s.

- **The Korean War Ends**
  Stalin's death triggers uncertainty in the Chinese regarding future Soviet foreign policy, and third-party Indian diplomats receive hints from Secretary of State Dulles that a policy of "absolute deterrence" or an all-out nuclear attack might be employed against the Chinese. Soon after, the armistice is signed ending the Korean War.

- **Air Force Special Weapons Center is established**
  As responsibility for Kirtland Air Force Base transfers to the Air Research and Development Command, the Air Force Special Weapons Command is renamed the Air Force Special Weapons Center, which becomes one of the distinct research and development centers within the command. Its mission is to ensure the atomic capability of aircraft and missiles.

- **Naval Air Special Weapons Facility**
  The Naval Air Detachment at Kirtland Air Force Base is renamed the Naval Air Special Weapons Facility, signaling increased Navy involvement in the special weapons field. Its mission is to adapt special weapons to naval aircraft.

1953

- **Soviet Union detonates a hydrogen bomb**
  The Soviet Union detonates a hydrogen bomb in August, causing the United States to reassess its military capacity to deter a first-strike attack by the Soviets.

- **4926th Test Squadron (Sampling) established at Air Force Special Weapons Center**
  The 4926th Test Squadron (Sampling) is established for nuclear cloud sampling during atmospheric testing. Analyses of samples collected from atomic clouds are considered the most accurate method of determining the efficiency and yield of a nuclear device. Air Force Special Weapons Center scientists accompany the squadron on sampling missions in order to assess effects on humans.

1954

- **Killian Report**
  Also referred to as the Surprise Attack Study, the Killian Report recommends the study of limited nuclear war as an alternative to massive retaliation and Mutually Assured Destruction. It also recommends development of United States Air Force Intercontinental Ballistic Missiles, Intermediate Range Ballistic Missiles, and research and development for anti-missile systems and intelligence gathering.

- **Air Force Special Weapons Center and the MB-1 Genie**
  The Air Research and Development Command assigns the Air Force Special Weapons Center its first nuclear missile project in mid-May 1954. The Air Force Special Weapons Center is tasked with developing an atomic warhead for an air-to-air rocket. The final result is the MB-1 Genie, an air-to-air, unguided, nuclear-tipped rocket designed to be armed in the air moments before being fired.

1955

- **Kirtland expands its runway**
  The Air Force Special Weapons Center oversees the master-planned extension of the east-west runway from 10,173 feet to 13,373 feet, maintaining its status as one of the longest in the nation.

- **USAF Albuquerque Air Defense Filter Center established**
  A Ground Observer Corps filter center is established at Kirtland Air Force Base. The United States Air Force Albuquerque Air Defense Filter Center is the first of its kind nationwide to be designed and built. It houses all facilities for administration, training, and active operations of the Ground Observer Corps, a group of civilian volunteers assisting with early warning air surveillance in the event of a Soviet attack.

1956

- **Blast Effects Research Group**
  The Blast Effects Research Group is transferred from Wright Air Force Base, Ohio to the Air Force Special Weapons Center's Research Directorate. It is renamed the Structures

Division and its primary objective becomes developing design criteria for hardened underground structures and other inputs to aid in the design of missile installations.

- **4950th Test Group (Nuclear)**
  The Air Force Special Weapons Center establishes the 4950th Test Group (Nuclear) to serve as a permanent United States Air Force Air Task Group for atmospheric testing. The 4950th assumes responsibility for units stationed in the Pacific and in Nevada, as well as the 4926th Test Squadron (Sampling).

1957

- **Soviets launch Sputnik I and II**
  The Soviets successfully place satellites Sputnik I and II into orbit around the earth, generating a "crisis of confidence" in the United States public. The ramification is that the Soviets now possess an Intercontinental Ballistic Missile capable of carrying a hydrogen warhead 5,000 miles, more powerful than any missile deployed by the United States.

- **150th Tactical Fighter Group**
  The New Mexico Air National Guard 188th Fighter Interceptor Squadron is redesignated the 150th Tactical Fighter Group. A year later, the 150th Tactical Fighter Group converts from the F-80 "Shooting Star" to the F-100 "Super Sabre" aircraft, the USAF's first operational aircraft capable of flying faster than the speed of sound. It's the first Air National Guard unit to receive the aircraft.

- **North American Aerospace Defense Command established**
  The North American Aerospace Defense Command is established. It is a joint United States–Canada air defense command housed inside Cheyenne Mountain near Colorado Springs, Colorado. The command is linked directly with a variety of radar and satellite-monitoring systems to provide warning of a potential enemy attack.

1958

- **Moratorium on nuclear testing**
  In response to worldwide concern about the fallout from atmospheric testing, President Eisenhower proposes that an international conference be called to discuss permanent suspension of nuclear and thermonuclear weapons testing. The United States and Soviet Union agree to voluntarily suspend nuclear testing.

- **Defense Atomic Support Agency**
  The Armed Forces Special Weapons Project is redesignated the Defense Atomic Support Agency. Though its mission is little changed, the Defense Atomic Support Agency shows improvements over the former agency in funding, personnel, and materiel issues. At Sandia Base, Field Command/Armed Forces Special Weapons Project becomes Field Command/Defense Atomic Support Agency. During the next decade, the Defense Atomic Support Agency operates the Nuclear Weapons School at Sandia Base.

1960

- **Semi-Automatic Ground Environment Direction Center established**
  For a brief period during 1960, the 34th Air Division serves as a Semi-Automatic Ground Environment Direction Center for the Air Defense Command. This is the first major real-time, computer-based command-and-control system designed to protect the United States from long-range bombers and other strategic weapons.

2.6 Phase III: A New Nuclear Readiness

Air Force Systems Command produced immediate changes at Kirtland Air Force Base, including the reorganization of the Air Force Special Weapons Center and the creation of the Air Force Weapons Laboratory. Coinciding with these changes was President Kennedy's implementation of his "Flexible Response" policy, which replaced the idea of massive retaliation with the selective use of nuclear weapons. The new policy pushed the creation of more Intercontinental Ballistic Missiles and Sea-Launched Ballistic Missiles. Kennedy also signed the Limited Test Ban Treaty, which ended atmospheric testing and resulted in the development of simulated testing methods for continued research and understanding of nuclear weapons and their effects. In response to these new policies, the Air Force Special Weapons Center focused on missile testing and maintaining readiness in the event that atmospheric testing would resume. The Air Force Weapons Laboratory focused on research and simulated nuclear testing and its effects on military equipment. A new focus—on laser technology—began in the 1960s. Phase III ends with the disestablishment of the Air Force Special Weapons Center and the transfer of Kirtland Air Force Base to Mobility Airlift Command, which ended 16 years under the Air Force Systems Command.

1961

- **Soviet Union resumes atmospheric testing**
  The Soviet Union resumes atmospheric nuclear testing in September with the largest series of tests to date.

- **Flexible Response**
  President Kennedy puts in place the defense strategy known as Flexible Response, whereby potential crises are matched with potential options for reaction.

- **Berlin Wall**
  In order to keep Berlin from being used as an escape route by East Germans, the Soviet Union builds the Berlin Wall, separating East and West Berlin.

- **Air Research and Development Command redesignated**
  The Air Research and Development Command is redesignated the Air Force Systems Command, ending years of contention between the Air Research Development Command and the Air Materiel Command. Air Force Systems Command assumes research, development, and production responsibilities for new United States Air Force technologies.

- **The 4950th Test Group (Nuclear) and 4925th Test Group (Atomic) are disestablished**
  In the wake of the 1958 atmospheric test moratorium, the primary testing support groups at Kirtland Air Force Base are disestablished.

- **Naval Weapons Evaluation Facility**
  The Navy combines the Naval Air Special Weapons Facility with the Naval Nuclear Ordnance Evaluation Unit from China Lake, California to establish the Naval Weapons Evaluation Facility at Kirtland Air Force Base. Its mission is to evaluate weapons systems and aircraft, including air-, surface-, and subsurface-launched nuclear weapons and joint Army and Marine Corps amphibious nuclear weapons.

1962

- **Cuban Missile Crisis**
  Cold War tension reaches its height when Krushchev seeks to even the arms race by placing Intermediate Range Ballistic Missiles and Medium Range Ballistic Missiles in Cuba. The Navy sets up a blockade to deter the arrival of Russian ships at Cuba. Kennedy and Krushchev reach an agreement whereby the United States withdraws its outdated missiles from Turkey and the Soviets do not introduce additional weapons at Cuba (Lewis et al. 1995).

1963

- **Limited Nuclear Test Ban Treaty signed**
  The United States, Great Britain, and the Soviet Union sign the Limited Nuclear Test Ban Treaty, marking the beginning of détente. The treaty ends nuclear weapons tests or any other nuclear explosion in the atmosphere, in outer space, and underwater. Four safeguards in the treaty provide for continued underground testing, modern nuclear laboratory facilities and research programs, readiness to resume atmospheric testing, and the monitoring of testing by other nations.

- **Air Force Weapons Laboratory established**
  The Air Force Weapons Laboratory is established at Kirtland Air Force Base from elements of the Air Force Special Weapons Center's Research and Development Directorates. Its mission is to research nuclear weapons, nuclear power, nuclear effects, and the vulnerability of United States weapons systems to nuclear attack.

- **Kirtland Air Force Base transfers runway ownership**
  In response to a slowdown in military flying activity at Kirtland Air Force Base that occurs in the wake of the Limited Test Ban Treaty, Air Force Systems Command transfers 1,242 acres of land, with runways, taxiways, and ramps, back to the city of Albuquerque. Thereafter, Kirtland Air Force Base leases use of the runways and taxiways from the city, while providing crash and fire protection for the airfield (Alberts and Putnam 1985).

- **58th Weather Reconnaissance Squadron**
  A successor to the 4926th Test Squadron (Sampling), the 58th Weather Reconnaissance

Squadron is established to conduct surveillance for evidence of Soviet and Chinese nuclear tests. Its mission is to obtain samples of the gaseous and particulate composition of the atmosphere, and to accomplish weather, photographic, and other high-altitude research projects as dictated by the United States Air Force.

1964

- **Geneva Peace Accords**
  The Geneva Peace Accords separate Communist-supported North Vietnam from United States–supported South Vietnam.

- **Vietnam**
  After North Vietnam attacks an American ship in the Gulf of Tonkin in 1964, the Lyndon Johnson administration begins limited air attacks on the Viet Cong in the north. In 1965, the United States introduces combat troops as well.

1965

- **Air Force Weapons Laboratory Blast and Shock Effects Studies**
  The Air Force Weapons Laboratory's Civil Engineering Branch begins studies using conventional high explosives to simulate nuclear blasts to test the hardness, or survivability, of underground missile silos and command centers.

1966

- **Field Command/Defense Atomic Support Agency and the stockpile**
  Field Command/Defense Atomic Support Agency is given the responsibility for accounting for the entire United States nuclear stockpile.

1967

- **First Electromagnetic Pulse Testing Facility**
  In light of the atmospheric test moratorium, the United States looks to simulation methods to determine the effects of nuclear blasts on military materiel. The Air Force Weapons Laboratory-Los Alamos Electromagnetic Pulse Calibration and Simulation facility is completed as a guided wave facility for simulating the electromagnetic pulse environment existing outside high altitude nuclear source regions. The facility is used to test Polaris and Minuteman missiles, the EC-135 and B-1 models.

1968

- **Strategic Arms Limitation Treaty (SALT) I**
  President Johnson participates in the Strategic Arms Limitation Treaty talks with the Soviet Union. The United States tries to negotiate an arms agreement with the Soviets to limit Intercontinental Ballistic Missiles and Antiballistic Missile systems and to ban further proliferation of nuclear weapons. The Soviet invasion of Czechoslovakia postpones further negotiations.

- **Air Force Weapons Laboratory and the Vietnam War**
  To support ground troops in Vietnam, the laboratory adapts surplus 10,000-pound bombs

to clear helicopter landing zones. These "Daisy Cutter" bombs, dropped from C-130s, are tested first in Southeast Asia in October 1968 and are first used in combat in 1970 (AFWL History Office 1988).

- **New Mexico Air National Guard and the Vietnam War**
  New Mexico Air National Guard personnel are deployed to Tuy Hoa Air Base in Vietnam and bases in South Korea. Between January 1968 and June 1969 the New Mexico group flies more than 6,000 combat missions in F-100s and receives more than 630 medals and decorations before release from federal active duty in June 1969.

- **AFWL is authorized to build a laser**
  The USAF authorizes AFWL to design, build, and fire a gas dynamic laser capable of engaging static or moving targets.

1969

- **Readiness aircraft stored**
  As the National Nuclear Test Readiness Program comes into question owing to increasing costs of maintaining the capability to "promptly" resume nuclear tests in prohibited environments, the Air Force Special Weapons Center's readiness support aircraft, B-52s and B-57s, are placed in storage, and related personnel are transferred to other United States Air Force units.

1970

- **Air Force Special Weapons Center and the Air Force Missile Development Center**
  In August, when Holloman Air Force Base is transferred from Air Force Systems Command to Tactical Air Command, the Air Force Special Weapons Center absorbs the Air Force Missile Development Center and United States Air Force operations on the Army-owned White Sands Missile Range. The center establishes the 6585th Test Group at Holloman Air Force Base, and Air Force Special Weapons Center Commander Colonel A. G. Swan becomes White Sands Missile Range deputy for the USAF.

- **Sandia Optical Range**
  The Air Force Weapons Laboratory opens the Sandia Optical Range to test laser devices and their effects. It is the first major United States Air Force high-energy laser research and development facility.

1971

- **Defense Nuclear Agency**
  The Defense Atomic Support Agency is redesignated the Defense Nuclear Agency. The new agency is solely responsible for managing the Department of Defense nuclear weapons stockpile, managing DoD nuclear weapons testing and nuclear weapons effects research programs, and providing the government with staff advice and assistance on nuclear weapons matters. Field Command/Defense Atomic Support Agency becomes Field Command/Defense Nuclear Agency.

- **Sandia, Manzano, and Kirtland Air Force Bases merge**
  In July, Sandia and Manzano bases merge with Kirtland Air Force Base. Sandia Laboratories and the Field Command/Defense Nuclear Agency become tenants of Kirtland Air Force Base. The Air Force Special Weapons Center assumes control of the merged installation.

1972

- **Strategic Arms Limitation Treaty I signed**
  SALT I is finally signed and sets limits on the number of strategic missile launchers that can be deployed over the following five years, as well as prohibiting technological advances in Antiballistic Missile systems.

- **Antiballistic Missile Treaty**
  The United States and Soviet Union sign the Treaty on the Limitation of Antiballistic Missile Systems. Each side agrees to have only two Antiballistic Missile deployment areas, both of which are restricted and located so they cannot provide nationwide missile defense or become the basis for developing one.

- **Air Force Contract Management Division**
  The Air Force Contract Management Division transfers to Kirtland Air Force Base from Los Angeles Air Force Station. Its mission is to perform contract management in support of systems acquisition.

1973

- **Project DELTA**
  The Air Force Weapons Laboratory succeeds in the first shoot down of an aerial target by a ground-based laser, titled the Drone Experimental Laser Test and Assessment (Project DELTA). This accomplishment renews confidence in the development of laser weapons.

- **Interservice Nuclear Weapons School**
  The Nuclear Weapons School, which was run for years at Sandia Base by the Defense Atomic Support Agency, is transferred to the Air Force and renamed the Interservice Nuclear Weapons School.

1974

- **Air Force Test and Evaluation Center**
  The Air Force Test and Evaluation Center is organized and headquartered at Kirtland Air Force Base to oversee operational testing of emerging United States Air Force aircraft and systems. The Air Force Test and Evaluation Center is created largely because of the pressure on the armed services to prioritize their operational test and evaluation functions.

1976

- **Antiballistic Missile Treaty Protocol**
  The United States and Soviet Union sign a protocol of the Treaty on the Limitation of Antiballistic Missile Systems. The protocol reduces the number of Antiballistic Missile deployment areas from two to one.

- **Air Force Special Weapons Center disestablished**
  Having become largely obsolete in the wake of atmospheric testing bans, the organization is officially disestablished by Air Force Systems Command. The Air Force Weapons Laboratory has already largely absorbed its research and development activities, and its nuclear test readiness services are no longer necessary. This closure ends a span of 24 years of service to the United States Air Force, and the Air Force Contract Management Division takes over base host duties.

- **1550th Aircrew Training and Test Wing**
  The 1550th Aircrew Training and Test Wing of Military Airlift Command's Aerospace Rescue and Recovery Service moves from Hill Air Force Base, Utah. This increases flying activity at the base, and the Wing requests its parent organization to take over host responsibilities in 1977. The 1550th Aircrew Training and Test Wing is responsible for United States Air Force advanced helicopter training, conducting fixed-wing rescue and recovery training, and testing new helicopter systems and techniques.

2.7 A New Deterrence

Phase IV begins with the transfer of Kirtland Air Force Base to Military Airlift Command. During the major command's tenure at the installation, President Reagan's election in 1980 leads to dramatic changes in foreign policy and military strategy, as he and his advisors advocate an all-out military buildup that will enable the United States to negotiate with the Soviets from a position of strength. Reagan's Strategic Defense Initiative, which proposed defending the United States from space with directed energy beams [lasers], took center stage in American military policy. Reagan's plan called for a space shield to destroy incoming ballistic missiles. By the mid-1980s, the Air Force Weapons Laboratory had become part of Air Force Systems Command's Space Division, and much of its budget was devoted to space research in support of the Strategic Defense Initiative. This involved intensive research and development of space-based and ground-based lasers. Phase IV ends with the November 1989 fall of the Berlin Wall, which is considered the symbolic end of Cold War hostility between the United States and the Soviet Union.

1977

- **Military Airlift Command**
  Military Airlift Command assumes command of Kirtland Air Force Base. The 4900th Air Base Wing is deactivated and Military Airlift Command activates the 1606th Air Base Wing to assume base host duties.

- **A new laser**
  Air Force Weapons Laboratory invents the first chemically pumped oxygen-iodine laser [COIL], which is a potential weapons-grade, ground-based system with excellent propagation through the atmosphere and advanced optical systems for beam direction. The objective of the program by the mid-1980s is to demonstrate a scalable laser for possible future weapon deployment as a lethality/countermeasure system and ground-based laser, anti-satellite weapon under the Strategic Defense Initiative.

1979

- **Strategic Arms Limitation Treaty II**
  President Carter and General Secretary Brezhnev sign the SALT II agreements at Vienna, Austria. The treaty is an attempt to attain parity between the superpowers by establishing numerically equal limits on nuclear weapons. The treaty also restricts modernization of existing weapons systems, the number of nuclear missiles equipped with more than one warhead, and the development of new Intercontinental Ballistic Missiles to only one type. However, the agreement is held up during ratification hearings in the Senate as a result of the Soviet invasion of Afghanistan, and it is removed from further consideration by President Carter in 1980.

1980

- **Limited Nuclear War**
  President Carter establishes Limited Nuclear War as the official United States military strategy through Presidential Directive 59. Carter introduces “countervailing strategy,” which emphasizes flexibility in the use of nuclear weapons, giving the president many options on whether and how to use them.

- **Trestle completed**
  The Air Force Weapons Laboratory electromagnetic pulse simulator, generally referred to as the Trestle, becomes operational in March, eleven years after it was first conceptualized. It is the only electromagnetic pulse simulator able to test B-52s, C-5As, E-4Bs, B-1s, and other large aircraft in simulated flight under realistic threat conditions. Hardness evaluations of a B-52G strategic bomber begin immediately.

1982

- **Strategic Arms Reduction Talks**
  The United States and Soviet Union resume nuclear arms negotiations with the Strategic Arms Reduction Talks (START). President Reagan wants steep reductions, rather than just limitations, in the number of nuclear weapons deployed. Neither side can agree on which weapons to reduce.

- **Air Force Space Technology Center**
  The Air Force Space Technology Center is activated at Kirtland Air Force Base to become the United States Air Force focal point for space technology planning and development and for coordinating United States Air Force programs for space missions. In addition to supervising the Air Force Weapons Laboratory, the Air Force Space

Technology Center oversees the Air Force Rocket Propulsion Laboratory at Edwards Air Force Base, California, and the Air Force Geophysics Laboratory at Hanscom Air Force Base, Massachusetts.

1983

- **Strategic Defense Initiative**
  President Reagan introduces his Strategic Defense Initiative [SDI], a plan for a multibillion-dollar research program to determine if a defensive shield can be built to destroy incoming ballistic missiles and their warheads. Because it proposes in part to defend the United States from space, with lasers or directed energy beams to knock out nuclear-armed missiles, critics dub Reagan's initiative "Star Wars" after the science fiction movie of the same name.

- **Airborne Laser Laboratory**
  In a series of California demonstrations, the Air Force Weapons Laboratory's Airborne Laser Laboratory program succeeds in negating five AIM-9 "Sidewinder" missiles over the Naval Weapons Center Range and three Navy BQM-34A drones over the Pacific. These events confirm the potential of high-energy lasers as airborne weapons.

- **Strategic Arms Reduction Talks fail**
  The Soviets walk out of Strategic Arms Reduction Talks negotiations when it is discovered that the United States is deploying Pershing II ballistic missiles and Tomahawk cruise missiles in Western Europe.

1985

- **Gorbachev appointed**
  Mikhail Gorbachev is appointed Soviet General Secretary. Gorbachev understands the reality of the Soviet economy and reverses its anti-western viewpoint by inviting western advice on how to organize a democratic government and a market economy. At the Geneva Summit, Reagan and Gorbachev issue a joint statement on cooperation in arms reductions with the goal of 50 percent reductions in nuclear arms.

1986

- **Reykjavik Summit**
  Gorbachev-Reagan arms talks stall over Reagan's refusal to limit Strategic Defense Initiative research and testing. The two sides come close to agreement on arms reduction, only to end the summit without an agreement because Reagan will not accept concessions on the initiative.

1987

- **Strategic Defense Initiative**
  Belief in the feasibility of a space shield is waning. Congress denies defense spending for projects violating the 1972 Antiballistic Missile Treaty in its traditional interpretation (Lewis et al. 1995).

1988

- **Strategic Arms Reduction Talks**
  Nuclear and space talks resume in Geneva with the United States and the Soviet Union developing a joint draft Strategic Arms Reduction Talks Treaty (Lewis et al. 1995).

1989

- **Berlin Wall**
  The Berlin Wall is torn down and East Germans stream into West Berlin. The fall of the Berlin Wall is considered the symbolic end of the Cold War.

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3.0 EARLY ALBUQUERQUE (1880 – 1928)

Albuquerque began its rise to prominence as New Mexico's largest city in the late 1800s resulting from the mid-1800s concept of Manifest Destiny, which drove Americans west across the United States (U.S.). The arrival of the railroad in Albuquerque in 1880 was part of the late 19th century railroad boom that brought the whistle of locomotives into the frontier (Figure 1: Bird's-eye view of Albuquerque in 1886). The Atchison, Topeka and Santa Fe (AT&SF) Railroad established Albuquerque as a transportation center, bringing homesteaders, miners, ranchers and others who simply saw opportunity and stayed in the town.

At the turn of the 20th century, with the 1902 construction of the first tuberculosis hospital, Albuquerque was further established as a beneficial locale for those suffering from tuberculosis or "consumption," which was a worldwide epidemic. Railroad campaigns encouraged the migration of the sick to Albuquerque by touting its dry air and abundance of sunshine—the prescribed antidote at the time. Throughout the first half of the 20th century, great numbers of consumptives arrived in Albuquerque from all over the country and the world. These included members of the professional classes, many of whom stayed after recuperating, contributing a high level of sophistication to the town.

As the town grew, so too did the aspirations of its citizens, eager to transform Albuquerque into a transportation center for not only the railroad—which had benefited it so well—but also for the automobile and airplane. In 1919, the Albuquerque Chamber of Commerce leased land in hopes of creating an aviation school (Armstrong 1984). Civic leaders several times held an "Aviation Week," featuring the flying feats of early pilots or "barnstormers," and promoted Albuquerque in brochures as a great destination for tourists on wheels, an effort that would ultimately take off with the building of U.S. Highway 66 right through the town. In 1928, two AT&SF employees established the first major airport in Albuquerque. As a new crossroads for Southwestern air traffic, Albuquerque was on its way to more substantial developments.

3.1 The Railroad Arrives at Albuquerque

Prior to the arrival of the AT&SF in 1880, Albuquerque was one of many small villages along the Rio Grande. In the 174 years between its founding and the railroad's arrival, Albuquerque remained a large cluster of adobe houses and a few stores around the church of San Felipe de Neri. In addition to this "Old Town," isolated farm settlements were scattered along the river valley north and south of the plaza. The U.S. Census of 1880 documented 2,315 citizens of Albuquerque (City of Albuquerque Planning Department 2001).

The AT&SF line was built from Topeka, Kansas, arriving at Albuquerque on 10 April 1880 (Figure 2: The locomotive General J. A. Williamson at Albuquerque). The Atlantic & Pacific (A&P) Railroad line, which was half owned by the AT&SF, was to be built from Isleta to the Pacific Coast. Major repair and construction shops were needed, and surveyor crews settled on Albuquerque for both a depot and the A&P's division offices and repair shops (Wilson 1986).

On 5 May, a railroad-employed civil engineer by the name of John Fulton registered a plat map for most of the prime business lots around the depot, in the name of the New Mexico Town Company—a venture formed by the AT&SF and three prominent Albuquerque citizens. Local investors with foresight—Franz Huning, Elias Stover, and William Hazeldine, had purchased land for the railroad before its arrival and then transferred title to the New Mexico Town Company for a share of the profits from the sale of lots. If businesses wanted to set up shop near the tracks, they had to buy land from the railroad (Lang and Moore 1981).

The area was subdivided into small parcels averaging 25 by 140 feet. Starting in the $200 range, almost $60,000 worth of lots had been sold by the end of 1880 (Oppenheimer 1962). By the end of 1881, some of these sites were selling for as high as $2,000 (Johnson and Dauner 1981). A "New Town" sprang up from the dirt around the railroad yards—almost two miles to the east of Old Town (Figure 3: Plat of Albuquerque showing Old Town and New Town). Hundreds of American and European settlers arrived by rail to populate the growing town.

"Buildings are every day springing into existence all over the platted part of town," wrote Vermont newspaperman C. M. Chase while on an 1881 visit to Albuquerque, which became fodder for his book *The Editor's Run in New Mexico and Colorado*. "The sound of the hammer and trowel is heard on every corner and a heterogeneous crowd of human beings are hurrying to and fro on business, or in search of a location" (Chase 1882).

An Albuquerque Street Railroad was established in 1881 and continued in operation through 1904. It was a horse-drawn line paid for by Oliver Cromwell, a New York investor who profited handsomely [Oliver Cromwell's daughter Louise grew up to marry General Douglas MacArthur]. The "railroad" ran between Old Town and New Town down Railroad Avenue (Johnson and Dauner 1981). Railroad Avenue, the forerunner of Central Avenue, was the heart of the newly bustling urban area. Mercantile businesses, hotels, barbershops, and saloons moved in rapidly. The first complete 1882 business directory listed two newspapers, five grocery stores, four hardware stores, two jewelers, three druggists, seven cattle and sheep dealers, two clothing stores, ten lawyers, twelve general merchandise stores, five hotels, nine boarding houses and restaurants, three dance halls, and twelve saloons. These included the Bucket of Blood, the St. Elmo, and the White Elephant (Figure 4: The interior of an Albuquerque saloon), which stood where the Sunshine building stands today (Stanley 1963).

The rowdiness of early Albuquerque is well documented by historians with tales of fistfights and heavy drinkers. The first business in New Town was reportedly a saloon composed of a board over two kegs inside a tent; whiskey and beer cost five cents a shot (Johnson and Dauner 1981). C. M. Chase described the less-than-stellar character of the city. "The devil seems to be in command of enterprises and principles intended for human elevation. The saloons are in the lead, and the ring of bottles, the rattle of highballs, the click of billiards and the strike of dice, accompanied by the roundest and loudest profanity, fill the air" (Chase 1882). Between the years 1881 and 1889, 26 different men tried wearing the badge of town marshal (Lang and Moore 1981).

3.2 Livestock and Mining on the East Mesa

The building of the AT&SF provided a ready market for livestock and eliminated long cattle drives, thus promoting the livestock industry in the Territory (Boyle 1949). The construction of immense stockyards at the depot afforded quality market facilities, and the very first shipment of cattle by rail from Albuquerque occurred in 1884, when 30,000 head were shipped north (Oppenheimer 1962).

The cattle industry in New Mexico reached the height of its prosperity that year, and livestock were driven to market in Albuquerque from the north, south, east, and west. Many cattlemen came across the East Mesa through Tijeras Canyon from the Estancia Valley, just east of the Manzano Mountains. From Albuquerque, cattle were shipped to Kansas City, St. Louis, Chicago, and Omaha.

Raising sheep was even bigger business than cattle in Albuquerque, both sheep and cattle ranchers used the city's East Mesa, the land which eventually became KAFB, for grazing and access to the railroad. As early as 1860, the Territory of New Mexico was the principal sheep raising area of the U.S. Many Castilian families, dating back to the first Spanish settlement of the area, raised sheep around Albuquerque (Oppenheimer 1962). Estimates of livestock in New Mexico increased from 830,000 in 1860 to 4 million in 1880. Between 1883 and 1885, nearly one million sheep were driven north and east from New Mexico to stock new ranges in Wyoming, Kansas, Nebraska, and Texas (Oppenheimer 1962). In the early part of the century, Governor William C. McDonald ordered a census of sheep owners, which showed owners by county, area within county, brands, and numbers of sheep (Figure 5: Bernalillo County shepherds and brands, 1914). Historic photographs depict shepherding in nearby Coyote Canyon (Figure 6: Shepherding in Coyote Canyon) on what would one day be KAFB. Wool "trains" from near and far lined up for loading onto the railroad in Albuquerque.

At the turn of the century, Albuquerque became a significant wool- and sheep-exporting center. Circa 1900, the Albuquerque Wool Scouring Mill and Rio Grande Woolen Mill employed 40 people, with an annual payroll of $18,000 (Johnson and Dauner 1981). The Ilfeld Brothers Co. of Albuquerque was formed in 1883 by livestock and wool businessmen Louis and Noah Ilfeld. Their competitor for years, the firm Gross, Kelly & Co., was organized in 1902 with branches in Las Vegas, Santa Fe, and Albuquerque (Figure 7: Gross, Kelly & Co. wagon train). It too was a huge buyer of hides and wool. These firms contributed to Albuquerque's economic prosperity. By 1890, Albuquerque businesses had handled more than five million pounds of wool from locals and outlying parts of the Territory (Oppenheimer 1962).

The new transportation center also encouraged ranching in the greater area, specifically on the vast mesa spreading east from the new town to the mountains. In efforts to encourage land ownership for such pursuits, a 1900 booster pamphlet titled "Albuquerque Illustrated" advertised "good unimproved land near Albuquerque for $25 to $1000 an acre" (Swan 1900).

Just as Albuquerque served as the marketplace for sheep and cattle products, it also became the shipping point for ores from the surrounding mining areas. The 1872 Mining Act, designed to encourage settlement of the West, allowed mining companies to purchase land for $2.50 per acre (Columbia Electronic Encyclopedia 2000a). This precipitated a nationwide interest in mining. The AT&SF brought miners to the Albuquerque area in search of riches. One example was Sidney Weil, who came to Albuquerque with an interest in mining and went on to help finance the Franciscan Hotel, built in 1923, and establish the newspaper La *Gaceta*, for Spanish-speaking citizens (Stanley 1963).

Most of the mining in close proximity to Albuquerque took place on the East Mesa in the Tijeras Canyon district. This district included the northern Manzano Mountains and all of the Sandia Mountains (Ackerly 1997). The 1912 promotional booster "Albuquerque: Chief City of the New Sunshine State" (Hening and Johnson 1912) touted the Sandia and Manzano Mountains as "heavily mineralized and offering rich returns to legitimate mining on a large scale."

Though mining in the region certainly never offered up anything close to that of Cerrillos and Madrid, which produced enough coal to keep the mining towns open until the 1950s, there are some records of mining claims. Maps of what is now KAFB illustrate mining claims in the Coyote Springs area, and in the Madera, Lurance, and Tijeras Canyons. These include Red Hill, Red Top, Reliance Gold, Blackbird (Figure 8: Blackbird Mine headworks), Eighty-five, Riverview Placer, Frustration, Highland Mary, Mary #3, and Quail Lode. Very little is documented about these operations. Red Top appears to have been claimed in 1932 by homesteaders Frank Apodaca, Joseph Wright, Jacob Wright, and a Howard Beasley, though no details are known of their operations (Scurlock 1995). Oral histories indicate that Joseph Wright came from Little Rock, Arkansas, and homesteaded in the Coyote Springs area. According to Wright's daughter, Beasley was a cousin who lived with the family. Frank Apodaca, whose name appears on the early landowner maps of KAFB, reportedly lived below Coyote Springs and grazed cattle both on his homestead and in the nearby Manzano National Forest. According to historical studies, he moved to the area in the early 1900s and lived there until the military bought his property in 1941 (Scurlock 1995).

The Quail Lode mining claim was reportedly staked for gold and silver in 1881; the Reliance Gold and the Highland Mary began their gold and silver claims circa 1904 and in 1909, respectively. In later years, gold and silver were staked at the Riverview Placer (1929) and the Blackbird Mine (circa 1943—by a J. E. Mock). While most claims were for mining gold and silver, a few others were established for mining fluorspar, barite, and galena (Scurlock 1995). These three minerals were used primarily for industrial purposes. Fluorspar is currently used to manufacture products such as aluminum, gasoline, insulating foams, steel, and uranium fuel. Barite is used for a variety of manufacturing processes and as a compound in barium, while ground barite is used as filler in the manufacture of linoleum, oilcloth, paper and textile manufacturing, rubber, and plastics. Galena is the most common mineral containing lead and has a simple extraction process. The large volume of galena that is processed for lead produces enough silver as a by-product to make galena the leading ore of silver. Galena was also used in early radio devices.

During World War II, fluorspar mining on and near what eventually became KAFB experienced a resurgence. The mineral was considered strategic for the war effort, owing to its use as a flux in steel making. The federal government sanctioned a prospecting and mining program during that time and was stockpiling fluorspar at Fort Wingate, New Mexico. In the KAFB area, only the Blackbird and Galena King were reported to have actually shipped ore (Kirtland Air Force Base n.d.).

Although there were useful minerals on the land, mining efforts in the area were curbed by the late 1940s, when Kirtland and Sandia bases encroached on most of that land. One Albuquerque resident remembers:

> My grandfather was kind of a crazy guy—he was a romantic. He used to have old gold maps, treasure maps, and even when I was a kid he would still get out and go—he and Father Libertini and a French priest—they would go out on these searches for gold. That I know of—they never found anything. This map my grandfather had—it showed a place somewhere out in the Manzano Mountains, but part of it happened to be also on the Air Force Base. He was busted out there—looking for sites—and the priests too (Sargeant and Davis 1986).

3.3 Urban Refinement comes to Albuquerque

The industriousness of newcomers gradually changed the nature of New Town from its rough roots. Examples of early citizens who arrived by rail include Angus Grant, a native of Canada who arrived at Albuquerque as a bridge contractor for the railroad. He stayed to form Grant Brothers Construction Company, finance the Albuquerque Gas Company, and build the Grant Opera House. Newspaperman Thomas Hughes came from Kansas in 1881, purchased the *Albuquerque Morning Journal,* and subsequently the *Evening Citizen*. Bernard Rodey, an Irishman, came from Boston as a stenographer with the railroad. He then became a lawyer, was elected to Congress, and drafted the bill to create the University of New Mexico (UNM) (Stanley 1963).

From 1880 to 1890 there was a remarkable boom in business and population growth. The 1890 U.S. Census documented 3,785 residents of Albuquerque, an increase of 63.5 percent over the preceding decade (City of Albuquerque Planning Department 2001). Notable industrial developments included the Albuquerque Gas Company (1881), Albuquerque Electric Light Plant (1882), and Albuquerque Foundry and Machine Works (1884). The foundry, which employed 40 men with an annual payroll of $23,000, cast rolling stock for the railroad and repaired mining and manufacturing equipment (Johnson and Dauner 1981).

In the spring of 1881, Albuquerque's first fine hotel, the Armijo House, opened. Built at the southwest corner of Third Street and Railroad Avenue, the 35-room hotel's cost was $25,000. The Armijo House and the $103,000 San Felipe Hotel that was built three years later were considered as fine as hotels in Denver and San Francisco (Johnson and Dauner 1981).

Also in 1881, from October 3 to 8, the first Territorial Fair was held, with highlights including a speech by Governor Lionel Sheldon, oil painting, taxidermy, Indian "curiosities," and traditional agricultural and livestock displays (McIntyre 1995). That same year the First National Bank was chartered and a new Albuquerque Post Office built.

The town saw its first electric lights turned on in August 1883. On 14 August 1883 the *Albuquerque Democrat* wrote, "The city was illuminated last night for the first time with electric light, and the illumination was a success. Large crowds, including ladies, were out upon the streets inspecting the lights" (Johnson and Johnson 1983).

The aforementioned Grant Opera House introduced culture to the town in 1882, with a first production of "H.M.S. Pinafore" by the Albuquerque Musical and Dramatic Society. The opera house went on to host political rallies and the first commencement of UNM (Johnson and Dauner 1981).

In 1889, Albuquerque won the right to build a state university over bidders such as Socorro, Las Cruces, Las Vegas, and Santa Fe. UNM gave Albuquerque an intellectual life and made it a more appealing locale for artists and scholars (Price 1992). The university constructed its first building in 1892. It was called Hodgin Hall, was named after public school superintendent C. E. Hodgin, and was located one and a half miles east of New Town on the East Mesa.

An editorial in the *Albuquerque Citizen* on the last day of the 1890 proclaimed, "Albuquerque is already recognized by the country at large as the railroad and commercial center of the Southwest" (Fitzpatrick and Caplin 1975). Months later, on 15 April 1891, Albuquerque's townsmen officially approved changing its political designation to "city."

The 1890s saw further development of the growing metropolis. An Albuquerque public school system was formed in 1891; C. E. Hodgin acted as its first superintendent. The school counted 635 elementary and 35 high school students (Fitzpatrick and Caplin 1975). The same year, a group of enterprising women pushed for the opening of a public library located in the Commercial Club.

Forerunner to the Albuquerque Chamber of Commerce, the Commercial Club was established on 21 May 1890 in a new $70,000 building on the southwest corner of Gold Avenue and Fourth Street. Furnished with billiard and meeting rooms, bachelor quarters, a dance hall, parlors, and business offices, the club held many social and business functions for its 200 members (Figure 9: Albuquerque Commercial Club). Its main purpose, however, was to promote Albuquerque's climate, cultural assets, and business potential, primarily with "booster booklets," which painted idealistic portraits of Albuquerque (Johnson and Dauner 1981). Now that Albuquerque was a city, its officials had to work to keep it growing.

3.4 A Southwest Health Mecca

These early boosters focused on the health benefits of the dry Southwestern city, a characteristic that would dramatically affect Albuquerque's development. The boosters appealed strongly to Easterners suffering from tuberculosis. A dry climate, sunshine, fresh air, and lots of rest were believed to be antidotes for the disease (Sergeant and Davis 1986).

An 1893 booster for Albuquerque proclaimed, "Persons with weak lungs, or with a tendancy [sic] to consumption, may count that they will never fall victim to the dread destroyer, if they take up residence here" (Johnson and Dauner 1981). Railroad publicity campaigns also exploited the health angle (Williams 1986). They portrayed a cool mountain climate and healthy, happy citizens.

The publicity was successful, as the beginning of the 20th century brought an influx of the sick to Albuquerque. Tuberculosis was one of the three leading causes of death in the U.S. In 1900, 194 out of every 100,000 Americans died of tuberculosis (Roberts 2001). A 1908 brochure published by the Commercial Club listed 10 reasons "Why Albuquerque Will Make You Well." These included "pure air," "pleasant outdoor life," the fact that the city was "a good town to live in," and "the enthusiastic testimony of thousands."

Spas at area hot springs and sanatoriums sprang up everywhere in Albuquerque. The city's first hospital, St. Joseph's Sanitarium, was built in 1902 as a tuberculosis sanitarium on Railroad Avenue, or "TB Alley" as it came to be called. It was built by the Sisters of Charity, who traveled from Cincinnati, Ohio, in covered wagons to build the hospital (Money 1998). St. Joseph's began when the sisters held a bazaar, netting $2,500 toward construction fees. By the time of its official dedication in May, the sanatorium already had seven patients (Johnson and Dauner 1981).

Tuberculosis sufferer Rev. Hugh A. Cooper founded the Southwestern Presbyterian Sanatorium several years later in 1908 (Figure 10: Southwestern Presbyterian Sanatorium, circa 1913). Cooper had come to Albuquerque in 1903 for his health, and he became pastor of the First Presbyterian Church before founding the sanatorium, the precursor to the contemporary Presbyterian Healthcare System. Care was provided for $40 a month per patient (Johnson and Dauner 1981). These were just two examples of the many facilities that included cottages and even makeshift tents, built or converted to house the sick.

By 1910 there were 3,000 tuberculars (Simmons 1982), among a U.S. Census statistic of 11,020 residents, and they continued to arrive in Albuquerque until after World War II. Many of the patients in New Mexico were veterans of the war and were discharged by the U.S. Army with no provision for care. In 1918 the State of New Mexico, Council of Defense and Governor Washington E. Lindsey made a concerted effort to find hospital beds for these men. At the time there were over 200 U.S. Army men discharged with tuberculosis and only 35 available U.S. Army beds (Lindsey 1918).

In the late 1940s and 1950s, anti-tubercular drugs caused a substantial decline in the disease. Many members of the professional class—businessmen, journalists, politicians, artists, and musicians—who survived tuberculosis chose to stay in Albuquerque, thereby imparting their sophistication to the city's business, social, and civic life. One North Valley resident remembered, "The whole area was filled with sanatoriums. Practically all the people who built their fortunes here came for their health" (Sargeant and Davis 1986).

Prominent resident George Kaseman was one such patient. He had come to Albuquerque for his health in the early 1900s, after attending Stanford University, where he roomed with future president Herbert Hoover. In 1906, Kaseman became president of the Cerrillos Coal Company, the owner of the Madrid coal mines. In the early 1920s, he rescued State National Bank of

Albuquerque from failure, forming the new Albuquerque National Bank. Kaseman also loaned money to the city to lease land for a new municipal airport in the late 1930s.

Other examples of residents who first arrived in New Mexico with tuberculosis include Clinton P. Anderson, who became a U.S. Senator from New Mexico; Albert Gallatin Simms, a prominent landowner, rancher, and businessman as well as a U.S. Congressman from New Mexico; and John Gaw Meem, famed architect of the Southwest and the designer of the original Sandia School, which is now owned by KAFB. Even Albuquerque's famous "Mayor" Clyde Tingley (officially he was the chairman of the Albuquerque City Commission, informally the city's ex-officio mayor), a primary player in wooing the U.S. Army to the area, arrived in Albuquerque because of tuberculosis. He followed his sweetheart Carrie Wooster, whom he would marry a year after moving to New Mexico in 1910.

3.5 Railroad Tourism

In addition to the health seekers, another target for city officials determined to make Albuquerque grow was tourists. Travel to the Southwest was becoming popular with Americans. Writer Charles Lummis was the first to coin the expression "See America First," a slogan quickly adopted by the railroads in a campaign to draw travelers to the West. A Harvard graduate, Lummis had walked from Ohio to California, passing through New Mexico in 1884, and became captivated by the state's mix of cultures (Frommer's 2000). A fan of Native American culture, he went on to glorify the Southwest in books, criticizing Americans for traveling to Europe instead of exploring the beauty of the United States (Simmons 1988).

The early 1900s continued Albuquerque's population boom as U.S. Census numbers climbed to 6,238 residents in 1900 and up to the 11,020 count of 1910—an increase of 76.7 percent over the decade (City of Albuquerque Planning Department 2001). As the number of Albuquerque citizens grew, so too did its businesses and cultural institutions.

As the population grew, those located along Railroad Avenue supported its name change to Central Avenue in 1907, the result of the thoroughfare's prosperity. On 21 May 1907 the *Albuquerque Morning Journal* reported, "It is the consensus of opinion that the name of Railroad Avenue was misleading and inappropriate. . . . The name Central Avenue, it is believed, will at once convey the idea that it is the city's main business street and center of town."

The building of the Alvarado Hotel (Figure 11: Alvarado Hotel) in 1902 by the Fred Harvey Company in conjunction with the AT&SF was extremely significant to the growing tourist business. The California Mission–style hotel was built on First Street at Railroad Avenue, and its opening heralded a decade of growth and prosperity for Albuquerque. It boasted 89 rooms, a restaurant and bar, banquet rooms, and separate parlors for ladies and gentlemen. That same year, a Harvey Indian curio building and a new depot were also built near the hotel, making the city a center of the AT&SF efforts to draw tourists to the Southwest (Johnson and Dauner 1981).

By the turn of the century, Fred Harvey's restaurants and hotels were a sensation around the West, having transformed railroad travel with the comforts of good food and excellent service. Harvey had begun a partnership with Charlie Morse, president of the AT&SF in 1878, and in

1889, Morse gave him exclusive rights to manage and operate his eating-houses along the Santa Fe's railroads west of the Missouri River (Morris 1994).

With the Alvarado, the city also welcomed Harvey's equally sensational "Girls," the neatly attired young waitresses hired from the East. Author Juddi Morris writes, "Not only did Fred Harvey civilize this part of the country, but he also helped populate it with a new breed of working woman who did much to change the rough reputation of towns smelling of cattle and full of dusty-faced men wearing boots and revolvers." The girls were also deemed socially respectable, as one former Harvey Girl remembered. "When I first came to the Alvarado Hotel in Albuquerque, some of the socially prominent families gave parties for the girls. The Mayor and his wife held an open house at New Year's and a prominent dentist's wife gave an annual tea" (Morris 1994).

The Alvarado also became a social and political center for Albuquerque, hosting the yearly Montezuma Ball, war veterans' reunions, and even President Theodore Roosevelt, who gave a speech in the courtyard on a western tour in May 1903 (*Albuquerque Tribune* 6 May 1966). Lunching at the Alvarado and watching railroad passengers disembark on the promenade became favorite local entertainment (Johnson and Dauner 1981). Famous people including Rudolph Valentino and Joan Crawford walked the promenade at one time or another (Fitzpatrick and Caplin 1975).

Outdoor getaways were also promoted by the early booster pamphlets to draw both tourists and new residents. "Albuquerque: The Metropolis of the Land of Sunshine," published in the early 1900s by the Franklin Hudson Company, proclaimed nearby Coyote Springs to be "the mecca of many who seek the charm of the mountains for a brief respite from city life." The springs, located on what is today KAFB, had been developed in 1886 by Adolph Harsch, who had moved to Albuquerque from Illinois in 1880. Harsch and his brother Edwin opened the Coyote Springs Bottling Plant in Albuquerque and produced effervescent water and soda pop from the spring's mineral water (Figure 12: Coyote Springs mineral water advertisement). "Coyote Water" was a great success, and a favorite chaser for whiskey in local saloons (Scurlock 1995). In a letter to the *Albuquerque Tribune* on 9 October 1973, a local resident stated that the Harsches also built a house on the rim of the canyon wall and rented rooms to tourists wanting mineral baths (Hurt 1973) (Figure 13: Coyote Springs). Harsch apparently operated the bottling plant until his death in 1928 (Scurlock 1995).

For many years, Trimble's "Red Barn" Livery Stable on Second Street and Copper rented small buggies, coaches, or 20-passenger tallyhos for trips into the mountains or down by the river (Johnson and Daumer 1981) (Figure 14: Tijeras Canyon). Early photographs illustrate hunting parties, riding, and target practice on the East Mesa. In *A Boy's Albuquerque*, Kenneth Balcomb remembered a neighbor riding frequently to the mesa. "Mr. A. B. McMillan was a big man, who lived in a big house on South Walter Street, and had saddle horses and a pack of greyhounds," Balcomb wrote. "He would ride on the mesa beyond the university to let the dogs chase rabbits."

To the east of Albuquerque, the mesa lands, which eventually became KAFB, were also highlighted by early promotional campaigns that encouraged homesteaders, miners, ranchers, and even the military to locate there. In the early 1900s, the U.S. Army was considering the East

Mesa for the site of a New Mexico military post. A 1902 report by Major George E. Bushnell noted the climatic and sanitary conditions of Albuquerque, particularly an area of land four miles north of Coyote Springs referred to by Bushnell as "Site No. 3". A 1906 Albuquerque promotional pamphlet refers to that possibility, describing the East Mesa as a delightful location for "either city or populous and productive agricultural district. The U.S. government intends to establish a military post in New Mexico. Should Albuquerque be selected as the location, the regiment would make its home on this great mesa" (McIlhargey 1906). However, the East Mesa was not to house the military for several decades.

3.6 Expansion onto the East Mesa

A year after city councilmen approved Albuquerque's designation from town to city (Figure 15: Albuquerque City Council in 1901), they voted to expand its boundaries and annex its first addition. Urban expansion had begun. Between 1901 and 1940, city officials added 7.9 square miles of contiguous land to the town's original 3.1 square miles.

Most of the new developments were added in the 1920s, including the Country Club (near UNM), Raynolds, Huning Castle, and North End additions. Established in 1922, Country Club stretched from Grand to Los Lomas, Mulberry to University. Raynolds represented the first major suburban addition west of the original city limits. It ran from Eight Street west to Fourteenth and from Park south to Stover. First platted in 1912, it was replatted in 1924 (Biebel 1981).

The following year, 1925, the city doubled its size to the east by annexing nine sections of land that were almost all unplatted and undeveloped. The Terrace, University Heights, and Monte Vista additions were almost immediately developed and populated, though Terrace and University Heights had been platted over 15 years earlier, in 1910 and 1906, respectively. The last major 1920s residential area to be annexed to the city was the Huning Castle Addition in 1928. The addition encompassed 156 acres west of the Raynolds Addition between Rio Grande Park and Central Avenue (Biebel 1981).

During the 1930s, the East Mesa also became home to both the U.S. Veterans Hospital and the private Sandia School for young ladies. Both facilities would contribute to the city's wartime efforts the next decade. A large portion of the hospital's acreage was leased to the War Department during the 1940s for military base use, and the U.S. Army leased the Sandia School for its wartime Convalescent Center.

The Veteran's Hospital was completed in 1932, just west of the first Albuquerque Airport. The War Memorial Mothers Association, a major proponent of the facility, donated the land, and the total cost of construction was $1,250,000. Fifteen buildings sat on the property, which encompassed 516 acres on the city's southeastern boundary—in close proximity to the future air base. It was so close that after World War II a doctor from Germany was arrested and accused of spending his off-duty time on the roof of Building 1 taking pictures and "spying" on the nearby military grounds (Veterans Administration Medical Center 1982).

In 1936, Ruth Hanna McCormick Simms built the Sandia School on 126 acres of undeveloped mesa northwest of the hospital. Ms. McCormick had moved to Albuquerque in 1932 to marry Albert Gallatin Simms, whom she had met while they were both serving terms in the U.S. Congress. Simms, the first woman ever to win a statewide election was featured on the cover of *Time* magazine in 1928. The school was first established in 1932 to prepare the Simms' daughter Bazy and other friends' female children for transfer to Eastern schools and colleges.

The Sandia School was so successful that Simms commissioned architect John Gaw Meem to design a school complex for 80 students. The location was considered excellent for the school's purposes. The locale as described in a 1939 Sandia School booklet was "just within city limits, gives the advantages of ample space, fire and police protection, excellent medical care and accessibility. A few miles away are wooded mountain slopes which offer an inviting variety for picnics and riding expeditions." Built between 1936 and 1937, Sandia School operated until 1942 (*Focus* 1984) when the wartime economy and the expansion of the new air base in close proximity to the school made it "impossible for us to continue … in our present location," as Simms wrote to a student's parent (Department of Energy n.d.a).

A small number of homesteaders and ranchers also called the East Mesa home during the first three decades of the 20th century. A 1908 promotional booster titled "Albuquerque: Chief City of a New Empire in the Great Southwest" described "rolling table lands, covered with waving grass and dotted with homesteads, stretching nearly 10 miles to the Sandia and Manzano mountain ranges" (Hening and Johnson 1908). But the number of homesteads in the KAFB area was never very large; the largest number patented in any one decade was 15, in the 1920s, and only 12 more were recorded between 1930 and 1939. There were two waves of homesteaders, the first from 1912 to 1919 and a second one in the 1920s and 1930s (Scurlock 1995).

Under the Homestead Act, passed by the U.S. Congress in 1862, any citizen 21 years of age or older could claim ownership of 160 acres of land. The land was theirs at the end of five years if they had built a house on it, dug a well, plowed 10 acres, fenced a specified amount, and actually lived there (Columbia Electronic Encyclopedia 2000a). The settlement of the mesa reached its peak after World War I, when improved roads, automobiles, and well-drilling technology made it much more attractive to homesteaders.

The 1920s depression in Albuquerque was also a factor in the reason why the greatest wave of homesteaders on the East Mesa occurred during that decade. Homesteader Reuben Logan, in a 1993 oral history, remembered that a banking crisis in Albuquerque in 1925 drove his father, H. V. Logan, onto the mesa to homestead:

> My dad lost everything he had, and so we moved out of our house on North 12th… he borrowed $500 from his brother in Fort Worth, we took out a homestead and built a house with that $500. It was at the base of the second of the Four Hills, going south about a mile and a quarter. We had 160 acres there (Scurlock 1995).

H. V. Logan's name appears on 1939 landowner maps of KAFB land (Figure 16: Albuquerque and the East Mesa in 1939). Logan is believed to have patented this homestead in 1932, and his brother Robert, a homestead just to the north in July 1939. Eventually the family acquired about

8,000 acres, some of which was later absorbed for the New Mexico Proving Ground (NMPG) (Scurlock 1995).

Land near reliable water sources was settled first. Homesteaders found water in Tijeras and Coyote Arroyos and in the foothills of the Manzanos (Scurlock 1995). For many settlers the aridity, high winds, summer heat, and winter cold were a major hardship. Those families who didn't relocate after a few years survived by farming, ranching, and working in Albuquerque (Scurlock 1995). Frank Speakman, the man who would build Albuquerque's first airport, homesteaded in the foothills of the Manzanos and traveled across the mesa daily to work for the AT&SF railroad downtown (Speakman 1965).

3.7 World War I, Automobiles and Airplanes

The decade from 1910 to 1920 was one of continued growth for Albuquerque, whose population grew to 15,157 by 1920. This was a 37.5 percent increase from 10 years prior according to U.S. Census numbers (City of Albuquerque Planning Department 2001). New Mexico became the 47th state in the Union in 1912. And in 1916, one of the city's most famous politicos, Clyde Tingley, was sworn in as an alderman for the Second Ward, where the railroad shops and machine works were located (Simmons 1982). Tingley adopted the slogan "Build it or buy it" and pushed for civic improvements ranging from better city services to new city parks (Kammer 1997).

The decade was also one of increasing automobile use in both Albuquerque and the country as a whole. Nationally, automobile ownership skyrocketed between 1910 and 1920 from less than half a million owners to a staggering figure of more than 8 million (National Park Service 1999). The first automobile had arrived in Albuquerque in 1897, the property of bicycle dealer R. L. Dodson (Fitzpatrick and Caplin 1975). In 1910, 470 automobiles were registered in the Territory, but this would change with Henry Ford's introduction of the assembly line for mass production in 1913 (Coates 2000). By 1920, that number increased to 17,720 registrations in the state of New Mexico (Kammer 1997). Beginning in 1918, the Albuquerque Automobile Trades Association held an annual automobile show. The program for the Sixth Annual Automobile Show held 8–10 February 1923 displayed ads for Studebakers, Oldsmobiles, Chevrolets, and Fords.

The decade also marked Albuquerque's first experiences with aviation, which would play an extremely important role in the city's future. The first airplane flight in New Mexico took place in 1911 at the Territorial Fair. On 11 October, pilot Charles F. Walsh took off from the Old Town fairgrounds in a Curtis biplane and flew 27 miles in 10 minutes (McIntyre 1995).

On the international front, territorial and economic rivalries were intensifying in Europe and the threat of war—World War I—was imminent. The countries at conflict were Germany, France, Great Britain, Russia, and Austria-Hungary. Rivalry grew over spheres of influence in China and territories in Africa. The assassination of Archduke Francis Ferdinand at Sarajevo in June 1914 set the war in motion, as Austria-Hungary declared war on Serbia the following month. Germany declared war on Russia and France in August. In the following weeks, Montenegro and Japan joined the Allies—Great Britain, France, Russia, Serbia, and Belgium. The Ottoman Empire joined the Central Powers—Germany and Austria-Hungary.

President Woodrow Wilson declared U.S. neutrality in August 1914 but that neutrality was seriously jeopardized after the 1915 sinking of Britain's *Lusitania,* with 128 U.S. citizens on board, by a German submarine. On 1 March 1916, Germany declared unrestricted submarine warfare with the goal of breaking British control of the seas by the end of 1916. The U.S. entered World War I in April 1917. With American participation, the Allies then had almost unlimited industrial and manpower resources (Columbia Electronic Encyclopedia 2000b).

Albuquerque's involvement in World War I was relatively brief. All units of the 1st New Mexico Infantry, New Mexico National Guard, as well as the Battery of Field Artillery, New Mexico National Guard were concentrated in the city (Fitzpatrick and Caplin 1975). UNM briefly became the site of a training camp. Camp Funston, named after U.S. Army Corps Brigadier General Frederick N. Funston, was built on vacant UNM land during the summer of 1917 (Simmons 1982).

All units of the 1st Infantry were ordered to relocate to Camp Funston on 12 June 1917 (Ortiz 1995a). Under the command of Colonel Edmund C. Abbott, more than 1,500 members of the New Mexico National Guard trained for battle and marched daily for four months beginning in June (Figure 17: 1st New Mexico Infantry from Camp Funston in Albuquerque, 1917). A local historian described it as a "noisy soldiers" city of barracks and tents, Red Cross hospitals, supply houses, and horse corrals" (Simmons 1982). Officers' quarters were housed in Kwataka Hall, and military offices were set up in the Administration Building. Training exercises involved the use of trenches that had been dug in the university grounds (Simmons 1982).

Units from Albuquerque were reorganized into other divisions that went overseas in late 1917 and 1918 (Fitzpatrick and Caplin 1975). The 1st New Mexico Infantry was ordered to Camp Kearney, California in early October 1917, joining the 40th Infantry Division, which consisted of National Guard units from Arizona, California, Colorado, and Utah. From there, the 40th Infantry headed to France in July 1918 (Ortiz 1995a).

Battery A, Field Artillery left Camp Funston for Camp Greene, North Carolina, in late September 1917. There it joined the 66th Field Artillery Brigade, including members of the Idaho and Washington National Guards. In mid-November, the brigade transferred to Camp Mills, New York, before departing for France in December. In July 1918, it was sent to the front lines, where it helped to stop the German Army, which had come within 50 miles of Paris. The brigade remained on the firing lines at Marne, Saint Mihiel, and the Argonne until November 1918. One-time 66th Field Artillery Brigade commander Major General Johnson Hagood later wrote that "the brigade fired more rounds in combat than all the other American heavy mobile field artillery combined" (Ortiz 1995b).

By the fall of 1918, the tides of war had shifted, and Germany and its allies had surrendered by November (Sargeant and Davis 1986). The 40th Infantry Division arrived back in the U.S. in April 1919. The New Mexican regiment of the 66th Field Artillery Brigade returned home in July 1919 (Ortiz 1995b). Just after the war, the newly formed Albuquerque Chamber of Commerce sent out 15,000 brochures boasting of the city's assets, focusing mainly on climate and health. As soon as the brochure was printed, the Chamber sent a representative to Washington D.C. to see what the chances were of establishing a recuperation camp for World War I veterans (Armstrong 1984).

The Chamber's other tactic was to promote the city as a transportation center—through aviation, the railroad, and highway traffic. In 1919, it staged an Aviation Week, highlighted by a flying circus, and even leased 155 acres of land on the East Mesa, hoping to start an aviation school. This hope had still not come to fruition by 1923, when another flying circus was staged, with proceeds to go towards construction of a landing field for aircraft on the 155 acres (Armstrong 1984). However, it would be another half decade before the East Mesa became home to a significant airport.

The post-World War I depression hit Albuquerque hard, rather worse than the Great Depression of the next decade. With war's end, the worldwide market for local wool and agricultural products collapsed and caused severe disruption of the state's economy. Forty-seven of New Mexico's 123 banks closed, including two of Albuquerque's three. By the mid to late 1920s, however, Albuquerque's economy recovered, thanks primarily to the significant tourism and healthseekers business.

Despite the postwar depression, several downtown Albuquerque "skyscrapers" were built in the 1920s. These included the First National Bank in 1922, the Sunshine Building in 1924, and the Kimo Theatre in 1927. More than $6 million worth of new buildings were constructed between 1926 and 1930, accounting for almost one third of the city's total assessed valuation at the end of the 1920s (Biebel 1981).

The decade also marked the beginning of Clyde Tingley's reign in Albuquerque. Tingley was elected chairman of the City Commission, or ex-officio mayor, in 1922, a position he would hold until his governorship in 1934. He was to have an immense impact on the city's development, and was much loved by its citizens. Tingley played a significant role in the formation of the Middle Rio Grande Conservancy District in 1925, as well as numerous parks in the North End, the Country Club Addition, and Highlands Park in the following years (Kammer 1997). Tingley's brainchild, Conservancy Beach (later dubbed Tingley Beach), was completed in 1931, a popular spot with residents for swimming, fishing, and motor boating for the next two decades until the polio epidemic of the 1950s caused it to be shut down. The politician's efforts to better the city would continue into the next decade, encompassing the Great Depression and the build-up toWorld War II.

The incidence of automobile travel rose greatly during the 1920s throughout the nation and in Albuquerque. The car became a fixture from the mid-1920s on. To accommodate the vehicles, Albuquerque began an aggressive campaign to pave streets. City boosters in 1920 boasted "60 miles of graded streets." By 1929, that figure had changed to 53 miles of paved streets. The number of automobile registrations in New Mexico had grown to 84,000 by 1930 (Kammer 1997).

The Chamber of Commerce's dream of making the city an automobile transportation center became reality when Central Avenue was made a part of the national highway system in 1931. Local civic leaders were triumphant when it was decided that U.S. Highway 66 would run through Albuquerque instead of Mountainair (Biebel 1981). Albuquerque became an exotic tourist destination, fueled by Americans' rising passion for motor travel. It became a "tourist oasis, dotted with cowboy-and-Indian-theme motels, diners, and last-stop-before-the-desert service stations" (Price 1992).

The 1920s also heralded the popularization of aviation, which had captured the American public's fancy. Barnstormers traveled the country giving exhibits of stunt flying and parachuting for spellbound locals. Frank Speakman, the man who would build the Albuquerque Airport, compared the pilot to "a living replacement for the cowboy, mountain man and Pony Express rider. This footloose wanderer introduced the sport of flying to a thrill-seeking public, inveigling many to fly who had never before seen an airplane" (Speakman 1965). This new public interest was to have a significant impact on Albuquerque, which would welcome its second important transportation center with the building of the first Albuquerque Airport in 1928. Like the arrival of the rail car in 1880, the airplane forever changed the city.

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4.0 BARNSTORMERS TO BOMBARDIERS (1928 – 1939)

The year 1928 was a landmark one for Albuquerque, which experienced its first organized efforts in aviation. Albuquerque Airport, a private venture between railroad employees Frank Speakman and William Franklin, had risen on the East Mesa with assistance from Mayor Clyde Tingley and the City of Albuquerque. The arrival on the scene of entrepreneur James G. Oxnard—who became Speakman's new partner—resulted in an influx of funding and the establishment of the corporation, Airport Holdings, Inc.

The airfield soon drew business from private flyers, as well as Transcontinental Air Transport (TAT) and Western Air Express (WAE), commercial airlines that set up operations at the new airport (Figure 18: Western Air Express 1930 schedule). The city's viability as a crossroads of air traffic in the Southwest was confirmed by this early success. WAE soon moved to the West Mesa Airport and was joined by TAT as the two airlines merged to become Trans World Airlines (TWA). This new facility, also private, became known as Albuquerque Airport, and the first, which was renamed Oxnard Field, also continued to service general aviation needs.

In the mid-1930s, Mayor Tingley, other city officials, and TWA management began to conceive of a municipal airport, the next necessary step in confirming Albuquerque's status as a "Crossroads of the Southwest." With the help of President Roosevelt's Works Progress Administration (WPA) funds, a new airport was begun four miles west of Oxnard Field and completed in 1939, on the cusp of World War II.

In January 1939, Major General Henry "Hap" Arnold, who became chief of the U.S. Army Air Corps (AAC), proposed to Congress that money be spent on a strong air defense. It soon became a national priority to secure airfields and bombing and gunnery ranges. An effort was also being made in cooperation with the WPA and Civil Aeronautics Authority to build up civilian airports of value to national defense efforts (Tagg 1998). Albuquerque city leaders began to examine the possibility of an air base locating on the mesa, and through extensive negotiations with the AAC, succeeded in their efforts when the Army established an air base on the East Mesa in 1939.

4.1 Speakman Builds an Airport

In 1927, at the age of 25, Charles Lindbergh became a legend when he made the first nonstop solo flight from New York to Paris in a tiny silver monoplane called the *Spirit of St. Louis*. That same year, AT&SF employee Frank Speakman was homesteading a ranch about 10 miles east of Albuquerque in the foothills of the Manzano Mountains. Speakman crossed the East Mesa each day to work the graveyard shift in the railroad's ticket office (Speakman 1965). He had a fascination with flying, and Lindbergh's groundbreaking transcontinental flight inspired him to become a pilot.

It occurred to Speakman that the East Mesa would be a logical location for an airport, and the idea began to take root. In just two years, Lindbergh himself would come to Albuquerque as a technical advisor to TAT to inspect its new facilities at Speakman's Albuquerque Airport (Figure 19: Charles Lindbergh and Clyde Tingley at the Albuquerque Airport in 1929).

In 1928, Speakman and colleague William Franklin, who worked in the AT&SF baggage room, leased 140 acres of land on the mesa. They contracted Archie Moore who had purchased it from the original homesteader and for some years had been the general factotum, an employee with numerous duties, at the First National Bank in downtown Albuquerque (Speakman 1965). The two men purchased battered equipment, including a light scraper and a tractor that had been discarded by a circus. They started to build an airport in their spare time.

Because the equipment was in poor condition, they approached Mayor Clyde Tingley for help. Tingley was aware of the desirability of a local airport for Albuquerque, but he knew there were no funds in the treasury for it. "Boys, I'll tell you what we'll do," he said. "We'll lend you all the graders and scrapers and tractors we can spare. We'll work them here in town during the day and you can work them out there at night" (Figure 20: Regrading the runway, circa 1930). Encouraged, Speakman quit his job with the railroad to work building the airport full-time (Speakman 1965).

The first hangar was 60 feet by 80 feet, with adobe walls, a concrete floor, and galvanized roof supported by steel trusses. Large letters proudly read "Albuquerque Airport." An administration building was erected several hundred feet to the east for a waiting room, offices, and three bedrooms for travelers. There were also permanent living quarters for Speakman and his wife (Speakman 1965) (Figure 21: Albuquerque Airport, 1929).

With the initial runway construction being complete in May 1928, Mayor Tingley appointed an airport committee of local civic and business leaders as well as Franklin and Speakman to participate in the development of the city's aviation future. In a speech to the Lions Club, Tingley pointed out that Albuquerque was only a short day's hop from both Los Angeles and Kansas City. The Lions Club then appointed their own Airport Committee (Speakman 1965).

Entrepreneur James G. Oxnard, who had been in France when Lindbergh landed, soon bought Franklin's portion of the venture. Oxnard had wanted to start an airline from Denver to Mexico City and was moving toward his goal when Mexico plunged into turmoil after the assassination of its president (Speakman 1965). Oxnard turned his attentions to the Southwest because of its beauty, weather, and great distances between cities. In the summer of 1928, Oxnard bought out Franklin's share of the airport and established Airport Holdings, Inc. On 20 July 1928, Oxnard and Speakman began promoting the airfield as a first-class facility, for private flyers and transport companies, and offering flight instruction (Speakman 1965) (Figure 22: Oxnard Field in 1928, overlaid onto modern KAFB map).

Albuquerque began to attract the attention of pilots and airline companies interested in using the airfield as a refueling stop. In November 1928, pilot Arthur C. Goebel spoke at the airport about Albuquerque's eligibility as a stop on a transcontinental air race route from New York to Los Angeles. Goebel, a pilot from Belen, New Mexico had won the Dole Prize the year earlier for the first flight from Oakland, California to Honolulu, Hawaii. C. C. Mosely, the vice president of the WAE airline, accompanied him. Before a crowd, Goebel praised Albuquerque's virtues as an aviation stop—a lack of exceptionally high mountains, no severe winter weather, plenty of open space for emergency landings, and the best weather anywhere (Oppenheimer 1962).

With the influx of Oxnard's funding and the concept that the Albuquerque Airport could become a crossroads for Southwestern air traffic (Figure 23: WAE 1930s air route map), the airport began a period of rapid expansion from 140 acres to 480 acres with a great increase in facilities in early 1929. The growth of air traffic through Albuquerque, as well as the influx of Oxnard's funding, precipitated the lengthening of the east-west runway to 4,000 feet, the grading of two diagonal runways, and the compaction and oiling of all runways. Telephone service and lighting for night operations were installed, and a 50-foot navigation beacon tower was erected (Speakman 1965).

On 11 July 1929, an Airport Inn was constructed east of the administration building for dining, dancing, and lounge facilities (Alberts and Putnam 1985). The inn had a dining room, ballroom, soda fountain, and lounge. It was open to pilots, visitors, and the general public. Airplane watching became one of the most popular past-times for Albuquerque citizens, who flocked to the new inn (Oppenheimer 1962), where they could watch the activities of the airport from the roof. A second, larger hangar was constructed later, 100 by 120 feet, and built of steel and masonry (Speakman 1965).

4.2 Airline Service on the East Mesa

In 1929, TAT made Albuquerque its western headquarters and built a facility at the airfield to accommodate its passengers and employees. Located east of the Airport Inn, the building contained offices, a passengers' waiting room, pilots' quarters, and a Fred Harvey dining room—the first all-electric Fred Harvey restaurant in the country. This building can be seen today as the Sandia Area Federal Credit Union, located on Wyoming Boulevard at KAFB (Figure 24: TAT's western headquarters at the Albuquerque Airport). On 24 June, local aviator Katherine Stinson broke a bottle of ginger ale (as it was Prohibition) over the propeller of a Ford tri-motor to be used by TAT in its western division (Speakman 1965). Stinson was famous in aviation circles: she had been the fourth woman in the U.S. to earn a pilot's license, after her family sold their piano to pay for her flying lessons. Only 21 at the time, she became known as the "Flying Schoolgirl," flying exhibitions all over the country, even adding lights and doing loops at night. She set many records, performed in Japan and China, and was the first woman sworn in by the Post Office as an air mail carrier (Eckland n.d.).

A crowd of 5,000 attended the christening, where Governor Richard C. Dillon predicted that Albuquerque would become the Grand Central Station of the Southwest. In July, Charles Lindbergh inspected the TAT facilities, receiving a feathered headdress from two Indian chiefs from the First American Indian Pageant. On 8 July TAT inaugurated service (Speakman 1965).

In 1925, WAE also set up operations at the airfield. Former racecar driver Harris "Pop" Hanshue and several other wealthy Los Angelenos, *Los Angeles Times* publisher Harry Chandler, realtor William May Garland, and Richfield Oil executive James Talbots, tarted WAE. WAE was the first airline in the U.S. to hire in-flight service attendants. A temporary office for tickets was set up in the Franciscan Hotel (Trans World Airlines Master Executive Council n.d.; Speakman

1965). On 15 May the airline flew inaugural service to Los Angeles, an event that drew more than 2,000 bystanders. A parade proceeded up Central Avenue to the airport. The first group of passengers paid $90 for the flight, lunch enroute, and airport limousine service (Alberts and Putnam 1985). Mayor Tingley was among them. Other notables included local contractor Charles Lembke, Princess Lou-Scha-Enya of the First American Indian pageant, and J. E. Mathews of Mathews Dairy (Speakman 1965).

In mid-May 1929, Herbert Hoover Jr., son of President Hoover, installed WAE's radio equipment, which he had also designed, at the airport. Hoover was the chief radio engineer for WAE. Speakman remembered that he "wore hunting boots, corduroy knickers, and a heavy sweater, and his clothes were thoroughly mud splattered before he arrived at the Airport, as it had been raining for several days … [Hoover] avoided the limelight, and few people discovered that he was in town" (Speakman 1965).

By the end of 1929, the business created by the airport was positively affecting the local economy. Gasoline sales were exceeding 30,000 gallons per month, and many transcontinental passengers had layovers in Albuquerque and were spending money (Speakman 1965).

4.3 The Airlines, West Mesa and Oxnard Field

In late 1929, WAE moved its operations to Albuquerque's West Mesa, in an area near today's West Mesa High School, and the airline christened its facility the West Mesa Airport. The impetus for this move was the proximity of the mountains. The more than 5,000-foot-high Sandia Mountains to the east, combined with increased engine power/land speed, forced WAE to move its operations farther from the mountains (Oppenheimer 1962).

By the end of 1929, just as the two airlines were being established at opposite sides of the city, the Postmaster General was revising airmail routes as authorized by the McNary-Watres Act of 1930 (Alberts 1987). Postmaster General Walter Folger Brown summoned airline chiefs to Washington D.C. and offered them a deal—if they would merge into units big enough to be financially healthy, the government would give them a lock on direct cross-continental routes. The McNarys-Watres Act also offered bonuses to operators flying multi-engine aircraft equipped with the latest instruments—an incentive for the airlines to fly larger aircraft to accommodate both passengers and mail.

As a result, in 1930, WAE and TAT merged to become TWA, which was given the central transcontinental route through St. Louis. The executives of WAE took charge of TWA's western division, and Albuquerque continued to be an intermediate stop. TWA also went on to contract with Douglas Aircraft in 1932 to build the legendary DC-3—which flew faster, higher, and farther than any other commercial aircraft (KCET Hollywood n.d.).

The result of the 1930 merger was that the Albuquerque Airport and TAT facilities were all but abandoned. The West Mesa Airport became unofficially known as the Albuquerque Airport. Frank Speakman's airport was then renamed Oxnard Field (Speakman 1965).

During this period and up until 1942, Oxnard Field provided services to general aviation, was used as a stop for air racing, as a place for celebrities and famous aviatiors to land, and as a school for flight lessons. Famous persons who landed and took off at Albuquerque included Wallace Beery, Douglas Fairbanks, Mary Pickford, Lillian Gish, Barbara Stanwyck, Will Rogers and Irving Berlin. A nightclub for concerts by nationally recognized bands was set up in the former TAT depot in order to generate more funding for the field (Alberts 1981).

The mid-1930s was the Golden Age of air racing and record setting, with Oxnard servicing some of the best pilots in the country flying in the Bendix Trophy Race. Speakman later remembered esteemed pilot Jimmy Doolittle remaining in his racer's cockpit as the plane was refueled, accepting water, sandwiches, and weather reports (Alberts and Putnam 1985).

Hunters and fishermen also used the airport's planes and pilots for trips to distant or remote locations. Frank Speakman wrote in his memoirs that "hunting coyotes from the airport's Curtiss-Wright pusher plane was found to be great sport. There were many of these animals on the mesa south of the airport area. This was on McCormick Ranch, and occasionally the hunters would land and have breakfast with the ranch foreman" (Speakman 1965).

4.4 A New Deal and a New Airport

In the early 1930s, the Great Depression set in with nearly 10 million workers around the U.S. out of jobs. But unlike other industrial cities in the East, Albuquerque didn't immediately feel the backlash of the Depression. Until 1932, unemployment remained between four and six percent. Official 1930 census data placed the unemployment rate in Albuquerque at 4.9 percent. Major construction projects continued to be announced in 1930 and 1931, including a $40,000 addition to the Indian School, $1 million for a new Federal Building, and a $1.25 million Veteran's Administration Hospital (Figure 25: U.S. Veterans Administration Hospital in the early 1930s) (Figure 26: Veteran's Administration and Oxnard Field properties, overlaid on current KAFB map). By mid-1932, there were warning signs of impending depression. The AT&SF shops laid off workers and shortened the work week, and both UNM and the Albuquerque public school system were reducing faculty salaries. By mid-1933, construction had for the most part ceased in Albuquerque (Biebel 1981).

City administrators looked to President Franklin Delano Roosevelt's New Deal programs as solutions to economic instability. Roosevelt's Public Works Administration (PWA) had been established to administer the construction of various public works projects, such as public buildings, bridges, dams, and housing developments, and to make loans to states and municipalities for similar projects. Between 1935 and 1939, Albuquerque received PWA moneys for water main renovations, construction of viaducts and highway underpasses, a sewage disposal facility, and the construction of a Chamber of Commerce building downtown (Biebel 1981).

With the election of Clyde Tingley to the governorship in 1934, federal funding for Albuquerque increased. Tingley's persistence in securing funds for New Mexico and particularly Albuquerque did much to alleviate the difficulty of the Great Depression for New Mexicans. His rank as governor and his support of Roosevelt gave him access to the White House. Tingley traveled by train to Washington D.C. at least 23 times in order to get federal aid for the state and for Albuquerque in particular (Simmons 1982).

Tingley developed a friendship with Roosevelt, the impact of which was impressive (Simmons 1982). Many letters were sent between the two, including a 1938 letter from Roosevelt concerning the end of Tingley's governorship. It reads, "I cannot let you retire from your present office without telling you how deeply I have appreciated the fine and loyal cooperation you have always given to my administration during the period of your governorship. It has been a great pleasure to work with you. You take with you sincere wishes for every happiness and success" (Roosevelt 1938).

In the 1930s, a rapid succession of Federal Emergency Relief Administration grants came through for the city. The grants funded work on Rio Grande Park and Conservancy Beach, a new Veteran's Center, three new baseball fields, and major street grading and graveling, among other projects. UNM also benefited from federal relief programs, with more than $1,600,000 for building projects, student aid, and faculty research and housing (Biebel 1981).

By 1935, Roosevelt's WPA had established offices in Albuquerque and begun consideration of applications for $325,000 in relief funds allotted to New Mexico. The WPA, created when unemployment was widespread, was designed to increase the purchasing power of persons on relief by employing them on useful projects. Approved projects included $35,000 for a new Little Theater building, a new $22,000 fire station on Central Avenue in the Monte Vista addition, and $400,000 for a 181-acre State Fair Complex (Biebel 1981).

Albert Smith, the manager of the TWA terminal on the West Mesa, conceived the idea that Albuquerque would be a logical location for a big air base, contingent on the building of a large airport. To help him, businessman George Kaseman, president of the Albuquerque National Bank, optioned 888 acres of East Mesa land—four miles west of Oxnard Field—in order to spur the city to sponsor a WPA project to build an airport. Smith then persuaded his employer, TWA, to advance $100,000 in lease money (Oppenheimer 1962).

In the summer of 1936, state WPA authorities sent plans to Washington D.C. for a $750,000 municipal airport to be built on the East Mesa. In December, word came that the WPA had approved a $500,000 grant for construction of the new airport (Figure 27: WPA Project Proposal for Municipal Airport). The city's share of the project totaled $200,000. A portion of this, $100,000, was advanced to the city by TWA as "advance rentals subject to obtaining a suitable lease by TWA" (Tingley folder 231, New Mexico State Records Center and Archives, Santa Fe). During the project, delays by the WPA caused Jack Frye, President of TWA, to send letters to Clyde Tingley requesting:

1) that the project be sped up or TWA would choose another city for their division headquarters;
2) and that the runways be extended to allow for the new four-engine Boeing aircraft that were planned for service in 1938 (Tingley folder 231, NMSRC&A).

In 1935 as the new municipal airport was in the planning stages, Tingley and many local business and civic leaders, including Albert Smith, focused on increasing military aviation activity. They formed a Citizens Committee to attempt to get a military air base established near the new airport. The committee traveled to Washington D.C. to see about the possibilities of the AAC establishing a new military air base near the planned airport (Figure 28: Original WPA plan for airport). The committee was aided in its quest by Smith's friendship with AAC Chief, Major General Henry "Hap" Arnold (Alberts and Putnam 1985). Smith had served in the AAC with Hap Arnold and had completed the first transcontinental mission of the Corps in 1918.

Ernst Blumenthal, who had come from Germany in 1912 to cure his tuberculosis, was chosen to be the architect for the new airport. Timbers were cut in the Sandia Mountains for *vigas* (log beams) and support columns for the two-story lobby; flagstone for the floors was taken from a quarry in Tijeras Canyon (*Albuquerque Tribune* 1989). An *Albuquerque Tribune* special section titled "Airport 89," 18 May 1989, reported that Tingley broke ground on a windy March morning in 1938 by grabbing a shovel, hugging a TWA stewardess named Dorothy Koke, and proclaiming he was building a better New Mexico by promoting a bigger Albuquerque.

No fewer than 222 WPA workmen worked around the clock to complete runways, hangars, and terminal buildings at the airport, where the main hangar was reported to be one of the four largest in the country (Biebel 1981). The new municipal airport was finally ready for business in August 1939. Its Southwestern décor, excellent restaurant, lighting, and communications were state of the art.

TWA and Continental moved operations to the new Albuquerque Municipal Airport and the West Mesa Airport became a general aviation facility operating under the name Cutter-Carr Airport until 1947. When Cutter-Carr Flying Service relocated to the Albuquerque Municipal Airport in 1962, the land was then used for the urban development of the Greater Albuquerque area (Alberts and Putnam 1985).

Oxnard Field's business began to decline sharply by late 1939 because of competition from the new Albuquerque Municipal Airport and Cutter-Carr. One of its last functions was as a ferry stop for crews flying Lockheed Hudson and Douglas Boston bombers from the Lockheed factory to Great Britain. The planes were given fuel consumption test flights and final inspections before continuing their trip overseas (Speakman 1965).

The same year, Albuquerque civic leaders including Clyde Tingley convinced the U.S. Army to establish an air base in conjunction with the new airport (Figure 29: Clyde Tingley with military personnel). The city was finally to welcome a major military installation—one that changed the course of its future.

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5.0 WWII BOMBERS, TRAINING AND TESTING (1939–1945)

During World War II, Oxnard Field and the Albuquerque Municipal Airport were both used for U.S. Army military activities. The Albuquerque Army Air Base operated adjacent to the Albuquerque airport and used the municipal runway, while Oxnard Field was used alternately as an Army Air Depot and Convalescent Center (Figure 30: Development from airfield to KAFB). Both airfields were associated with training activities, the one adjacent to the airport primarily for advanced training for pilots and bombardiers and the Oxnard Field facility for mechanics training.

During World War II there were three levels of pilot training:

1. Primary Flying School
2. Basic Flying School
3. Advanced Flying School (including Transition Training)

In 1943, at the height of U.S. Army Air Forces (USAAF) training, there were 56 Primary, 30 Basic and 33 Advanced Flying Schools across the country. Between 1939 and 1945, more than 193,000 pilots and 45,000 bombardiers were graduated in the U.S. (Bright 1992). The Albuquerque Army Air Base provided advanced flying training in "AT" (advanced trainer) trainer aircraft and transition training in combat-ready aircraft, primarily the B-17 and the B-24. In addition to pilot training, the Albuquerque Army Air Base provided bombardier training at its Advanced Flying School. During this period, the facility was under the Flying Training Command and the Air Training Command.

Near the end of the war, the base, by then renamed Kirtland Field, became a center for B-29 Superfortress training under the Second Air Force of the Continental Air Forces. Kirtland Field was one of eleven USAAF bases to receive B-29 hangars. During World War II, the B-29 Superfortress bomber played a tremendous part in the U.S. battle against Japan (Bright 1992). Kirtland Field also served as an airfield for Manhattan Project scientists at Los Alamos (Furman 1990). The components of both Fat Man and Little Boy atomic bombs traveled through Kirtland on their way to Japan (*Albuquerque Journal* 1995; Furman 1990).

To the east of the air base, at Oxnard Field, the U.S. Army also acquired 1,100 acres of land to develop a school for aircraft mechanics. An Air Depot Training Station, it was unofficially referred to as "Sandia Base." After various other incarnations—as a convalescent center and aircraft burial ground—Sandia Base became the precursor to Sandia National Laboratories when the Manhattan Project's Z Division relocated from Los Alamos to continue top-secret work development of atomic weapons.

The NMPG was constructed concurrently with the development of the Albuquerque Army Air Base and the activities at the old Oxnard Field. It was built to the south to serve as the base for testing the top-secret proximity fuze, a device that played an important role in defeat of the German Vergeltungswaffe (V-1) rocket. The proximity fuze, a weapon that was later dubbed by the media as the second most important one developed during the war. By war's end, nearly

50,000 acres had been acquired for the NMPG (Verhaaren 1998), this acreage is to the south of the runway and main base that today makes up the greatest portion of KAFB.

Throughout World War II, Kirtland Field's soldiers and officers were a common sight on Albuquerque streets (Figure 31: Army personnel in downtown Albuquerque). The first troop train arrived in the summer of 1941, loaded with 500 base support people. The Alvarado Hotel was one of the major stops for military trains. A separate group of Harvey waitresses called "troop train girls", on call 24 hours a day, was hired to serve only servicemen (Morris 1994).

World War II dramatically affected Albuquerque's and Kirtland Field's future. As a result of wartime activities, the East Mesa became a center for high-tech scientific and military innovation. Accordingly, in the decade from 1940 to 1950, Albuquerque's population grew by 173 percent from 35,449 residents to 98,815 according to U.S. Census data.

5.1 WWII and an Air Force Strategy

The threat of a second World War was becoming a reality in the late 1930s. Under Hitler's rule, Germany had annexed Austria in 1938 and occupied Czechoslovakia in 1939. When Italy seized Albania in April 1939, Great Britain and France abandoned their appeasement policy and established alliances with Turkey, Greece, Romania, and Poland. In May, Germany and Italy signed a full military alliance. War was impending.

In the U.S., President Roosevelt called for an air force, not ground force, powerful enough to defeat Hitler and advised Congress "our existing air forces are so utterly inadequate that they must immediately be strengthened" (Tagg 1998). The Army Quartermaster General prepared plans for the expansion of existing military bases, and construction of new ones. Although air bases served as training and service organizations, it was important to properly locate air bases for continental defense. The U.S. Army Air Corps (AAC) required bases and auxiliary airfields in the four possible theaters of war: the northeast, southeast, northwest, and southwest. In addition, the U.S. AAC handpicked specific training locations that had year-round fair weather (Tagg 1998). In 1941, the U.S. Army designated the AAC the USAAF. The Commanding General for the newly created USAAF was none other than General Hap Arnold, the man who had helped to establish an air base in Albuquerque (Figure 32: Organizational chart for the USAAF).

In 1939, New Mexicans received news that the U.S. War Department had chosen Albuquerque Municipal Airport as an Army Air Station, and an Army Air Force Unit had been dispatched. The Civil Aviation Authority at Washington D.C. announced that Albuquerque's airport would receive "state of the art radio landing equipment as part of a seven million dollar National Defense Program" (Biebel 1981). Albuquerque was one of 10 U.S. facilities to gain this equipment (Biebel 1981).

The first of September brought the outbreak of World War II when Germany, without a declaration of war, invaded Poland. Great Britain and France declared war on Germany two days later. In the U.S. and specifically New Mexico, talk of war was everywhere. In anticipation of a new military base, the Albuquerque Chamber of Commerce worked with the Post Office on a survey to determine the availability of housing in the event that the military began dispatching servicemen to Albuquerque (Armstrong 1984).

5.2 Albuquerque Army Air Base

In late 1939, the U.S. Army leased 2,000 acres adjacent to the municipal airport from the City of Albuquerque (Figure 33: Military and airport properties overlaid on current KAFB map) (Figure 34: Aerial of Albuquerque Municipal Airport in 1939). A small Army Air Corps detachment arrived to service U.S. Army and U.S. Navy aircraft in transit as well as planes being ferried to Great Britain.

In September 1940 Brigadier General Frank D. Lackland of the Army Air Corps 1st Wing Headquarters wrote to New Mexico Governor John E. Miles notifying him that the AAC 1st Wing had conducted a study of airports in the state that would be suitable for use for heavy bombardment aircraft. In his letter, he requested that the governor focus WPA efforts on improving specific airports in the state, placing Oxnard Field and the municipal airport at the top of the list. The Brigadier General also requested that the information be considered secret and included a list of requirements for military facilities (Lackland 1940). By October 1940, TWA's Albert Smith, a former AAC officer, was transferred to active AAC duty as liaison officer to assist with the building of the new air base (Alberts and Putnam 1985). Albuquerque Army Air Base was one of the bases in the U.S. scheduled for construction under the original AAC 54-Air Base Plan, though that figure of national installations had jumped to 98 bases by the end of 1941 (Oppenheimer 1962).

Construction on base buildings began in January 1941. The firm of Morgan and Shufflebarger was contracted to build 110 buildings (Figure 35: Albuquerque Army Air Base in 1943). The Albuquerque base's first tenant was the 19th Bombardment Group. The quarters were designed to house 225 officers and 1,970 enlisted men comprising the 19th Bombardment Group and its attached squadron, quartermaster, signal, ordnance, medical, chemical warfare, chapel, and finance units (Alberts and Putnam 1985). On 8 March 1941, Albuquerque Army Air Base was activated as a training center under the jurisdiction of the AAC West Coast Training Center headquartered at Moffett Field, California. The Moffett Field center was one of three regional AAC training centers in the U.S.; Randolph Field, Texas and Maxwell Field, Alabama hosted the other two centers.

The existing 5,000-foot, north-south Albuquerque Municipal Airport runway was lengthened to 10,000 feet in order to accommodate B-17 heavy bombers, the aircraft of the 19th Bombardment Group (Alberts and Putnam 1985). The B-17s or "Flying Fortress" was the first big bomber used during World War II. They were used mainly in Europe by the 8th Air Force, but also in smaller numbers in the Far East, where the 19th Bombardment Group would be stationed (Hauser 1993).

In March 1941, the *Albuquerque Progress* reported, "As Albuquerqueans look forward to the first glimpse of great flying fortresses in majestic formations in our sky, they marvel at the speed with which base facilities for these defense eagles have been constructed. Starting late in January, Morgan and Shufflebarger ... have pushed the work at such speed that a new city seems to have risen on the mesa overnight."

Enlisted members of this advance group sent to the base soon were able to use barracks and general mess facilities; the half dozen officers present slept in a classroom building and ate at Chasen's Restaurant in the Municipal Airport building (Alberts and Putnam 1985). As soon as the quarters were completed they were filled. In late March, the men of Company C, 33rd Quartermaster Regiment; the 264th Quartermaster Company; and the 91st Quartermaster Battalion arrived to provide supply and transportation support. Detachments of the Medical and Finance departments and the 3rd Chemical Company arrived soon after.

Also in March of 1941, AAC Major Newton R. Laughinghouse assumed temporary command of the base in order to relieve Albert Smith of his liaison responsibilities. Two weeks later, Lieutenant (Lt.) Colonel Frank D. Hackett, the first official Albuquerque Army Air Base commander, replaced Laughinghouse. On 1 April 1941, Lt. Sid Young landed a B-18 "Bolo" bomber at the base, marking its official opening (KAFB 2000).

Albuquerque residents were getting used to their skies buzzing with aircraft. A tourism booster pamphlet titled "Pictorial Albuquerque, 1941" reported that "scores of military planes…huge flying fortresses, combat planes and pursuit planes" were present in the city (Redman 1941). That summer, the U.S. AAC became the USAAF (Figure 36: USAAF World War II poster), and in August the $1,455,401 base construction project was finished (Alberts and Putnam 1985).

During the greater part of World War II, the air base at Albuquerque served as a training facility under a variety of Army training commands (Figure 37: Training commands at the airfield in World War II). In January 1942, the Flying Training Command, which coordinated the activities of the three regional training centers, was established. Under the new command, Randolph Field, Texas became the Central Flying Training Command headquarters and Maxwell Field in Alabama became the Eastern Flying Training Command headquarters. In early 1942, the Western Flying Training Command, headquartered at Santa Ana, California, superseded the West Coast Training Center at Moffett Field (Costa Mesa Historical Society 2001; Moffett Field Museum n.d.). In March of 1942, the AAC Flying Training Command was redesignated the Army Air Forces Flying Training Command (Ravenstein 1986).

In February 1942, the base was renamed Kirtland Field for Colonel Roy C. Kirtland (Figure 38: Roy Kirtland), a pioneer Army aviator who had died in May 1941. Major General Arnold made the recommendation for the new name, as he had learned to fly under Kirtland's tutelage (Alberts and Putnam 1985).

In 1912, Kirtland was famous for piloting the first airplane from which a machine gun was fired. During the First World War, he organized aviation mechanic regiments and commanded the Third Regiment in France, concurrently serving as inspector of aviation activities in England and of Air Service rest camps. Kirtland was later appointed commander of Langley Field, Virginia, and then acting Commandant of the Air Corps Tactical School. Though he retired from service in 1938, he returned to active duty in 1941 at the AAC West Coast Training Center at Moffett Field, California where he died of a heart attack. At the time of his death at the age of 67, Roy Kirtland was the third oldest military pilot in the Army (Alberts and Putnam 1985).

Kirtland Field's primary activity from December 1941 to March 1945 was the operation of its Advanced Flying School (Figure 39: Kirtland Field in 1942). In March 1945, Kirtland Field was chosen to be a base for the Second Air Force for B-29 superfortress bomber crew training, a high priority in the military's plans. In addition to training American bombardiers, pilots, and aviation mechanics, the field also hosted various wartime participants ranging from the pilots serving Chinese General Chiang Kai-Shek to Los Alamos scientists, who were about to change the future of warfare. These roles secured Kirtland's status as a long-term base of importance.

5.2.1 The 19th Bombardment Group

The 19th Bombardment Group arrived from March Field, California, in April 1941, shortly after Albuquerque Army Air Base was activated. Its purpose was to train air and ground crews for reconnaissance and bombing duty on Boeing B-17 "Flying Fortresses" before deployment to Clark Field in the Philippine Islands (Figure 40: The Flying Fortress). The 19th Bombardment Group became the most famous bomber unit of WWII for its part in the strategic campaign against Japan (Bright 1992).

The 30th, 32nd, and 93rd Bombardment Squadrons and the 38th Reconnaissance Squadron were assigned to the 19th Bombardment Group. The 3rd Air Base Squadron, also assigned to the 19th Bombardment Group, was the first to arrive on base. Headquarters, materiel, quartermaster, ordnance, and signal detachments accompanied it. On 10 April the squadrons began operations (Alberts and Putnam 1985).

Because B-17s were in short supply, the pilots trained on Douglas B-18s and Northrop A-17s, as well as Stearman PT-17 biplanes (Alberts and Putnam 1985). Under the command of Lt. Colonel Eugene Eubank, the 19th Bombardment Group focused on precision, high-altitude, and formation flying. They also flew mock attacks on New Mexico villages and ranches. Eubank was known for being a taskmaster, demanding that his pilots gain extensive cockpit experience and that the men cross-train as navigators and bombardiers (Alberts and Putnam 1985). As such, it was purported that every B-17 flight had a half-dozen pilots aboard, two flying, two practicing dead-reckoning and celestial navigation, and two making practice bomb runs (*Nucleus* 1967).

The 19th Bombardment Group transferred to active duty in September 1941. Still short of B-17 aircraft, they moved in increments, with the 30th and 93rd Bombardment Squadrons leaving in September. Leaving Kirtland with them were the 440th Ordnance Company, the 701st Ordnance Company, the 7th Materiel Squadron, Company "C" 33rd Quartermaster Regiment, the 2nd Platoon Company "C", 89th Quartermaster Battalion, and the 3rd Detachment Chemical Company (Oppenheimer 1962). The ground and air echelons of the 32nd Bombardment Squadron and 38th Reconnaissance Squadron left in November and December. They flew to Hamilton Field, California, to Hawaii, to Midway Islands, to Wake Island, to Australia, and then to Clark Field in the Philippines (Alberts and Putnam 1985).

Houser after Pearl Harbor, the group was badly mauled on the ground at Clark Field by the Japanese (Bright 1992). Major General Arnold later said, "It is true that we were outnumbered, but I had always believed that our airmen would fight it out in the air; they should never have been caught flat-footed on the ground" (Davis 1997). For the next two weeks, and suffering heavy losses, the 19th Bombardment Group conducted reconnaissance and bombing operations against the Japanese (Bright 1992). Many members of the 19th Bombardment Group were decorated for bravery (KAFB 2000).

At the end of 1941 and into 1942, the 19th Bombardment Group conducted B-17 bombing operations out of Java, returning to Australia in March. During the same month, the group moved General Douglas MacArthur and his group from the Philippines to Australia. Later in 1942 the 19th Bombardment Group took part in the Battle of the Coral Sea and in operations in Papua and New Britain. In late 1942 the 19th Bombardment Group returned to the U.S. where it served as a training unit for replacements. On 1 April 1944 it was redesignated a B-29 outfit and transferred to Guam from December 1944 through February 1945 (Heavy Bombers 2001). There—as part of the 20th Air Force—the 19th Bombardment Group received two Distinguished Unit Citations for its part in the strategic campaign against Japan (Bright 1992).

5.2.2 The “Four-Engine School”

Also in 1941, before the U.S. entered the war, Major General Arnold selected domestic airline TWA to provide transition training on Consolidated’s B-24 *“*Liberator*”* bombers. At the time, TWA was the only commercial airline operating four-engine equipment (Boeing 307 Stratoliners) and its skilled personnel, both pilots and ground crew, were available to begin training (Oppenheimer 1962).

The school operated under the Army Air Corps Ferrying Command, which had been established in late May 1941 and charged with transporting aircraft overseas for delivery to the British. The students were training to ferry Consolidated B-24 bombers (Figure 41: The Liberator (B-24), the aircraft used at the Four-Engine School) and other multi-engine aircraft to the Royal Air Force in Great Britain. TWA chose Albuquerque for the school’s location because of its 10,000-foot runway, which could accommodate B-24s, as well as its fair weather (Alberts and Putnam 1985). The students were trained in pilot skills, instrument flying, meteorology, radio, briefing, and general transition.

TWA pilots and ground crews were readily available as instructors; the difficulty was in housing the students because base quarters were not finished. Consequently, they doubled up in the barracks (Alberts and Putnam 1985). The first contingent of B-24 trainees arrived in Albuquerque on 19 June 1941. The facility was officially titled the Air Corps Ferrying Command Four-Engine Transition School but was unofficially referred to as the “Four-Engine School” or “Jack Frye School”—for the president of TWA. Its location on the base was called the Eagle Nest Flight Center.

B-24s were produced in greater numbers than any other aircraft during the war. They were used primarily in the Far East against Japan but also saw action in Europe and North Africa. The twin-tail, four-engine aircraft was perhaps best known for the August 1943 bombing raids on the Ploesti oil fields, which were estimated to supply 60 percent of Germany’s crude oil (Hauser 1993).

Using Link Trainers and B-24 training aircraft, the TWA instructors trained more than 1,100 pilots and crewmen during the eight months the company operated the school. On 7 February 1942, the U.S. Army transferred the training function from TWA back to the USAAF, and the school was redesignated the Combat Crew Training School. The Air Corps Ferrying Command was redesignated the Army Air Forces Ferrying Command in March 1942, a month after the AAC transferred the school from TWA training back to the military. The command was then redesignated the Air Transport Command in July 1942—the same month that the school was transferred from Albuquerque to Smyrna, Tennessee (Alberts and Putnam 1985).

5.2.3 Bombardier Training

With the departure of the 19th Bombardment Group from Albuquerque Army Air Base in the fall of 1941, Major General Arnold moved the military's bombardier school from Louisiana to Albuquerque for two reasons—good weather and the availability of vacant land on which to build bombing ranges (Alberts and Putnam 1985). It was proclaimed the "World's First Bombardier School", and on 24 December 1941 it was officially designated an Army Air Forces Advanced Flying School under the USAAF Western Flying Training Command.

In the technology of World War II, the bombardier was vital to the USAAF success. His aircrew tasks were to locate and identify targets and to drop bombs on them. In addition to controlling the bomber during the aiming period, bombardiers also served as gunners (Bright 1992).

The 56th and 88th School Squadrons, the 9th Materiel Squadron, and the 92nd Quartermaster Battalion arrived the week after Pearl Harbor, followed shortly by the 383rd and 384th School Squadrons and the 459th Ordnance Company (Alberts and Putnam 1985). The director of the school, Colonel John P. Ryan, was praised for rapidly organizing the nation's first permanent bombardier training school (KAFB 2000).

"Paddy" Ryan, who transferred from Barksdale Field, Louisiana to take charge of the new school, had been in bombardier training since the first bombsights had been used at Langley Field, Virginia in the early 1930s (*Albuquerque Journal* 1942; Searle 1989). He was considered a pioneer in the field. According to an *Albuquerque Journal* article titled "Bombardier Stars Arrive Here", Ryan was also the inspiration for the lead character in the Hollywood movie *Bombardier*, which was filmed on the Albuquerque base in October 1942.

Instructors, maintenance personnel, and cadets arrived so quickly that base operations such as engineering and supply had to be operated out of pyramidal tents lacking heat and protection from blowing sand. Other problems included lack of aircraft parking space and adequate lighting near the aircraft parking ramp. New construction projects began early in 1942, adding offices and housing quarters, ordnance storage, a photography lab, flightline buildings, and maintenance hangars. The base undertook paving and lighting of aircraft parking spaces, and scheduled the building of additional runways and taxiways (Alberts and Putnam 1985).

Students began training on twin-engine Beechcraft AT-11 "Kansan" bomber trainers (Figure 42: Bombardier trainer [AT-11]). By January 1942, there were 50 aircraft on base, in addition to 28 B-18A bombers used for training. Eventually, about 150 AT-11s served the school (Alberts and

Putnam 1985). The AT-11 was the standard World War II bombing trainer, and about 90 percent of the more than 45,000 Army Air Force (AAF) bombardiers trained in AT-11s (United States Air Force Museum n.d.a).

The USAAF established a new minimum proficiency standard for bombardier trainees in 1943. Trainees were required to hit their targets during at least 22 percent of their drops. Practice combat flying missions required continuous evasive action within a 10-mile radius of the intended target. The final approach was required to be straight, level and taking no longer than 60 seconds (United States Air Force Museum n.d.a).

The bombardiers were trained to use the Norden bombsight, also known as the “Blue Ox.” The bombsight was developed by engineer Carl L. Norden and Captain Frederick Entwistle, assistant research chief of the U.S. Navy’s Bureau of Ordnance. It was a mechanical analog computer used to determine the exact moment bombs had to be dropped to hit targets accurately. When properly aimed, it could place a bomb inside a 100-foot circle from the altitude of four miles. A Norden was the bombsight used on 6 August 1945 to drop the atomic bomb, Little Boy from the B-29 *Enola Gay* (American Airpower Heritage Museum 1999).

Upon being sent to bombardier school, a recruit was required to take a special oath, promising to protect the then-top secret Norden bombsight with his life. The Bombardier’s Oath read:

> Mindful of the secret trust about to be placed in me by my Commander in Chief, the President of the United States, by whose direction I have been chosen for bombardier training…and mindful of the fact that I am to become guardian of one of my country’s most priceless military assets, the American bombsight … I do here in the presence of Almighty God, swear by the Bombardier’s Code of Honor to keep inviolate the secrecy of any and all confidential information revealed to me, and further to uphold the honor and integrity of the Army Air Forces, if need be, with my life itself (United States Air Force Museum n.d.b).

The school taught bombardiers the technique of bomb sighting. Bombardiers were required to crawl down shafts that gave way to the “bubble,” from which they had bird’s-eye views of the ground below. The bombardier’s job was to feed the bombsight the needed information, air speed, wind speed, wind direction, altitude, and the angle of drift. As the aircraft approached the target, the pilot turned the aircraft over to the bombardier and the Norden bombsight, which was also an automatic pilot that flew the aircraft as bombs were released over the target (American Airpower Heritage Museum n.d; Bright 1992).

Classroom instruction at the Albuquerque base was held at night and training missions were flown during the day to bombsights around Albuquerque (*Focus*, 20 October 1989). Servicemen and WPA workers were tasked with laying out bombing ranges for training. These were located west and southwest of Albuquerque, including a major range located between the neighboring village, Los Lunas and the Rio Puerco. Contracts for day and night bombing targets on the ranges were let during January 1942, and access roads to the targets were constructed. Bomb ranges numbered 2,450 square miles on ranch and Indian reservation land by the end of 1942. At that time, a total of 24 targets, simulated cities and warships, were in use on the ranges (Alberts and Putnam 1985). One of the ranges, the Alamogordo Bombing Range, encompassed parts of Socorro, Lincoln, Otero, and Dona Ana counties, according to an *Albuquerque Journal* article titled "Land Condemned for Air Base", (11 August 1942).

The AAF at Kirtland Field established an additional bombing range in March 1943. Under Public Land Order No. 108, dated 31 March 1943, nine square miles of rugged lava terrain in the El Malpais, east of Grants, New Mexico were removed from the public domain for military purposes. Practice bombing missions began in June. Officially, the military called the site the Army Air Forces Kirtland Demolition Bombing Range. According to a local resident at the time, Christine Adams, whose parents homesteaded in the area, the bombing did no apparent harm aside from frightening chickens and rattling dishes (Mangum 1990).

Bombardier school was 12 to 18 weeks during which a student dropped approximately 160 bombs; precise records were kept of hits and misses. The elimination rate for trainees was 12 percent, and upon graduation, a new bombardier was transferred to an operational training unit and trained for overseas duty. Albuquerque was an operational training facility, and the first class of 61 bombardiers from the Albuquerque base school graduated 7 March 1942 (*Focus,* 20 October 1989). By 1945, Albuquerque's flying training field had turned out 5,719 bombardiers and 1,750 regular pilots for the B-24 bomber alone (Alberts and Putnam 1985). The 51st class to complete the bombardier training course included 143 bombardiers, according to a February 1945 *Albuquerque Journal* article.

Chiang Kai-Shek pilots and bombardiers received training from Kirtland Field instructors. And, according to an *Albuquerque Journal* article titled "Jimmy Stewart Arrives at Base to Fly Bomber," film actor Jimmy Stewart was stationed at Kirtland Field briefly, beginning in August 1942, assisting bombardier cadet training by flying bombers on training missions.

5.2.4 Additional Training at Kirtland

Bombardier and pilot training was not the only focus at Kirtland Field between 1942 and 1945. In 1943, the USAAF Flying Training Command merged with the Technical Training Command in an effort to save manpower. The new command, the Air Training Command, became responsible for all training from classification center through pilot and technical schools (Bright 1992). In 1943, Kirtland Field facilities expanded to support existing bombardier training plus other training missions (Alberts and Putnam 1985). This expansion was the result of the merging of the two training commands.

Expanded training at Kirtland Field included a ground school for glider pilots—called the Glider Replacement Center, which was established in July 1942. The center served as a temporary training area for glider pilots awaiting vacancies at glider schools according to an *Albuquerque Journal* article titled "Glider Pilot Replacement Set Up at Air Base Here," 7 August 1942. The first glider pilots arrived on base on 8 July. In preparation for flight training elsewhere, they received physical fitness training at Kirtland Field, as well as basic military courses (Alberts and Putnam 1985).

The Army Air Forces glider-training program had expanded in June 1942, and prior flight training was eliminated as a necessary qualification for candidates. On 30 June, according to a

Roswell Daily Record article of the same day, the War Department opened the program to any man between 18 and 36 who could meet the physical and mental requirements, including civilians as well as officers and enlisted men. At Kirtland Field, the Glider Replacement Center operated until February 1943 (Kirtland Army Air Field 1944).

In May 1943, a Women's Army Auxiliary Corps (WAAC) contingent was established at Kirtland Field with the arrival of 45 women on base. Second Officer Mary D. Schureman, her WAAC rank equal to that of a first lieutenant in the U.S. Army, commanded the 736th WAAC Post Headquarters Company, this reported in an *Albuquerque Journal* article of 13 May 1943 titled "Soldiers Visit WAC Quarters." WAAC quarters built at Kirtland Field included barracks, a day room, beauty shop, and supply room. A WAAC open house for the new post was held in August 1943 and several hundred men with their wives and families attended.

The WAAC was created in May 1942 to enlist women as auxiliaries for noncombatant duty working with the U.S. Army (Figure 43: Poster encouraging women to enlist). The U.S. Army would provide up to 150,000 auxiliaries with food, uniforms, living quarters, pay, and medical care (Bellafaire n.d.). In July 1943, the WAAC was assimilated into the U.S. Army as the Women's Army Corps (WAC). Given full military status, WACs were also entitled to pay, protection, and privileges equal to men's. At Kirtland Field, the WAACs dropped the title of "auxiliaries," were sworn into the regular U.S. Army, and redesignated the Provisional WAC Detachment on 1 October 1943. That title was changed again in May 1944 to Section D, 3007th AAF Base Unit, according to an *Albuquerque Journal* article titled "Birthday Cake for Kirtland WACs."

Initially, most WAACs and WACs worked as file clerks, typists, stenographers, or motor pool drivers. Gradually, their jobs grew more technical as positions were created for weather forecasters, parachute riggers, radio operators and repair specialists, sheet metal workers, bombsight maintenance specialists, control tower operators, and cryptographers (Bellafaire n.d.).

In August 1943, Kirtland Field became host to a USAAF Provisional B-24 Pilot Transition School designed to train airplane commanders (Kirtland Army Air Field 1944). Transition training was the final step after successful completion of Primary, Basic, and Advanced Flying training. The new Kirtland Field training program, specifically for B-24 Liberator bomber pilots, began under the direction of Major Harry Campbell, who previously had been director of the TWA Four-Engine School. The Bombardier School, for the most part, furnished facilities and maintenance, and personnel from two squadrons, that had been part of the Bombardier School, were put to work in the B-24 school (Oppenheimer 1962 and *Albuquerque Journal,* August 1943).

Officer pilots were selected for the new school from advanced twin-engine training schools. Instruction covered day and night navigation and instrument flying, formation and altitude flying, comprehensive ground schoolwork, engineering, radio, meteorology, weather flying, first aid and oxygen training, as well as a course on the duties of an airplane commander (*Albuquerque Journal,* August 1943).

A school for navigation was also established at Kirtland Field in the summer of 1943. The six-week navigation-training course extended bombardier cadets' schooling from 12 weeks to 18 weeks, qualifying them to serve as navigators as well. The navigation instructors were often recent combat veterans, and operating under the direction of Lt. Vincent Hilsman, the school combined regular bombardier missions to targets throughout New Mexico with navigational missions (*Albuquerque Journal,* August 1943).

A month later, headquarters of the 38th Flying Training Wing relocated from Roswell, New Mexico to Kirtland Field (Alberts and Putnam 1985). One of the wings under the Western Flying Training Command, the 38th held jurisdiction not only over Kirtland Field but also the Hobbs, Roswell, and Carlsbad Army Air Fields; Williams Field, Arizona; and Victorville Air Field, California. During its 18-month tenure at Kirtland Field, the wing had several different commanders—Brigadier General M. F. Scanlon, Brigadier General Leland Hewitt, and Colonel Joseph Bailey. The wing relocated to Williams Field, Arizona, in February 1945 due to Kirtland Field's conversion to a Superfortress base under the Second Air Force.

In early March 1945 the Advanced Flying School at Kirtland Field was inactivated to make room for Superfortress training under the jurisdiction of the Second Air Force. As part of the inactivation, Kirtland Field's commanding officer, Colonel Louis W. Proper, received orders for reassignment to Williams Field in Arizona. Proper relocated to Williams Field with several members of his staff (*Albuquerque Journal,* 1 March 1945).

5.2.5 Host of the Superfortress Bomber

Kirtland Field served as a B-29 Superfortress (Figure 44: The Superfortress [B-29]) base in support of the incendiary bombing raids on Japan. Early in the war effort, the U.S. Army had intended to add "super heavy bombers" to its arsenal. This led to the creation of the B-29, an aircraft that could travel much further and with heavier loads than previous bombers (*Popular Mechanics* 2000). It was one of the most sophisticated, propeller-driven bomber to fly during World War II.

Boeing began production of the B-29 in 1942, at Wichita, Kansas. Farmhands, housewives, and shopkeepers built B-29s on 10-hour-shifts, day and night, during what later became known as the "Battle of Kansas" (Boeing 2001a). The aircraft company installed extremely advanced armament, engines, and avionics systems into the B-29 (National Air and Space Museum 1998).

Although new construction on military bases was discouraged after 1942, B-29 Superfortress support facilities were among several building types and projects that continued to be approved by the USAAF (Hirrel et al. 1994). The bomber was an important component of the 1944 strategy to create U.S. mobilized resources greater than Japan's and "pressing … everywhere (so that) the enemy was bound to be too weak to hold on some fronts if not on all" (Weigley 1973).

Whether the end of the combat with Japan was to be brought about by tactical or strategic methods, the B-29 was the critical aircraft its final defeat. In air warfare, tactical operations are conducted against hostile armed forces, while strategic operations are directed against an enemy's population or economy. For example, during strategic operations in Germany, USAAF targeted the electric, oil, and transportation industries (Bright 1992).

The 1944 to 1945 B-29 attacks on Japan were a more concentrated aerial attack than had been mounted at any time during World War II against the Axis powers (Weigley 1973). B-29 missions took place in the China-Burma-India theater, and then also the Marianas Islands in the Pacific. The successful operations were led by General Curtis LeMay (Bright 1992).

Superfortresses were used mainly in daylight bombing raids. Tokyo was bombed by as many as 1,000 Superfortresses at a time (Boeing 2001a). However, these attacks employed high-altitude precision bombing tactics that yielded poor results. In March 1945, LeMay bucked orders in the largest gamble of his career. He called for B-29 tactics to change, striking at night, from low altitude, using incendiary bombs. These attacks, carried out by hundreds of B-29s, soon devastated much of Japan's industrial and economic infrastructure (National Air and Space Museum 1998).

The incendiary raids, named "Operation Meeting House," started on 9 March 1945 and produced devastation in Tokyo with firestorms that caused superheated air in the city to reach 1,800 degrees Fahrenheit. By 15 June 1945, the B-29 crews had destroyed 112.7 square miles of Tokyo, Nagoya, Kobe, Osaka, Yokohama, and Kawasaki with a loss rate of only 1.9% to the B-29s. In addition to bombs, the B-29 crews began dropping pamphlets urging the Japanese to surrender.

As the B-29 became operational, 18 B-29 hangars were constructed at 11 U.S. Army Air Bases, including two hangars at Kirtland Field in 1945. While B-29s had an advantage in combat, there were impracticalities on the ground that required resolution, as the heavy loads of the B-29 were larger than load limits allowed by runway construction theory of the time. To accommodate the B-29, it was essential that the U.S. Army Corps of Engineers develop new construction design and implementation techniques, including new analysis of pressures on soil, runway component design, and base courses (Hirrel et al. 1994). No evidence that new runways were built for Kirtland Field in 1945 was found during this study.

In March 1945, Kirtland Field was converted into a Superfortress base in a matter of only 45 days after its assignment to the Second Air Force, as reported in the *Twenty-niner* in November 1945. The Second Air Force, operating under the Continental Air Forces (Ravenstein 1986), concentrated on training for heavy and very heavy bombers during the war (Bright 1992). Kirtland Field was one of six stations in the 16th Bombardment Operational Training Wing program. Other locations were Alamogordo Army Air Field and Clovis Army Air Field in New Mexico; Biggs Army Air Field and Pyote Army Air Field in Texas; and Davis-Monthan in Arizona—as reported in the *Twenty-Niner*, 12 May 1945.

Colonel Frank Kurtz was appointed base commander on 1 March. Kurtz had previously been stationed at Kirtland in 1941 as a member of the 19th Bombardment Group and participated in combat in the Philippines. He was highly decorated for campaigns in both the Pacific and European theaters. The 30 June 1945 issue of the *Twenty-niner* boasted that Kurtz was "chosen last year by the Junior Chamber of Commerce as the Outstanding Young Man in America, and had been nationally known in his college days as an Olympic platform diver." He was also famed for flying the B-17 named *The Swoose*, for which his daughter, actress Swoosie Kurtz, was then named (Figure 45: Colonel Kurtz's B-17, *The Swoose*). The B-29 crews arrived on base in mid-April for training. The 14 April 1945 *Twenty-niner* declared, "Their every need will receive top priority—their training is to be intense, thorough and complete. Their final destination—Tokyo."

In May, the Nazis surrendered to the Allies. Colonel Frank Kurtz was quoted, "To gamble that Japan will fall simply because her own position looks hopeless would be folly at this time. Our training program here at Kirtland assumes tremendous proportions. There is no higher priority than we in B-29s. The eyes of the nation now look west with undivided attention" (*Twenty-nine,* May 1945) (Figure 46: *Twenty-niner* headline announcing Nazi surrender).

In addition, success of the Manhattan Project was dependent on the B-29, as it was the only aircraft capable of delivering the atomic bomb. It was determined early on that the B-29 would be the only bomber to accommodate the lengthy Little Boy atomic bomb (Furman 1990). Specially modified B-29s, referred to as "Silverplates", were then constructed specifically for delivery of the atomic bombs. These were initially adapted at Wright Field in Ohio (Furman 1990).

5.2.6 Kirtland, Fat Man and Little Boy

Perhaps one of the most important functions Kirtland Field served during World War II was as a transportation center for the needs of scientists developing the atomic bomb in Los Alamos. The Manhattan Project personnel in Los Alamos first became aware of the value of the location of the air base during the process of converting the atomic bomb into a practical airborne weapon (Furman 1990). Because Kirtland Field was the closest large airport, its runways and bomb-loading pit (Figure 47: Bomb-loading pit at Kirtland Field) supported the atomic bomb program during 1944 and 1945. It also became an important staging ground for the ferrying of men and material to various field sites (Alberts and Putnam 1985).

The inception of the Manhattan Engineering District (MED), the site of the atomic bomb project, took place in August 1942, with the actual design and building of atomic bombs occurring at Los Alamos, Site Y. In the rush to develop an atomic bomb before Germany, the U.S. had chosen Brigadier General Leslie Groves of the U.S. Army to oversee the top-secret mission (Figure 48: Major General Leslie Groves). Groves was then deputy to the chief of construction for the Army Corps of Engineers and had overseen construction of the Pentagon, the world's largest office building (Los Alamos National Laboratory n.d.). Groves selected University of California physicist J. Robert Oppenheimer as director of the project and the University of California to handle administration. Oppenheimer, who owned a summer home east of Santa Fe, had discovered the area some years earlier while on a pack trip. He felt that Los Alamos was an excellent location for a secret laboratory (Furman 1990). Specifically, the remote location of the former Los Alamos Ranch School for Boys was deemed most suitable (Simmons 1982).

A brilliant group of American and European-refugee scientists gathered at the secret town in the mountains. These included Richard Feynman, Hans Bethe, and Edward Teller, who had first persuaded Albert Einstein to warn President Roosevelt of a potential Nazi atomic bomb (AJ Software 1998–2001a). By March 1945, the group was directing drop testing of shapes and models of the nation's first atomic bombs at Wendover Army Air Base, Utah. Specially modified B-29 bombers were used for the tests (Hawkins et al. 1983).

Two different bomb types were developed: an implosion type weapon known as Fat Man, and a gun-type assembly first code-named "Thin Man," which was later modified to Little Boy (Figure 49: Atomic bombs developed in Los Alamos) (Alberts and Putnam 1985). Thin Man, which was 17 feet long and 2 feet in diameter, was, according to popular opinion, a reference to U.S. President Franklin D. Roosevelt (Roger Meade, 27 August 2002 interview with Kristen Bisson). Fat Man, which was nine feet long and five feet in diameter, was a reference to British Prime Minister Winston Churchill (Furman 1990).

In June 1943, a young physicist named Norman F. Ramsey had first investigated aircraft to determine which would be suitable to carry the gun model bomb. He found that only the B-29 could accommodate the Thin Man. By the fall, it was apparent that the B-29 would also have to accommodate the Fat Man. Ramsey and Brigadier General Groves then met with the USAAF to implement the program to be named "Project Silverplate." Modifications to the aircraft took place through the winter of 1943 and 1944 under the direction of Colonel Don Putt at Wright Field, Ohio, aided by employees at Boeing who completed a large part of the mechanical design (Furman 1990). In late 1944, USAAF leaders ordered a batch of Superfortress atomic bombers codenamed "Silverplates" from the Glenn L. Martin Aircraft Company in Omaha, Nebraska. These were B-29s that had been modified by removing all gun turrets except for the tail position, removing armor plate, installing Curtiss electric propellers, and configuring the bomb bay to fit the individual bombs (National Air and Space Museum 1998).

In December 1944, the USAAF activated the 509th Composite Group to fly the 15 specially configured Silverplate bombers (National Air and Space Museum 1998). Lt. Colonel Paul Tibbets, a veteran of B-17 missions over Europe and B-29 test flights in the U.S., commanded the handpicked group of pilots, servicemen, and ground crew for the assignment. Because of the great importance and secrecy of the 509th Composite Group's mission, Tibbets was given free reign to select the best-qualified personnel available. He included in the group not only a normal B-29 unit, the 393rd Bombardment Squadron, but also a number of supporting elements including the 390th Air Service Group, the 320th Troop Carrier Squadron, and the 1395th Military Police Company (Aviation). For special technical requirements, the 509th Composite Group then acquired the 1st Ordnance Squadron (Aviation) and the 1st Technical Detachment, War Department Miscellaneous Group, a unit of both civilian and military scientists and technicians (Jones 1985).

Wendover Army Air Base was chosen as the group's training site because of its desolate location in Utah near the Nevada state line. The program was carried out from the winter of 1944 into the spring of 1945 (Furman 1990). Test drops provided critical information about ballistics, electrical fusing, flight performance of electrical detonators, operation of aircraft release mechanisms, vibration, and temperatures (Jones 1985).

From Kirtland Field, Manhattan Project scientists were flown back and forth to Wendover Army Air Base for testing in a disguised "Green Hornet" aircraft. Members of the USAAF made similar trips from Wendover through Albuquerque to Los Alamos. A special Manhattan Engineer District, Military Police unit was located at Kirtland Field to guard facilities used to load Los Alamos–assembled ordnance and test shapes on Silverplate aircraft. The loading pit constructed at Kirtland Field, although primitive and manually operated, operated until December 1945, when a hydraulic lift was installed (Furman 1990).

In May 1945, the 509th Composite Group deployed to Tinian, from which bombs would be dropped on Hiroshima and Nagasaki. The base had been established at the end of February 1945. Although the greater part of the 509th Composite Group arrived at Tinian during May, both troops and equipment continued arriving until the first week in August (Furman 1990). Among those planes sent to Tinian was Aircraft No. 44-27292, the *Enola Gay* (Furman 1990), which was named after Tibbets's mother. The other Silverplates were named *Strange Cargo*, *Necessary Evil*, *Bockscar*, *Laggin' Dragon, Full House, The Great Artiste, Big Stink, Up An' Atom, Straight Flush* and *Top Secret* (Society for the Historical Preservation of the Manhattan Project n.d.).

In the early dawn hours of 16 July 1945, to ensure their device would work properly as a weapon, Manhattan Project scientists exploded "The Gadget," as the first atomic bomb was called, at the top of a 100-foot tower in an area called Trinity Site near Alamogordo, New Mexico. Physicist Kenneth Bainbridge later commented, "No one who saw it could forget it, a foul and awesome display" (AJ Software 1998-2001b).

In a report to the War Department in Washington D.C. on 18 July, Major General Groves wrote:

> There were tremendous blast effects. For a brief period there was a lighting effect within a radius of 20 miles equal to several suns in midday; a huge ball of fire was formed which lasted for several seconds. This ball mushroomed and rose to a height of over ten thousand feet before it dimmed. The light from the explosion was seen clearly at Albuquerque, Santa Fe, Silver City, El Paso and other points generally to about 180 miles away. The sound was heard to the same distance in a few instances but generally to about 100 miles. Only a few windows were broken although one was [broken] some 125 miles away. A massive cloud was formed which surged and billowed upward with tremendous power, reaching the substratosphere at an elevation of 41,000 feet, 36,000 feet above the ground, in about five minutes (AJ Software & Multimedia 1998–2001b).

In his book *Albuquerque: A Narrative History* Albuquerque historian Marc Simmons described the incident. "In Gallup, houses rattled and windows blew out. Guests in Albuquerque's Hilton Hotel stumbled from their beds and saw an awesome red glow filling the southern sky" (Simmons 1982).

At Kirtland Field, two B-29 observation planes had set out early in the morning with instructions from Oppenheimer to steer a course at least 15 miles west of the detonation point. Because of thunderstorms, the planes dropped from 23,000 to 18,000 feet before circling the Trinity Site. In the navigator's seat sat Glenn Fowler, a young civilian employee at LASL who was a radar and ordnance expert. Fowler would go on to be vice president of research at Sandia Laboratory (Furman 1990).

While the Gadget underwent field-testing at Trinity, the nuclear components for the bombs and the active materials were being sent piecemeal to Tinian. Shortly before the bomb testing at the Trinity site, components of Little Boy were driven from Los Alamos to Kirtland Field and then flown to San Francisco (*Albuquerque Journal* 1995). This included some of the U-235 (Furman 1990). From San Francisco, they were transported to Hunters Point to board the cruiser U.S.S. *Indianapolis*, bound for Tinian. In record time, they reached Tinian on 26 July 1945 (Naval Historical Center 2001a).

The details were described in an Associated Press article in an *Albuquerque Journal* Special Reprint, July 1995:

> Two days before Trinity, on July 14, two Army officers, Major Robert R. Furman, a Groves aide, and Capt. James Nolan, the Los Alamos [chief medical officer], escorted by seven carloads of security guards, signed a receipt for three crates at Los Alamos, where the bombs were devised. The load was put in a closed black truck, driven to Kirtland Air Base [sic], put on two DC-3s and flown to San Francisco. Little Boy had begun its journey to Tinian (*Albuquerque Journal* 1995).

A survivor of the U.S.S. *Indianapolis* torpedoing, which took place after successful delivery of the components, remembered picking up the bomb.

> On July 15, we were ordered to go to San Francisco to take on some cargo. We tied up at the dock there and two big trucks came alongside**.** The big crate on one truck was put in the port hanger [sic]. The other truck had a bunch of men aboard, including two Army officers, CAPT [James F.] Nolan and MAJ [Robert R.] Furman … The two men carried a canister, about 3 feet by 4 feet tall, up to ADM Spruance's cabin where they welded it to the deck. As we got under way on July 16, CAPT McVay told his staff we were on a special mission. 'I can't tell you what the mission is. I don't know myself but I've been told that every day we take off the trip is a day off the war'… We had all kinds of guesses as to what the cargo was (Naval Historical Center 2001a).

Following that, the Fat Man plutonium core and its initiator were driven down to Albuquerque. They left Kirtland Field on 26 July and were flown in a C-54 to Tinian, where they arrived 28 July (Federation of American Scientists n.d.a). In addition, on 28 July, "three Fat Man assemblies, complete except for the nuclear material, were transported by truck from Los Alamos to Kirtland Field, New Mexico. There, three B-29s of the 509th met the contingent and flew the bombs to Mather Field in Sacramento, where they arrived July 28 and 29" (Furman 1990). This took place not without mishap, however. On the *Laggin' Dragon*, the life raft door flew open and damaged the right control elevator in the tail. Miraculously, the pilot managed to keep control of the plane and landed at Sacramento without further mishap. After servicing, the three B-29s took off for Tinian, delivering the components on 2 August (Furman 1990).

On 6 August 1945 the U.S. dropped Little Boy on Hiroshima, killing at least 70,000, and Fat Man on Nagasaki on 9 August, killing 35,000. On 14 August a defeated Japan announced its surrender and formalized it aboard the U.S. battleship *Missouri* in Tokyo Bay on 2 September.

Such was Kirtland Field's last important role in the U.S. defeat of Japan, thereby ending World War II (Figure 50: Kirtland Field airmen celebrating end of war). However, it was not its last connection with the Manhattan Project at Los Alamos, which largely would determine the base's fate in the postwar economy.

5.3 The New Mexico Proving Ground

Development of the New Mexico Proving Ground (NMPG) was first begun on the last day of 1941, when its director, Everly John "Jack" Workman, arrived in Albuquerque to begin acquiring lands for testing of the highly secret proximity fuze. After World War II, the fuze inspired headlines like "Device for Contact Explosion at Target is Put Second to Atom Bomb in War," which ran in the *New York Times* on 20 September 1945. During the course of the project, Workman accumulated more than 50,000 acres for testing and development. These lands were eventually acquired by the postwar Atomic Energy Commission in 1949, and subsumed by Sandia Base. They make up much of what today is KAFB.

5.3.1 The National Research Defense Committee and the Proximity Fuze

In the summer of 1940, the National Defense Research Committee (NDRC) was formed to support scientific research on U.S. warfare capabilities. Specifically, the "Order Establishing the National Defense Research Committee" stated, "It shall aid and supplement the experimental and research activities of the War and Navy Departments; and may conduct research for the creation and improvement of instrumentalities, methods and materials of warfare" (President's Safe Files: State Department, 1940, Franklin D. Roosevelt Digital Archives).

The committee began interacting with the U.S. academic and industrial research and development (R&D) communities. By the end of 1944, the NRDC accounted for one-half of U.S. chemists and three-quarters of U.S. physicists (Verhaaren 1999). Different "sections" were formed for various purposes, including the investigation of explosives, ballistics, and propulsion. Section T, named for its designated director Merle Tuve, undertook the development of a proximity or variable timing (VT) fuze for anti-aircraft artillery (Figure 51: Proximity fuze diagram and typical shells). Tuve came from the Department of Terrestrial Magnetism at the Carnegie Institution of Washington.

Anti-aircraft artillery at the time was a hit-or-miss affair, much to the U.S. Navy's frustration (Verhaaren 1999). Better anti-aircraft artillery capable of defending the U.S. Navy's capital ships was an extremely high priority for the U.S. Navy Department's Council on Research. In August 1940, the Naval Bureau of Ordnance requested the development of a radio fuze and the task was given to Section T (Verhaaren 1999). The proximity fuze would be designed to detonate a shell when it reached a lethal proximity to its target.

Section T conducted research on fuzes for the rotating projectiles fired by the U.S. Navy rifled guns. First on the agenda was the design of miniature electronic components that could withstand the shock of firing (Verhaaren 1999). Tuve staffed his new section with scientists and engineers from around the country, and by 1941, numerous universities had become involved in the project. These included Columbia, Johns Hopkins, Princeton, the University of Michigan, and UNM (Verhaaren 1999). Jack Workman, the chairman of the Physics Department at UNM, was on Tuve's team (Figure 52: Jack Workman). Workman had made a name for himself researching the atmospheric physics of electrical storms (Verhaaren 1999). Section T-4, to which Workman was assigned, was given the task of testing the electrical components of the proximity fuze for ruggedness.

Workman was asked to find and secure a location, both large and remote, for the fuze testing (Hume 1988). Workman suggested the creation of a proving ground near Albuquerque, to be managed by the Research and Development Division of UNM. Subsequently, in November 1941, the NDRC contracted with UNM to test the fuze, the first step in establishing the New Mexico Proving Ground. UNM's Physics Department served as the headquarters and furnished laboratory and shop support (Verhaaren 1999).

5.3.2 Jack Workman and the New Mexico Proving Ground

Tuve approved Workman's concept, and Workman arrived at Albuquerque on 31 December 1941. Located a few miles south of the airport on the East Mesa, the McCormick Ranch owned by A.W. McCormick was the first land leased for the proving ground. By 1944, Workman had acquired rights to more than 30,000 acres of lands that had previously been used for ranching and mining, including the former Coyote Springs resort, as well as nearby national forest lands and federally held rangeland. The land extended from the southern end of the Manzano Mountains south to Isleta Pueblo. Under the original lease conditions, ranchers retained grazing rights to the land (Verhaaren 1998).

Workman hired a group of local cowboys to watch the cattle, build and mend the boundary fence, and act as security patrol. These cowboys lived in the former ranch houses and Coyote Springs facilities (Verhaaren 1998). This colorful fact led later UNM president J. P. Wernette to call the ranch a scientific wonderland with "a lot of the flavor of the West, for among its 175 employees were cowhands who rode fence as guards, pistols and all, throughout the long period of experimentation" (*New Mexico Alumnus* 1945).

The first task of Workman's team was to develop and test safety mechanisms for the fuze and to prevent premature detonations, or "barrel bursts." These first tests were carried out on the southern portions of the McCormick Ranch, later called the A Range, and a second adjacent property, the Logan Ranch. Lands were also eventually acquired from rancher Frank Apodaca—lands that came to be known as the T Range (Verhaaren 1998).

In May 1942, Section T was separated from the NDRC and placed directly under the Office of Scientific Research and Development (OSRD), and became Section T, OSRD. At this time Section T headquarters moved from the Department of Terrestrial Magnetism at the Carnegie Institution of Washington, which could not accommodate the requirements for the new facility.

To accommodate the expansion, Section T developed a new laboratory facility at Silver Spring, Maryland, under contract with Johns Hopkins University, which had signed a contract with the OSRD to continue the proximity fuze work. This laboratory was named the Applied Physics Laboratory of the Johns Hopkins University (Naval Historical Center 2001b).

With an agreement between UNM and Section T to expand the proving ground in the fall of 1942, permanent field headquarters and other facilities were constructed for the scientists. In the spring of 1943, Workman and his crew began testing prototypes of the VT fuze for reliability and burst pattern. Stationary tests were conducted to determine the fundamental pattern produced by an exploding shell, and shells were fired using full-scale aircraft mock-ups as targets to determine the shells' sensitivity. The NMPG placed an order for two 247-foot oak towers, which were erected 400 feet apart on the eastern part of the proving ground. Replicas of enemy and U.S. aircraft, usually made of balsa wood and covered with chicken wire, were suspended between the towers and served as targets. Test ordnance was fired from both Naval guns and Army field artillery pieces, including 57-, 75-, 76, 90-, 105-, and 120-mm guns (Verhaaren 1999) (Figure 53: Replica aircraft on test tower at NMPG in 1944).

That same year, the Danish underground gave to British Intelligence drawings and photographs they had compiled of a German prototype V-1, a jet-powered pilotless or "robot" bomb that had crash-landed in Denmark. These were sent to the U.S. where Workman and his crew constructed a mock-up target of the V-1, and special fuzes were designed by March 1944 to counteract the massive German V-1 attacks on London, which began that summer (Verhaaren 1999). In addition, in 1944, a third type of testing to assess aircraft vulnerability was conducted at the NMPG.

The proximity fuze proved victorious against German V-1 buzz bombs and caused a sensation in the press. The official story of the top-secret project was released to the public on 20 September 1945. Interviewed by the *Albuquerque Tribune* in October 1945, Workman explained, "[The fuze] enabled our fleet to sail into enemy ports in the latter stages of the war and literally challenge Jap planes to attack. It enabled the British to end the buzz bomb threat in four weeks." It helped, said Workman, to drastically decrease the amount of shells wasted in warfare. "During the early days of the London Blitz," said Workman, "as many as 25,000 shells sometimes were fired per plane brought down. With the fuze, the proportion was almost evened in many instances."

After the Battle of the Bulge, General George S. Patton Jr. praised the proximity fuze (Figure 54: General Patton and Brigadier General Jimmy Doolittle, circa 1942). "The new show the funny fuze is putting on is devastating," said Patton. "The other night we caught a German battalion trying to cross the Sauer River with a battalion concentration and killed 702. I think when all armies get this fuze, we will have to devise some new method of warfare. It is really a wonderful development" (*New Mexico Alumnus,* November1945).

According to the 6 October 1945 issue of the *Twenty-niner*, Eisenhower wrote to the War Department on 17 January 1945, stating that "the timely release of the VT-artillery fuzes has vastly multiplied the lethal effect of interdictory and harassing fire. By the unprecedented effectiveness of unseen fire at all hours of day and night, the enemy has been severely upset as confirmed by prisoners of war reports."

5.4 Sandia Base

In May 1942, the U.S. Army acquired 1,100 acres of land on the East Mesa to establish a training center for aircraft mechanics, as skilled aircraft mechanics were in great demand for base support (Alberts and Putnam 1985). Included in the 1,100 acres was the 480-acre purchase of Oxnard Field from Airport Holdings, Inc. for $95,000 (Department of the Army 1954).

For Frank Speakman, whose determination had resulted in Albuquerque's first airport, it was the end of a great era. "It was a time of great personal daring; one in which major strides were made in aircraft, engines and the techniques of flying," wrote Speakman in his memoirs. "It is a period that we will never see again" (Speakman 1965).

The new U.S. Army acquisition was officially titled the Albuquerque Air Depot Training Station but unofficially referred to as "Sandia Base" after the mountain range overlooking the field, though this unofficial title was not appreciated by the military. A February 1943 *Albuquerque Journal* article quoted Col. John H. Fite, the commanding officer of the installation, as saying "The Air Depot Training Station, for the present, so far as we are concerned, can be, and we would like it to be known as the Albuquerque Air Depot Training Station. It is not, however, Sandia, or Oxnard Field, and we would appreciate it if references to the station by those names were discontinued."

By the end of the war, the station/base would be home to the Manhattan Project's Z Division, the forerunner of Sandia National Laboratories, which remains KAFB's largest tenant. The "Sandia Base" moniker would stick until 1971, when Sandia and KAFB bases merged.

5.4.1 Air Depot Training Station

The new training center for aircraft mechanics and air depot service personnel was a facility of the Air Service Command (predecessor of the Air Materiel Command, and then Air Force Logistics Command) of the USAAF. Training focused on aircraft servicing, repair, and maintenance in combat situations (Figure 55: Aircraft maintenance training at the Air Depot Training Station). Officially activated on 12 May 1942, actual training began in June (Alberts and Putnam 1985).

The depot's first tenants, the 41st and 42nd Air Depot Groups, arrived on 20 May. Major Carl A. Diemer and Major Earle B. Dunning, commanding officers of the 41st and 42nd, respectively, commanded a convoy of 30 trucks and 62 enlisted men, according to the 12 May 1943 *Albuquerque Journal* article "ADTS Founded Just a Year Ago." Their slogan was "Keep 'Em Flying."

Soldiers entering the Air Depot Training Station already had basic training and a regulation number of hours in Army technical schools. "Engine and aircraft mechanics, radiomen, parachute rigging experts and photographers receive[d] on the job training in the hangars and shops" (*Albuquerque Journal* 12 May 1943). In addition to their specialized training, soldiers also had required hours of physical training, rifle practice, and close-order drill.

The old Oxnard Field hangars and runways were used for test flights of aircraft that had been repaired in the training station. In addition to the construction of new buildings and hutments, buildings from several New Mexico Civilian Conservation Corps locations were brought to the new base. The old TAT building housed station headquarters (Alberts and Putnam 1985).

In her personal diaries, noted Albuquerque historian Erna Fergusson mentioned the depot in August 1942. "Men in training here were selected from Army schools all over the country," she wrote. "Many are skilled mechanics. Colonel Dagley said the depot is only a start. Many more of these specialists of the Army Air Forces will be seen around Albuquerque" (Erna Fergusson Papers, 1942).

In August 1943, the station shifted from a training station for air depot groups to a training station for service groups. The former were to perform complete overhaul, rebuild and supply of airplanes, and operate from highly mobile units. Service groups, in comparison, performed repair, maintenance and supply duties which were less comprehensive in nature than those of air depot groups. Because of the shift, the 12th Service Group of the Air Service Command moved from Biggs Field in Texas to the Albuquerque depot under the command of Lieutenant Colonel Floyd E. Lindley.

At the height of the Air Depot Training Station's activity, the base numbered almost 2,300 instructors and students. By October 1943, four Air Base Groups had been trained at the Air Depot Training Station and sent overseas. The Army had no need for more trained units from Albuquerque, so when the last trained contingent shipped out, the Air Depot Training Station (Figure 56: Air Depot Training Station in 1944) was redesignated the Albuquerque Army Air Field (Alberts and Putnam 1985).

Nine months of relative inactivity followed. With most buildings deserted, a standby crew performed essential maintenance and packed the aircraft repair equipment for shipment to Fort Sam Houston, Texas, for storage (Alberts and Putnam 1985).

5.4.2 USAAF Convalescent Center

In mid-1944, Albuquerque Army Air Field became an Army Air Forces Convalescent Center for wounded pilots and air crewmen recovering from surgery. The facility was under the new Air Service Command (ASC) convalescent program, which counted seven convalescent centers by January 1945, as well as 75,000 hospital beds at 200 station hospitals and 30 regional hospitals (Powell 2000). The first patients arrived in April 1944, 26 men to be nursed back to health.

The objectives for the new center, as outlined by ASC Commanding General Walter H. Frank, were detailed in a 21 April 1944 *Albuquerque Journal* article titled "First Patients for Convalescent Center Arrive." The objectives were:

- To complete the medical, surgical, and psychiatric treatment of AAF casualties and to return the individual to duty or civilian life in the best possible physical and mental condition.
- To occupy the time of those undergoing the treatment with subjects and activities that, in so far as possible, are of their own choosing and interest to them.

There were two classifications of men: those confined to their beds and those who had advanced from hospital care. For those not in the hospital and confined to bed, a minimum of two hours of physical reconditioning took place every day. Three hours of daily classwork accompanied this (*Albuquerque Journal*, 20 August 1944).

Barracks and support facilities were used for quarters. The USAAF had been leasing the former Sandia School complex for use as a hospital since October 1943 (*Focus* 1984) (Figure 57: Convalescent Center at the former Sandia School in 1944). The complex was located just north of Kirtland Field, and its use was in line with the War Department's policy to utilize existing buildings as far as possible when facilities were required (*Albuquerque Journal*, October 1943).

The Sandia School complex had been designed by well-respected architect John Gaw Meem for founder Ruth Hanna McCormick Simms. When the USAAF leased the school, Meem designed the renovations to adapt it for hospital use. The faculty bedrooms upstairs in the main building were converted to nurses' stations; the dining room became an officers' mess; and a kitchen was built to the west of the library. Many of the floors were cemented so hospital carts could move over them more smoothly (Department of Energy n.d.a). The porches were glassed in to serve as wards (*Albuquerque Journal* 12 October 1943).

Active at the hospital were members of the U.S. Army Nurses Corps, as well as "Gray Ladies," or local volunteer Red Cross workers who tended to the airmen according to a 1944 article in the *Twenty-niner*. The Convalescent Center numbered 800 beds (Oppenheimer 1962).

No new buildings were erected for the center, but many old depot facilities were reactivated to provide services and occupational therapy for the convalescing airmen (Alberts and Putnam 1985) (Figure 58: Occupational therapy at the Convalescent Center in 1944). Photographs illustrate that various subjects were taught, including Spanish, business, leather tooling, photography, celestial navigation, and simulated flight training (Albuquerque Museum 1944).

According to a May 1944 article in the *Albuquerque Journal*,

> While primarily intended to return the men to duty, and the greater percentage are so returned either to their former duties or to duties suitable to their present physical condition, those whom it is found necessary to send back to civilian life have had the opportunity to plan their future and are turned over to the appropriate agency with a substantial background of training.

A rest and recreation facility with horseback riding and other outdoor facilities was acquired by the U.S. Army from two former teachers of the Sandia School, as reported by *Albuquerque Journal* in a June 1944 article titled "Forest Park Guest Ranch Turned Over to Army for

Convalescent Soldiers." The teachers, Gretchen Sickle and Jeanne Moore, had owned the Forest Park Guest Ranch at Cedar Crest in the Sandia Mountains for several years and lent it to the U.S. Army voluntarily. They then planned supervised recreation for the soldiers while the convalescent center operated.

In April 1945, the need for its services was no longer pressing, so the Army Air Forces Convalescent Center was shut down. At the time, it housed about 250 patients, who were then discharged or sent to Santa Ana, California.

5.4.3 Bomber Burial Ground

When the Convalescent Center closed, the base again became Albuquerque Army Air Field and was used by the Reconstruction Finance Corporation—later called the War Assets Administration (Furman 1990). Old or surplus aircraft were to be sold or demolished at the site. Albuquerque Army Air Field received some 2,250 old or surplus aircraft, such as obsolete B-24 and B-17 bombers, and smaller aircraft like AT-6 trainers, Curtiss P-40 and Bell P-39 fighters (Alberts and Putnam 1985) (Figure 59: Sandia Base and graveyard for decommissioned aircraft).

Aircraft that the Civil Aeronautics Administration licensed for public use were sold to the public, with prices ranging from $100 for a PT-17 to $90,000 for a C-54. North American Aviation bought back a large number of their AT-6s, overhauled and resold them to customers including the Dutch and Chinese governments. A small number of fighters and bombers were sold to individuals for stunt flying, crop-dusting, racing, and similar activities. Aviator Jacqueline Cochran bought a P-51 that she flew in two transcontinental Bendix Trophy races, and stunt flyer Paul Manz bought a P-64, which he used in several movies (Alexander 1963).

The remaining 1,151 aircraft were put up for bid in the fall of 1946. The Denver contracting firm that successfully bid on the surplus planes sold some of the engines for commercial air transports, but by the end of the year, the remaining surplus planes were "chopped into sections and melted into ingots in a constantly burning smelter near the old Oxnard Field hangars" (Alberts and Putnam 1985). This storage and recycling effort was the last of Albuquerque Army Air Field's wartime contributions.

5.5 World War II draws to a close

In its expansion during World War II, the USAAF had become the world's most powerful air force. The AAC of 1939, with 20,000 men and 2,400 planes, transformed dramatically into the USAAF of 1945, with almost 2.4 million personnel and 80,000 aircraft. After the war, General Arnold began advocating an autonomous U.S. Air Force (Air Force History Support Office n.d.).

On 18 August 1945 the *Twenty-niner* reported that Clyde Tingley, as chairman of the Albuquerque City Commission, would seek the perpetuation of Kirtland Field as a peacetime USAAF base. Tingley stated, "Some of the air bases will be kept. It would be a real boon to Albuquerque to have flyers stationed here permanently."

By the end of the war, Kirtland Field had 402 buildings, and a base population of 2,500 military and civilian workers. It had played a significant role in WWII training activities and was an important part of Albuquerque's community and economy (Alberts and Putnam 1985). Postwar, the air base was inactivated by the Second Air Force, to which it had been transferred from the Flying Training Command on 1 March 1945. It was transferred from the Second Air Force to the Fourth Air Force on 31 January 1946 and to the Fifteenth Air Force on 31 March 1946. In November 1946, the Eighth Air Force took over responsibility for Kirtland Field, a command which only lasted to 1 December (Alberts and Putnam 1985).

Air Materiel Command (AMC) then took over on 1 December 1946, a situation that lasted through the end of 1949 (Alberts and Putnam 1985). In early 1947, the AMC established Kirtland Field's mission as the USAAF nuclear weapons facility, a continuation of the wartime Wendover Army Air Base (509th Composite Group)–Manhattan Project operations (Jones et al. 1976).

5.5.1 Z Division Moves to Sandia Base

The dropping of the Fat Man and Little Boy atomic bombs in August 1945 drew World War II to a close with Japan's final surrender. On the heels of their success, the Manhattan Project scientists predicted a busy future for atomic weapons development. A few months prior to the successful completion of the Trinity Project, J. Robert Oppenheimer and Major General Leslie Groves had begun looking for a new site convenient to Los Alamos for continuing weapons development.

The former Albuquerque Army Air Field became desirable to the Manhattan Project. It was already using Kirtland Field for its transportation needs, and a special Manhattan Engineer District Military Police unit was located there to guard the facilities, including a loading pit used to load ordnance and test shapes onto aircraft. Continued weapons development would also require proximity to USAAF aircraft and personnel for bomb loading and drop testing. Albuquerque Army Air Field had buildings for operations, and barracks for housing Manhattan Project personnel (Hawkins et al. 1983).

After the closing of the Convalescent Center, the Secretary of War and Defense Plant Corporation had negotiated a new contract for the bomber burial ground. For the Manhattan Project, this contract was significant because it allowed the licensee to assign the reservation to "any other branch, Department, or agency of the U.S. Government." By mid-July 1945, the Defense Plant Corporation and the War Department approved the transfer of Albuquerque Army Air Field from the USAAF to the Army Service Forces, Chief of Engineers. From there, it was assigned to the Manhattan Engineer District (Furman 1990).

The transfer took place on 21 July 1945 (Alberts and Putnam 1985). It included the air base and all leased facilities, such as hangars, warehouses, garages, a service club, and the officers' mess and quarters (Furman 1990). From that point forward, the base was officially titled "Sandia Base" (Alberts and Putnam 1985) (Figure 60: Sandia Base, Kirtland Field and NMPG in 1946, overlaid on current KAFB map).

An advance party of officers and enlisted men from both Los Alamos and Wendover Army Air Base arrived to ready the base for its new mission. With them came non-nuclear weapons parts that had not been sent to the Pacific, as well as shipments of bomb parts that had been ordered before the end of WWII. At Sandia Base, they were stored in crates in the open as few warehouses were available (Johnson 1997).

As these arrangements were taking place, a new subgroup of the Manhattan Project at Los Alamos was being organized. Titled the Z Division for its chief, Dr. Jerrold Zacharias—a Los Alamos scientist from the Massachusetts Institute of Technology (MIT), the new group's mission was to manage the engineering design, production, assembly, and field-testing of the non-nuclear components associated with nuclear bombs.

Construction began on guard, storage, administrative, and laboratory facilities for the Z Division. Because the airfield was still receiving surplus warplanes, the U.S. Army constructed a fenced area for classified activities. They employed security measures including tanks, guard towers, and watch dogs to protect the small stockpile of nuclear weapons parts (Johnson 1997). In the years after the war, Sandia Base boundaries would vastly expand to include the thousands of acres owned by the NMPG, which occupied much of the East Mesa.

5.5.2 Kirtland Field Assumes a New Role

At Kirtland Field in September 1945, General Hap Arnold stopped on his way to Los Angeles from Washington D.C. (Figure 61: Hap Arnold and Colonel Kurtz at Kirtland in 1945). He announced in a speech that 140 USAAF stations in the country had already closed, and more closings were to come. In mid-September, Kirtland Field's working hours changed from a 24-hour day, 7-day week wartime basis to a 40-hour workweek for civilians and a 44-hour week for military, according to the 15 September 1945 issue of the *Twenty-niner*. The base's fate was uncertain.

The base was put on a temporary inactive basis on 31 December 1945 (*Albuquerque Journal,* 31 January 1946). On 1 February 1946, it was transferred to the Fourth Air Force for use as a flight test center. The commander of the base and its new mission, to develop proper aircraft modifications for weapons delivery and determine ballistic characteristics for weapons of the future, nuclear weapons, was Colonel Perry M. Hoisington II (*Albuquerque Journal,* 2 February 1946; Bossi 2001).

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6.0 INCEPTION OF THE COLD WAR: JULY 1945–APRIL 1952

Throughout American history, the U.S. has been a country that periodically has gone to war. As a result, the armed forces were viewed by military strategists as objects of war to be consumed in combat. The strategy of deterrence had typically served as a secondary military policy, but after 1945, deterrence became the primary strategy for the U.S. military. Not only was deterrence the primary military strategy of this new age, but it also had an absolute and final element that no military strategy in the history of the world had experienced:

> [Strategic deterrence] uses a kind of threat which we feel must be absolutely effective, allowing for no breakdowns ever. The sanction is, to say the least, not designed for repeating action. One use of it will be fatally too many. Deterrence now means something as a strategic policy only when we are fairly confident that the retaliatory instrument upon which it relies will not be called upon to function at all (Weigley 1973).

The military was now protecting a country that found itself in a constant and continual war: the Cold War. This new war was waged through political and diplomatic channels with the military machine serving as the sword that was to be respected by the enemy but never actually wielded.

6.1 Postwar United States

Immediately postwar, the U.S. relationship with World War II ally Russia changed dramatically for the worse. Polarization of the countries' political ideologies—democracy and communism, respectively, transformed the former atmosphere of alliance to one of distrust. This distrust spawned the need for strategic deterrence, with atomic weapons as the ultimate means of that deterrence. The "Cold War," as journalist Walter Lippman first coined it (Primary Sources n.d.), waged from 1945 to 1989 when the fall of the Berlin Wall essentially ended the conflict.

The first phase of the Cold War extended from the testing of the first atomic bomb at Trinity in July 1945 to the election of Dwight Eisenhower to the American presidency in 1952. Eisenhower's "New Look" policy focused on maximum military power in nuclear weapons because they were less expensive than conventional weapons. Policy and strategy focused on air defense, maintenance of economic and military stability in Europe, and deterrence (Lewis et al. 1995).

The reasons for the abrupt postwar change in U.S.-Soviet relations, as the U.S. and its allies saw them, were as simple as they were numerous. Russia wanted to retain control of Eastern Europe, which it had taken during the war. Soviet dictator Joseph Stalin revealed himself inflexible and unsympathetic in the face of postwar pleas for cooperation, while his state seemed even more totalitarian and at least as territory hungry as Hitler's Germany had been. While British and U.S. forces were demobilized as fast as transport could be organized to bring the soldiers home, a vast Red Army still sprawled across its Eastern European conquests (Time-Life 1990).

Against this dramatic backdrop, the nuclear weapon, which stunned the world with its decimation of Hiroshima and Nagasaki, became the means for deterrence of a third world war as both countries focused on production of warheads. Although the growing concept of deterrence through strength in military technology was in existence before the dropping of the atomic bombs on Japan, immediately postwar it came to the forefront of both countries' strategy and policy. The incorporation of deterrence into national policy and strategy was the primary force behind the escalation of the arms race (Lewis et al. 1995).

Though the Soviet Union did not detonate an atomic weapon until 1949, Soviet research began soon after the bombing of Hiroshima and Nagasaki. In late August 1945, the Soviets established the Special Committee on the Atomic Bomb. In November, the U.S. Joint Chiefs of Staff (JCS) prepared its first list of targets for nuclear weapons in the Soviet Union (Gaither 1997).

In 1945, on 13 July, the Manhattan Project scientists had officially transferred active Plutonium 239, in a bomb component, to the U.S. Army for use in the Trinity test explosion (Office of the Assistant to the Secretary of Defense 1978). From that point forward there was a continuing struggle over the custody of nuclear weapons: civilian [AEC] vs. military [DoD]. Sandia Base was the initial focal point for the issue of nuclear weapons and fissionable material custody. According to the History of the Custody and Deployment of Nuclear Weapons, "To say that the issue of civilian versus military control of atomic energy had been a burning acrimonious issue for years would be an understatement of classic proportions" (Office of the Assistant to the Secretary of Defense 1978).

In the two years immediately following the end of World War II, there was no clear U.S. policy on the development of, or strategic planning for the use of, nuclear weapons, and the U.S. Congress was engaged in a vigorous and contentious debate over civilian versus military control of atomic weapons. As management of nuclear weapons development had not yet been determined at the federal level, nuclear scientists and engineers set about continuing their work without clear directives (Ullrich 1998).

The Atomic Energy Act of 1946 [The McMahon Bill] was signed 1 August of that year, was intended to settle the civilian versus military debate, and resulted in the 1947 establishment of the AEC, a full-time, five-member civilian federal agency designed to oversee American nuclear policies and practices. The Act transferred nuclear R&D from the MED to the five-member civilian AEC, and the AEC became responsible for the development, manufacture, and custody of atomic weapons and other military applications of atomic energy (Office of the Assistant to the Secretary of Defense 1978).

While the AEC had control over atomic weapons, the U.S. President had the authority to transfer or delegate the functions to the military. The Military Liaison Committee (MLC) was set up to provide a "two-way channel of communication" between the military and civilian AEC (Office of the Assistant to the Secretary of Defense 1978). Both the head of the Armed Forces Special Weapons Project (AFSWP) and his deputy were to serve as members of the MLC.

U.S. officials had grave fears that the depressed state of Western Europe would open the door to the Soviet Union. When economic depression caused the British to stop economic and military aid to Greece and Turkey, the U.S. called for economic support of the region (Lewis et al. 1995). In March 1946, President Truman addressed Congress with a plan to bypass the United Nations

(UN) and give independent financial aid to both Greece and Turkey. Soviet officials were angry that the U.S. had bypassed the UN, and there were now fears that the Soviet Union would act without consulting the UN either (CNN Interactive n.d.).

The Truman Doctrine of 1947 pledged America's dedication to economic support of the Balkans to provide for containment of Soviet influence in Eurpoe. This marked the start of the U.S. containment policy to curtail Soviet influence in Europe (Lewis et al. 1995). The Cold War was in full force, and in 1948 the Soviets blockaded all land routes leading into West Berlin through East Germany, beginning the "Berlin Crisis." The birth of a significant Chinese communist regime under Mao Tse-tung increased the U.S. fear of the Soviet Union and communism (Lewis et al. 1995).

In September 1949, the Soviets exploded a fission device, breaking America's nuclear monopoly. On 3 September the special air-filter system of a U.S. weather reconnaissance plane flying over the North Pacific registered an increase in atmospheric radiation. The data led the U.S. to believe that an atomic bomb had been exploded somewhere in the Soviet Union. Scientists examined samples taken from a radioactive cloud drifting over the U.S. Truman was shocked at the news, having disregarded the advice of atomic scientists who had estimated the Russians could make a bomb within five years after Hiroshima. On 23 September the White House told the world what had been discovered, nicknaming the bomb "Joe One" for Stalin (Pringle and Spigelman 1981).

By 1949, the Cold War had divided the European continent into Soviet and U.S. spheres of influence. With the lines drawn in Europe, the two nations competed for dominance in other parts of the world—the Middle East, Latin America, Asia, and Africa (Hess 1973). At this point, U.S. foreign policy and defense strategies were reevaluated. Within six months after the first Soviet bomb was tested, President Truman agreed to major increases in the production of fissile material and approved a wide-ranging policy of rearmament for the U.S. and its allies. He followed this with the decision to go ahead with development of the hydrogen bomb (Pringle and Spigelman 1981).

In 1949, the U.S. also entered the North Atlantic Treaty Organization (NATO) to defend 10 nations of Western Europe located in an arc from Norway to Italy and to bolster the positive effects of the Marshall Plan, a U.S. offer to all European countries to rebuild. This was meant to strengthen the independence of those countries the Soviets had not begun to influence. NATO's principle was that an attack on one member was an attack on all. The same year, the U.S. National Security Council (NSC) declared deterrence as the national military strategy (Lewis et al. 1995). Because the U.S. Army and U.S. Navy had been hit hard by military cutbacks, the USAF essentially held the responsibility for the strategic defense of the U.S.

NSC Document No. 68 (NSC-68) of 1950 stated that the Soviet Union was focused on world domination and by 1954 would the Soviets equal the U.S. in atomic capability. NSC-68 demanded that the U.S. strengthen its conventional military capabilities and begin work on a thermonuclear hydrogen bomb. On the last day of January in 1950, President Truman told the public about the U.S. intention to develop such a bomb, resulting in a new priority to create new and more potent strategic thermonuclear weapons (Lewis et al. 1995).

U.S. policy began to focus on military buildup rather than economic intervention in Europe. The invasion of South Korea by North Korea, with the subsequent involvement of communist China, was the manifestation of a communist threat. U.S. defense spending tripled. Truman's reaction was to increase the number of U.S. conventional forces. These troops were then assigned to a police action in Korea in an effort to contain "what appeared to be Soviet expansion by piecemeal aggression" (Lewis et al. 1995).

The late 1940s and early 1950s also saw the rise of multiple initiatives for the air defense of the U.S. The Air Defense Command (ADC) was established in March 1946. By the late 1940s, numerous radar stations and USAF Fighter Interceptor Squadrons (FIS) around the country stood on alert, searching the skies for unauthorized aircraft. The Ground Observer Corps (GOC) was created to supplement these early radar systems. These groups of volunteer civilians manned observation posts and eventually filter centers to manage incoming reports concerning the potential of enemy aircraft (Winkler 1997). The Albuquerque area, including KAFB, Sandia Base, and LASL, was considered high priority for air defense, and ADC, FIS, and GOC facilities were established there (Flaxman 1958).

Phase I of the Cold War ended with the election of Dwight Eisenhower. With the change in leaders came a reevaluation of U.S. defense strategy. Eisenhower focused on balancing the budget even more than Truman had, but he was also determined to maintain a strong military force (Lewis et al. 1995).

6.2 The Early Cold War, Kirtland Field and Sandia Base

At the end of World War II activities at Kirtland Field slowed considerably and then began to increase again as the Manhattan Project's Z Division moved from Los Alamos to Sandia Base. For Kirtland Field, the early years of the Cold War were characterized by its direct support of the atomic testing, training, and scientific work of the Z Division at Sandia Base. In response to Kirtland Field's evolving atomic responsibilities and the unclear U.S. policies for the development and strategic use of atomic weapons, the installation experienced continual changes in command (Figure 62: Chart of Phase I Cold War Activities at Kirtland).

6.2.1 Postwar Kirtland Field

As World War II drew to a close, Kirtland Field continued as a Superfortress base under the command of Colonel Frank Kurtz of the USAAF Continental Air Forces' (CAF) Second Air Force. In October 1945, Colonel Alva Harvey, also of the Second Air Force, succeeded Kurtz (*Albuquerque Journal,* 20 October 1945). During the war, Harvey commanded the 58th Bombardment Wing's 444th Bomb Group under the 20th Bomber Command. In 1944, Harvey had taken the 444th Bomb Group to India to initiate B-29 raids against Japan (United States Air Force Museum n.d.c).

Lt. Colonel Delbert Hahn succeeded Harvey as base commander in early December 1945. For months, there had been rumors of Kirtland Field being inactivated. The *Albuquerque Journal* announced in early December that the base would be on "temporary inactive" status beginning 31 December but would reactivate immediately.

On 31 December 1945 Kirtland Field was temporarily inactivated and then a month later reassigned to the ADC's Fourth Air Force. On 31 January 1946, Colonel Perry M. Hoisington II relieved Lt. Colonel Delbert Hahn as Kirtland Field was transferred to the command of the Fourth Air Force (Figure 63: Colonel Hoisington takes command). Kirtland Field was returning to B-29 activity as the flight-testing headquarters for the 58th Bombardment Wing, which had been stationed at Roswell Air Field, New Mexico under the Fourth Air Force [the command to which the wing was assigned prior to moving the KAFB] (*Albuquerque Journal,* 2 February 1946). This B-29 unit would assist the Z Division at Sandia Base with flight-testing new weapons designs (Hawkins et al. 1983).

Like Colonel Alva Harvey, Hoisington was a B-29 veteran of the 20th Bomber Command's 58th Bombardment Wing (United States Air Force n.d.a). The 58th Bombardment Wing had been activated in June 1943 at Marietta, Georgia, near the Superfortress factory, and had been the first organization to fly the B-29 Superfortress (Air Force Magazine Online n.d.). Hoisington had gone overseas with the first heavy bombardment group to the China-Burma-India theater, later moving to the Marianas in the Pacific. The colonel had flown 21 sorties during the war, including the first night raid and first daylight mission against Japan (*Albuquerque Journal,* 2 February 1946).

The 428th AAF Base Unit (Flight Test) was activated as a unit of the 58th Bombardment Wing and the host of Kirtland Field on 1 February 1946. The abovementioned *Albuquerque Journal* article stated that the flight-testing program under the 58th Bombardment Wing was not expected to bring about a great increase of personnel or equipment. At that time, there were fewer than 300 officers and enlisted men at the field. According to "Narrative Histories of KAAF from April to December of 1946," personnel were actually transferred from Kirtland Field to other facilities during the months of February and March.

Because there were so few personnel on hand, morale was low and workloads were strenuous for the installation throughout the early Cold War period. Many facilities were vacated, and numerous buildings released to the Albuquerque District of the U.S. Army Corps of Engineers (USACE), the Federal Public Housing Authority, and Sandia Base. Of the 83 houses on base for officers and enlisted men, 45 were released to Sandia Base (Kirtland Army Air Field 1948).

On 21 March 1946, Strategic Air Command (SAC) replaced the ADC. On 31 March 1946, SAC's Fifteenth Air Force assumed operation of Kirtland Field. Colonel Hoisington and the 58th Bombardment Wing remained in command of the installation under SAC, and there was a return of personnel. Shortly thereafter, an "S-2 Section" was established on base and became responsible for the security of Kirtland Field and the "W-47 Project" (Kirtland Army Air Field 1948).

The W-47 Project had been the wartime operation established at Wendover Army Air Base to train the 509th Composite Group to drop the atomic bombs on Hiroshima and Nagasaki. In keeping with Kirtland Field's mission to assist Sandia Base's Z Division with the marriage of bombs and aircraft, the 509th Composite Group's Flight Test Section was transferred to Kirtland

Field in November 1945 (Jones et al. 1976). During the early setup for the S-2 Section and security for the W-47 Project, there was an "extreme shortage in radios, unmarked government cars for CIC [Counter Intelligence Corps] use, and small arms weapons" (Kirtland Army Air Field 1948). There is no mention of the 509th Composite Group's Flight Test Section after the year 1945; it is likely that it was thereafter incorporated into Kirtland Field's 428th AAF Base Unit (Flight Test).

Base operations began to increase in June 1946 with the organization of a full-scale Ground Training Program and the arrival of the Special Ordnance Squadron and Special Transport Flight of the 58th Bombardment Wing. Aircraft being maintained by the 58th Bombardment Wing included five B-29s and C-45s, two C-47s, B-25s and L-5s, and an C-46, AT-11, F-80, F-61, and F-59. Prior to the new Ground Training Program, which began officially on 24 June 1946, some training was carried out by individual units, primarily physical engineering, bombardiering, and armament. With the new program came a push for development of a comprehensive organization, with training in navigation, bombing, personnel equipment, chemical warfare, physical training, synthetic training, and use of the gunnery range (Kirtland Army Air Field 1948). This was part of Colonel Hoisington's stated "polishing." Hoisington stated, "Military discipline is to be emphasized. Training must be well organized, and personnel must know their jobs and be able to perform them to the best of their ability" (Kirtland Army Air Field 1948).

Hoisington's polishing was most likely connected with the important events that took place the following month. In July, Kirtland Field personnel supported Operation Crossroads, the second and third nuclear atmospheric tests after Trinity. For the first time, a primary mission for Kirtland Field was recorded in the September 1946 narrative history: "[To] provide aerial and ground functioning testing facilities and conduct functional tests on all equipment and materiel related to the use of special weapons and radioactive materials" (Kirtland Army Air Field 1948). The narrative history also reported that ground training was fully operational. The ground training and primary mission supported the nuclear role and work of the group of USAAF officers referred to as the "Armstrong Committee."

The Armstrong Committee was a small group of men who, in the spring of 1946, began developing training programs at Kirtland Field to teach USAAF personnel to handle nuclear weapons. Handbooks and training manuals for weaponeers were prepared in conjunction with bomb assembly courses. Recommendations were also made for strategic application of the bomb, and reports on the organization and types of units that should handle the bomb (Jones et al. 1976). This Armstrong Committee, Colonel John Armstrong, William Hatcher, Joseph Thomas, William Skaer, John Ryan, and Colonel Leo Harman, started working with the Z Division and the MED at Sandia Base to learn details of nuclear operations and associated technical work (Oppenheimer 1962).

Between late 1946 and early 1947, after the Atomic Energy Act creating the AEC was passed, the AFSWP was established with Sandia Base as an installation under its control. A special engineering battalion was also created to aid in the assembly and maintenance of atomic bombs at Sandia Base (Defense Threat Reduction Agency 2001). In November 1946, the major command at Kirtland Field switched again, from SAC's Fifteenth Air Force to SAC's Eighth Air Force, which lasted only briefly (Alberts and Putnam 1985).

With the focus on atomic weapons, in early December 1946, Kirtland Field was again transferred, this time to the AMC, specifically the Directorate, Research and Development, HQ, AMC. AMC was responsible for all USAF R&D, including special weapons (AFSC 1986). The transfer took place due to Kirtland Field's close proximity to Sandia Base and the Z Division. The AMC mission at Kirtland Field was "to provide flight services for the Manhattan [Engineering] District at Sandia and Los Alamos in atomic bomb testing" (Air Materiel Command 1946).

Kirtland Field was one of 12 installations in the U.S. associated with AMC's R&D functions. Air Materiel Areas (AMA) were established to facilitate the depot needs of AMC and also managed the R&D efforts in proximity. Thus, AMC's San Antonio, Texas AMA was given jurisdiction over the base at Albuquerque (Weitze 2001).

With this major command change, Colonel Hoisington was placed on temporary duty at Sandia Base and his deputy commanding officer, Lt. Colonel McLyle Zumwalt, was appointed Commanding Officer in his absence (Kirtland Army Air Field 1948). On 20 January 1947, Hoisington resumed command of Kirtland Field (Mueller 1989). The 428th AAF Base Unit (Flight Test) of the 58th Bombardment Wing was reassigned to the AMC as the 428th AAF Base Unit (Special) (KAAF 1948; AMC 1947). The 58th Bombardment Wing was officially deactivated 1 December 1946 (Strategic Air Command n.d.).

During early 1947, AMC formally established the installation's mission as the USAAF's atomic weapons facility, and Kirtland Field became the first USAAF facility concerned with atomic weapons (Jones et al. 1976). This new mission called for work on ballistics, handling equipment, aircraft modification, and development tests for existing and proposed weapons designs (Alberts and Putnam 1985).

Meanwhile, HQ, USAAF became increasingly interested in a formal liaison at the field level with the AEC and its contractors, namely the Z Division at Sandia Base, its military component the AFSWP, and the laboratories at Los Alamos. Also in 1947, the informal training and nuclear work begun by the Armstrong Committee in 1946 formed the basis for a new committee under the USAAF, called the Tactical and Technical Liaison Committee (TandTLC).

In May 1947, Kirtland Field and the 428th AAF Base Unit (Special) had been transferred from jurisdiction under the San Antonio AMA and reassigned to the direct jurisdiction of HQ, AMC. Kirtland Field became home to the TandTLC, which was formally established on 29 July 1947 [shortly before the USAF was formally established] to:

> Provide the necessary tactical and technical liaison with the AFSWP, Sandia Base, and such direct contact as is appropriate between the Air Forces and the Sandia-Los Alamos activities of the Atomic Energy Commission in furtherance of the atomic energy program in the Army Air Forces (Oppenheimer 1962).

In addition, the TandTLC was charged with maintaining a technical library, studying the problem of military requirements for nuclear weapons, and broad supervision over the ordnance project in action at the base. The TandTLC consisted of seven members with representatives of

SAC, AMC and HQ, U.S. Army. This group would eventually grow to include 18 officers, one warrant officer, two airmen, and nine civilians (Jones et al. 1976). Upon its establishment, the TandTLC became a field division of the Atomic Energy Division, Deputy Chief of Air Staff for Research and Development, HQ, USAAF (KAFB 1949).

6.2.2 Sandia Base and the Z Division

The Z Division, or bomb assembly group, from Los Alamos began moving from the MED in Los Alamos to Albuquerque in September 1945. Kirtland Field's runway and bomb-loading pit, which had been used to fit the first bombs to B-29s bound for the Pacific, were factors in the decision to relocate the Z Division to Sandia Base, adjacent to Kirtland Field. U.S. Army personnel improved the field's existing bomb-loading pit with a hydraulic lift in December 1945 (Furman 1990).

As the Z Division was moving, its leader, Dr. Zacharias, chose to return to MIT and Roger S. Warner replaced him. During World War II, Warner had served at the MED as the organizer of the Tinian operation, including its field equipment needs. He was known as a superior engineer and down-to-earth individualist (Furman 1990).

Upon arrival, Z Division took charge of the nuclear stockpile, extremely small at that time, with responsibility for receiving, storing, assembling, testing, and improving atomic bombs. The group also began immediate testing to improve the Fat Man implosion type design (Ullrich 1998) and identifying usable components of the Little Boy and Fat Man weapons that remained from wartime contracts.

As these components became available, members of the 509th Composite Group's 1st Ordnance Squadron, which transferred from Wendover Army Air Base to Sandia Base in October 1945, aided in high-explosive assembly. The assembly crew was under the command of Captain J. Leslie Rowe of the MED, who had performed the same task for the W-47 Project at Wendover during the war. The assembly work was done in the ordnance area of Kirtland Field, and the completed weapons were stored in igloos located in a large arroyo south of the runways (Alexander 1963).

Shortly after the Z Division's arrival, the MED authorized construction of guard, storage, administrative, and laboratory facilities for Sandia Base (Alberts and Putnam 1985). Because the old Albuquerque Army Air Field was still storing and salvaging war aircraft, a fenced area for Z Division's classified activities was necessary. This area, bounded by F, H, Fifth, and Eighth Streets, was called Technical Area 1 (Tech Area 1) (Figure 64: Sandia Base Tech Area I), and it consisted of some of the older, wood-frame, tar-papered temporary buildings dating back to the World War II Air Depot days (Figure 65: Air Depot buildings used by Z Division). Tech Area 1 began operations in 1946, working out of the temporary buildings until 1948 when construction of permanent buildings for an expanded facility began (Alberts and Putnam 1985).

Security measures were stringent, with fully armed Military Police (MP) roaming the base. An early resident of Sandia Base remembered "anyone entering the Tech Area at night might find himself suddenly spread-eagled against a wall and searched" (Furman 1990). Employees working late were subject to on-the-spot security checks when leaving the building. If challenged, an employee was required to put his badge on the ground and walk back 10 paces to allow the MP to scrutinize the badge for proper identification (Furman 1990).

6.2.3 Operation Crossroads

In July and August 1946, Kirtland Field and Sandia Base personnel took part in Operation CROSSROADS at the Eniwetok Proving Grounds in the Pacific's Marshall Islands. The primary goals of testing were to learn how to maximize the effects of atomic weapons, gather information about the environment created by their detonations, and test their effects on living beings and military equipment. Operation Crossroads was the first of many atmospheric nuclear weapons tests. It consisted of the second and third tests of atomic bombs after Trinity: Able on 1 July, the first air test, and Baker on 25 July, the first underwater test. Another intended Operation Crossroads test, Charlie, was cancelled in September 1946. At the time, there were only nine bombs in the nation's stockpile. Using three would have depleted a third of the U.S. reserves (Defense Threat Reduction Agency 2001).

Both Kirtland Field and Sandia Base personnel took part in the testing. The Kirtland Field Narrative Histories do not make specific reference to participation in Operation Crossroads by groups at Kirtland Field, but this is most likely due to the high security that the operation garnered.

Testing took place in the Marshall Islands under the authority of Joint Task Force ONE (Figure 66: Organizational chart for Task Force ONE). The task force had been appointed by the JCS to oversee the initial test operation. It included members of Army, Navy, USAAF, and civilian personnel under the jurisdiction of the JCS.

Approximately 42,000 U.S. Army, U.S. Navy, and USAAF personnel (Figure 67: Crossroads crews after hours) participated in the tests (Furman 1990) and logistics for Operation Crossroads, including rehearsals for both Able and Baker, and the mobilization of 251 ships, 156 airplanes, and a host of nuclear scientists. Los Alamos was given the responsibility of handling the technical direction and the test devices. Accordingly, Sandia Base's Z Division provided ordnance-engineering support, including assembling the test weapons, loading the device for the Able drop, and gathering data on the tests (Ullrich 2001). During these tests Kirtland Field's 58th Bombardment Wing provided materiel support and aircraft capabilities (Davidson 2001).

The bombs used in the tests were the same implosion design as those dropped on Nagasaki. Each had power equivalent to 21,000 tons of TNT (Defense Threat Reduction Agency 2001). To test the environment created by an atomic blast, pressure, heat, and fallout radiation were measured and the effects on animals and equipment were monitored and recorded (Figure 68: Eniwetok Proving Ground). An unexpected result of the tests was new knowledge about trajectory accuracy: Able fell 980 feet short and 1,870 feet to the left of the intended target, sinking the USS Gilliam, one of the key instrument ships, rather than the targeted U.S.S. *Nevada* (Jones et al. 1976). Because bomb trajectory inaccuracies caused less damage to the target vessels than had been expected, the 1946 Operation CROSSROADS tests also demonstrated a need for engineering and development of the weaponry itself (Johnson 1997).

Dr. Karl T. Compton, Chairman of the Evaluation Board for Operation Crossroads, sent a letter to President Truman in July 1946 emphasizing the importance of the recent testing. In it he wrote:

> A vast amount of data which will prove invaluable throughout scientific and engineering fields has been made available by this test. Once more, the importance of large-scale research has been dramatically demonstrated. There can be no question that the effort and expense involved in this test may be amply justified both by the information secured and by greatly narrowing the range of speculation and argument. Moreover it is clear to the Board that only by further large scale research and development can the United States retain its present position of scientific leadership. This must be done in the interest of national safety (Compton 1946).

Although the early tests revealed inherent problems with the weaponry, it remained important to the U.S. military services to understand how to maximize the effects of nuclear weapons and the damage they could cause to an enemy. Another problem highlighted during the Crossroads tests was the need for properly trained personnel. With military strength at a postwar low, the tests revealed a real lack of experience among available personnel. Additional training was necessary for aircrews, photographers, and weather and communications personnel (Jones et al. 1976). This set in motion the desire to create training programs for personnel who would undertake future atmospheric tests.

Several months later, in December 1946, the Joint Task Force ONE was dissolved. Although the Task Force was dissolved, the basic structure was retained and adapted for future atmospheric tests. Each series of tests was assigned a new task force to oversee them. It was another year before the second round of testing, titled Operation SANDSTONE, began (Jones et al. 1976).

6.2.4 The Armed Forces Special Weapons Project and Sandia Base

In late summer 1946, as Operation CROSSROADS was finishing up, Major General Groves sent Colonel Gilbert Dorland to command Sandia Base and to organize a special engineering battalion for weapons assembly designated the 2761st Engineer Battalion (Special) (Defense Threat Reduction Agency 2001). The military intended to manage the nuclear weapon ordnance program much like the MED at Los Alamos, “with military leadership supported by the federal civil service,” and this new battalion was meant to play an important role in the military framework (Johnson 1997).

Accordingly, the 2761st Engineer Battalion (Special) was divided into a Headquarters and a Service Company, with Company A handling base security and Company B to help with the assembly of atomic bombs. Company B most likely included the members of the 509th Composite Group’s 1st Ordnance Squadron and was created from personnel who were returning from the Operation CROSSROADS tests (Defense Threat Reduction Agency 2001). Since many experienced assembly leaders had returned to civilian life at the end of the war, Company B would have to be largely self-trained from manuals and reports prepared at Los Alamos.

By October of 1946, Company B was undergoing initial orientation lectures covering nuclear physics and the basics workings of the Fat Man implosion bomb. It was important to replace this preliminary training with more technical weapons assembly training, but “the scientists remained aloof, certain that ‘none of those stupid Army people could understand the intricacies of an atomic weapon’” (Defense Threat Reduction Agency 2001). The reason for this, Groves believed, was that they had only dealt with housekeeping and security soldiers at the MED (Defense Threat Reduction Agency 2001). This discrepancy between the military and the scientists was the seed of the greater issue of nuclear custody that came to the fore once the AEC was established, and it greatly added to the later arguments that the military was inadequately trained to accept full responsibility for nuclear weaponry.

Early into the Cold War the military maintained that it needed control over nuclear weapons for ready access. David E. Lilienthal, the chairman of the AEC, did not concur, because even if the military had custody of the nuclear weapons, it had no experience in handling, storing, or maintaining them. Lilienthal believed that the stockpile was too complicated for the military to maintain. These conflicting beliefs created an atmosphere of suspicion and distrust on both sides at Sandia Base (Office of the Assistant to the Secretary of Defense 1978).

Because of the poor rapport between the military and science community, for the first several months military personnel serving as instructors were poorly trained in bomb assembly methods. Subsequently, in the winter of 1946, training for Company B was divided into four training groups:

1) Command: in charge of organizing the relocations of assembly teams to forward bases. This included the preparation of assembly kits, aircraft loading calculations, and time schedules.
2) Mechanical Assembly: trained on assembling detonators and high-explosive lenses.
3) Electrical Assembly: focused on the flight test box, a device for testing the batteries and electrical firing system.
4) Nuclear: moved up to Los Alamos for on-the-job training with the scientists to learn how to put the cores together and take them apart.

Many of the officers began taking classes in theoretical physics at UNM. Gradually, during the course of the training sessions at Los Alamos and Sandia Base, attitudes of the scientists toward the soldiers began to improve (Defense Threat Reduction Agency 2001).

When the AEC was established in 1946, the civilian agency gained responsibility for the custody of the existing atomic stockpile. This decision terminated U.S. Army plans to convert the Z Division into a military command with civil service support and instead created two separate groups to divide the MED’s nuclear weapons responsibilities: the civilian AEC and a military counterpart called the AFSWP, an interservice organization (Figure 62).

The AEC took over the MED’s developing scientific and industrial complex in December 1946. However, at Sandia Base, the base’s physical properties and its military personnel remained under the control of the military under the AFSWP (Defense Threat Reduction Agency 2001). The AFSWP was officially established 31 December 1946 and assumed all of the MED functions that had not transferred to the AEC. The AFSWP focused on readiness by training for both offensive and defensive atomic warfare, assessed the affects of these new weapons, and supported postwar national defense planning (Defense Special Weapons Agency 1997).

The U.S. Army established Sandia Base as an installation under control of the AFSWP on 1 January 1947, and the AFSWP charter [published the same month] authorized training for assembly and employment of atomic weapons and encouraged AFSWP participation in the development of atomic weapons of all types. On 29 January 1947, the AFSWP was given the responsibility for discharging all military functions relating to atomic energy in coordination with the AEC. AFSWP continued to train "special" personnel and coordinated with the AEC on development of atomic weapons. Because DoD did not have custody over nuclear weapons, representatives of the AEC supervised AFSWP training in bomb assembly.

In early 1947, Colonel Dorland established a Technical Training Group within the AFSWP with a mission to recruit new instructors, primarily those skilled in radio and radar electronics. The group established operations in the old Civilian Conservation Corps buildings at the south end of the base. Two instructors in the group developed a teaching laboratory in the "Farm," a building on Kirtland Field, located near the loading pit. Workbenches electrical outlets were installed to test the electrical components of a bomb (Defense Threat Reduction Agency 2001).

At the end of February 1947, the president appointed Major General Groves to be Chief of the AFSWP. Groves organized the new AFSWP, whose main task was Sandia Base activities (Defense Threat Reduction Agency 2001). In July 1947, the charter of the organization was revised to provide for AFSWP storage and surveillance of weapons in the custody of the armed forces. The AFSWP continued to provide explosives assembly service to the Z Division operations at the base, as well as base engineer, military police, and other housekeeping services. AFSWP also began building permanent headquarters and offices, and upgrading military quarters (Alberts and Putnam 1985).

In early 1947, AEC chairman David Lilienthal embarked on an orientation tour of the facilities the AEC had inherited from the MED. He was impressed by the young engineers and U.S. Army officers he met at Sandia Base. However, he reported to President Truman that "he could count the number of ready nuclear weapons on the fingers of one hand," and as a result an investigation was launched into methods for rapidly increasing the stockpile (Johnson 1997).

Swift reorganization to standardize improved weapons, components, and test equipment was urged by the AEC. Z Division was ordered to prepare standardized drawings and manuals, attend closely to production and procurement, initiate training programs, and institute long-range development and testing procedures. Plans were made to increase both personnel and facilities at Sandia Base (Johnson 1997).

The 2761st Engineer Battalion (Special) was renamed the 38th Engineer Battalion (Special) in April 1947. Operations continued to expand in measured pace. Because the stockpile of parts was for fewer than 50 Mark (Mk) III implosion bombs, classroom training and developing of standard operating procedures were considered more important than operational exercises. "Mark" was another term for "bomb." The "III" refers to the third prototype of atomic bomb created, after Fat Man and Little Boy. In the fall of 1947, AFSWP conducted its first joint field exercise titled Operation AJAX. The AJAX mission was to practice and test both personnel and equipment in bomb assembly, and to inspect the condition of the existing stockpile (Defense Threat Reduction Agency 2001).

Paul Larsen was appointed director of Z Division in late 1947 and he pushed to meet these goals. A $25 million construction effort began in 1948 to build permanent structures to replace the temporary frame and tarpaper buildings initially used and erected by the MED (Johnson 1997). Between the spring of 1948 and fall of 1951, 14 permanent buildings were constructed, and by 1952 Sandia Base had become the foremost assembly area for the country's nuclear stockpile (Ullrich 1998).

Operation SANDSTONE, the third series of atmospheric tests, was conducted at Eniwetok in April 1948. Operation SANDSTONE proof-tested the improved-design atomic weapons from Los Alamos. AFSWP personnel laid miles of submarine cable connecting a 200-foot tower at Eniwetok Atoll with electronic test instruments to measure blast, thermal, and radiation effects. Other AFSWP personnel practiced arming dummy weapons, tested firing circuits, served as security guards, or worked in the radiation safety unit (Defense Threat Reduction Agency 2001).

Operation SANDSTONE boosted AFSWP activities at Sandia Base (Defense Special Weapons Agency 1997). The operation demonstrated the feasibility of a lightweight bomb, which made the old 10,000-pound Fat Man implosion bomb immediately obsolete. A new core design allowed the weapons to be prefabricated. This was a significant improvement—allowing what had been in essence laboratory devices to become production weapons. With the new bomb, American scientists had created "more bang for fewer bucks" (Defense Threat Reduction Agency 2001).

The military believed that at Sandia Base they had demonstrated that they could perform all the necessary functions with regard to nuclear weapons except developmental surveillance, and that the AEC could be given access to the weapons for that purpose. The more important issue for the military was that the weapons be available in case of emergency and that the men who would use the weapons in battle had experience handling, assembling, and repairing them as a way to ensure the weapons' reliability (Office of the Assistant to the Secretary of Defense 1978).

Although the military made a compelling argument, the AEC retained custody of nuclear weapons and materiel, and plans were exercised, reviewed, and revised to maximize the efficiency and speed to assure that weapons were made available and placed in usable positions in the shortest possible time. Shortly thereafter, the JCS recommended to the U.S. President that a protocol for an emergency transfer of atomic weapons be developed. By mid-April 1948, emergency transfer arrangements had been made and training of military technicians at Sandia Base was accelerated. That transfer protocol greatly improved the rapport between the military and the AEC at Sandia Base (Office of the Assistant to the Secretary of Defense 1978).

The week of 24 May 1948, the MLC and AEC toured KAFB, Sandia Base, and LASL to observe training of military technicians handling nuclear weapons, visit storage facilities, and discuss the custody of nuclear weapons. During the custody discussions the AEC maintained that the military was incapable of becoming qualified in recognizing the need for and developing improvements to the weapons. The AEC believed it therefore followed that custody should remain with the technically qualified civilians of the AEC (Office of the Assistant to the Secretary of Defense 1978).

The new protocol combined with the war scare over the Berlin Crisis created a sense of urgency at Sandia Base to train bomb assembly crews. The training programs expanded so quickly that equipment shortages were a constant problem. In December 1948, the rapid expansion, creation of new weapons, and changing operational concepts spurred a reorganization of AFSWP. The 38th Engineer Battalion (Special) was redesignated the 8460th Special Weapons Group. "The 8460th Special Weapons Group became an administrative and operational command formed with special units from all three services, and was fully integrated into AFSWP (Defense Threat Reduction Agency 2001).

In January 1949, AFSWP could assemble 10 Mk III bombs per day. In July that number rose to 45 bombs per day—21 Mk IIIs and 24 Mk IVs. In September, the number of bombs assembled in one day reached 63 (Defense Threat Reduction Agency 2001). By the end of 1949, although he had retired, Groves's goal of building a highly trained cadre of military personnel to handle nuclear weapons had been accomplished.

By 1950 there was no doubt that the military had the technical competence in surveillance, inspection, and maintenance activities for nuclear weapons at operating storage sites under the supervision of the AEC. Approximately 1,500 trained personnel from the AFSWP were available for this purpose. The same year, President Truman approved a request by the JCS to store non-nuclear components in England, later in Guam and numerous components on aircraft carriers overseas. The components were then the responsibility of the service concerned, under supervision by the AFSWP. The president also approved transfer of 90 Mk IV non-nuclear assemblies to the AFSWP for assembly training programs at Sandia Base, as well as Sites Able [Manzano Base], Baker, and Charlie (Office of the Assistant to the Secretary of Defense 1978).

In December 1951 the JCS again raised the matter of custody and stated that the "current system of divided responsibility for storage, surveillance, maintenance and security of the stockpile was harmful to the best interests of the United States and that the Armed Forces should have sufficient numbers of atomic weapons in their custody to assure operational flexibility and military readiness" (Office of the Assistant to the Secretary of Defense 1978). Nevertheless, there was no change in custody.

In 1951, a new commander took over AFSWP. Major General Herbert P. Loper reorganized the responsibilities of the AFSWP to be:

- Provision of specialized training and technical services
- Coordination of storage and surveillance of the nuclear stockpile with AEC
- Planning of continental and overseas weapons tests with other agencies
- Determination and evaluation of weapons effects of those tests (Defense Threat Reduction Agency 2001).
-

In addition, the unit at Sandia Base was officially designated Field Command (FC), AFSWP, by General Order No. 4, 28 April 1951. Commander General Robert Montague was assigned responsibility for exercising command jurisdiction over and supervision of activities at Sandia Base and its tenants. At this point, FC/AFSWP's primary mission of bomb assembly training grew less important than stockpile inspection, plans and budgets for military participation in the atomic testing, and directing the study of the effects of nuclear weapons. By the end of 1951, AFSWP's role in atomic testing had evolved to be more active in the planning stages than in actual test participation (Defense Threat Reduction Agency 2001).

6.2.5 Secondary Missions at Kirtland Field

Secondary missions at Kirtland Field during the inception of the Cold War included furnishing facilities for the Air Reserve and Civil Air Patrol (CAP). The establishment of the Air Reserve facilities was commanded in a letter from HQ, USAAF, Washington D.C. on 10 October 1946. The letter ordered SAC to "furnish facilities at Kirtland to ADC on a joint use basis for the Air Reserve" and requested a site plan outlining facilities for Air Reservists to use (Kirtland Army Air Field 1948). Air Reservists were formerly active-duty USAAF pilots who remained on call in case of national emergency or war.

CAP is first referred to in Kirtland Field historic documents in November of 1946. The CAP was a national volunteer network of private pilots and aviators, established one week before the events at Pearl Harbor. During the war, CAP pilots were called the "Flying Minutemen," who specialized in coastal patrol for enemy submarines, search and rescue missions throughout the U.S., and cargo and courier flights to transport materials and personnel (Civil Air Patrol 2001).

In July 1947 the New Mexico Air National Guard (NM ANG) was assigned to Kirtland Field and federally recognized as the 188th Fighter Bomber Squadron. The squadron was comprised of approximately 100 officers and airmen (Benolkin n.d.). The unit was composed of a flight equipped with Douglas B-26 light bombers, a fighter squadron flying 25 P-51 Mustangs and three T-6 Texan trainers, plus a small weather detachment (Photo Science Inc. 1995).

6.2.6 The Proving Ground, the School of Mines and the AEC

In anticipation of its postwar disbanding, the OSRD transferred oversight of the NMPG to the Naval Bureau of Ordnance on 6 April 1945. At UNM, president James Zimmerman died and John Wernette became president of the university. From the beginning, Wernette and Jack Workman did not see eye to eye. Wernette exerted increased control over NMPG. Workman later described the situation in a speech delivered at the New Mexico School of Mines in 1975:

> [President Zimmerman] under whom I had been pleased to work died, and soon they replaced him, and [J. P. Wernette] had many ideas different from those of his predecessor. We encountered trouble having him make decisions for us. Now we didn't ask anybody to make decisions for us, but when somebody insisted on making the decisions, we rather hoped that he would do it promptly, but he would delay action so long that it became very tiresome. I hesitated for example to ask him what time it was because I was afraid he would answer me tomorrow (Workman 1975).

To effect the change, on 1 March 1946, in response to relations with Wernette, Workman transferred the proving ground and its considerable funding to the New Mexico School of Mines at Socorro, enlisting the help of then-Governor John Dempsey (Workman 1975). Dempsey had arranged for a meeting with the boards of regents of both UNM and the New Mexico School of Mines. "At one instant, we resigned and were rehired in the same afternoon," said Workman (Workman 1975). The NMPG then became known as the New Mexico Experimental Range (NMER).

The NMER staff stayed at Albuquerque near the experimental range, so new laboratory and administrative facilities had to be arranged. The state-owned New Mexico School of Mines leased the former Sandia School and wartime hospital complex, 10 miles northwest of the T Range, from the estate of Ruth Hanna McCormick Simms with an option to buy it for $300,000. "We were at that time without a roof over our heads," said Workman. "And even in this climate, it's nice to have a roof over your head" (Workman 1975). Laboratories, shops, and administrative offices were created at the former school and Workman and his family moved into the former headmistress's bungalow (Verhaaren 1999).

NMER stayed at this complex until 1949. In 1948, Workman was informed that the AEC wanted the nearly 50,000-acre experimental range and Sandia School for its own purposes. The same year, the AEC filed condemnation proceedings for the both properties (Verhaaren 1999). Workman saw an opportunity in the situation, and he persuaded the state to exercise its option to purchase the complex for the $300,000, which was much less than its market value. The federal courts then requested the AEC to buy the school for closer to its market value; eventually the AEC paid $640,000 for the school property (Verhaaren 1999). The industrious Workman then persuaded the New Mexico legislature to let him use the profits from the sale of the school complex to construct new laboratory facilities at the New Mexico School of Mines, of which he had become president. In 1949, lands for a new NMER were acquired near Socorro and new facilities constructed, including research laboratories (Figure 69: NMPG chart).

The New Mexico School of Mines eventually became the highly regarded New Mexico Institute of Mining and Technology—the NMER became the Energetic Materials Research and Testing Center in 1992. The nearly 50,000 acres south of Kirtland Field eventually became part of KAFB.

6.3 Kirtland Field becomes an Air Force Base

On 18 September 1947 the USAF was established with the same basic functional structure that was developed for the USAAF (Bright 1992). The National Security Act of 1947 designated the USAF as a separate branch of the armed forces, as well as the office of the Secretary of Defense, the JCS, the NSC, and the Central Intelligence Agency (Bright 1992). Kirtland Field, with a population of 972 military and civilian personnel, became KAFB on 13 January 1948 (KAFB 2002; Mueller 1989).

6.3.1 KAFB and Atomic Weapons

In October 1947, while there was no change in the designation of the TandTLC [which had been established as a technical liaison between Kirtland Field, the AFSWP, Sandia Base, and the AEC], the Atomic Energy Division, Deputy Chief of Air Staff for Research and Development, HQ, USAAF [under which the TandTLC operated] was redesignated the Special Weapons Group, Deputy Chief of Staff, Materiel, HQ USAF (Department of the Air Force 1949).

The following year [July 1948] the Special Weapons Group, Deputy Chief of Staff, Materiel was redesignated the Office, Assistant Deputy Chief of Staff, Operations for Atomic Energy. Similarly, the TandTLC was renamed the USAF Field Office for Atomic Energy (Department of the Air Force 1949). This was an increase in stature for the organization, since it now reported to the Office for Atomic Energy HQ, USAF, which was charged with conducting a vigorous advisory and consultant program to furnish the USAF with comprehensive information on all aspects of the atomic energy program at the Sandia–Los Alamos operating level (Oppenheimer 1962).

The USAF Field Office for Atomic Energy’s mission through 1949 included:

1) the provision of facilities for permanent liaison with SAC, ADC, and other USAF commands for nuclear weapons matters;
2) maintenance and operation of a “technical library on all data pertinent to USAF participation in the Atomic Energy Program,” responsibility as the field contact agency for all USAF visitors to LASL and Sandia Laboratory;
3) broad technical supervision over special weapons programs at KAFB; and
4) monitoring of the Atomic Energy Program of the USAF at the Sandia–Los Alamos operating level (Department of the Air Force 1949).

Activities and operations at the installation began to multiply. On 28 August 1948 the 428th AAF Base Unit (Special) was redesignated HQ and HQ Squadron, 2758th Air Force Base. The new KAFB assigned organizations were:

- HQ and HQ Squadron 2758th Air Force Base
- HQ and HQ Squadron 3170th Special Weapons
- 2930th Base Supply and Maintenance Squadron
- 2780th Air Police Squadron
- 2797th Base Medical Complement (Kirtland Army Air Field 1948).

The Convair B-36 aircraft arrived at KAFB in September 1948, most likely into the hands of the HQ Squadron 3170th Special Weapons. The B-36 was a state-of-the-art bomber and was large and heavy, weighing 300,000 pounds. It was limited to a small number of bases (Bright 1992). KAFB, with its 10,000-foot-long and 200-foot-wide runway, was one of those bases, and as such was one of few installations around the country to receive the aircraft. In anticipation of the arrival of the B-36, facilities at KAFB were improved, including new overlays on the north-south runway (Weitze 2001).

The B-36 was the first intercontinental bomber able to carry any weapon in the U.S. arsenal across distances up to 3,900 miles. Thus, it was the principal means of deterrence from 1948 to the late 1950s. It was flown extensively in later weapons tests at the Marshall Islands and at the Nevada Proving Ground. Yet, in its entire history, the "Peacemaker" never dropped a bomb in combat (Medema 2000). Although the six-engine B-36 bomber was one of the newest aircraft in the USAF, it was not designed to carry atomic weapons and therefore required modifications in order to be coupled with such weapons. These modifications and weapons marriage occurred at KAFB under the HQ Squadron 3170th Special Weapons.

Many other marriages of aircraft and weapons were completed at KAFB. The XB-47 jet, the first U.S. swept-wing, multi-engine bomber, shortly followed the arrival of the B-36 at KAFB for modification. According to KAFB monthly histories, during that period, as new types of aircraft were acquired by the USAF, they were flown to KAFB to undergo modifications and fly missions related to their incorporation into the special weapons arena.

The following summer (June 1949), the assigned organizations of KAFB were again redesignated, by General Order No. 52, HQ, AMC. They were as follows:

- HQ and HQ Squadron, 2758th Experimental Wing
- HQ and HQ Squadron, 3170th Special Weapons Group
- HQ and HQ Squadron, 2930th Maintenance and Supply Group
- HQ and HQ Squadron, 2797th Medical Group
- HQ and HQ Squadron, 3078th Air Base Group (KAFB 1950).

6.3.2 Sandia Laboratory and Technical Area II

The early focus at Sandia Base on weapons assembly required the development of a second classified area. Technical Area II (Tech Area II), designed for the handling and incorporation of explosives into the weapons. Tech Area II was established about a half mile south of Tech Area I. Construction began in 1948 and included two identical assembly buildings and a control building completed in 1949 (Alexander 1963).

The architectural firm of W.C. Kruger and Associates, of Albuquerque, was responsible for the design of the first buildings. A late 1947 estimate of the projected cost of the five buildings the Kruger firm was designing (Buildings 901, 903, 904, 907, and 908) was $593,000 (Ullrich 1998). Under the direction of the Z Division, Tech Area II was eventually surrounded by a perimeter fence, with guard towers situated outside the fence at its four corners. These towers overlooked the area and its surroundings as a whole, including the perimeter fence. They remained in use until the late 1960s (Ullrich 1998).

Tech Area II was designed specifically for the assembly of the non-nuclear components of nuclear weapons. These were assembled and stored separately from the nuclear material and components that provided their operability as nuclear weapons. The devices were known as sub-assemblies or mechanical assemblies. Were a weapon required, it had to be partially disassembled, the nuclear core inserted, and the weapon reassembled. Between 1948 and 1952, Tech Area II was the primary assembly site for the nation's nuclear stockpile (Ullrich 1998).

After 1949, the U.S. and the Soviet Union entered a period of confrontation, resulting in a rapid escalation in nuclear weapons production, which greatly affected the workload at Sandia Base.

In the summer of 1948, the Z Division was renamed Sandia Laboratory, a separate branch of the University of California's LASL. It began a vigorous recruiting campaign, and employee numbers jumped from 470 at the beginning of the year to more than 1,000 by the end of 1948. For a time, Sandia Laboratory physicists took over the former Sandia School complex, making it "Sandia West Lab" (Alberts and Putnam 1985).

Less than a year later, in early 1949, the regents of the University of California asked to be relieved of the contract for operating Sandia Laboratory (Oppenheimer 1962) because they were not pleased with the expansion at Sandia Base and the emphasis on ordnance engineering and production (Ullrich 1998). While weapons research was a justifiable activity, the University felt that the actual design and production of weapons did not have a place in academia (Verhaaren 1998). Consequently, the AEC began to search for an industrial firm to manage the engineering facility. President Truman wrote a letter to American Telephone and Telegraph (AT&T) president Leroy Wilson, asking the company to assume the operation as an "opportunity to render an exceptional service in the national interest" (Johnson 1997). On 11 July it was announced that Western Electric Company, AT&T's manufacturing arm, would accept the management role on a no-profit, no-fee basis. Sandia Corporation was then formed as a wholly owned subsidiary of Western Electric to manage Sandia Laboratory, and the corporation took over management of Sandia Laboratory on 1 November 1949 (Ullrich 2001). With the change, George Landry was appointed the first president of Sandia Corporation (Ullrich 1998).

In 1949, as the Soviet Union successfully tested its first atomic device, a national vision emerged of a larger stockpile that was mass produced and quickly available. Sandia Laboratory's responsibility for coordinating weapons production among the various AEC contractors expanded as the number of weapons in development grew. The beginning of the Korean War pushed several emergency development programs for new weapons (Johnson 1997).

Sandia Corporation's President Landry received a telegram reading "Anticipating a military requirement not yet firm, you are directed to formulate a plan using all facilities at your disposal to deliver to War Reserve at the earliest possible date service models of the 'TX-5'" (Johnson 1997). The TX-5 [test experimental] was an experimental version of an implosion bomb, called the Mk 5. Sandia Laboratory went to a six-day workweek to meet the delivery schedule, and production of the Mk 5 began in 1951.

6.3.3 Site Able: The Creation of Manzano Base

By the late 1940s, a nuclear stockpile had become crucial to the national defense. Working with the AEC and the DoD, Sandia Laboratory contracted with the USACE to design and construct storage sites for nuclear weapons; the national effort was codenamed Project Water Supply. Richard Bice, Sandia Laboratory's Director of Engineering, served as project engineer (Johnson 1997).

The first three storage sites built were Site Able in the Manzano Mountains near Sandia Base and KAFB; Site Baker at Killeen Base in Texas; and Site Charlie at Clarksville Base in Kentucky.

When these first sites opened for service in 1949, the AEC assigned Sandia Laboratory the responsibility for monitoring the activities at the sites. Sandia Laboratory stationed staff at the storage sites "to monitor, maintain and assemble the weapons" (Johnson 1997). The AFSWP assisted Sandia Laboratory as the military arm of the operation. By 1957, the USACE had constructed a total of 13 weapons storage areas (Table 2). Six of these were National Stockpile Sites, or major storage depots, including Sites Able, Baker, and Charlie, and seven were Operational Storage Sites, or smaller distribution sites (Verhaaren 1998). Originally the sites were jointly operated by the AEC, the AFSWP, and the respective service: U.S. Army, USAF, or U.S. Navy (Arkin et al. 1998). At each storage site there were up to two dozen Sandia Laboratory employees (Johnson 1997).

Table 2: Nuclear weapons storage areas

Source: Arkin et al. 1998

Site Name	Installation	Location
National Stockpile Sites		
Site Able	Manzano Base	New Mexico
Site Baker	Killeen Base	Texas
Site Charlie	Clarksville Base	Kentucky
	Barksdale AFB	Louisiana
	Nellis AFB	Nevada
	Lackland AFB	Texas
Operational Storage Sites		
	Limestone AFB (now Loring)	Maine
	Ellsworth AFB	South Dakota
	Fairchild AFB	Washington
	Travis AFB	California
	Westover Air Force Station	Massachusetts
	Yorktown Naval Weapons Station	Virginia
	Seneca Army Depot	New York

The first Project Water Supply site to be designed was Site Able, or Manzano Base as it came to be called. In 1948, the USACE, Albuquerque District received a $10 million authorization to construct Site Able in the Manzano Mountain foothills, the Four Hills, near what was then Sandia Base's southeastern boundary. Early construction included underground igloos and two subterranean "plants" or facilities for weapons inspection, maintenance, and modification built directly in the granite core of Four Hills, to serve as underground nuclear storage and maintenance. The site's remote location and proximity to Kirtland Air Force Base met the need for security, convenient air transportation, and deployment of munitions (Verhaaren 1998).

Four types of storage igloos were used for Project Water Supply: Types A, B, C, and D. Each consisted of an entry corridor and a main chamber with a rectangular floor plan. Igloo Types A, B, and C were built aboveground and covered with earth scraped from the surrounding area. "Type A" igloos were shorter than any of the other types and served as small plants instead of storage. "Type B" were mid-size igloos. "Type C" were the largest of the three aboveground types. Type D igloos were tunneled underground (Verhaaren 1998).

By 1949, 40 underground igloos were tunneled into the flanks of Four Hills. These were "Type D" with vaulted, straight-sided passages of varying length which led to the storage chamber. The first part of the passage was constructed from an open cut in the mountain that was roofed and then covered with earth. The remainder of the passage and storage chamber was tunneled into solid rock; the walls and ceilings were lined with reinforced concrete (Figure 70: Type D igloo) (Verhaaren 1998).

The two plants for inspection, maintenance, and weapons modification were tunneled into the Manzano Mountains. These were in effect a maze of vaulted tunnels connecting working bays, emergency generators, and facilities for personnel. Plant 1 was completed in 1949 and Plant 2 in 1950 (Verhaaren 1998). The various chambers of the plants were built underground, both to minimize the effects of an accidental explosion and to protect their contents.

Site Able opened in 1949 consisting of two areas: administration and storage. Site Able became operational by April 1950 under the AFSWP's 8460th Special Weapons Group at Albuquerque. The purpose of Site Able was "to receive, inspect, store, maintain, assemble, modify, transport, and perform custodial transfer of munitions to storage or combat organizations of the USAF and other military services as directed" (Verhaaren 1998). As with all the sites, Sandia Laboratory stationed about two dozen staff at the site to monitor, maintain, and assemble the weapons. To ready a weapon for use, major components were tested and assembled, with the assistance of the AFSWP's 8460th Special Weapons Group. The weapons and nuclear cores remained in the custody of the AEC until the U.S. President authorized release of the weapon to the military (Johnson 1997). Four chain link fences topped with barbed wire surrounded the storage complex. The second fence was electrified (Verhaaren 1998). The administrative area was a secure complex separate from the weapons storage area. Four chain link fences separated it from Sandia Laboratory and KAFB to the west. On the east, three additional lines of fencing separated it from the weapons storage area itself (Verhaaren 1998).

As tensions in Korea increased and NSC-68 was published, recommending a massive military build-up, nuclear weapons development and production efforts were renewed, and the number of weapons storage areas nationwide was increased. War had been brewing in Asia since 1948 when the Republic of South Korea declared itself independent from the northern portion of the country. Shortly thereafter, the People's Republic of Korea in the north was established and laid claim to the entire peninsula and opposed U.S. presence in the south (Gaither 1997). The Communist invasion of South Korea in June 1950 dispelled the notion that atomic superiority alone would deter military aggression. The U.S. response, under President Truman, was to renew efforts in weapons development and production, with particular emphasis on offensive weapons.

Existing facilities, such as Site Able, were expanded. Underground bays storing weapon components were subdivided, and new aboveground storage facilities were built. Thirty-five "Type B" igloos were constructed in 1950 (Verhaaren 1998). These were constructed aboveground, consisting of half cylinders of reinforced concrete covered with earth scraped from the surrounding area. Like their underground counterparts, they consisted of two sections—a short entry corridor and a main chamber. Additional construction followed as the 1950s continued.

6.4 KAFB and the Special Weapons Command

In response to the explosion of a Russian atomic bomb in the fall of 1949, and following the U.S.'s new military strategy of deterrence, in December 1949 the Air Force Special Weapons Command (SWC) was established to develop and test atomic weapons. This new command was of the same stature as AMC, SAC, and Tactical Air Command.

The SWC was headquartered at KAFB, with Brigadier General Howard G. Bunker serving as Commanding Officer (Alberts and Putnam 1985). The mission was to provide an organization for development testing of special weapons, including atomic, biological, and chemical weapons, and to increase the efficiency of airborne vehicles to carry these weapons. As a result, the responsibility for biological-chemical warfare research was moved from Wright-Patterson AFB to the SWC at KAFB (Weitze 2001).

The SWC assumed all the functions of the old USAF Field Office for Atomic Energy [TandTLC] and employed personnel who were transferred from that office to form the cadre of the HQ, SWC (KAFB 1949). The command was also directed to provide personnel and equipment for development and proof testing of aircraft equipment and ground handling appurtenance to special weapons. Shortly after it was established, the SWC took over the host responsibilities for KAFB from AMC (Oppenheimer 1962).

Officially, the SWC mission was:

> To establish and maintain technical supervision over a test facility and group of qualified personnel, aircraft, equipments and instrumentation that will provide for the Air Force, the AEC, their contractors, and other agencies of the DoD—an organization for the development testing of atomic weapons and other special weapons with their associated equipment, and for determining the adequacy of airborne vehicles to carry these special weapons (KAFB 1949).

As such, it was referred to as the "AEC's Air Force." It also served as the primary source for scientific and technical information on special weapons development (KAFB 1949). To accomplish its mission, SWC redesignated numerous units that had been under the USAF Field Office of Atomic Energy with no change in station (KAFB 1949). The new units were as shown on Table 3.

Table 3: "AEC's Air Force" Units

Source: Kirtland Air Force Base 1951

SWC Redesignated Unit	USAF Field Office of Atomic Energy Units
4901st Special Weapons Wing	2758th Experimental Wing
4925th Special Weapons Group	3170th Special Weapons Group
4905th Maintenance and Supply Group	2930th Maintenance and Supply Group
4910th Air Base Group	3078th Air Base Group

According to historic organizational charts, the 4901st Special Weapons Wing was redesignated the 4901st Support Wing (Atomic) by 1951. As such, it appears that the 4901st Special Weapons Wing had administrative control over the groups, with the 4905th Maintenance and Supply Group and the 4910th Air Base Group serving as support and the base host, respectively, while the 4925th Special Weapons Group was the group actively involved with atomic testing.

During the 1950s, new housing was constructed, and service and recreation facilities that had been closed were reopened. Because of the level of military activity, the City of Albuquerque deeded leased runways and airfield land to the USAF for one dollar, with the concession that commercial airlines would be able to use the runway and taxiway facilities. A seven-year base master plan called for more industrial and test facilities to facilitate the mission of the SWC (Alberts and Putnam 1985).

6.4.1 4925th Test Group (Atomic)

In January 1950 President Truman directed the AEC to emphasize thermonuclear research, with the prime objective to become operational in delivering hydrogen bombs. As a result, the military strived to overcome the two major problems: to adapt aircraft and the bombs to each other [referred to as “marriage”] and to develop bombing techniques that were both effective and allowed the aircraft and crew to return from attacks safely. Working on top-secret projects and with the AEC, during the 1950s the SWC developed delivery systems and techniques to drop thermonuclear weapons from low and high altitudes while protecting the aircraft and crew (Hardison 1990).

The primary USAF group to work on this mission was the 4925th Special Weapons Group. The 4925th Special Weapons Group was a mix of elite U.S. airmen and support personnel tasked with testing all aircraft in the USAF inventory for nuclear weapons delivery capability. Its overall mission was specifically to:

- Marry all nuclear weapon types to all suitable types of aircraft
- Establish the ballistics of each type of nuclear weapon on precision bomb ranges
- Support the AEC with live test drops at Nevada and in the Pacific
- Fly through and “sample” highly radioactive nuclear “clouds” after explosions at those test drops (Hardison 1990).

The group also recommended military characteristics and requirements for special weapons, provided facilities for training programs, and maintained an instrumentation laboratory and a technical liaison with the AFSWP, AEC, and others (KAFB 1949).

The top bomber and fighter pilots in the USAF and expert support personnel were transferred to the 4925th Special Weapons Group. These included bomber, fighter, and helicopter pilots; bombardiers; nuclear project engineers; depot level modification personnel; aerial cameramen; and crew chiefs and crews. Each had to have AEC “Q” clearance, a background check by the Federal Bureau of Investigation [FBI] that went back 15 years (Hardison 1990).

The group was established within a double-barbed-wire-fence complex dubbed “Area Charlie” with a small sign on the gate reading “Santa Fe Operations” (Hardison 1990). The 4925th Special Weapons Group’s first commander was Colonel Osmund J. Ritland (Hardison 1990), who had been awarded the Distinguished Flying Cross for test flying at Wright Field, where he flew more than 200 different aircraft. At Wright Field he had been responsible for creating programs for the engineering, flight performance, and functional testing of most American aircraft used during World War II (United States Air Force n.d.b). After his tenure at KAFB, Ritland went on to become vice commander of the Air Force Ballistic Missile Division, then commander of the Space Systems Division of the Air Force Systems Command (AFSC), and then deputy to the commander of Manned Space Flight, AFSC (United States Air Force n.d.b).

In July 1951, the 4925th Special Weapons Group was redesignated the 4925th Test Group (Atomic) and continued for 11 years as an important component of KAFB’s nuclear responsibilities (Figure 71: 4925th Test Group (Atomic)) (Jones et al. 1976).

6.4.2 Joint Test Group and the 4930th Test Support Group

SWC’s responsibilities expanded in July 1951 to include monitoring the Military Weapons Effects Program, the ongoing series of full-scale nuclear tests, and exercising overall control over participating USAF personnel. SWC was to provide aircraft and crews for airdrops, sampling and courier services, disaster and radiological safety. Other support activities included damage assessment, telemetry, photography, and administrative services (Alberts and Putnam 1985).

The 4930th Test Support Group appears for the first time on SWC organizational charts in December 1951. It was detailed as “a holding cadre for USAF participating personnel of overseas nuclear testing Joint Task Forces” (Air Force SWC 1951). The 4930th Test Support Group’s Technical Operations Squadron (Provisional) was also activated at KAFB to handle the many administrative details associated with the new test support. An operational portion of the squadron was titled the Weapons Effects Test Group and based at the test sites to assume responsibility for technical matters directly related to the programs and projects of the atmospheric tests. The rest of the Technical Operations Squadron (Provisional) was charged with providing administrative support for program and project personnel involved in the weapons effects tests (Jones et al. 1976).

Also in late 1951, SWC was asked to establish a “Joint Test Group” to plan for future full-scale atmospheric tests (Alberts and Putnam 1985). The Joint Test Group, which became operational in December 1951, was also required to insure adequate military support for the tests (Jones et al. 1976).

A week after the formation of the Joint Test Group, however, responsibility for future atmospheric tests was reassigned from SWC to AFSWP. The SWC’s Joint Test Group then became Test Command, AFSWP and operated out of KAFB (Alberts and Putnam 1985). Additional personnel were requested from the three military services, as needed (Jones et al. 1976).

6.5 New Mexico Air Defense and KAFB

Along with its assignment under SWC, KAFB received a related air defense mission for ADC. ADC established air defense zones around the country and a system that consisted of many agencies working in tandem to ensure that American skies were safe from enemy aircraft (Figure 72: ADC Air Divisions 1952). At its height, the system involved Air Divisions (Defense) in charge of Aircraft Control and Warning (AC&W) radar stations manned by AC&W radar squadrons, which worked in tandem with Ground Observer Corps (GOC) observation posts and FIS in ready alert mode.

The GOC was first established during World War II when civilian volunteers manned observation posts along U.S. coasts for the USAAF in order to search the skies for enemy aircraft. The USAAF disestablished the GOC in 1944 because of the diminished threat from German and Japanese air forces. However, it was reestablished in 1952 as part of a revised GOC plan titled Operation Skywatch (Air Defense Radar Veterans' Association n.d.).

The second incarnation of the GOC manned observation posts nationwide in search of enemy aircraft. They communicated sightings to other GOC volunteers at "filter centers" whose job was to collect the GOC information being reported. This information would be sent to Air Defense Detection Centers (ADDC) which would then alert the FIS and the Air Defense Control Center (ADCC). The ADCC would then alert ADC's Central Air Defense Force, which consisted of the Western Air Defense Force [WADF], the Central Air Defense Force [CADF], and the Eastern Air Defense Force [EADF] (Figure 73: Diagram showing GOC operations) (Flaxman 1958).

The USAF created ADDCs to receive the information from both the AC&W radar stations and the GOC filter centers. If enemy aircraft were spotted, the ADDCs would direct the nearest FIS to man its aircraft, identify, and, if necessary, destroy intruders. If an aircraft were identified and further action deemed necessary, the ADDC would consult the division's ADCC, which had responsibility for an entire air defense region (Figure 73) (Flaxman 1958).

KAFB hosted one of the first ADCCs in the country, which was under construction at KAFB in late 1950 and operational before the close of 1951 as part of the 34th Air Division (Defense). ADCCs were innovative buildings that were proto-hardened and designed for protection from atomic, biological, and chemical warfare. A single ADCC controlled multiple FISs for its air defense jurisdiction. Along with the ADCC at KAFB was a corresponding ADDC (Weitze 2001).

6.5.1 34th Air Division (Defense)

The central New Mexico region was considered a high air defense priority in the early Cold War (Winkler 1997) because of Sandia Laboratory, LASL, and the newly created nuclear weapons stockpile. On 25 April 1950, KAFB became HQ for the newly created 34th Air Division (Defense). The 34th Air Division (Defense) protected New Mexico and Arizona, most of Colorado and Utah, and a portion of West Texas. This included "Los Alamos, the Sandia-

Kirtland complex, White Sands and … Biggs, Walker and Davis-Monthan Air Force Bases" (Flaxman 1958).

The 34th Air Division (Defense) mission was "to detect, identify, intercept and destroy hostile airborne forces … to defend the critical areas in the Southwest, but the task is infinitely greater than the sum of geography to be defended because of the strategic importance of its area of responsibility" (Flaxman 1958).

In tandem with its hosting of HQ 34th Air Division (Defense), KAFB began hosting a subordinate AC&W radar station in 1950 (Figure 74: AC&W station east of Moriarty). The 690th AC&W radar squadron in charge of the station was supported, at the outset of the mission, directly on base in temporary Jamesway huts—round Quonset-hut type structures (Weitze 2001). The AC&W system was part of the country's first air defense radar network called Lashup.

Lashup was an interim, temporary system built by the USAF. Lashup was an appropriate name for the system as World War II vintage radar antennas were literally lashed to the top of wooden platforms (Winkler 1997). The World War II systems were AN/CPS-5 search radar, which were deficient in both range and low-altitude detection capability. By 1950, Lashup comprised 43 sites, including the AC&W at KAFB (Boyne 1999). A permanent site was constructed soon after. On 2 December 1949, the USAF directed the USACE to proceed with construction of the first 24 "permanent" radar sites on the list of 75, and KAFB was the recipient of one of these sites (Winkler 1997).

The USAF devised a permanent system in 1947 called the Radar Fence Plan, which proposed 411 radar stations and 18 control centers at a cost of $600 million. These radar stations were designed to monitor the skies for enemy aircraft, but because the cost exceeded what the USAF could pay, a Permanent System was created, calling for 75 radar stations and 11 control centers at a cost of $116 million spread over 1949 to 1950. This system was accepted, but it was not fully operational until April 1953 (Winkler 1997).

KAFB remained the HQ for the 34th Air Division (Defense) throughout the 1950s until 1 January 1960 (Weitze 2001). From that date until 1 November 1960, the zone was referred to as the Albuquerque Air Defense Sector (Mueller 1989). By the early 1960s, however, the USAF began shifting emphasis away from intercepting bombers in favor of the detection of ICBMs. Funding cutbacks began to cripple ADC programs, and that particular era of air defense drew to a close.

6.5.2 93rd Fighter Interceptor Squadron

In June 1949, KAFB became host to one of the earliest alert ADC fighter interceptor wings created for air defense of the U.S., the 81st Fighter Wing, which had been established in May 1948 at Wheeler AFB, Hawaii. The 81st Fighter Wing was redesignated the 81st Fighter Interceptor Wing in January 1950, flew the F-86 Sabre Jet (81st Fighter Wing Association n.d.,) and was responsible for defense of the areas around LASL and Sandia Base. The 81st Fighter Interceptor Wing was on constant alert, with aircraft typically parked at the ends of runways and their crews on duty in nearby makeshift structures. In July 1950 KAFB was one of only 14 priority FIS locations in the continental U.S. (Weitze 2001).

However, the air defense area in New Mexico for the 81st Fighter Interceptor Wing lasted only a short while. In May 1950, the 81st Fighter Interceptor Wing departed for Moses Lake AFB in Washington state, along with the 91st and 92nd FIS, which were under its jurisdiction (81st Fighter Interceptor Wing 1954). The 93rd FIS took the 81st Fighter Interceptor Wing's place at KAFB and was attached to the Albuquerque Air Defense Sector in the same month. The 93rd FIS employed the F-86A Sabre jet, the USAF's first swept-wing jet designed as a high-altitude day fighter, was on ready alert, and was continually training to increase its combat efficiency (Flaxman 1958).

6.6 New Mexico Air National Guard

In 1948 the NM Air National Guard (ANG) 188th Fighter Bomber Squadron was renamed the 188th FIS (Photo Science Inc. 1995). By the early 1950s, the NM ANG was nicknamed the "Enchilada Air Force" because of the green chile and enchilada dinners they served to their hosts in other states.

Between 1950 and 1952 the squadron served on active duty in Korea. In December 1950, a total of 54 officers and 400 airmen from the 188th FIS were absorbed by the other USAF units and dispatched to Japan and Korea. In all, some 1,411 combat missions were flown over Korea by pilots of the NM ANG (Benolkin n.d.). The unit was released from this federal active duty in November 1952.

6.7 Naval Air Detachment

While the USAF was the military branch primarily concerned with the capability of aircraft to deliver nuclear weapons, the U.S. Navy also investigated nuclear capabilities for its naval aircraft. In June 1949, the Department of the Navy, in a tactical maneuver in order to make a connection between naval aviation and the AFSWP, commissioned a U.S. Naval Air Detachment at KAFB. Its mission was "to provide specified naval aircraft with nuclear-bomb carriage and delivery capability" (Naval Air Warfare Center 1993).

The detachment consisted of seven officers and nineteen enlisted men under the command of Commander Thomas J. Walker, who had been previously assigned to LASL as a prospective bomber commander for a once-planned additional atomic bomb mission during World War II. This first contingent of men had just three aircraft assigned to them for bomb compatibility testing. These were a P2V-2, an AJ-1, and a JRB-4. They began by evaluating new special weapons shapes developed by Sandia Laboratory for compatibility with Naval aircraft (Naval Air Warfare Center 1993).

In June 1951, Commander Frederick H. Michaelis replaced Walker. By that time, the detachment had eight officers and 53 enlisted men, and AD-4 and F2H-2 aircraft had been added to the others being tested (Naval Air Warfare Center 1993). The mission was not easy, trying to marry new weapons with existing aircraft necessitated extensive modification of equipment, and much trial and error. The naval detachment was about to become an official facility.

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7.0 NUCLEAR TECHNOLOGY ESCALATION: APRIL 1952 – APRIL 1961

Phase II of the Cold War focused on nuclear technology escalation and the resulting concept of Mutually Assured Destruction (MAD). The development and operation of nuclear weapons, the B-52 Stratofortress, Intercontinental Ballistic Missiles (ICBMs), and satellites were the physical manifestation of the military escalation of nuclear technology required to maintain deterrence (Figure 75: Chart of Phase II Cold War Activities at Kirtland). Phase II began with the election of Eisenhower in 1952, and the implementation of Eisenhower's "New Look" policy which focused on nuclear striking power and the threat of massive retaliation. Phase II ended in 1961 with the creation of President John F. Kennedy's "Flexible Response," in opposition to Eisenhower's massive retaliation defense strategy (Lewis et al. 1995).

Shortly after election Dwight Eisenhower unveiled his "New Look" strategy, which was a focus on maximum effectiveness at minimum cost. Nuclear weapons were cheaper than conventional weapons, and by focusing on nuclear striking power, the U.S. could reduce the size of its military forces. This concept was based on Secretary of State John Dulles' suggestion that the U.S. "rely chiefly on its nuclear superiority and the threat of massive retaliation to thwart Communist aggression" (Lewis et al. 1995). In 1952, nuclear weapons in the U.S. stockpile numbered 1,000, a dramatic increase from just two nuclear weapons in 1945. By 1958, that number increased to 7,100 (Defense Threat Reduction Agency 2001).

Joseph Stalin, who had led the Soviet Union since 1928, died in March 1953. The death of Stalin and the concept of absolute deterrence were both factors that led to the end of the Korean War. Stalin's death left the Chinese uncertain about future Soviet foreign policy. Third-party Indian diplomats received hints from Secretary of State John Dulles that the Chinese could be subject to a policy of "absolute deterrence" or an all-out nuclear attack by the U.S. to prevent enemy aggressions. Soon after, the Korean War ended with the signing of the armistice (Lewis et al. 1995).

In August 1953, the Soviet Union detonated its first hydrogen bomb, and Soviet scientists began working on the world's first ICBM, called the R-7. Later in the year, the R-7 was approved for carrying a nuclear warhead (Gaither 1997). The U.S. began to reassess its ability to deter the possibility of a Soviet first-strike attack (Lewis et al. 1995).

The Killian Report or "Surprise Attack Study" was published in 1954. It recommended that the highest national priority should be placed on the development of the USAF ICBM program, Intermediate Range Ballistic Missile (IRBM) capabilities for land and shipboard launch, construction of an early warning system in the Arctic, and R&D into a possible anti-missile system (Kunsman and Lawson 2001; Leslie 1993). The Killian Report also recommended the development of technology for intelligence gathering. By 1956, the U.S. had developed the U-2 photoreconnaissance plane as well as reconnaissance satellites (Lewis et al. 1995). By June 1956, the DoD's priority list for R&D included three programs that activities at KAFB supported: the Polaris SLBM, Atlas ICBM, and satellite reconnaissance.

The following year, the North American Aerospace Defense Command (NORAD) was established. NORAD was a joint U.S.-Canada air defense command housed inside Cheyenne Mountain at Colorado Springs, Colorado. The command was linked directly with a variety of radar and satellite monitoring systems to alert it of a potential enemy attack.

Also in 1957, the Soviets launched Sputnik I and II satellites into Earth's orbit. The ramification was that if the Soviets could launch a satellite into space, they had the capability to launch a hydrogen warhead 5,000 miles to the U.S.—a capability that the U.S. did not have at the time. The following year, the U.S. launched the Explorer 1 Satellite into orbit. The U.S. public's confidence in U.S. superiority was somewhat restored (Lewis et al. 1995).

The decade of the 1960s opened with the end of Eisenhower's second term, and the election of President John F. Kennedy. The Kennedy administration was determined to move the U.S. ahead economically and be decisive and flexible in terms of foreign policy and national defense. Kennedy felt that the Eisenhower administration's reliance on the strategy of massive retaliation left only two choices for reaction: do nothing or retaliate in full against the enemy, which would lead to destruction of the U.S. Instead, Kennedy developed multiple options for different potential crises. He also encouraged the selective use of nuclear weapons in the event that deterrence failed (Lewis et al. 1995).

7.1 Air Research and Development Command at KAFB

By 1952, the AEC had substantially increased both the quantity and variety of nuclear weapons, requiring SWC to engage in R&D work and expand its test support activities. Major General John S. Mills, who succeeded Brigadier General Howard G. Bunker, proposed that the SWC be incorporated within the framework of the Air Research and Development Command (ARDC), which had been established in September 1950 as a major command devoted to R&D.

The establishment of the ARDC was the result of a battle by USAF officials to create a command devoted entirely to R&D. It had become a heated issue for senior USAF leaders following the establishment of the USAF in September 1947. AMC had been performing logistics and R&D activities for decades, and having just contributed to a successful war effort, it had strong claims to those traditional roles. Many within the military believed the R&D function should remain within AMC. However, Lt. General Donald Putt, who was appointed director of Research and Development in the Office of the Deputy Chief of Staff for Materiel at HQ USAF in 1948 (United States Air Force n.d.c), gathered support from the civilian scientific community to persuade the Chief of Staff of the USAF to establish a separate command for weapons development. In the minds of General Putt and his supporters, AMC wanted to focus on cost, quantity, and maintainability of weapons; the cutting-edge R&D that was required to maintain an edge for Cold War deterrence was not a function of the AMC (AFSC, Office of History 1986). General Putt wrote a study showing that the USAF trailed behind other services in R&D budget, personnel, and facilities. He was successful in his efforts, and the Research and Development Command (RDC) was established in January 1950 and renamed the Air Research and Development Command (ARDC) in September 1950 (Bright 1992).

The impetus for the creation of the ARDC was a result of the USAAF World War II experience. During the war, the new technologies capable of revolutionizing war had either originated or been perfected abroad. These included radar, jets, ballistic missiles, and nuclear weapons. U.S. military leaders were threatened by this. Except for the heavy bomber, the equipment of the USAAF had been inferior to those of other powers at the outset of the war. Consequently, the ARDC was encouraged to take risks to be as innovative as possible (Bright 1992). With this shift, the ARDC gained responsibility for the overall special weapons program—atomic, biological, and chemical systems, with an emphasis on developing warheads for missiles.

However, AMC was still resistant to yielding its R&D responsibilities to the new command. Although weapons R&D was indeed assumed by the ARDC, AMC still maintained control over procurement and production. This control gave AMC considerable input as to how ARDC programs were conducted. While the ARDC wanted to proceed with cutting-edge R&D, AMC was concerned with cost, quantity, and maintainability. The disagreement between the two commands caused tension in USAF R&D over the next decade and overall resulted in a less efficient development of new weaponry (AFSC, Office of History 1986).

KAFB became an ARDC facility on 1 April 1952. SWC was reduced from a major command, put under the ARDC, and redesignated the Air Force Special Weapons Center (AFSWC). Also at this time, the responsibility for biological and chemical research and testing—which had been established at KAFB during the tenure of SWC—was transferred to Eglin, Edwards, and Holloman AFBs. KAFB then maintained an administrative role over those programs (Weitze 2001), presumably through the AFSWC.

7.2 Air Force Special Weapons Center

AFSWC became one of the distinct R&D centers within the ARDC. Its principal task was the proper marriage of aircraft and weapons: The best combinations of aircraft/weaponry were to be analyzed, designed, developed, and tested. The AFSWC was to conduct this development and test work in conjunction with the AEC, Sandia Laboratory, LASL, and the FC/AFSWP at Sandia Base.

In short, LASL would build the "physics package" of a new weapon. This included the high explosive, the physical nuclear material, and the package. Sandia Laboratory would put the weapon in a case and install firing, fusing, timing, and safety systems, the electromechanical element. The AFSWC would track all of this new development for USAF use and drop test the new weapon designs (Edward Giller, 17 April 2002 interview with Kristen Bisson). The AFSWC was also required to monitor the development work of aircraft contractors to assure compatibility of plane and bomb. Lastly, it provided support concerning special weapons to other USAF commands and support for full-scale atmospheric testing, as had the SWC.

AFSWC commander Brigadier General William Monte Canterbury summarized its role:

> The current national military policy of our country has decreed that air power, together with nuclear weapons, is the foremost line of defense for this nation and the free world. In an era when revolutionary concepts of aircraft, weapons and strategy are becoming

> commonplace, great responsibility rests upon the shoulders of all individuals in the Air Force whose daily tasks are concerned in the fields of research, development and test. We, at the Air Force Special Weapons Center, have a vitally significant role in our nation's destiny: It is our responsibility to insure practical applications of atomic capability to aircraft and missiles (Air Force Special Weapons Center 1956).

At its inception, AFSWC kept the SWC's 4901st Support Wing (Atomic) and its 4910th Air Base Group as base housekeeper. However, in 1955 the AFSWC replaced SWC's 4910th Air Base Group with the 4900th Air Base Group, which then served in that capacity for the next 22 years (Alberts and Putnam 1985). It is not clear what happened to the 4901st Support Wing (Atomic); it most likely was deactivated as it ceased to appear on AFSWC organizational charts after 1955.

AFSWC followed through with the seven-year base master plan begun by SWC in 1950 (Alberts and Putnam 1985). AFSWC headquarters buildings were constructed in 1955, as well as hangars for Boeing B-52 bombers and other large aircraft. By 1960, construction of the base's permanent administrative and service facilities was basically finished (Alberts and Putnam 1985).

AFSWC also oversaw the master-planned extension of KAFB's east-west runway from 10,173 feet to 13,373 feet, maintaining its status as one of the longest in the nation and the longest high altitude runway in the world (Figure 76: 1955 runway expansion plan). The runway was engineered at a length of 13,700 feet to offset Albuquerque's elevation of 5,320 feet (AFSWC 1953). According to the science of aerodynamics, the higher the altitude, the less dense the air, which negatively affects engine horsepower and aerodynamic lift. Added runway length was one antidote to the problem. The new extended runway was dedicated on 28 March 1955 (Mueller 1989).

By September 1956, AFSWC included a group with three squadrons trained in the testing of atomic weapons (the atom bomb) and a group trained in testing thermonuclear weapons (the hydrogen bomb). AFSWC was organized into the following units:

- Research Directorate
- Development Directorate
- 4900th Air Base Group
- 4925th Test Group (Atomic)
  - 4926th Test Squadron
  - 4927th Test Squadron
  - 4928th Test Squadron
  - 4929th Test Squadron
- 4950th Test Group (Nuclear)
  - 4926th Test Squadron (Sampling)
  - 4951st Support Squadron (Test)
  - 4935th Air Base Squadron, Indian Springs (Greene et al. 1957)

7.2.1 AFSWC and Missile Development

The Development and Research Directorates of the AFSWC took on vital roles during the early 1950s as the nuclear weapons mission unfolded. Both divisions contributed heavily to technological advances in terms of aircraft/weapons marriage and nuclear weapons effects phenomena. The Air Force Weapons Laboratory (AFWL) would be formed from them in the mid-1960s (Air Force Research Laboratory, Space Vehicles Directorate, Historical Information Office 1998).

AFSWC's Research Directorate became a focal point for USAF research in nuclear matters and advanced weaponry. Its mission was to "conduct applied research in the fields of nuclear weapons analysis, requirements and development, and to advise Air Force Special Weapons Center staff on nuclear research matters" (AFWL History Office n.d.a; AFRL, Space Directorate 1998). In 1953 the Research Directorate began a weapons data-indexing project and maintained a technical library for all data on USAF contributions to the atomic energy program. The Research Directorate essentially led the charge in USAF efforts to conduct special weapons testing for weapons survivability and vulnerability. It also provided the groundwork for USAF interest in directed energy and weapons (AFWL History Office n.d.a; AFRL Space Directorate 1998).

During the 1950s, the Research Directorate conducted numerous studies on nuclear weapons effects. One was to find a way to mitigate the flash blindness of aircraft crews following in the wake of the detonation of nuclear bombs. Ideas researched included special goggles to protect retinas from flash burns (Edward Giller, 17 April 2002 interview with Kristen Bisson).

The Research Directorate also conducted numerous studies on the hazards of neutron and gamma radiation exposure for aircraft crews both in the air and on the ground. For example, directorate scientists accompanied AFSWC's 4926th Test Squadron (Sampling) during nuclear cloud samplings taken at atmospheric tests in the Pacific and in Nevada (Edward Giller, 17 April 2002 interview with Kristen Bisson). The directorate's Biophysics Division began experiments during Operation TEAPOT in 1955. Penetrations were made 17 to 40 minutes after detonation, the earliest times ever for manned aircraft flights through the kiloton clouds. During Operation REDWING in 1956, scientists and aircrews flew through thermonuclear clouds (Harvey 1957). These scientists also researched what danger there would be to ground crews called upon to refuel a fighter or bomber that had flown through a nuclear cloud (Harvey 1957).

In the mid- to late 1950s, the Research Directorate also took part in Operation ARGUS, a joint effort by the AFSWP and the Navy to determine the effects of exploding bombs in the earth's radiation belts. The directorate undertook preliminary studies by firing sounding rockets into the earth's radiation belt, off Wallops Island near Virginia (*Atomic Flyer* 1957). The project culminated in 1958 in the Pacific with three very high altitude test shots of the W-25 warhead. Operation ARGUS investigated how the charged particles and radioactive isotopes of an exploded weapon would interact with the earth's magnetic fields, potentially interfering with radar tracking, communications, and the electronics of satellites and ballistic missiles (Federation of American Scientists n.d.a). The directorate's scientists were on hand to gather and analyze the resulting scientific data (Edward Giller, 17 April 2002 interview with Kristen Bisson).

And in 1956, the Research Directorate received the Blast Effects Research Group from Wright-Patterson AFB. Renamed the Structures Division under the Research Directorate, this division conducted extensive research into the shock and blast effects of nuclear explosions, with an emphasis on developing "design criteria for structures to withstand nuclear attack" (AFWL History Office n.d.b).

The Development Directorate's mission was to study, research, and develop nuclear weapons, weapons systems, components, and associated equipment for the USAF. In early 1950s, the Development Directorate conducted numerous nuclear weapons studies focusing on specific target effectiveness and detonation conditions of atomic weapons. These included BRASS RING (1952), CAUCASIAN (1952–54), CORNROSE, ROCKY MOUNTAIN and HEAVENBOUND (1953), and BARROOM (1953–54). For example, CORNROSE studied the possible use of nuclear weapons to destroy large dams and harbor infrastructure. ROCKY MOUNTAIN studied cryogenics (working with liquid deuterium), and HEAVENBOUND researched the idea of exploding nuclear weapons in very high altitudes as a defensive measure—which eventually led to the creation of the MB-1 Genie (Genie), a nuclear-tipped air-to-air rocket (Weitze 2001).

The Development Directorate was the AFSWC division working in conjunction with LASL and Sandia Laboratory as new bomb designs were developed. In terms of the stockpile-to-target sequence, the Directorate conducted R&D on techniques for suspension and release of the bombs created by Sandia Laboratory, retardation devices and lay-down delivery of the bombs, as well as monitoring their designs for USAF requirements (Greene et al. 1957). The 4925th Test Group (Atomic Test) conducted the drops. For example, the Development Directorate investigated adding a parachute to a bomb to delay delivery, which allowed for the combat crew to release the bomb and escape before it exploded. The goal of one of the early lay-down projects was to determine the feasibility of delivering a parachute-retarded thermonuclear weapon weighing more than 40,000 pounds, the heaviest nuclear weapons in the stockpile, from altitudes exceeding 40,000 feet. One early effort was the development of a system that could retard the fall of either a TX-14 or a TX-16 weapon, heavy airburst bombs, from altitudes of 40,000 feet to 4,000 feet in 167 seconds from a B-36 (Greene et al. 1957).

With the advent of the Mk-17 and Mk-24 bombs in the stockpile, the Development Directorate created a modified 64-foot parachute providing for 100 seconds of fall time from a B-36 within the same altitude range. After delivery tests with these various weapons, SAC changed its requirements to include 75 seconds fall time for the Mk-17 and 100 seconds for the Mk-24. Both were releasable from the B-36 and the B-52 at maximum speeds from altitudes of 20,000 feet or above (Greene et al. 1957).

In the mid-1950s, the AFSWC's Development Directorate began work on atomic warhead installations in guided missile weapons and the development of warhead support equipment (Alberts and Putnam 1985). ARDC assigned AFSWC its first nuclear missile work in mid-May 1954. AFSWC was tasked with developing an atomic warhead for an air-to-air rocket, under the AEC and AFSWC Memorandum of Understanding for defined areas of cooperation for nuclear warhead-missile projects, which had been signed eight months earlier (Weitze 2001).

With this new missile role the Development Directorate issued $20,000 stipend requests for proposal contracts to four companies: Douglas Airplane Company, Consolidated Vultee Aircraft Corporation, McDonnell Aircraft Company, and Lockheed Aircraft Corporation. In January 1955, Douglas Airplane Company was awarded the development contract for the weapon that became known as the Genie (Figure 77: Genie being launched from F-106 Delta Dart) (Greene et al. 1957).

The Genie was an air-to-air, unguided nuclear-tipped rocket that was designed for arming in the air moments before it was fired. The nuclear warhead of the Genie was a W-25 with a yield of approximately two kilotons. It was the only nuclear rocket to actually be launched and detonated from an aircraft, which took place at 20,000 feet over the Nevada Test Site on 19 July 1957. The original Genie was referred to as the MB-1 and later redesignated the AIR-2A; the carrier aircraft included the F-89J, F-101B, and F-106A (Air Force Magazine Online n.d.).

The Development Directorate managed the development of the Genie from the external configuration and warhead, through the unique rocket engine and igniter. Simultaneously, the Research Directorate conducted parametric studies on the Genie kill radius, or the necessary distance of aircraft from weapon upon detonation for the safety of the flight crew (Edward Giller, 17 April 2002 interview with Kristen Bisson).

The Development Directorate gave assistance to the ADC for the testing, assembling, and loading of the first operational Genie rockets onto F-89J aircraft. Problems cleared during 1956 included rocket fin modifications, rocket engine temperature control and storage matters, final testing of systems components, flight-testing and examining possible weapon vulnerability, and hazards in operational situations. Results of ground firings at Holloman Air Development Center in 1956 revealed a fin instability problem. Douglas then had to redesign the original configuration (Greene et al. 1957).

General Nathan Twining, the USAF Chief of Staff, wrote a letter commending the AFSWC's work on Genie. In it he wrote, "The ARDC through its Special Weapons Center has pressed with unrelenting vigor the development and testing of the MB-1 rocket" (Greene et al. 1957). Similar weapons system plans were originated or continued for the B-66B, F-101, F-102, and F-106 aircraft.

Following the May 1954 assignment of missile development to AFSWC, ARDC also completed the design release of the XW-5 warhead [XW = experimental warhead] for the Matador guided missile and then turned its attention to use of the Snark as a carrier of the Class C XW-15-X1 warhead (Weitze 2001). The Matador was a surface-to-surface tactical missile designed to carry a conventional or nuclear warhead; the Snark was an air-breathing intercontinental missile (United States Air Force Museum n.d.b,c). Also in the works was the Bomarc, a surface-launched pilotless interceptor missile designed to destroy enemy aircraft, to be fitted with the XW-40 as of March 1956 (Weitze 2001) (Figure 78: A sample of missile delivery systems developed by ARDC at KAFB).

In March 1959, the ARDC defined the missile development role of AFSWC as monitoring and coordinating warhead development work, handling equipment, arming and fusing, and carrying out warhead missile possibility studies. AFSWC also planned and supported missile testing at the Nevada Test Site and at the White Sands Missile Range (Alberts and Putnam 1985). The missile mission of AFSWC had continued to develop throughout the 1950s, and by the early 1960s missile work became the major focus of AFSWC, which worked closely with the Air Force Missile Development Center at Holloman AFB in New Mexico (Alberts and Putnam 1985). The Air Force Missile Development Center was also under the command of the ARDC, and testing during this period took place at the Integrated White Sands Missile Range [combined facilities from the White Sands Proving Ground and the missile center at Holloman AFB]. Basically the studies and missile design development took place at KAFB under the AFSWC and the designs were tested at Holloman AFB at the Air Force Missile Development Center.

7.2.2 AFSWC and Atmospheric Testing

The atmospheric tests conducted throughout the 1950s were critical to the definition of nuclear weapons effects for the design of survivable U.S. offensive and defensive weapons systems. In this era, the U.S. maintained a substantial lead over the Soviet Union in the number and yield of deployed nuclear weapon systems.

Conducted under the auspices of the AEC, each test series was directed by a Joint Task Force appointed by the JCS. Within each task force were five project groups. The first group was composed of the scientists involved, including men from both LASL and Sandia Laboratory; the second, the U.S. Army; the third, the U.S. Navy; the fourth, USAF; and the fifth, Base Services, a support group of contractors hired to build test site buildings and facilities as well as scientific and military test structures (Jones et al. 1976). Two proving grounds were established for test purposes. The first was the Marshall Islands of the Pacific Ocean; the second was the Nevada Proving Ground in the continental U.S. (Jones et al. 1976).

In early nuclear test series, the USAF assembled one Air Task Group per test to perform air support and missions (Figure 79: Diagram of Typical Joint Task Force). This Air Task Group was always made up of personnel from all the USAF commands and reported directly to HQ, USAF. The USAF determined that a permanent test unit should be created to conduct the USAF portion of the tests. A permanent unit was seen as a way to eliminate troubles encountered when personnel throughout the USAF who had not previously been involved in testing were organized into a task group for a particular test (Greene et al. 1957).

In earlier tests, Air Task Groups had not become operational far enough in advance of a nuclear test to plan and acquire all the test equipment needed. Also, with the disbanding of each Air Task Group at the end of a test, files and records were scattered, lost, or destroyed. The frequency of tests and these issues justified a permanent group, and the USAF looked to AFSWC to fill the requirements (Greene et al. 1957).

In response, in 1956 AFSWC established the 4950th Test Group (Nuclear) to serve as a permanent USAF Air Task Group for atmospheric testing (Figure 80: Typical early USAF Air Task Group). The 4950th Test Group (Nuclear) then took responsibility for the 4926th Test Squadron (Sampling), the 4930th Test Support Group for operations at Eniwetok, and the 4935th Air Base Squadron stationed at Indian Springs AFB, Utah (Greene et al. 1957).

AFSWC's 1956 yearbook described its role in atmospheric testing:

> Air Force Special Weapons Center personnel, usually forming a special cadre, perform a variety of highly specialized and vitally important atomic test operations. They drop the bomb or nuclear test device, pilot aircraft to collect atomic cloud samples, gather a wide variety of other information in 'flying laboratories,' provide radiological safety aircraft and track the atomic cloud to determine fall-out hazards. Also the Air Force Special Weapons Center has active projects in the various tests such as early cloud penetration and radiological contamination of aircraft (Greene et al. 1957).

Table 4 is a summary of the tests with which the ASFWC was involved during this period. The information is based on the best available data found during research for this project and should not be considered comprehensive, but rather as a tool to provide some background data.

Table 4: Nuclear test operations during the 1950s

Source: Kirtland, 2000 and Jones et al. 1976.

Date	Operation Name	Location	Type of Test	Notes
1951	RANGER	Nevada Proving Ground	▪ First full scale continental air drop of nuclear device ▪ B-29 sampling ▪ Photographs with radar	Conducted Jan - Feb
1951	GREENHOUSE	Eniwetok	▪ Tower tests of nuclear weapons development by LASL ▪ Weapons effects data (biomedical) ▪ Training for crews	Conducted April - May
1951	BUSTER/ JANGLE	Nevada Proving Ground	▪ A series of seven tests; the second Jangle test was the first underground test of atomic device	Conducted Oct – Nov First full USAF control
1952	TUMBLER/ SNAPPER	Nevada Proving Ground	▪ AEC interest in weapons development (Snapper) ▪ DoD interest in weapons effects (Tumbler)	Conducted April - June
1952	IVY	Eniwetok	▪ First multi-megaton explosion	Conducted in November
1953	UPSHOT/ KNOTHOLE	Nevada Proving Ground	▪ First atomic artillery device fired	Conducted March – June Considered smoothest continental test to-date
1954	CASTLE	Eniwetok Pacific Proving Ground	▪ 15 megaton deliverable bomb tested ▪ Tests resulted in B-57s being recommended as sampling aircraft	Conducted March – May
1955	TEAPOT	Nevada Proving Ground	▪ High altitude drop to aid in design of defense warheads ▪ Low altitude drops	Conducted Feb – May A series of 14 tests

Date	Operation Name	Location	Type of Test	Notes
1955	WIGWAM	400 mi south of San Diego	▪ 32 kiloton atomic device exploded 2000 feet below the Pacific Ocean	Conducted 14 May
1956	REDWING	Eniwetok	▪ First airdrop of a megaton weapon – high altitude release ▪ First double shot and simultaneous double shot tests	Conducted May – July A series of 17 tests
1957	PLUMBOB	Nevada Test Site	▪ First live firing of the MB-1 air-to-air nuclear warhead rocket	Conducted May – Oct 786 sorties completed
1958	HARDTACK – PHASE I	Eniwetok	▪ High altitude and ultra-high altitude missile tests ▪ Diagnostic instrument tests near mushroom clouds	Conducted March – Aug
1958	HARDTACK – PHASE II	Nevada Test Site	▪ Eighteen one-point safety experiments ▪ Nineteen nuclear shots	Conducted Sept - Oct

7.2.2.1 4925th Test Group (Atomic)

During the early 1950s, AFSWC's 4925th Test Group (Atomic) participated in the majority of atmospheric tests, both in the Pacific and in Nevada (Hardison 1990). In 1956, however, AFSWC was directed to establish a permanent USAF Air Task Group for atmospheric tests. Thus, in 1956, the 4950th Test Group (Nuclear) was created, holding equal stature to the 4925th Test Group (Atomic) (Greene et al. 1957). At that point, the atmospheric test participation of the 4925th Test Group (Atomic) was cut back and the group focused on the aircraft/weapon marriage mission.

Prior to 1956, the 4925th Test Group (Atomic) completed nuclear live drops at both the Nevada and Pacific test complexes and ballistic drops, or duplicates of the real thing, at the Edwards AFB Precision Bomb Range, the AEC Salton Sea Precision Bomb Range in southeastern California, and the Low Altitude Bombing System (LABS) Bomb Range near Edwards AFB (Hardison 1990). The 4925th Test Group (Atomic) also participated in drops at the Navy Auxiliary Air Station Bomb Range, California, Tonopah Bomb Range, Nevada, White Sands Missile Range, New Mexico (Hardison 1990), and at KAFB's Practice Bomb Range on Isleta Pueblo (Davidson 2001).

The 4925th Test Group (Atomic) then continued its aircraft weapons marriage work for the AFSWC. The group evaluated equipment for the installation of special weapons into aircraft. This included sway braces, bomb suspension and control systems, pylons and racks, handling and loading equipment, and control and monitor apparatus (Greene et al. 1957).

During 1956 the 4925th Test Group (Atomic) worked on equipment testing to provide single Mk-15 and Mk-21 capabilities for the B-52. Both configurations were in use by the end of 1956, and successful flight and drop tests continued into February 1957. The group also began testing the TX-28 with the swept-wing F-84F "Thunderstreak." Aircraft modifications included pylon and weapon loading and compatibility, proper functioning of the units, clearances, and complete electrical checks of the special weapons control. Flights determined aerodynamic loads, vibration, stability and control affects in straight and level, flight dive and LABS maneuvers. A new technological innovation in the early 1950s, LABS was a component of the flight control system; it controlled an aircraft automatically during low-altitude bombing. These test maneuvers were made at various true airspeeds, altitudes, and release and dive angles (Greene et al. 1957).

In 1957, AFSWC, including the 4925th Test Group (Atomic), assisted the ADC with the loading of the first operational Genie rocket onto F-89J "Scorpion" aircraft (Greene et al. 1957). The F-89J was the aircraft used for the live test fire of the Genie rocket at the Nevada Test Site and became the ADC's first fighter-interceptor to carry nuclear armament. Other aircraft tested by the 4925th Test Group (Atomic) included B-29, B-50D Superfortress, B-36H Peacemaker, B-45, B-47 Stratojet, B-57, and B-66 bombers. These were paired with fission and thermonuclear bombs, both established and those in development.

7.2.2.2 The 4950th Test Group (Nuclear)

In response to a need for a permanent Air Task Group to carry out USAF involvement in atmospheric testing, ARDC activated the 4950th Test Group (Nuclear) at AFSWC in September 1956 (Jones et al. 1976). The group was activated as the permanent organization responsible for planning and conducting the USAF portion of both continental and overseas nuclear tests (Greene et al. 1957).

Prior to this, the AFSWC's 4925th Test Group (Atomic) and its 4926th Test Squadron (Sampling), specifically organized for nuclear cloud sampling, flew many of the test drop missions. In 1956, the 4950th Test Group (Nuclear) took responsibility for the 4926th Test Squadron (Sampling). Other squadrons assigned to the group were the 4930th Test Support Group (Eniwetok) for test operations in the Pacific, and the 4935th Air Base Squadron at Indian Springs AFB for test operations in Nevada (Figure 75). The 4930th Test Support Group (Eniwetok) was then disestablished, and the 4951st Support Squadron (Test) was established under the 4950th Test Group (Nuclear). Throughout the remainder of the 1950s, the 4950th Test Group (Nuclear)—as the representative of the USAF—supported the various Nevada and Pacific test series.

The 4926th Test Squadron (Sampling) was established in 1953 (Napolin n.d.). The idea of atomic cloud sampling developed from atmospheric testing during Operation SANDSTONE in the spring of 1948. During the operation, an aircraft accidentally flew through an atomic cloud. An analysis of the radiation dosages received by the crewmembers was found to be minor and led to the realization that sampling could be accomplished effectively with manned aircraft (Jones et al. 1976). Analyses of samples collected from atomic clouds were considered the most accurate method of determining the efficiency and yield of a nuclear device. The AEC recommended that the USAF establish an organization specifically for gathering cloud samples (Greene et al. 1957).

In 1953, HQ, USAF approved a test squadron for sampling atomic clouds; the squadron was titled the 4926th Test Squadron (Sampling) and assigned to the 4925th Test Group (Atomic) (Napolin n.d.). The new squadron was created within AFSWC's 4925th Test Group (Atomic), as the group, up to that time, had assisted the AEC and AFSWP in nuclear weapons effects tests and had actually developed operational techniques for airborne sampling of the effects. These included in-flight laboratories to gather airborne data on test results, piloted and drone aircraft to sample radioactive clouds, safety aircraft to measure radioactivity in areas surrounding tests, and nuclear-cloud-tracking aircraft to establish fallout patterns (Greene et al. 1957).

The sampling aircraft was the B-57, whose predecessor, the English Electric Canberra, was developed in Great Britain in 1944 (Napolin n.d.). The aircraft was Great Britain's first jet bomber, with a prototype first flown in 1949. The U.S. soon acquired manufacturing rights, adapted the aircraft for the USAF and named it the B-57. The Glenn L. Martin Co. was awarded a contract in March 1951 to build the B-57A, followed by B and C and D variants (United States Air Force Museum n.d.d). Flying the B-57, the 4926th Test Squadron (sampling) participated in many operations, the majority at the Nevada Test Site and the remainder at Eniwetok Atoll (Figure 81: Diagram of test during REDWING) (Napolin n.d.).

7.2.2.3 Indian Springs AFB Testing Support

To support the aboveground nuclear testing at the Nevada Proving Ground, AFSWC received management jurisdiction over Indian Springs AFB, Nevada on 1 July 1952. The base's proximity to the Nevada Proving Grounds, 30 miles southwest, made it a good auxiliary airfield for support and staging of nuclear tests. The 4935th Air Base Squadron was activated to operate the base in accordance with ARDC General Order No. 39 on 16 July 1952 (AFSWC 1953). This jurisdiction, in support of aboveground nuclear testing, continued through 1961.

At first fewer than 300 officers and enlisted men were stationed at Indian Springs AFB, but when testing began, the population grew to more than 1,500 personnel. The base also hosted more than 100 of the most modern aircraft in the world at the time (Medema 2000). Its mission included providing logistic and support functions for nuclear test operations. Indian Springs AFB also gave support for operations and maintenance of a fighter, gunnery, rocketry, and bombing range used by Nellis AFB through the provision of housing facilities and services for Nellis AFB personnel who were operating and maintaining the range. The range was used chiefly by F-86 pilots for training prior to overseas duty (AFSWC 1953).

Indian Springs AFB served as a support base for projects from Operation RANGER in 1951 to Operation STORAX in 1962. As mentioned previously, the 4935th Air Base Squadron came under the jurisdiction of the 4950th Test Group (Nuclear) in 1956. However as talks of suspending atmospheric testing continued, the USAF transferred Indian Springs AFB missions to Nellis AFB under the control of TAC on 1 April 1961 (Jones et al. 1976).

7.2.2.4 Moratorium on Atmospheric Testing

The year 1958 was a pivotal one for AFSWC, as a voluntary nuclear test moratorium was being considered early that year, spurred by worldwide concern about the fallout of radionuclides from clouds blown around the Earth after atmospheric tests. In January, the ARDC began a study to determine the effects of a test moratorium on the USAF nuclear capabilities. Centers involved in nuclear testing were directed to draw up contingency plans in case nuclear testing was internationally suspended. ARDC laid down two ground rules for planning a course of action during test suspension: plans for full-scale nuclear testing would be maintained, and an ambitious laboratory and simulation test program would be launched (Jones et al. 1976).

In August, President Eisenhower proposed that an international conference be called to discuss permanent suspension of nuclear and thermonuclear weapons testing. He also announced that on 31 October the U.S. would suspend nuclear testing for a period of one year. The HARDTACK II test series ended on 30 October and the test ban went into effect on 31 October (Jones et al. 1976). The Soviet Union also suspended testing, though both nations reserved the right to resume testing (Johnson 1997).

At first, no dramatic changes occurred. There were no changes in units, facilities, or responsibilities at Eniwetok. AFSWC maintained jurisdiction over Indian Springs AFB, and the 4950th Test Group (Nuclear) and the 4926th Test Squadron retained full strength. The 4950th Test Group continued with AFSWC activities in the interim (Jones et al. 1976). In early 1959, AFSWC received guidance from ARDC HQ that stated: “No actions are to take place that will jeopardize or reduce Air Force capability to resume testing immediately following the termination of any test moratorium. Planning and programming personnel and other supporting activities must be maintained” (Jones et al. 1976).

However, in August 1959, phase down of the 4950th Test Group (Nuclear) at Eniwetok was approved and the facility moved into maintenance standby status. In October, the AFSWC proposed further reorganizations of the 4950th Test Group (Nuclear), but these proposals were not carried out. The 4950th Test Group (Nuclear) was given responsibility for Eniwetok buildup in the event that testing was resumed (Jones et al. 1976).

In 1960, the 4926th Test Squadron (Sampling) moved from the 4950th Test Group (Nuclear) and consolidated with other organizations into the 4925th Test Group (Atomic). The 4951st Support Squadron (Test) was discontinued at Eniwetok, and base supplies and personnel transferred to KAFB. The USAF also directed the transfer of Indian Springs AFB from the ARDC to TAC, which occurred 1 April 1961, and AFSWC recommended deactivation of the 4950th Test Group, stating: “Lacking guidance from higher headquarters in the nuclear testing field, current manning would not allow accommodations of a large-scale planning effort” (Jones et al. 1976). It is assumed that with the transfer of Indian Springs AFB, the 4935th Air Base Squadron was deactivated. The squadron is listed on the 22 April 1960 organizational chart of the AFSWC, but it does not appear on the 1 January 1962 AFSWC organizational chart.

7.2.3 Armed Forces Special Weapons Project and Defense Atomic Support Agency

In 1951, the JCS gave the responsibility for continental atmospheric testing to the AFSWP. The AFSWP in turn established a Test Command unit. The Test Command was to direct the weapons effects tests of primary concern to the military, and to coordinate military participation and assistance in support of the AEC (Jones et al. 1976).

With the advent of the construction and operational status of Weapons Storage Sites under the jurisdiction of the AEC and the military, it became necessary for an agreement between the AEC and the services to specify the responsibilities of the AFSWP and the individual services in light of the ongoing custody battle over nuclear weapons. In September 1952, DoD was given custodial responsibility for "stocks of atomic weapons outside the continental U.S. and for such numbers of atomic weapons in the continental U.S. as may be needed to assure operational flexibility and military readiness for use" (Office of the Assistant to the Secretary of Defense (Atomic Energy) 1978). The AEC would maintain custodial responsibility for the rest. The DoD was to provide security and services required for the operation of all storage sites, still largely under AEC supervision (Office of the Assistant to the Secretary of Defense (Atomic Energy) 1978).

The AFSWP workload increased as it accepted military personnel from each of the military services for training in weapons assembly and maintenance and in operational site storage and technical inspection of weapons. Between 1951 and 1952, AFSWP personnel numbers reached an all-time high of 11,000 (Office of the Assistant to the Secretary of Defense (Atomic Energy) 1978).

In June 1953, President Eisenhower approved a request by the Secretary of Defense to deploy to overseas storage sites, nuclear components in numbers equal to the non-nuclear components, which had begun to be shipped overseas with the 1950 JCS request. The sites were located in the United Kingdom, Guam, Hawaii, three Naval vessels in the Atlantic, and five Naval vessels in the Pacific. In response, in October 1953 the Secretary of Defense directed AFSWP to track the status and location of all nuclear weapons in the custody of DoD at all times. To do this AFSWP maintained a centralized system of reporting and accounting (Office of the Assistant to the Secretary of Defense (Atomic Energy) 1978).

Also in 1953, Operation IVY in the Pacific exploded the first thermonuclear device built. It was considerably more powerful than all the high explosives used in the two World Wars put together. The tests resulted in a rapid proliferation of nuclear warhead designs, many of which could be adapted for use with a variety of weapons systems. Both HQ AFSWP's and FC/AFSWP's workloads increased in terms of organizing training, warhead assembly, weapons storage maintenance, and planning for weapons testing (Defense Threat Reduction Agency 2001).

After the 1953 IVY test, the number of thermonuclear tests increased and operations in the Pacific became almost continuous. New test series quickly followed those just completed. Throughout the 1950s, AFSWP directed testing in both the Pacific and Nevada. In April 1953, the JCS gave

AFSWP the responsibility for exercising "within any Task Force organization technical direction of weapons effects tests of primary concern to the Armed Forces and the weapons effects phases of development or other tests of atomic weapons" (Defense Threat Reduction Agency 2001). In 1958, the Director, Defense Research and Engineering (DDR&E) in the Office of the Secretary of Defense began allocating most of the DoD funding for nuclear effects research and testing through AFSWP (Defense Special Weapons Agency 1997).

As a result of this increase in responsibility, AFSWP was redesignated the Defense Atomic Support Agency (DASA) in 1959 (Defense Special Weapons Agency 1997). However, there was no change in leadership within the organization, and little difference between the old and new agencies (Defense Threat Reduction Agency 2001). It was little changed in mission, being also an interservice organization under DoD. Like its predecessor, the agency had its HQ in Washington D.C. and its operational unit, FC/DASA, at Sandia Base (Defense Threat Reduction Agency 2001).

Following the 1958 moratorium on atmospheric testing, DASA's attention turned to analyzing vast quantities of data that had been collected from previous tests, especially Operations HARDTACK and ARGUS. This was in addition to stockpile responsibilities and continued special weapons training (Defense Threat Reduction Agency 2001).

FC/DASA served as the base host and housekeeping unit for Sandia Base, which included Sandia Laboratory, the base AEC office, and other military tenants. Sandia Base Military Police Command provided law enforcement and base security, while Sandia Corporation provided internal security for Sandia Laboratory's tech areas and test facilities. FC/DASA continued improvements to Sandia Base that had been begun by FC/AFSWP. These included the construction of permanent buildings (Alberts and Putnam 1985).

7.2.4 Sandia's Changing Role

During the early 1950s, Sandia Laboratory's mission evolved from engineering for production to increasingly sophisticated designs of new ordnance. Work focused on two primary categories: weapons released from aircraft (bombs) and missile-connected weapons (warheads). New designs were meant to meet the military's desire for different types of weapons delivery, survivability, and maintenance (Alberts and Putnam 1985).

Donald Quarles replaced George Landry as president of Sandia Corporation in 1952. At his first press conference, Quarles expressed the mission at Sandia Base: "to convert the Los Alamos nuclear explosive systems into deliverable weapons" (Johnson 1997). There were many new ideas for different weapons types. Quarles stated, "Our job is to study these possibilities very carefully and to lay such information before the [Atomic Energy] Commission and the military as will enable them to make wise decisions as to the lines of development to be pursued" (Johnson 1997).

From 1946 until the early 1950s, the work at Sandia Base was in fission weapons [generally referred to as atomic weapons]. In the early 1950s Sandia Laboratory's attention turned to fusion, or thermonuclear, weapons [generally referred to as nuclear weapons] after preliminary fusion tests in 1952 and 1954 revealed the new application's possibilities. When the Soviets began testing their own fusion weapons in 1953 and 1955, Sandia Laboratory developed a sense of urgency to remain the technology leader (Johnson 1997).

When Lawrence Livermore Laboratory (Livermore) was created in 1952 to compete with LASL in the design of nuclear explosives, Sandia Laboratory's workload increased. It now had to develop designs from both labs into operational weapons (Defense Threat Reduction Agency 2001). Some Sandia Laboratory personnel were relocated to Livermore (Johnson 1997). In 1956, Sandia Corporation opened a Sandia California branch.

The years 1952 to 1959 were transitional for Sandia Laboratory, Tech Area II. Weapons assembly was gradually phased out. The buildings formerly used for assembly were renovated to integrate new assignments involving the use of explosives in a variety of weapon components. New components had to be designed and tested to meet the demand for new weapons designs for new delivery systems, including missiles. By 1960, Tech Area II had become a small explosives devices development laboratory. This was to be the case until 1995 (Ullrich 1998).

Sandia Laboratory produced numerous breakthroughs in weapons design during the 1950s. The laboratory was under pressure to create weapons for the military that would be smaller and lighter, more rugged, and able to stay dormant in the stockpile for greater lengths of time. Three particular concepts of great value to the military were "wooden bombs," "building blocks," and a type of bomb delivery named "laydown and wait."

The "wooden bomb" concept was to create nuclear weapons that could lie in storage for more than 20 years without requiring extensive maintenance. However, they would also need to function immediately when removed from the stockpile. One Sandia Laboratory employee noted the concept as "scary, like parking your car in a garage for years and expecting it to start when you first turn the key" (Johnson 1997).

Until the mid 1950s, the stockpile required extensive maintenance. Equipped with components such as liquid electrolyte batteries and electromagnetic relays, the weapons necessitated highly trained personnel to test and monitor their individual components. Expensive testing equipment was required at all weapons storage sites. The military desired more reliable weapons that would reduce costs in terms of time, personnel, and equipment (Johnson 1997).

In order to fulfill the wooden bomb concept, the laboratory designed several pieces of equipment, including zippers, one-shot components, and sealed pit weapons. In older nuclear weapons, an initiator inside the pit released a neutron burst to initiate the chain reaction. These initiators had limited lives, and weapon maintenance necessitated disassembly in order to replace them (Johnson 1997). Sandia produced a small electronic device, and a neutron generator located next to the pit, which was used to replace the initiators. These new devices were called "zippers," as "their location next to the pit and high explosive assembly made it possible to open the side of a weapon, replace the neutron source, and 'zip it back up'" (Johnson 1997). Disassembly and initiator replacement was no longer necessary.

In addition to these zippers, Sandia Laboratory made advances in battery technology. Early weapons made use of lead-acid batteries and nickel-cadmium batteries. Both "required frequent charging and contained liquid electrolytes that were corrosive." Sandia initiated research into new technology, and recommended the use of one-shot, just for one-time usage, thermal batteries that had been developed in Germany. They contained no liquid, did not need charging, and would not deteriorate for years (Johnson 1997). These and numerous other Sandia Laboratory advances in bomb technology made the wooden bomb concept a reality.

The "building block" concept involved the design of sealed-pit weapons. In previous bomb designs, the capsule holding the fissile material of a bomb had been stored separately from the rest of the weapon. It was inserted only when the weapon was going to be used. Sealed-pit weapons were designed whereby the capsule holding the fissile material was "contained permanently within the pit at the center of the weapon" (Johnson 1997). The sealed pit "allowed the physics package to be utilized as an interchangeable building-block component that could readily be used in different weapon systems."

For example, the B28 bomb building-block system evolved into a sealed-pit warhead with bomb and missile applications. "When fitted with kits of various shapes and arming, fuzing and firing capabilities" (Johnson 1997), bombs could be assembled that were capable of both internal and external carriage by a variety of aircraft. The W25 warhead was the first to enter the stockpile as a sealed-pit weapon/wooden bomb system. It was designed for use with the Genie rocket. Because it was hermetically sealed, maintenance was far simpler than with earlier weapons.

In addition to the building block concept, nuclear weapons also had a "laydown and wait" concept. Flying low over targets was an excellent way to elude radar detection by the enemy. However, delivering a bomb at low altitudes was risky as the bomb blast was likely to destroy the aircraft and crew before they could escape. The USAF and Navy required a bomb that could hit its target and await the escape of the aircraft before detonating. The laydown and wait concept referred to weapon delivery by aircraft with a delayed fall, which allowed delivery aircraft to escape before the explosion. The delay occurred by parachute delivery, which retarded descent, slowed the bomb to prevent destruction at impact, and allowed a timer to delay detonation. (Johnson 1997).

7.2.5 Sandia's New Testing Facilities

With emphasis at Sandia Laboratory shifting from engineering for production to new ordnance designs, test facilities were added south of the original Tech Areas I and II and into the adjacent mountains of the Manzanos (Alberts and Putnam, 1985). Between 1953 and 1961, Sandia Laboratory began work on 22 new bomb programs, some of which never made it to the inventory of operational weapons, and at least as many warhead designs (Ullrich 1998).

Sandia Laboratory began planning for Technical Areas III and V in 1952. These areas were needed for testing new weapons devices. The first group of facilities, a centrifuge, rocket sled, vibration testing facility, and instrument control center, was completed in 1953. Other facilities were completed between 1954 and 1960 (Sandia National Laboratories 2000).

Tech Area III was built for acceleration impact testing for laydown bombs and other weapon designs. In this area, Sandia Laboratory built rocket sled racks to drive weapons into revetments at high speeds. The centrifuge was used to spin weapon parts at great acceleration. Compressed air guns were used for impact testing. In 1956, Sandia Base added a 300-foot tower to Tech Area III in order to drop-test bombs and other items. “With facilities added to check the effects of temperature variations, vibrations, and essentially all environmental stresses that might affect a weapon, Technical Area III became one of the nation’s largest and most versatile test sites” (Johnson 1997).

In addition testing weapon designs, Sandia Laboratory developed a new warhead for ICBMs and IRBMs. This was a result of the 1957 Soviet Sputnik orbiting the earth, which shocked the American scientific and military community. SAC began operating in “quick reaction alert” mode (Johnson 1997). On the national defense front, work involving the deployment of Atlas and Titan ICBMs, Jupiter and Thor IRBMs, and submarine-launched Polaris missiles was given top priority (Johnson 1997). Sandia Laboratory set a time limit of 10 months on the development of the W49 thermonuclear warhead for the missiles. There were no limits placed on the operational capabilities of the system. Sandia designers developed a warhead electrical system that used components immune to credible levels of nuclear radiation. The W49 was put into the stockpile in 1959 (Johnson 1997).

7.3 Manzano Base

In early 1952, the USAF exchanged Weapons Storage Area Site Baker (in Texas) with the U.S. Army for Site Able (in New Mexico). Site Able was renamed Manzano Base and was operated as a separate facility from Sandia Base. Site Baker, a weapons storage area near Kileen, Texas, was eventually renamed Kileen Base. When Site Able was renamed Manzano Base, the weapons storage facility then reported to USAF Field Command, AFSWP, located at Sandia Base. The USAF 1094th Special Reporting Group handled base operations, including maintenance and security. In 1955, the 1094th Special Reporting Group was redesignated the 1094th Aviation Depot Squadron (Verhaaren 1998).

Because personnel numbers at Manzano Base rose throughout the 1950s, new buildings were required. Since the base was a highly secured area, these facilities were needed to keep the personnel separate from the outside. Recreation and support needs were met in order to minimize the time personnel spent in other locations, where they might be targets of espionage and subversion. Although there was no weapons production at Manzano Base, weapons were being stored, maintained, modified, and prepared for use. “Manzano personnel, thus were privy to information of some use to the Eastern Bloc” (Verhaaren 1998).

Assembled weapons and weapon casings were typically stored in igloos, or storage magazines of reinforced concrete half-cylinders either covered with earth or tunneled into the ground (Verhaaren 1998). In 1953, 44 “Type C” igloos were built and the next year “Type A” igloos were constructed (Verhaaren 1998). Both types were aboveground storage facilities. These accompanied the existing aboveground “Type B” igloos and underground “Type D” igloos.

During the same period, additional security measures were taken, including the addition of 20 concrete pillbox guard structures in 1953, located near the entrances of plants and modified igloos. They were seven-foot-square with one-foot-thick concrete walls, each with gun ports. Although built for human surveillance, they were occupied regularly only during their first year. After that, they were manned only during training and special alerts (Verhaaren 1998).

By 1953, the underground maintenance and modification facilities were no longer suitable because of new technology. Aboveground Plants 3 and 4 were added in 1955 and 1953, respectively, to handle newer weapons with different maintenance requirements (Verhaaren 1998). By the late 1950s, most weapons no longer required intensive maintenance because of advances resulting from Sandia Laboratory's wooden bomb concept. The new generation of weapons was better stored in larger, aboveground plants. At this time, portions of the underground plants began to be used for other activities.

The administrative area of Manzano Base was located outside the storage area proper, though four chain link fences crowned with barbed wire surrounded the entire complex. This area contained the base HQ, barracks, mess hall, a fire station, motor pool, and variety of support facilities. Barracks, a motor repair shop, and an electronics maintenance shop had been constructed in 1950. A kennel for security police dogs, a movie theater and classroom, and a softball diamond accompanied these in 1954. In 1956, a second motor vehicle repair shop, a mess hall and library, a gymnasium, bowling alley, swimming pool, bathhouse, Non-Commissioned Officer's club, and a fire station were added. A chapel, gas station, and maintenance shops followed in 1957, with the last addition of a crafts and recreational auto shop built in 1960 (Verhaaren 1998).

In 1959, Manzano Base came under the control of FC/DASA. Throughout the 1950s and 1960s, Manzano Base functioned as a separate base, with Sandia Base providing logistical support. However, as Manzano Base became increasingly dependent on Sandia Base for support functions, it essentially became the Manzano Area of Sandia Base by 1971 (Verhaaren 1998).

7.4 Nuclear Simulation under the AFSWC

With the initial testing moratorium of 1958, AFSWC scientists shifted their efforts to developing techniques and devices to simulate the effects of nuclear weapons (KAFB 1968). Nuclear explosions produce radiation effects on equipment ranging from weapons storage structures to electronics. The process of making equipment resistant to damage from nuclear effects is called "hardening." Two primary types of simulation were established at KAFB: one to test hardness of structures and the other to test the effects of electromagnetic pulse (EMP).

In 1958, AFSWC scientists built the first pulse power system in a mess hall (Boone Publications 1969). This was the beginning of EMP testing, which took center stage over the next two decades. The 1960s, 1970s, and early 1980s saw the development at KAFB of other simulated nuclear effects such as X-ray induced shock and transient radiation.

7.4.1 Shock Tube Test Annex

In 1956, a unit called the Blast Effects Research Group transferred to the AFSWC and was renamed the Structures Division under the Research Directorate (AFWL History Office n.d.b). The Blast Effects Research Group was initially a part of the Special Studies Office of the Design Branch, Installations Engineering Division, Headquarters AMC, and Wright-Patterson AFB. Its original focus was on "difficult or unusual civil engineering problems" (AFWL History Office n.d.b). This was replaced by a second focus, on developing design criteria for structures to be able to withstand nuclear attack (Figure 82: Diagram showing nuclear blast effects). Austrian engineer Eric H. Wang was hired to lead the group, which transferred from AMC to ARDC under his leadership and was renamed the Blast Effects Research Group of the Aeronautical Research Laboratory, Wright Patterson Development Division, Wright Patterson AFB (AFWL History Office n.d.b).

When ARDC transferred the Blast Effects Research Group to KAFB as the Structures Division of the Research Directorate, AFSWC, Wang was managing shock tube experiments at a facility built in Gary, Indiana. Titled "Project 1080: Nuclear Weapons Effects on Hardened Structures (Protective Construction)," the facility simulated atomic shock wave propagation (AFSWC, Office of History 1971).

The primary tube was six feet in diameter and 245 feet in length. A second tube was 2 feet in diameter and 132 feet long. Both were used in researching shock wave effects on structures aboveground and underground. By detonating explosives at one end, the tube created a shock wave. The wave moved quickly to the other end of the tube, "with the resulting shock moving into a test section which held the models and instrumentation" (AFSWC, Office of History 1971).

In 1958, AFSWC began considering relocating the shock tube because of complaints from Gary citizens: The explosions, with the tube open, were too noisy. These complaints resulted in the tube operating with both ends closed, which resulted in less effective tests but created less noise (AFSWC, Office of History 1971). The moratorium on nuclear testing that same year dramatically increased the need to simulate nuclear effects for continued advancements in nuclear weapons systems and hardened construction. The decision was then made to move the facility to KAFB (AFSWC, Office of History 1971).

AFSWC disassembled the shock tube at Gary, Indiana, and reassembled it at KAFB as the Air Force Shock Tube Facility. The shock tube was set up on an isolated 80-acre tract of land on Sandia Base through funding from the Air Force Ballistic Missile Division's Minuteman program. Construction for the facility was completed in mid-May 1961 (Figure 83: Shock Tube Facility). At the same time the structure was moved, responsibility for Project 1080 was also given to AFSWC's Structures Division (AFSWC, Office of History 1971).

Wang died in 1960, before the new facility was completed, but his shock tube research continued at KAFB. AFSWC chose UNM to be the contractor in charge of the Shock Tube Facility in April 1961. Shortly thereafter, it was renamed the Eric H. Wang Shock Tube Facility (AFSWC, Office of History 1971). The primary objective of the facility was to develop design criteria for hardened underground structures and other inputs to aid in the design of missile installations. Officials at the annex conducted experimental research into ground shock phenomena, the effects of high-density stress waves on buried structures, and the motion transmitted to the structure contents.

7.4.2 Electromagnetic Pulse Simulation Begins

In the late 1950s AFSWC began to simulate the effects of nuclear explosions in order to harden U.S. missiles, missile sites, and aircraft against possible enemy attack. A group of young scientists assigned to the Research Directorate of AFSWC launched a campaign to study the properties of high-temperature materials. Essentially, they wanted a facility to gain a better understanding of what happened when a nuclear weapon detonated. The first pulse power system was built in a mess hall in 1958, and scientists subsequently realized that the facility could be used to obtain information about nuclear effects in the upper atmosphere (Boone Publications 1969).

Materials being tested were placed in an explosion chamber situated above four low-inductance condensers, capable of storing as much as 16,000 joules of electrical energy at 125,000 volts. Energy was then released from the condensers into the test material, producing certain phenomena similar to those resulting from high-altitude weapon detonations. One minute was required to charge the condensers, and about one-half a microsecond to release the energy from the condensers into the test materials. Peak power during this very small period of time was estimated to be 10 billion watts. Instrumentation used to record the effects included several high-speed cameras (AFSWC 1960).

In 1964, the second incarnation of this type of experimentation was an exploding wire facility built for AFWL that became operational. Since there were distinct similarities between nuclear detonations and the pulses generated in the facility, it was possible to simulate phenomena such as light output, plasma production, shock waves, and other effects associated with nuclear explosions (Denny, Wagoner & Associates 1964). This pulse power system discharged at a peak power of 20 billion watts, the equivalent of the power generated by 10 Grand Coulee dams. It used 15 energy storage and pulse-forming units, connected in parallel. These were charged from conventional power sources and needed approximately two minutes to store the energy but only a few billionths of a second to release it. The pulse, lasting 50 nanoseconds, was discharged into a tiny wire a few thousandths of an inch in diameter and a few inches long. Energy was deposited so rapidly and at such high temperatures that the wire would explode violently (Denny, Wagoner & Associates 1964).

7.5 34th Air Division (Defense) Continues at KAFB

KAFB hosted ADC activities on base from the early 1950s to 1960. The activities included the 34th Air Division, the 93rd FIS on alert, GOC, and for a brief period, a manual Semi-Automatic

Ground Environment (SAGE) facility (Weitze 2001). The 34th Air Division (Defense) began operations at KAFB during the first phase of the Cold War with just one fighter interceptor squadron (the 93rd FIS) and three radar squadrons. By 1958 the division had grown to directing two FIS and nine radar squadrons (Flaxman 1958).

7.5.1 93rd Fighter Interceptor Squadron

The 34th Air Division (Defense) oversaw the 93rd FIS at KAFB and the 15th FIS at Davis-Monthan AFB in Tucson. The 93rd FIS at KAFB originally had F-86A aircraft, which were replaced by F-86D Sabres in 1954. The F-86D was an advanced version of the F-86A and was developed as an all-weather interceptor. Throughout the 1950s, the aircraft was used both in the U.S. and overseas to guard against possible air attacks (Flaxman 1958). In 1957 the F-86L, a version of the F-86D adapted to use the SAGE datalink system, was employed by the 93rd FIS (Flaxman 1958).

The datalink system was a special receiver aboard the F-86L. It transmitted air surveillance data from the SAGE system in real-time. The data receiver converted the data into heading, speed, altitude, target bearing, and range information that was used to guide the pilot in his interception. No voice instructions were used; the interceptor was automatically positioned for an attack with its own fire-control system (March Field Air Museum n.d.).

Also in the late 1950s, the 93rd FIS received Convair F-102 "Delta Daggers." The F-102 was the first supersonic, all-weather jet interceptor. In combat, the electronic equipment on board would locate the enemy aircraft, and then the F-102's radar would guide it into position for attack. The electronic fire-control system would then automatically fire air-to-air rockets and missiles. By the late 1950s, more than 25 ADC squadrons were equipped with F-102s (Federation of American Scientists n.d.b).

In 1958, the 93rd FIS was assigned the air-to-air nuclear-tipped Genie, which had been developed by the Douglas Airplane Company for AFSWC. The Genie was assigned only to extremely important FIS squadrons (Weitze 2001). The Genie was carried by the F-102 Delta Dagger, as well as F-89J, F-101B, and F-106 aircraft. The Genie was the first nuclear-armed interceptor rocket to be tested, and it was designed to give USAF fighters the ability to destroy enemy bomber squadrons (Parsch 2002).

The 93rd FIS was inactivated in July 1960, its completed mission for ADC coinciding with the tenure of ADCC on base. With ADC concluding its FIS mission at KAFB, the NM ANG's 150th Tactical Fighter Group took over the FIS compound in January 1960 (Weitze 2001).

7.5.2 Aircraft Control and Warning and the Ground Observer Corps

Also under the 34th Air Division (Defense) during this period were nine AC&W squadrons, based in New Mexico, Arizona, and Texas. The 34th Air Division squadrons are listed in Table 5.

Table 5: AC&W Squadrons under the 34th Air Division in 1956

Source: Flaxman 1958

AC&W Squadron	Location	State	Assignment Date
612th	Ojo	Arizona	
684th	Mount Lemmon	Arizona	1953
685th	Las Cruces	New Mexico	1955
686th	Walker AFB, Roswell	New Mexico	1952
687th	West Mesa Air Force Station West of Albuquerque	New Mexico	1956
697th	Pyote AFB	Texas	
768th	Moriarty	New Mexico	
769th	Continental Divide 110 miles west of Albuquerque	New Mexico	1951
904th	Winslow	Arizona	

In the early 1950s the 34th Air Division also spurred the organization of a five-state GOC and the building of GOC filter centers in Albuquerque, El Paso, Salt Lake City, Tucson, and Colorado Springs. These centers operated until the deactivation of the GOC in 1959. The GOC filter center at KAFB, the USAF Albuquerque Air Defense Filter Center—the first of its kind in the nation to be designed and built—was officially dedicated on 22 October 1955. The center housed all facilities for administration, training, and active operations of the volunteer personnel. USAF personnel assigned to the filter center supervised and assisted in the training and coordination of operations (*Albuquerque Progress* 1955).

A network of observation posts covered the center's zone of responsibility; each was linked by priority telephones or radio to the filter center. These posts were located generally eight miles apart. When aircraft were spotted, reports were immediately made to the filter center, where a lighted board kept a plot of sightings. There the information was checked against flight plans of military, commercial, and private aircraft operating in the area. If identification was not made within a short period of time, the ADDC ordered the fighter interceptor squadron to identify or destroy the unknown intruder (*Albuquerque Progress* 1955).

The ADDC would then alert the ADCC of the report and action taken. The ADCC, in charge of all activities in the 34th Air Division's zone, then decided whether or not further action was necessary (*Albuquerque Progress* 1955).

To provide additional support to the radar system, the GOC was organized to stand all-night watches in towns to the north of Albuquerque (*Albuquerque Progress* 1955). KAFB became the HQ for the 4679th GOC on 1 January 1955 (Air Defense Radar Veterans Association n.d.).

USAF GOC recruitment techniques included this radio spot:

> It may not be a very cheerful thought, but the Reds right now have about a thousand bombers that are quite capable of destroying at least 89 American cities in one raid .... Won't you help protect your country, your town, your children? Call your local Civil

> Defense office and join the Ground Observer Corps today (Air Defense Radar Veterans' Association n.d.).

Eventually more than 800,000 volunteers stood alternating shifts at 16,000 observation posts and 73 filter centers throughout the U.S. The 34th Air Division (Defense) counted five filter centers in its area–in Albuquerque, El Paso, Salt Lake City, Tucson, and Colorado Springs. HQ for the 34th Air Division (Defense) GOC operation was located at KAFB. The GOC operated until its disestablishment in 1959 (Air Defense Radar Veterans Association n.d.).

7.5.3 Semi-Automatic Ground Environment is activated

In 1955, ADC planned for KAFB to house a combined SAGE Combat and Direction Center (Weitze 2001). SAGE was the first major real-time, computer-based command and control system designed to protect the U.S. from long-range bombers and other strategic weapons. SAGE was an automated, nationwide computer-based air defense system designed by MIT, which converted raw radar data to digital form and displayed it in real time, speeding up the process of observing, plotting, transmitting information, and assigning targets. The SAGE system sent information from the radar stations over telephone lines and gathered it at a central location for processing by a newly designed, large-scale digital computer (MITRE n.d.). The computers used by SAGE were called "Whirlwinds" and were manufactured for the project by IBM (Figure 84: SAGE computerized console) (Edwards 1996). SAGE "broke new ground in radar, communications, computer, information display and programming technologies" (MITRE n.d.).

SAGE systems were constructed across the country between 1955 to 1960, overlapping the ADCCs building program that ran from 1949 to 1956. SAGE centers eventually replaced the ADCCs that had derived from the earlier AC&W radar stations, and by 1963 the SAGE system was fully deployed. There were 24 SAGE Direction Centers and three SAGE Combat and Direction Centers in the U.S. (MITRE n.d.). Each Direction Center was responsible for air surveillance and weapons employment in its sector. It received data transmitted from outside sources like the AC&W squadrons and the GOC. The Direction Center had the ability to communicate with other SAGE centers, and to transmit guidance data to weapons under its control (Figure 85: SAGE Direction Center) (Everett et al. n.d.). SAGE Combat and Direction Centers were the higher echelon to which the Direction Centers looked for approval.

Though ADC had planned for KAFB to house a combined SAGE Combat and Direction Center, KAFB operated just a SAGE Direction Center briefly. In 1960, a SAGE Direction Center replaced the ADCC at KAFB. The USAF planned that the ADCC would serve for a brief period as a manual SAGE facility until a regional SAGE Direction Center came on line. As such, Albuquerque's 34th Air Division HQ served as a manual SAGE center between January and October 1960 until the SAGE Direction Center at Luke AFB in Arizona was established (Weitze 2001).

Shortly after the SAGE centers were established, the USAF focus moved away from intercepting bombers, instead focusing on the detection of ICBM's (Boyne 1999). Soviet technical advances were threatening to make America's air defenses obsolete. Defense Secretary Robert McNamara spoke before the House Subcommittee on Department of Defense Appropriations in February 1966. McNamara stated:

> The elaborate defenses which we erected against the Soviet's bomber threat during the 1960s no longer retain their original importance. Today, with no defense against the major threat, Soviet ICBM's, our anti-bomber defenses alone would contribute very little to our damage limiting objective and their residual effectiveness after a major ICBM attack is highly problematical. For this reason, we have been engaging in the past five years in a major restructuring of our defenses (Winkler 1997).

7.6 Naval Air Special Weapons Facility

In the early 1950s, the Chief of Naval Operations urged an increased U.S. Navy presence at KAFB to keep up the U.S. Navy's involvement in the special weapons field. Therefore, in August 1952, the Naval Air Detachment at KAFB was redesignated the Naval Air Special Weapons Facility (NASWF). Its goal, like the majority of U.S. military organizations at the time, was to build a nuclear arsenal and provide its forces with nuclear capability (Naval Air Warfare Center 1993).

In many ways, the NASWF was the Navy's version of the USAF's AFSWC. Both the AFSWC and the NASWF were tasked with providing their service's aircraft with nuclear weapon capability. This involved extensive stockpile-to-target support—from handling and loading to aircraft compatibility and carriage to tactics for delivering weapons. Both were directed to work with Sandia Laboratory, the AFSWP, and the AEC for this mission.

Commander Frederick H. Michaelis became NASWF's first commanding officer. He oversaw 23 officers, 177 enlisted men, and 11 aircraft transferred from the Naval Administrative Unit. The aircraft consisted of five F2H-2s, two AD-4s, an F3D, an AJ, a JRB, and an F7F (Naval Air Warfare Center 1993).

The mission of the NASWF was:

- To participate in various programs to adapt special weapons to naval aircraft
- To represent the U.S. Navy, Bureau of Aeronautics in relations with Sandia Corporation and the FC/AFSWP
- To conduct special weapons tests in connection with AEC programs
- To assist the AFSWP with naval equipment for demonstrations and training (Naval Air Warfare Center 1993).

Focusing on aircraft survivability studies, NASWF began participating in the nuclear tests at the Nevada Test Site and Eniwetok Proving Ground. During Operation TEAPOT in 1955, one of the facility's tasks was "to evaluate the effects of radiation on paint samples on the side of an aircraft exposed to a nuclear blast; the white and off-white paints were observed to see which could best withstand the intense heat and radiation" (Naval Air Warfare Center 1993).

NASWF pilots and aircraft also participated in Operation REDWING at Eniwetok in 1956 and Operation PLUMBOB in 1957 in Nevada. During Operation PLUMBOB, the NASWF pilots flew FJ-4, HSS-1, and A4D-1 aircraft close to nuclear blasts to see what the shock wave and radiation would do to the aircraft. The data gathered was "used to improve theoretical prediction methods [of nuclear effects] for wartime missions" (Naval Air Warfare Center 1993).

In terms of adapting special weapons to naval aircraft, NASWF conducted the special weapons phase of the 1956 and 1957 trials of the Douglas A3D-1, the first production version of the Douglas A-3D Skywarrior, the U.S. Navy's first twin-jet nuclear bomber (Boeing 2001b). NASWF later worked on equipping the Douglas A-3D Skywarrior for use with a variety of nuclear devices. It was the largest and heaviest aircraft to operate from an aircraft carrier (A-3 Skywarrior Association 2001). The facility also worked on the AD/A-1 Skyraider and S2F/S-2 Tracker.

In the mid- to late 1950s, the U.S. Navy began developing a series of modifications to turn standard bombs into "Destructors," which were shallow-water bottom mines that filled the gap between large, moored mines and torpedoes. The NASWF worked with the Mk 36, Mk 40, and Mk 41 destructors (Mk 82, 83, and 84 bombs respectively), and with the shallow-water mine Quickstrike, and deep-water mine CAPTOR (Naval Air Warfare Center 1993).

Also in the late 1950s, studies were conducted on the nuclear versions of the Talos surface-launched weapon. The U.S. Navy expanded into testing surface-to-air missiles. The development of the surface-to-air missile Terrier in 1959 and the Antisubmarine Rocket (ASROC) in 1960 followed the Talos. Submarine-launched weapons were tested as well, including the Submarine-Launched Antisubmarine Rocket (SUBROC) in the mid-1950s (Naval Air Warfare Center 1993).

In 1958, the NASWF was given command over the Naval Nuclear Ordnance Evaluation Unit (NNOEU), which had formerly been the Naval Ordnance Test Station (NOTS) China Lake branch—a leader in conventional weapons development and testing. The following year, a new NASWF mission statement established its intent "to represent and maintain liaison for the Bureau of Naval Weapons with all activities in the Albuquerque area concerning nuclear applications for weapons of interest to the Navy" (Naval Air Warfare Center 1993). At the beginning of the next decade, the NASWF would rise again in prominence to become the Naval Weapons Evaluation Facility (NWEF).

7.7 New Mexico Air National Guard

In 1953, the 188th FIS received its first jet aircraft—the F-80 Shooting Star. The F-80, one of the first USAF tactical fighters and operational jets, had been designed for use in World War II but was not completed in time to see action. The small single-engine aircraft reached a maximum speed of 580 miles per hour, much faster than the piston aircraft that were used during World War II, and it is the aircraft credited with the first jet-to-jet combat kill of a MiG-15 in Korea (Lewis et al. 1995).

In 1957, the 188th FIS was redesignated the 150th Tactical Fighter Group, and a year later converted to F-100 "Super Sabre" aircraft—the first ANG to received the aircraft. The F-100 was the USAF's first operational aircraft capable of flying faster than the speed of sound in level flight (United States Air Force Museum n.d.e). The F-100 was used extensively in an attack role during the Vietnam War (Lewis et al. 1995).

The NM ANG took over the 93rd FIS's quarters in January 1960 and began to serve a 14-hour ready alert mission for the ADC, and by July 1960, was on 24-hour ready alert. This lasted through the Cuban Missile Crisis in 1962.

During these years, HQ, 150th Fighter Group was organized to include:

- 188th Fighter Squadron
- 150th Maintenance Squadron
- 150th Materiel Squadron
- 150th Air Base Squadron
- 150th USAF Dispensary (Benolkin n.d.).

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8.0 A NEW NUCLEAR READINESS: APRIL 1961 – JUNE 1977

Phase III of the Cold War at KAFB ran from 1961 to 1977 and was largely characterized by developments in testing for nuclear readiness (Figure 86: Chart of Phase III Cold War Activities at Kirtland). President Eisenhower announced in December 1959 that the U.S. would no longer consider itself bound by the 1958 voluntary moratorium on testing, but it would give advanced notice before resuming any tests. Although the Soviet Union responded that it would not test as long as the U.S. did not test, in September 1961 the Soviets did resume nuclear testing, and with the largest series of tests to date (U.S. Congress, Office of Technology Assessment 1989). In response, the U.S. began a new series of underground tests. After the moratorium most of the testing groups were disbanded, so the U.S. was not entirely prepared to resume testing, but because Livermore Laboratory had been planning future Plowshare activities [civil engineering uses of nuclear blasts], there was a cadre of scientists who were ready and available to act quickly on the new test series (Ogle 1985).

As the nuclear testing continued, the U.S. realized that it could continue the development of their nuclear program solely through underground tests. The President also understood that ratification of a comprehensive test ban treaty would not be achieved, and as a result he proposed a limited ban on tests in the atmosphere, oceans and space (U.S. Congress, Office of Technology Assessment 1989). This concept developed into the Limited Nuclear Test Ban Treaty (LTBT) of 1963, which was signed by the U.S., Great Britain, and the Soviet Union and marked the beginning of détente.

The Kennedy presidency was marked by several crises, including the building of the Berlin Wall, the Bay of Pigs, and the Cuban Missile Crisis. Each of these events was different in scale and cumulated in a new view of the use of nuclear weapons. It became clear that not all events would require massive retaliation, which could result in MAD, and as such the strategy developed by Kennedy during 1961 was termed “Flexible Response,” whereby different potential crisis situations were matched with a number of potential options for reaction. Under Flexible Response if deterrence failed, nuclear weapons were to be used selectively, and the U.S. would only use massive nuclear force in retaliation for a first-strike (Lewis et al. 1995).

The new U.S. deterrent, Flexible Response, was based on the knowledge that U.S. bombers and missiles were better, more numerous and more able to survive a first strike than those of the Soviet Union. To aid with Flexible Response, Secretary of Defense Robert McNamara recommended the allocation of funds for more submarines, and Polaris and Minuteman missiles. He also put more bombers on ground alert: This new strategy required an increase in military funding to support the associated increase in conventional forces. Based on McNamara’s recommendations, Kennedy (Figure 87: Kennedy visits Sandia Base in 1962) set a goal of producing an arsenal of 1,000 ICBMs and up to 656 sea-launched ballistic missiles (SLBM) (Lewis et al. 1995). The development and improvement of many of these weapons was an important part of activities at KAFB.

The LTBT of 1963 which effectively ended nuclear testing in the atmosphere, in outer space, and underwater, greatly affected the commands and programs at KAFB. Because atmospheric testing was banned, the scientific and military community developed ways of simulating nuclear affects in order to maintain testing of defense weapons and aircraft and, ultimately, nuclear readiness. Because the U.S. had had some difficulty in gearing up for renewed testing in 1961 [even with the Livermore Laboratory scientists' Plowshare preparations], Kennedy also pledged to the Senate to implement four safeguards to ensure that nuclear readiness would be maintained:

Safeguard A: Continue an extensive underground test program in order to improve the U.S. arsenal.
Safeguard B: Maintain modern nuclear laboratory facilities and research programs.
Safeguard C: Maintain readiness to promptly resume atmospheric testing.
Safeguard D: Monitor testing by other nations (Ogle 1985; Medalia 1996).

Safeguard C established a National Nuclear Test Readiness Program and Safeguard D provided for verification of the LTBT, including the Vela Uniform program, which was developed to detect nuclear explosions underground, produce ground-based devices, and establish satellite-based devices, the latter two for the detection of explosions in outer space (Department of Energy 1997).

After Kennedy's assassination in 1963, Lyndon Johnson sought to push Kennedy's domestic policies through Congress. Before he left office, and following through with détente, President Johnson participated in the first Strategic Arms Limitations Treaty (SALT) talks with the Soviets to limit ICBMs and Antiballistic Missile (ABM) systems and to ban further proliferation of nuclear weapons. The negotiations were initiated partly in response to the Soviet deployment of an ABM system and the impending development of U.S. ICBM multiple reentry vehicles (MIRV), for these developments would contribute to an escalation of the arms race:

> Insofar as the U.S. MIRV systems were perceived by the Soviets as strengthening the U.S. counterforce capability (high accuracy of low yields) and improving the U.S. first-strike capability (larger number of warheads), they probably contributed to an escalation in the arms race (Buchonnet 1976).

However, the Soviet invasion of Czechoslovakia in August 1968 postponed any further negotiations concerning arms control between the two superpowers, and the SALT I talks were put on hold.

The AEC also moved forward a new program to explore the technical and economic feasibility of using nuclear explosives for industrial applications. This was called the Plowshare Program, named for the Biblical injunction to ensure peace by beating swords into plowshares. The reasoning was that the relatively inexpensive energy available from nuclear explosions could prove useful for a wide variety of peaceful purposes. Between December 1961 and May 1973, the U.S. conducted 27 Plowshare nuclear explosive tests (Department of Energy n.d.b).

Concurrently, American involvement in Vietnam was also gathering momentum. After the French withdrew from Vietnam, the Geneva Peace Accords of 1954 separated the country into north and south divisions. While the Democratic Republic of Vietnam (North Vietnam) was Communist supported, the U.S. supported the development of the Government of the Republic of Vietnam (South Vietnam), which became ruled by Ngo Dinh Diem in 1956.

From 1956 to 1960, the Communist Party of Vietnam tried to reunify the country through political means. However, in December 1960, the Communist-run National Liberation Front (NLF) took on more violent tactics. In 1961, Kennedy sent a team to Vietnam to report on conditions in the south. The "December 1961 White Paper" encouraged an increase in military, technical, and economic aid, and the large-scale introduction of American advisers to help stabilize Diem's government and crush the NLF (Brigham n.d.). Kennedy decided to increase military involvement through more machinery and advisers, rather than the wholesale use of troops. With U.S. approval, Diem was later assassinated, after bringing the South Vietnam government to the verge of political collapse. After an attack on an American ship in the Gulf of Tonkin in 1964 believed to be carried out by North Vietnam, the Lyndon Johnson administration began limited air attacks. In 1965, the U.S. introduced combat troops into the country and continued bombing missions after the NLF attacked two U.S. Army installations in South Vietnam. By the end of 1967, U.S. troops in South Vietnam numbered 485,000 men. During his terms, President Nixon withdrew some troops but continued air strikes against North Vietnam. It was not until 1975, with the fall of Saigon, that the Vietnam War ended.

With the onset of Nixon's presidency, a series of negotiations was also begun that culminated in the SALT I treaty. Though Nixon wanted to lower the defense budget in response to the slowing down of the war in Vietnam, he also was adamant that militarily the U.S. would not fall behind the Soviet Union. SALT I was finally signed in 1972 and set numerical limits on the number of strategic missile launchers that could be deployed over the following five years, as well as prohibiting technological advances in ABM systems.

With Nixon's resignation in 1974 and the subsequent Ford and Carter presidencies, negotiations continued between the super powers of the east and west. SALT II, the Vladivostok Accords, and ABM Protocol were all implemented during this period. The Vladivostok accords of 1974 laid the basic groundwork for SALT II by placing a limit of 2,400 on all ICBM and SLBM launchers and a sublimit of 1,320 for launchers carrying MIRVs. The ABM Protocol, also of 1974, limited the U.S. and Soviet Union to one ABM site each. The 1970s are known for the steady development of détente between the two superpowers; as a result, weapons development and deployment activities were dramatically low. While weapons development efforts were lower than in previous Cold War phases, military weapon R&D and related nuclear survivability efforts were carried out by activities at KAFB.

8.1 Air Force Systems Command at KAFB

In April 1961, the ARDC was redesignated the Air Force Systems Command (AFSC). The new command was given the weapons procurement and production functions of ARDC's longtime rival AMC, which effectively ended the ten years of contention between the ARDC and AMC (AFSC, Office of History 1986). The catalyst for resolution of the long-time problem was the U.S. space program.

When the Soviets placed their first manned orbiter into space in 1961, the USAF was in jeopardy of losing its military space R&D mission because of the inefficiency of its R&D organization. Deputy Secretary of Defense Roswell Gilpatrick ordered the USAF to remedy the situation (Bright 1992). In response, the USAF centralized research, development, and production responsibilities into one command: the AFSC. When the AFSC was created, it had full responsibility, authority, manning, and funding for R&D—which had been called for a decade earlier by R&D advocates (AFSC, Office of History 1986). The AFSC became the parent organization for the groups shown in Table 6.

Table 6: AFSC organizations outside New Mexico

Source: Kirtland AFB 1968

California	Florida	Ohio	Other Locations
Flight Test Center	Aerospace Medical Proving Ground Center	Aeronautical Systems Division	Arnold Engineering Development Center in Tennessee
Western Test Range	Armament Laboratory	Aero-Propulsion Laboratory	Electronics Systems Division in Massachusetts
Rocket Propulsion Laboratory	Eastern Test Range	Avionics Laboratory	Rome Air Development Center in New York
Contract Management Division		Flight Dynamics and Materials Laboratory	Aerospace Medical Division in Texas
Space and Missile Systems Organization		Foreign Technology Division	

With the disestablishment of ARDC in 1961, AFSC took command of KAFB and AFSWC (Figure 86). The replacement of ARDC with AFSC resulted in significant changes for AFSWC, but there were many adjustments that did not result solely from the change in command. AFSWC's primary role as "the AEC's Air Force"—the primary USAF flight support for atmospheric testing—was no longer a military priority by the early 1960s owing to the 1958 moratorium on atmospheric testing (Alberts and Putnam 1985).

As the phase-down of testing activities continued during the moratorium, in August 1961 the 4950th Test Group (Nuclear) and 4925th Test Group (Atomic) were disestablished (Alberts and Putnam 1985). Also during this moratorium period most of the missions of the AFSWC's 4926th Test Squadron (Sampling) consisted of U.S. Weather Bureau projects. On 16 August 1961 the 4926th Test Squadron (Sampling) was placed under HQ, 9th Weather Reconnaissance Group, Air Weather Service of the Military Air Transport Service (MATS), since MATS also used the B-57 aircraft and could easily add the unit to their inventory (Jones et al. 1976). The new unit designation was the 1211th Test Squadron (Sampling) (KAFB 1974). Although the unit was no longer under AFSC, it remained based out of KAFB (Napolin n.d.).

Excess manpower from the disbanded 4950th Test Group (Nuclear) was used to staff the AFSWC's Plans Division. At least one historic record also refers to the transfer of 4925th Test Group (Atomic) personnel to the new division. A Nuclear Test Support Planning Branch was created in May 1961 with three goals:

1) To maintain liaison with organizations having air support requirements;
2) To prepare "on shelf" plans for USAF support for nuclear testing; and
3) To keep the AFSWC informed on the status of planning for support of nuclear tests (Jones et al. 1976).

8.1.1 Atmospheric Testing Resumes

Shortly after the testing groups were disestablished, the testing ban was lifted briefly when the Soviet Union detonated a nuclear device in the atmosphere in September 1961. A flurry of full-scale U.S. test activity resulted (Table 7). Joint Task Force EIGHT was established by the AFSWP, under orders from the JCS, to conduct an overseas test series in the Pacific called Operation DOMINIC. Also, in Nevada, Operation NOUGAT commenced, for which the AEC asked the AFSWC to provide air support. AFSWC also provided advisory service and personnel to assist in housekeeping (Jones et al. 1976).

Table 7: Phase III Tests

Source: Jones et al. 1976

Date	Operation Name	Location	Type of Test	Notes
1961	NOUGAT	Nevada Test Site	Atmospheric	Conducted Sept
1962	DOMINIC – Phase I	Eniwetok	Atmospheric	Conducted April – July Joint Task Force EIGHT Joint Task Group 8.4
1962	DOMINIC – Phase II	Eniwetok	Atmospheric	Conducted Oct – Nov Joint Task Force EIGHT Joint Task Group 8.4
1964	CROSSCHECK		Simulated test exercise proved readiness to conduct nuclear testing by 1 January 1965	Conducted Oct - Nov
1965	WHIPCORD ALPHA	Nevada Test Site	Simulated test exercises to provide training necessary to maintain constant state of readiness	Conducted during April
1965	WHIPCORD BRAVO		First tests using the targetless array to collect data	
1965	LONG SHOT	Amchitka Island, AK	Underground nuclear detonation	Conducted in October Continental Test Division
1965	ROUNDUP		Simulated test exercises to prove readiness for atmospheric testing	Conducted Nov - Dec
1966	WHIPCORD CHARLIE			Conducted in March Continental Test Division
1966	WINDLASS	Pacific Test Area	Tested U.S. readiness to resume atmospheric testing	Conducted Sept – Oct Joint Task Group 8.4
1967	HARNESS, ALPHA and BRAVO	Warning Area 291	Tested U.S. readiness to resume atmospheric testing	Conducted in February and May Southern California coast

Date	Operation Name	Location	Type of Test	Notes
1967	PADDLEWHEEL	Pacific	Tested U.S. readiness to resume atmospheric testing	Conducted Sept - Oct
1967	GASBUGGY	Farmington, NM	Plowshare experiment	Conducted in December Rimrock
1968	FAULTLESS	Central Nevada Test Site	Test suitability of the test site for underground testing of high yield nuclear devices	Conducted in January
1968	TANGLEWOOD	Warning Area 291	Test to evaluate the feasibility of simultaneous sampling around the periphery of a simulated nuclear cloud at a specific time with manned aircraft	Conducted in May
1968	SPINNAKER ALPHA	Warning Area W-291	Off-shore non-deployment exercises	Conducted in November Joint Task Group 8.4
1970	THOR	Pacific	High Altitude Test Vehicle Development Test	Conducted in July Joint Task Force EIGHT
1971	MEDUSA		Off shore nuclear readiness training	Conducted in April Joint Task Force EIGHT
1971	CANNIKIN	Amchitka, AK	Underground nuclear test	Conducted in November

By early 1962, the AFSWC created a Nuclear Test Directorate for air support planning and responsibility for nuclear testing overseas and, in Nevada (Jones et al. 1976), transferring personnel from the previously established Nuclear Test Support Planning Branch. In preparation for Operation DOMINIC, Joint Task Group 8.4, or the USAF representatives for the test series, was created at KAFB from members of the Nuclear Test Directorate.

Operation DOMINIC analyzed a variety of new nuclear theories and weapons and was the last such series of tests before the 1963 treaty prohibited atmospheric, space, and underwater testing (Collins 1996). DOMINIC involved 36 tests off Christmas Island and Johnston Island in the Central Pacific. Twenty-nine of the tests were airdrops evaluating weapons designs such as the XW-56 and XW-59 warheads [XW = experimental warhead] for the Minuteman 1 missile, and the XW-58 warhead for the Polaris A2 missile. Five tests were rocket-launched to obtain further weapons effects data on high-altitude phenomena. These involved Thor missile-launched warheads, detonated at very high altitudes. The final two were tests of the Polaris SLBM and the ASROC weapons systems.

When atmospheric testing resumed, the 1211th Test Squadron (Sampling) joined Joint Task Group 8.4 and flew B-57Ds for Operation DOMINIC. During the tests, the B-57D had a disappointing altitude range, and after the tests there were discussions of the possibility of a similar aircraft with increased altitude capability. Subsequently, in March 1962, a contract was awarded to Convair Aerospace to create a modernized version of the B-57 series aircraft. In October, the USAF authorized Convair to manufacture and test the newly designed RB-57F, which had a much greater wingspan and surface to allow for higher altitudes in flight, and a longer tail to allow for greater thrust. The altitude reached by the RB-57F was 65,000 feet in comparison wtih the B-57's 49,000 feet (Wright Patterson AFB n.d.).

8.1.2 Simulated Testing after the Limited Nuclear Test Ban Treaty

During 1963, the AFSWC's mission was redefined to focus more closely on missile development in support of nuclear readiness. This was partially in response to the NSC and its understanding that there was a major shift from a nuclear threat by bombers to a nuclear threat by ICBMs (NSC 1960). Shortly after the AFSWC received this new missile development mission in September, the U.S., United Kingdom, and Soviet Union ratified and signed the LTBT.

With the reorganization of the AFSWC, its Nuclear Test Directorate was redesignated the Deputy for Nuclear Field Operations. Within this new agency were four divisions: The Overseas Test Division, Continental Test Division, Materiel Division, and Detachment No. 1 at Indian Springs AFB [by this point Indian Springs AFB was no longer directly attached to KAFB] (Jones et al. 1976).

Tests conducted after Operation DOMINIC simulated nuclear explosions and tested readiness to resume atmospheric testing in case the ban was lifted (Table 7). These tests were part of the National Nuclear Test Readiness Program, which had been set up as a direct response to Kennedy's Safeguard C, which required readiness to promptly resume atmospheric testing should the need arise. The program provided for:

> The maintenance of the facilities and resources necessary to institute promptly nuclear tests in the atmosphere should they be deemed essential to our national security or should the treaty or any of its terms be abrogated by the Soviet Union (Sandia National Laboratories 2001).

In the wake of the LTBT, full-scale testing ended, which in turn resulted in a slowdown in military flying activity at KAFB. Meanwhile, commercial airline traffic at the Albuquerque airport was increasing. Because of this, the AFSC transferred 1,242 acres of KAFB land—with runways, taxiways, and ramps—back to the city of Albuquerque. The transfer took place on 3 January 1963, and thereafter, KAFB leased use of the runways and taxiways from the city and agreed to provide crash and fire protection for the airfield (Alberts and Putnam 1985).

On 16 June 1963, also after the LTBT, the 1211th Test Squadron was redesignated the 58th Weather Reconnaissance Squadron. The new designation created no change in unit mission, although the squadron then emerged into the "Age of the F Troop" (Napolin n.d.). The "F" was from the RB-57F designation of the unit's aircraft. According to the official history of the "F-Troop 58th Weather Squadron," the RB-57F proved itself to be an aircraft gifted with the capabilities of exceptional payload, high altitude, long-range performance, and extended loiter time, all of which were useful for taking air samples.

During the "F Troop" era, the 58th Weather Reconnaissance Squadron obtained samples of the gaseous and particulate composition of the atmosphere, and carried out other weather, photographic, and high-altitude research projects dictated by the USAF, governmental, and civilian scientific agencies. Two or more RB-57F aircraft operated as a team to accomplish the collection of nuclear debris. The control aircraft had the purpose of directing and monitoring the sampling operation and ensuring that mission accomplishment was attained within established radiation dose limits, while the second aircraft assumed the collection responsibility.

This monitoring activity was directly related to Kennedy's LTBT safeguards: to monitor testing by other nations. An ongoing assignment of the 58th Weather Reconnaissance Squadron was observation for evidence of Soviet and Chinese nuclear tests, a direct response to Safeguard D. For example, the 58th Weather Reconnaissance Squadron flew back and forth to Argentina during 1965 for its top secret QUICK DIP program. QUICK DIP involved biweekly flights of two RB-57Fs to El Plumerillo Airport in Mendoza, Argentina, for periods of four to five days. During each period, five to six air samplings were to be taken to estimate the amount of plutonium being produced by the Soviets (Department of State 1965).

In 1968 the Air Weather Service's RB-57Fs were redesignated WB-57Fs, and they continued to be used in the atmospheric sampling role, mostly on behalf of the AEC. Some of the aircraft were fitted with probes to scoop up airborne particles in a program of ongoing monitoring of nuclear tests. Most of this activity was centered on the nuclear tests carried out in China, but some of it was used in U.S. air space to monitor air in the aftermath of underground nuclear tests.

The AFSWC was also given responsibility for supporting the National Nuclear Test Readiness Program. The AFSWC was to develop operational concepts and plans for air operations, and maintain and operate primary airdrop and diagnostic test aircraft. It was also responsible for providing the staff nucleus for Joint Task Group 8.4 in charge of atmospheric testing (Department of the Air Force 1972).

By 1969, the National Nuclear Test Readiness Program came into question because of the expense involved in being able to "promptly" resume nuclear tests in prohibited environments. The advances in test simulation expertise also contributed to the questioning of the program's viability. As a result, AFSWC's readiness support aircraft—B-52s and B-57s—were mothballed, and related personnel were transferred to other USAF units (Alberts and Putnam 1985).

Still based out of KAFB under MATS, the 58th Weather Reconnaissance Squadron was the last squadron in the USAF to use the WB-57F; in the spring of 1972, the decision was made to transfer 12 F-Troop aircraft, WB-57Fs and WB-57Cs, to Davis-Monthan AFB in Arizona for storage at the Military Aircraft Storage and Disposition Center [MASC], which is now known as the Aerospace Maintenance and Regeneration Center [AMARC]. Half of the squadron's authorized manpower positions were also deleted. Mission requirements continued at the same level, and were often more demanding, but they had to be accomplished with half of the previous resources. By the summer of 1973 there were rumors of squadron reductions, and deactivation of the squadron was announced officially in March 1974 as a result of the continual downsizing since the 1958 moratorium (Napolin n.d.).

8.1.3 Missile Development and the AFSWC

Throughout the remainder of the 1960s, the AFSWC worked closely with the Air Force Missile Development Center at Holloman AFB. The AFSWC's responsibilities at this time included the testing and evaluation of airborne missiles, aircraft reconnaissance systems, and missile reentry vehicles (KAFB 1971). The precursor to the Air Force Missile Development Center was the Guided Missile Test Range, which was established at the Alamogordo Army Air Field (AAF) in 1947 to develop and test pilotless aircraft, guided missiles, and the associated systems and equipment (Lewis et al. 1997). Many of the facilities and personnel from Wendover Army Air Base (AAB) were transferred to Alamogordo AAF [renamed Holloman AFB in 1948] to develop the test range (Lewis et al. 1997).

Many of the scientists that participated in the early missile program at Holloman AFB came from Operation Paperclip, which was designed to ensure scientific and military superiority and was one of the earliest manifestations of the Cold War arms race. At the end of World War II, the U.S. and Soviet Union fiercely competed for the German Peenemünde rocket scientists who had excelled at military technological developments over the previous two decades. Through Operation Paperclip the U.S. identified, recruited, and brought German scientists and technologists to the U.S. to aid in the development of American military missiles (Lewis et al. 1997).

The early work of the Operation Paperclip scientists at Holloman AFB involved the German V-2 rocket. Throughout the Cold War, the Air Force Missile Development Center launched many missiles, including Tiny Tim (the first U.S. Army rocket), Rascal, XQ-2 Drone, Falcon, MACE, Matador, and Shrike (Holloman n.d.). By the late 1950s more German scientists and engineers had worked at Holloman AFB (approximately 70) than at any other USAF installation, with the exception of Wright-Patterson AFB (Weitze 2001).

With the creation of the ARDC in 1951, Holloman AFB was transferred from the jurisdiction of the AMC to ARDC. Likewise, when the ARDC was redesignated the AFSC in 1961, Holloman AFB came under jurisdiction of the AFSC. In August 1970, while Holloman AFB was transferred from the AFSC to TAC (Lewis et al. 1997), the AFSWC absorbed the Air Force Missile Development Center, as well as USAF operations on the U.S. Army-owned White Sands Missile Range (WSMR). The AFSWC established the 6585th Test Group at Holloman AFB on 1 August 1970 to operate the Air Force Missile Development Center, and AFSWC Commander Colonel A. G. Swan became the White Sands Missile Range deputy for the USAF (*Nucleus* 1970; Mueller 1989).

Calling itself the "Gateway to the White Sands Missile Range," the AFSWC sponsored all USAF programs at White Sands and an AFSWC office was located at WSMR for day-to-day operations. The AFSWC provided flight test support from KAFB, and mission control support and drone launch from the Air Force Missile Development Center at Holloman AFB (AFSWC 1970).

The drone operations at Holloman AFB offered a number of facilities, including a fixed ground-launch facility, a mobile ground-launch facility, and facilities for assembling, weighing, and balancing drones. There was also a telemetry station for control of drones, and electronics laboratories for maintenance, modification, and checkout. In addition the AFSWC guaranteed personnel "trained and experienced in remote control flight operations" to be available at Holloman AFB for tests (AFSWC n.d.).

A small group of Peenemünde scientists that had been recruited under Operation Paperclip and located at Holloman AFB during the 1950s transferred to KAFB after 1958. The number of German scientists and engineers at KAFB appears to have been small, including at least Dr. Gerhard Eber, Dr. Bruno Manz, and Josef Schneider (Weitze 1997).

By the mid-1970s, missile development support within the AFSWC reached a plateau—with advanced missiles work entirely focused through the AFSC's Space and Missile Systems Organization (SAMSO) at Los Angeles Air Force Station. SAMSO was a precursor to today's Space and Missile Systems Center at what is now known as Los Angeles AFB (Los Angeles Air Force Base n.d.). By September 1974 the function of the AFSWC had become largely obsolete, and in 1976 the center was officially disestablished by the AFSC (Air Force Research Laboratory, Space Vehicles Directorate, Historical Information Office 1998).

Another milestone during AFSC's tenure at KAFB took place in July 1971 when the Sandia and Manzano bases merged with KAFB. The AFSWC assumed control of the merged installation until 1976. That same year, the AFSC pronounced that it no longer wanted to be responsible for KAFB, and the USAF set out to choose another major command to control the installation (Alberts and Putnam 1985).

The AFSC maintained jurisdiction over KAFB through 1977 when MAC assumed responsibility. Through those years, many accomplishments were made at KAFB in the fields of missile work, EMP simulation, and laser R&D, which were all part of the shift in strategic policy during this period from early warning and interceptors to the focus on Flexible Response, ICBMs, and passive defense methods, such as hardening (NSC 1960). By the late 1960s at KAFB, work under the AFSC included new missiles, aircraft, armaments, electronics and other hardware for strategic offensive and defensive warfare, airlift, reconnaissance, and command and control. Space R&D at KAFB included work on satellites, boosters, probes, and re-entry systems (Boone Publications 1969).

Aside from strides in scientific and engineering research, another important events occurred at KAFB during those years. The AFSC established its Non-Commissioned Officers (NCO) Academy at KAFB in April 1961. The academy taught classes in oral and written communications, training, leadership, management and supervision, drill, ceremonies, discipline, military justice, world affairs, history, and USAF organizations. Seven senior NCO six-week classes were taught per year.

8.2 Air Force Weapons Laboratory at KAFB

In 1963, the Air Force Weapons Laboratory (AFWL) was created from elements of the AFSWC's Research and Development Directorates as a new laboratory for cutting-edge nuclear research (Figure 88: AFWL buildings in 1963). The AFWL was responsible for researching nuclear weapons and the vulnerability of U.S. weapons systems to nuclear attack. Because atmospheric testing had been prohibited in 1963, weapons vulnerability testing now focused on nuclear weapons effects simulations (Air Force Research Laboratory, Space Vehicles Directorate, Historical Information Office 1998). As early as 1959, the USAF had conceived of a new nuclear laboratory at KAFB, separate from, although related in mission to—the Special Weapons Center, LASL and Livermore Radiation Laboratories, and Sandia Laboratory (Weitze 2001).

Specifically, the reorganization consolidated functions of the AFSWC's Research and Development Directorates, the Foreign Technology Division, Technical Library and the computer function of the AFSWC's Nuclear Test Directorate. According to an April 1965 Air Force Weapons Laboratory Information Package, the new laboratory was created to meet certain objectives of the AFSC's Research and Technology Division (AFWL 1965b). These were to:

- Establish strong, technically-competent laboratories with clear missions and lines of responsibility
- Reduce intermediate echelons of review
- Make careers in research and technology attractive and productive
- Use the total research and technology resources of United States and foreign technology
- Improve research and technology management and procedures
- Provide effective laboratory support to current and future systems (AFWL 1965).

AFWL's original mission was to explore the military uses of nuclear power, weapons, and support equipment, and to reduce the vulnerability of U.S. systems to nuclear weapons effects. This involved studying nuclear weapons effects through testing, ensuring the compatibility of nuclear weapons with USAF delivery systems, providing advanced nuclear weapons delivery techniques, and investigating nuclear power concepts (AFWL 1965). A result of the LTBT of 1963, the AFWL began pioneering techniques in nuclear explosion effects simulation.

In the beginning, AFSC staffed AFWL at just over 600 personnel. The initial personnel came from the AFSWC's Research and Development Directorates, giving the new laboratory a sound foundation in the research of nuclear weapons and their effects. The personnel included 285 officers, 98 enlisted, and 234 civilians. In the mid-1960s, five divisions made up the laboratory. The actual division names changed during the decade, but Figure 89 shows the basic organization (Figure 89: Typical Organizational Chart for AFWL during Phase III).

In 1960 the NSC published a secret document called "U.S. Policy on Continental Defense" that outlined the changing nuclear threat and what the U.S. defensive response should be. The document author predicted that there would be a gradual transition from a bomber threat to that of ICBMs. The new ICBM threat had two important components: travel time for ICBMs was 30 minutes, and once launched, they could not be recalled. The U.S. began to understand that early warning and interceptor aircraft systems could not function against the new ICBM threat. As a result, the military began to look at some passive measures that could be employed to protect the U.S. retaliatory forces (National Security Council 1960). These measures included dispersal, mobility, hardening, and concealment. Hardening became a primary focus for the AFWL at KAFB.

Throughout the 1960s, AFWL scientists designed underground tests and a variety of nuclear effects simulations. For example, in 1965, AFWL's Civil Engineering Research Branch began studies using conventional high explosives to simulate a nuclear blast to test the hardness or survivability of underground missile silos and command centers (AFRL, Space Vehicles Directorate 1998). In 1964, AFWL built its first EMP simulator, titled the AFWL/Los Alamos Electromagnetic Pulse Calibration and Simulation facility, to simulate a nuclear blast to test military materiel, such as aircraft, tanks, and rockets, for the effects on the equipment and systems.

AFWL also made important contributions throughout the decade to improve the nuclear systems related to such aircraft as the F-4, F-105, F-111, and the B-58. The weapons systems corresponding to these aircraft included the air-to-ground missiles (AGM) AGM-28 "Hound Dog," AGM-29 "Short-Range Attack Missile," as well as the Titan and Minuteman ICBMs, and the Spartan ABM.

Over the years, AFWL's mission broadened to include an extensive array of technical R&D—including space experiments and directed energy projects like the Airborne Laser Laboratory (ALL) of the early 1970s.

8.2.1 Electromagnetic Pulse Simulation

The fact that nuclear explosions create EMP was well known by the mid-1950s. EMP and electromagnetic fields exist in everyday life but are much weaker than those produced by a nuclear explosion. For example, kitchen appliances and televisions produce electromagnetic fields, as well as cell phones and garage door openers (White Sands Missile Range 2002), but the importance of EMP effects first began to be noticed in 1957 when a series of magnetic field measurements were made during Operation PLUMBBOB testing.

During a nuclear explosion, EMP is created by the interaction of the atmosphere with the gamma rays from that explosion. The gamma rays ionize an area of the atmosphere and produce an electrical field. The current flowing through that field is EMP, which reaches its peak in about 10 nanoseconds. If a detonation took place 200 miles above the center of the U.S., the EMP effects would cover nearly the entire country (AFWL 1983–1984). Metallic conductors collect EMP and feed it into electrical and electronic equipment. Such conductors could include antennas, cables and conduits, power lines, aircraft, and missile bodies (AFWL 1983–1984), and if the EMP is strong enough, electronic components of the attached systems could be severely damaged.

Because of this, the military was concerned about the battlefield survivability of its equipment and the electronic systems. One facet of EMP testing was to test the hardness of everything from aircraft to missile silos with the goal of using the data to create equipment that could withstand the effects of nuclear explosions. Other facets of such testing were the simulation of EMP effects on equipment at high altitudes and also on grounded equipment.

In 1958 discussions took place between Great Britain and the U.S. regarding the EMP vulnerability of military systems and hardening of those systems. A number of EMP measurements were attempted in 1962 during the SMALL BOY nuclear test in Nevada. Though the goal was to obtain data on the close-in EMP environment of a ground burst, the attempts at gaining accurate data were unsuccessful because of instrumentation issues.

The more significant tests were those in the last series of Operation DOMINIC, in 1962, which resulted in the realization that just one burst of EMP created at a high altitude could potentially adversely affect equipment across the entire U.S. This high-altitude test series was referred to as Operation FISHBOWL, and it demonstrated that when nuclear weapons detonated at extremely high altitudes, energy released by the detonation took the form of an intense radiation burst. In addition to the burst of X-rays, gamma rays, and neutrons, high-altitude detonations produced EMP capable of damaging electronic equipment, not just in the area of the burst but over thousands of square miles (Defense Threat Reduction Agency 2001).

In the wake of the 1963 LTBT and the discoveries at Operation DOMINIC, nuclear effects simulation testing became extremely important. The military community had to develop other ways, besides atmospheric testing, to fully study EMP effects (Defense Threat Reduction Agency 2001). It became necessary to create other modes of testing the effects of such explosions by simulating the resulting EMP. The years 1963 and 1964 marked the beginning of simulated EMP testing of military systems, when AFWL first used a distribution of loops, a fast switch, and a large capacitor bank to carry out EMP tests. Over the next two decades, AFWL created numerous EMP testing facilities across the country for the U.S. Army, U.S. Navy, and USAF (Table 8).

EMP facilities were constructed in a variety of configurations to simulate different types of nuclear weapon detonations, accounting for variables such as the location of the nuclear detonation and the location of the system exposed to the EMP environment produced by the detonation (Baum 1978). The EMP simulators at KAFB fell into three distinct types: guided wave, hybrid, and equivalent electric dipole EMP facilities.

Guided wave simulators used metal plates driven by one or more high-voltage generators to propagate a single transverse electromagnetic (TEM) wave through a region referred to as the “working volume,” or the area in which the test object was located. Most guided wave simulators produced a vertical electric field and horizontal magnetic field, using the earth as one of the conducting plates (Giles 2001). This class of simulator was used primarily to simulate the free space environment produced by a high-altitude nuclear burst. These were most appropriate for testing missiles and aircraft in flight (Baum 1992).

Hybrid simulators were two-dimensional wave guiding structures simulating plane waves and their ground reflections. The waves propagated in the air, with metal conductors forming a large part of the structure. Because the structure formed part of the boundaries for the guided wave, such facilities were also referred to as “bounded wave.” The high-frequency portion of the waveform reaching the test object was radiated from a relatively small source region compared with the major simulator dimensions. Hybrid simulators produced EMP environments similar to those that would be experienced by ground-based systems exposed to EMP from high-altitude nuclear detonations. These were suitable for testing fixed sites and parked aircraft (Baum 1992).

Equivalent electric dipoles produced vertically polarized EMP fields over a conducting surface. However, since they were radiating antennas, they weren’t as efficient as guided wave simulators at converting pulse power energy into fields. They also suffered from a deficiency in low-frequency energy (Giles 2001). They were useful for EMP simulation in cases where the TEM wave was far from the test object relative to the size of the dipole structure (Baum 1978).

EMP sites at KAFB were named after the first EMP simulator built on them. If subsequent simulators were built on the same site, the suffixes I, II, and III were used. Table 8 shows all the EMP facilities built during the Cold War for the U.S. military.

Table 8: Electromagnetic Pulse testing facilities

Source: AFRL Phillips Research Site Historical Information Office: AFWL Test Facility (1981, 1990) folder, Box #43 B

EMP Facility	Host Agency and Location	Facility Type	Sponsor/ Operator	Test Capabilities
ARES	AFWL – LASL KAFB, NM	Guided wave vertically polarized, horizontally propogating transmission-line EMP simulator	DNA/ DNA	Testing items such as small to medium ground systems and missiles for classical EMP waveform; also used to test C^2, ground vehicles, models, and SAC C^3.
ALECS	AFWL KAFB, NM	Guided wave vertically polarized, horizontally propogating transmission line EMP simulator	USAF/ AFWL	Designed primarily for testing of aircraft in high-altitude nuclear environments, but could be used for a wide variety of systems.
HPD	AFWL KAFB, NM	Elliptical hybrid EMP simulator	USAF/ AFWL	Primarily designed for large aircraft testing; also used to test ground, missiles and C^3 systems.
VPD-I	AFWL KAFB, NM	A vertically polarized equivalent electric dipole EMP simulator	USAF/ AFWL	Primarily designed for testing simple models of aircraft-like structures
VPD-II	AFWL KAFB, NM	A vertically polarized equivalent electric dipole EMP simulator	USAF/ AFWL	Primarily designed to illuminate large aircraft in flight; also used to test ground, missiles and C^3 systems.
Trestle	AFWL KAFB, NM	Guided wave horizontally polarized, horizontally propagating transmission line EMP simulator	USAF/ AFWL	Designed to test in-flight mode system response to a simulated nuclear EMP.
HSI	AFWL KAFB, NM	Guided wave horizontal and vertical polarized and continuous wave antenna.	USAF/ AFWL	Continuous wave for low-level EMP hardness surveillance of missiles and aircraft including B-1B.
AESOP	Harry Diamond Laboratories (HDL), Woodbridge, VA	Fixed-site, large-area, threat-relatable simulator with a large horizontally polarized, free-field EMP environment.	U.S. Army Laboratory Command (LABCOM) and HDL	Designed to test DoD large transportable equipment in a wide range of threat environments.
CWIS	HDL, Woodbridge, VA	Continuous wave, radiating horizontal monopole or direct drive EMP.	LABCOM/ HDL	Designed to provide continuous wave radiated fields for components up to 150 meters in size.

EMP Facility	Host Agency and Location	Facility Type	Sponsor/ Operator	Test Capabilities
REPS	HDL, Woodbridge, VA	Radiating horizontal dipole, transportable to other testing sites.	LABCOM/ HDL	Capability for expedient diagnostic testing, primarily for ground systems.
RPG	HDL, Woodbridge, VA	Radiating horizontal dipole, transportable to other testing sites; smaller kilovolt capacity than REPS.	LABCOM/ HDL	Main function is to provide an EMP source for diagnostic and quick-look data for a wide variety of ground systems.
Suitcase	HDL, Woodbridge, VA	Radiating dipole antenna; transportable in a station wagon.	LABCOM/ HDL	Primary use to provide a reliable EMP source for diagnostic tests in areas without electric power of utilities.
VEMPS	HDL, Woodbridge, VA	Radiating vertical monopole.	LABCOM/ HDL	Normally used to test ground systems, but had no limitation on candidate test objects.
VEMPS-II	HDL, Woodbridge, VA	Designed to produce a high-frequency vertically polarized EMP environment; radiating vertical monopole.	LABCOM/ HDL	Used to test objects 30 × 35 × 15 meters in volume
TES	U.S. Navy NATC, Patuxent River, MD	HPD-type, free-field pulse facility	NASC/ NATC	
NAVES	U.S. Navy NATC, Patuxent River, MD	VPD-type.	NATC/ NASC	
EMPRESS -II	U.S. Navy NSC, Cheatam Annex, Williamsburg, VA	Vertical monopole, transportable into open water.	NSSC/ NSSC	Vulnerability and survivability testing of combat ships and shipboard systems
WESTA	White Sands Missile Range	Hybrid - bounded wave and free field radiating technology to produce a horizontally polarized test environment.	WSMR/ WSMR	

8.2.1.1 ALECS Site

The first EMP simulator built was the AFWL/Los Alamos Electromagnetic Pulse Calibration and Simulation (ALECS) facility—completed in 1967. The ALECS was a guided wave facility for simulating the EMP environment that existed outside the high-altitude nuclear source region. ALECS was constructed of a flat plate, tapered transmission line above a ground plane that had a pulser at one end and a resistive termination at the other (Figure 90: ALECS Diagram). The parallel transmission plate was constructed of 41 copper-clad steel wires supported by eight pairs of telephone poles guyed with fiberglass cables. The ground plane was a perforated aluminum sheet that covered the ground directly beneath the top plate from the generator to the termination. When a test was being conducted, solid aluminum was used under the area of the working volume. Two pulsers were used with this facility: the EMP-28 pulser for a high-level electromagnetic field and the Repetitive Pulse Generator (RPG)-2 for a low-level, repetitive pulsing (AFWL 1981).

ALECS was capable of testing items with a volume no greater than 82 feet long by 45 feet wide by 41 feet high and would provide a higher quality field for smaller items. When the test item was large with respect to the available working volume, special effort had to be made to map the resultant fields to ensure that the data acquired during the test were valid. The facility included the simulator, an underground control and instrumentation room, a gantry crane, and buildings for data acquisition and support. Materiel tests conducted at ALECS included Polaris and Minuteman missiles, EC-135, the B-1 scaled model, and the ALCM (AFWL 1981). Communications systems tested included the Air Force Satellite Communications System, Aircraft Alerting Communication EMP Detector, and the Commander-in-Chief Strategic Air Command Residence Communications System. Some of the last tests conducted took place in the late 1970s. These involved testing the pairing of a B-52 with the Air Launched Cruise Missile (ALCM) and the Navy Sea Launched Cruise Missile.

8.2.1.2 ARES Site

The AFWL RAND EMP Simulator (ARES) was another guided wave EMP simulator, and it became operational in 1970. ARES was built in the late 1960s to overcome the size restrictions of ALECS. ARES was equipped with a pulser, a two-plate transmission line, and a termination point (Figure 91: ARES facility). The pulser was a charged coaxial capacitor with a fast switch to transfer energy to the load. A van de Graaff generator charged the coaxial capacitor to the required voltage. The two-plate transmission line consisted of a ground plane—made of various sizes of metallic mesh—and top plate, a flat array of 78 wires. ARES had a total length of 189 meters.

Discharging the pulser into the transmission line produced the electromagnetic environment in the working volume of ARES. The wave then propagated through the output conic section to the load, where it terminated. ARES, like ALECS, was used primarily to test missiles. Tests conducted at ARES included the Minuteman and Poseidon (Dr. Carl E. Baum, 3 April 2002 interview with Karen Van Citters and Kristen Bisson).

8.2.1.3 ACHILLES Site

In 1971, AFWL built the AFWL Characterization Interim Low Level EMP Simulator (ACHILLES), commonly referred to as the Vertically Polarized Dipole (VPD-1). The vertical radiating EMP simulator was built to simulate an electromagnetic environment produced from a high-altitude nuclear burst. The simulator consisted of a resistively loaded conical antenna driven by a 1.75 megavolt (mV) generator. From ground level, where the voltage generator and vertex of the antenna were located, the antenna extended 90 feet upward, where it had a diameter of 130 feet (AFWL 1972). Eight telephone poles were used to support the antenna structure.

Initial tests were performed on simple models of aircraft-like structures oriented parallel to the ground plane. VPD-1 was used for testing the E-3 Sentry, E-4A Sentry, and a version of the EC-135 Looking Glass aircraft (William Prather, 5 April 2002 interview with Kristen Bisson). The

E-3 and E-4A Sentry were airborne warning and control system (AWACS) aircraft providing all-weather surveillance, as well as command, control, and communications for air defense. The EC-135 was a Boeing 707 airframe loaded with high-tech communication equipment for command, control, and communication with U.S. nuclear forces.

The VPD-1 ceased being used when its successor, VPD-II, was completed in 1976. Bigger and better than VPD-1, it instantly made the former obsolete (William Prather, 5 April 2002 interview with Kristen Bisson).

8.2.1.4 ATHAMAS Site

The AFWL Terrestrial High-Altitude EMP, also known as HEMP, Alert Mode Aircraft Simulator (ATHAMAS I), generally referred to as the Horizontally Polarized Dipole (HPD), became operational in 1974. The HPD was a hybrid EMP simulator in that it combined some of the features and qualities of the radiating class with those of the bounded-wave class simulator. As with the ALECS, the HPD simulated the EMP environment that exists outside the high-altitude nuclear source region, but it was specifically aimed at testing aircraft and missiles on the ground. It was designed as a ground alert mode simulator, rather than an in-flight simulator.

The HPD was constructed of a semi-elliptical antenna (494 feet long and 48 feet high) with the ends grounded and a high voltage pulser (Figure 92: HPD diagram). It included a 76-meter-diameter aircraft test pad, data acquisition equipment, test article support equipment, and support buildings. The HPD used four pulsers with voltage outputs ranging from 50 kV to 3 mV:

- The RPG-1 provided a low-level, repetitive, horizontally polarized electromagnetic field.
- The HAG-1A and the RES-1 pulsers were almost identical and provided a horizontally polarized electromagnetic field.
- The HAG-IIC had the highest output of the pulsers used with the HPD and used two pulsers in one frame (AFWL 1981).

The HPD provided the capability to test large aircraft in ground alert mode with regard to the effects of a horizontally polarized EMP. The best test mode was to locate the test article directly beneath the pulser and antenna: in that configuration, the field spectrum uniformity was maximized. Tests at the HPD included E-3A, E-4B, B-52, C-130, F-16, and A-7E aircraft (AFWL 1981).

The ATHAMAS II, or the Vertically Polarized Dipole II (VPD-II), was completed in 1976 adjacent to the HPD. The VPD-II was designed as a ground alert mode simulator. Although its primary purpose was the ground alert mode, the VPD-II also had the capability to serve as a pulse radiator for illuminating aircraft that were actually in flight. Such in-flight tests were usually for aircraft appendages (e.g., trailing wire antennas) that could not be tested by direct illumination in other simulators because of the size of the objects.

The simulator was constructed with a vertical mono-cone antenna that was resistively loaded and a steel mesh ground plane. The antenna was a wire mesh in the shape of an inverted cone 131 feet high; it was over 238 feet in diameter at the top and tapered to a 30-foot diameter at the base

(Figure 93: VPD-II Diagram). The facility included an underground pulser, an underground control and instrumentation room, a 100-meter-diameter concrete aircraft test pad, and data acquisition, test article support equipment, and support buildings (AFWL 1981).

The VPD-II pulser was the largest (in size and weight) at KAFB; it was 30 feet long and 9 feet wide, tapering to 5 feet wide, and was located underground beneath the monocone antenna. Tests at the VPD-II included the E-3A, E-4B, B-52, C-130, F-16, and A-7E aircraft (AFWL 1981).

8.2.1.5 ATLAS Site

The most impressive of the EMP facilities built at KAFB was the AFWL Transmission Line Aircraft Simulator (ATLAS)—more commonly referred to as the "Trestle." The Trestle was a 12-story high, all-wood (including the fasteners) facility built to simulate in-flight EMP effects on aircraft and electrical equipment (Figure 94: Diagram of the Trestle in testing mode). Though plans for the Trestle began in the late 1960s, the facility was not operational until 1980.

The Trestle was a horizontally polarized, bounded wave EMP simulator designed to provide free space simulation of the EMP resulting from a high-altitude nuclear burst. The wooden platform was constructed with one-foot, glue-laminated wood members and 250,000 dielectric bolts made of phenolic impregnated beech material. More than six million board feet of lumber were used in the construction—enough to build 4,000 frame houses. Unlike steel or concrete, wood's nonconductive and nonmagnetic properties would not distort test results. The Trestle was constructed with a flat plate tapered transmission line that was driven at one end by two pulsers and terminated at the other end by resistive termination. The transmission lines were oriented vertically and produced a horizontally polarized EMP.

Trestle included a wood ramp, test stand, and central ground plane wedge (Wedge). The test stand is a square wooden platform measuring 200 feet by 200 feet and 118 feet high, providing removal of the test object a sufficient distance from the ground to allow for a meaningful in-flight simulation. The test volume was 75.7 meters in diameter by 20 meters high. The Wedge was a four-story steel structure (covered with wire mesh) housing facility administration, a shield room for command and control, pulser generators, pulser maintenance, facility maintenance, and mechanical support systems. In addition, the facility included trailers for infrastructure and test planning, as well as support vehicles. There were two pulsers in the facility's Pulse Power System, one at each side of the Wedge base. These pulser modules were Marx generators which provided a short but very high voltage pulse by charging a stack of capacitors in parallel and discharging them in a series. The Trestle generators included peaking capacitors and output switches housed in a large fiberglass gas enclosure filled with SF^6.

Captain Carl E. Baum, then a member of the EMP Group of the Physics Branch in the Research Division of AFWL, was the first to suggest this type of structure. Baum suggested that a trestle-supported platform could test large aircraft with guided-wave EMP simulators. In his notes, published in April 1969, a description appeared of a "dielectric trestle" constructed of some type of insulating material to avoid the electromagnetic wave reactions with the ground. Baum admitted he "conceived the trestle type of test stand by noting the similarity of design requirement to that of railroad trains crossing canyons in the Rocky Mountains in the old West."

Originally, the acronym ATLAS appeared in formal documentation, but “Trestle” became the term in general use by 1972 (AFWL 1979).

AFWL personnel in the EMP Group established a small unit in name and purpose solely for one project. The unit was titled the Trestle Section. The Trestle Section gave a number of contractors three months in which to develop conceptual designs for the Trestle framework, along with cost proposals. The time period was termed “Phase Zero.” Phase 1 was to develop designs for two pulsers or simulators—a horizontal as well as a vertical simulator.

The program received a boost when Secretary of Defense Melvin Laird asked the House Armed Services Committee in 1972 for extra funds to support EMP work. He cited concern over the Soviet upgrading of the armed forces, which led to “reevaluation of the possible vulnerabilities of our own forces … to effects of the electromagnetic pulses” (AFWL 1979). The public was told that EMP resulted from nuclear explosions and was like “a strong burst of electricity that can travel a considerable distance through the atmosphere” (AFWL 1979).

In 1973, McDonnell Douglas Astronautics Company of Huntington Beach, California, was contracted to create the ATLAS facility. In 1976, the Allen M. Campbell Company of Tyler, Texas, began construction of the wood structure (Air Force Contract Management Division 1980). After the expenditure of approximately $58 million, the facility was completed in 1980 (AFCMD 1980).

8.2.2 Blast and Shock Effects Testing

Another area of AFWL nuclear weapons effects testing was the study of shock and blast effects on ground-based systems and facilities (Figure 95: Blast and shock effects diagram) in order to gather information on hardening these structures, one of the strategies inaugurated in the early 1960s in preparation for the event of a nuclear attack (NSC 1960). These studies played an integral role in the evaluation of existing and proposed USAF ground-based systems. For example, the majority of nuclear weapons effects research projects from 1963 to 1976 focused on evaluating the hardness of the Minuteman facilities. The Structures Division of the AFSWC’s Research Directorate transferred to AFWL to conduct this work.

Upon AFWL’s establishment, the Structures Division of AFSWC’s Research Directorate was transferred to the new laboratory. It became the Structures Branch of AFWL’s Research Division, and then in 1964 it became the Civil Engineering Branch of the same division. In 1965, it was moved from the Research Division to the Development Division (AFWL History Office n.d.b). By 1970, it became its own division, the Civil Engineering Research Division, with four branches: Experimental; Facility Survivability; Aerospace Facilities; and Programs Control (Air Force Weapons Laboratory 1987). The focus was on protective structures such as missile storage sites and hardened command posts like the North American Aerospace Defense Command (NORAD) center inside Cheyenne Mountain in Colorado.

8.2.2.1 The Shock Tube Facility

Along with the transfer of the AFSWC's Structures Division, AFWL also received the Eric H. Wang Shock Tube Facility, which it renamed the Eric H. Wang Civil Engineering Research Facility (CERF) in 1965 (AFWL 1971). The mission was to determine the threat to, vulnerability of, and new construction criteria for protective structures. For this, scientists conducted experimental research into ground shock phenomena (AFWL 1966).

By mid-1964 there were seven shock tubes of varying sizes, which delivered shock waves ranging from 20 pounds per square inch (psi) to 50,000 psi. Besides the devices, the CERF added a Soils Engineering Laboratory, Models Laboratory, and Electronics Laboratory. The Soils Engineering Laboratory was used to determine the static and dynamic properties of soil as an environment for protective structures. The Models Laboratory conducted both destructive and non-destructive tests on construction materials used in building protective structures, concrete being the most common test subject (AFWL 1966). Examples of work in the 1960s involved the testing of Minuteman silos, for example the blast doors and other components. The Electronics Laboratory provided instrumentation and recording support, such as testing and calibration, for the facility.

Other projects included performance testing for the NORAD blast valves to determine closing times, strength, and general characteristics to ensure the survivability of the command center. The blast valves protected air, water, and wastewater utilities entering or exiting the command center and could be closed by overpressure (Cheyenne Mountain Operations Center n.d.). For Sandia Laboratory, the CERF also tested the response of reentry vehicles (the parts of missiles carrying nuclear warheads that reenter the earth's atmosphere) to shock loadings.

8.2.2.2 High Explosive Simulation Technique

The High Explosive Simulation Technique (HEST) was a project carried on by the Civil Engineering Branch in addition to experiments with shock tubes. HEST developed primarily out of concern for the survivability of Minuteman silos and associated complexes. The Civil Engineering Branch endeavored to induce shock-like motions into the ground with such a controlled force that scientists could gather data from instrumentation regarding potential effects on the Minuteman facilities (Figure 96: HEST testing) (AFWL 1978).

Created by airblast-induced ground shock, initial HEST tests produced overpressures of 300 psi. The first test took place in December 1964 on a scaled, one-quarter-size Minuteman silo. In December 1965, HEST I was conducted on an actual Minuteman silo in Wyoming (AFWL History Office n.d.b). Tests in the following years resulted in further refinement and development of HEST testing. Some of these took place at sites on or near KAFB, including McCormick Ranch and on the grounds adjoining the CERF. In 1966, AFWL ran a test at a Minuteman launch control facility in Nebraska, followed by a test on the M-28 Minuteman site in North Dakota the same year (Weitze 2001).

The Direct Induced High Explosive Simulation Technique [DIHEST] produced direct-induced ground shock. MiniDIHEST I was the lab's first attempt to develop this technique. It took place in April 1967 on Sandia Base. Its purpose was to determine if a vertical planar shock wave could be produced in soil by simultaneously detonating a buried vertical planar array of high explosives. MiniDIHEST II followed in July 1967, but neither produced a vertical planar stress wave. Planewave I, in October 1967, simulated direct induced ground shock in rock in the Estancia Valley (AFWL 1976).

ROCKTEST I and II, in 1968 and 1970, were high pressure tests for superhard silos in rock out in Estancia Valley. A contractor described the experimental facility, which gives some insight into the experiments:

> The achievement of specific blast effect phenomena required the construction of an earth supporting structure of limestone and shale. Earth material was compacted against the exterior walls and on the top of the structure to a specified density. A framework of steel columns, beams and decking was designed to support the total surcharge load. Detonating card was installed in the cavity of the structure in such amounts and configurations that when detonated, a shock wave would propogate throughout the cavity at the requisite velocity….The end result of the test was the collection of data relating to blast and shock-wave effects on structures, materials and devices (AFWL 1976).

Other techniques included the Berm-Loaded Explosive Technique [BLEST] and Dynamic Airblast Simulator [DABS], both of which allowed the laboratory to simulate much higher overpressures. Each of these tests focused on improving the hardness of Minuteman missile complexes (Air Force Weapons Laboratory History Office 1988).

8.2.2.3 AFWL Civil Engineering and the Vietnam War

The more conventional, civil engineering side of the division involved various projects. The 1964 Alaskan earthquake precipitated a study to evaluate its resulting damage and make recommendations for future earthquake-resistant construction. In addition, as the war in Southeast Asia began to heat up, so did research in conventional weapons effects and combat support.

Work began in 1965 on protective shelters for personnel and aircraft. Initial studies concentrated on finding the best construction techniques and materials for aircraft revetments. In 1966, AFWL began research on aircraft shelters focusing on protection against automatic weapons fire and mortars and advancing to stopping 122-millimeter rockets and 750-pound bombs. Developing means of sealing the opening of the aircraft shelters began in 1968; materials tested ranged from a curtain of ballistic nylon to large doors made of aluminum and steel plates. The following year, the laboratory perfected an easily constructed earth and steel shelter for personnel (Air Force Weapons Laboratory History Office 1988).

To support ground troops in Vietnam, AFWL adapted surplus 10,000-pound bombs to clear land for helicopter landing zones (Air Force Weapons Laboratory History Office 1988). The bombs were fitted with fuze extensions to provide detonation from one to six feet above the ground, maximizing the blast effect (Wikipedia n.d.). Named "Daisy Cutters," they were dropped from

C-130s, and tested first in Southeast Asia in October 1968. A larger version of this “Combat Trap” device entered combat in the spring of 1970 and used a 15,000-pound bomb with an extended fuse to detonate approximately seven feet above the ground (Air Force Weapons Laboratory History Office 1988).

Additional AFWL efforts to support activity in Vietnam included improved bomb ejector racks, release systems, and armament control systems. AFWL also modified conventional munitions handling equipment and developed a device that enabled air controllers to detect camouflaged soldiers and equipment (Air Force Weapons Laboratory History Office 1988).

8.2.3 Other Simulated Testing

In addition to studying the effects of EMP, AFWL also studied the effects of the neutrons, gammas, and X-rays produced by nuclear detonations. These produced transient—or short-lived—radiation effects in electronics (FAS n.d.b). These effects could disrupt or destroy sensitive electronic equipment. These various effects were tested on electronic components, circuits, and systems in simulation facilities built for these tests. AFWL worked on developing hardening techniques for enhancing the survivability of aerospace systems. This involved generating X-ray environments and producing gamma radiation simulation through flash X-ray devices (AFWL 1965b).

To study transient radiation effects, AFWL built a Transient Radiation Effects on Electronics (TREE) Facility in the mid-1960s. It housed devices for producing X-ray and other radiation effects on electronic components. The laboratory had the capabilities to irradiate any component that could be affected by transient radiation and then measure and analyze the data.

AFWL also experimented with pulsed power in order to study X-rays. Pulsed power consists of generating very high voltages and very high currents in very short periods of time. Pulsed power systems are described by the amount of energy they store in joules or the power they deliver in watts. To produce a high level of X-rays similar to a nuclear weapon, an electron beam is generated by a pulsed power system and aimed at a heavy metal target, such as tantalum. As the electrons are slowed down or stopped by the heavy metal, X-rays are produced (Air Force Research Laboratory 2002).

In 1970, AFWL took over the Pulserad 1590 (Pulserad) from the AFSWC. The Pulserad was a pulsed power machine that produced X-rays for studies of the hardness levels of ICBMs and ABM guidance computers. The Pulserad could provide 1 trillion watts, or 1 terawatt, of pulsed electrical power. This experimentation continued until 1976, when the Pulserad was modified to produce electron beams for studies of beam propagation in the atmosphere. It was mothballed in the late 1970s (AFWL, History Office 1988).

In 1971, the lab created SHIVA I, a pulsed power source to produce intense X-rays. A going concern for the USAF and DoD was that satellites and reentry vehicles passing through a nuclear environment in space would be damaged by the X-rays produced by that environment. Because X-rays cause approximately 80 percent of the damage caused by a nuclear bomb, R&D of a workable X-ray device was considered an urgent goal. SHIVA I was also an alternate to underground testing of the same nuclear effects, a process that was considerably more expensive (AFWL 1977).

SHIVA I had four “arms” of capacitor banks. The name SHIVA was a reference to the multi-limbed Hindu god known as “the destroyer of worlds” (McKenna 1999). By 1977, SHIVA I produced 100 kilojoules of X-rays. SHIVA I was rated “the highest energy-producing machine in the world” (AFWL 1977).

AFWL also made major scientific and technical contributions to understanding natural and man-made radiation in space in a series of satellite flights and space probes from 1963 to 1973. In the mid-1960s, the mission was to determine the nuclear radiation environment and the doses to which humans would be exposed in the atmosphere and in space as a result of nuclear weapons or power devices or natural radiation belts (AFWL 1965b).

The AFWL’s Space Physics and Biophysics Division instrumented Atlas payloads with particle counters that measured electrons in the earth’s inner Van Allen belts [sources of intense radiation surrounding the earth discovered in 1958 and consisting of high-energy charged particles trapped in the earth’s magnetic field that follow roughly helical paths], studied the hazards to manned spaceflight posed by solar flares, and measured the increased radiation caused by nuclear explosions in space.

In 1965 and 1966, Gemini astronauts used AFWL sensors to monitor radiation received during their flights and to measure the Van Allen belts and cosmic ray radiation. Launched by a converted Titan 2 missile, Gemini was the most sophisticated spacecraft then created. The Gemini missions were firsts for NASA: Gemini astronauts accomplished the first space rendezvous, the first two-week space mission, and the first space docking (Figure 97: Gemini IV). This all occurred in preparation for the first lunar landing by the Apollo mission in 1969. To learn more about radiation effects, the Apollo and subsequent Skylab II astronauts used AFWL dosimeters, spectrometers, and other sensors to study the effects of prolonged spaceflight on humans. Using the results from this mission, AFWL then was able to develop and test analytic computer transport codes capable of predicting the level of radiation that future astronauts would face (AFWL, History Office 1988).

8.2.4 Laser Technology

Laser R&D became a mission for AFWL during the 1960s and was its main focus into the 1970s. The term “laser” is an acronym for Light Amplification by Stimulated Emission of Radiation. The difference between laser light and white light (e.g., a standard light bulb) is that a laser is monochromatic (all light is of a single wavelength), directional (low divergence from its source), and coherent. These characteristics allow the light to maintain high beam intensities over long ranges (Princeton University n.d.). Three conditions are necessary for “lasing” to occur:

1) A gas, liquid, or solid medium in which the beam is produced;
2) An intense energy source, usually a chemical reaction or electricity to excite the medium; and

3) A “resonator”—a chamber designed to extract precise optical energy in the form of a beam (Duffner 1997).

To create a laser beam, energy is pumped into the chosen medium, causing a population inversion, which occurs when more of the material’s electrons move into an excited state (an unstable orbit) rather than a stable state. The atoms with excited electrons have a tendency to return to their normal state; as they return they release energy in the form of a photon. When the photon is released it collides with another excited atom, at the exact same wavelength and frequency, and causes that atom to give up its photon. These two photons set up a chain reaction of photons releasing from the lasing medium. It is the chain reaction of the photons that creates the light of a laser beam. The intensity of the beam grows as more photons are released, and this intensity increases exponentially. The control and buildup of the photons and resulting laser beam takes place in a resonator (Duffner 1997).

Early in the 1960s, the military began to view lasers as potentially superior to conventional weapons because of lasers’ intensity over great distances and envisioned developing them for ballistic missile defense, as well as anti-satellite and anti-aircraft missions. To investigate the possibilities, the DoD sponsored a conference on laser technology in November 1963. This was the first conference on lasers, and DoD employees presented only 8 of the 43 papers. This ratio of papers demonstrated that private industry had pioneered laser R&D programs. Now that the military had become interested in the potential of lasers, the DoD took action to emerge as a prominent player in the industry (Duffner 1997).

Two specific weapons development facets of lasers appealed to the DoD:

1) They travel over long distances at the speed of light, which means that large amounts of energy can be delivered to a target (long or short range) almost instantaneously; and
2) Lasers are highly selective weapons because their energy and destructive power are concentrated on one small area; as such they are considered “clean weapons” with much less potential for collateral damage and civilian casualties. Because of this, politically, they are not seen as weapons of mass destruction (Duffner 1997).

By 1968 the DoD had significantly advanced its role in laser research, and that year John Foster, the director of Defense Research and Engineering at the DoD, met with the Defense Science Board (DSB) to discuss the development of a Gas Dynamic Laser (GDL) for the three military services. GDLs are high-energy lasers (output of 20 kilowatts or higher) and include a gas-filled tube with an electrical current applied to excite the gas atoms, and a supersonic nozzle (such as those used in rockets) to extrude the light beam (Duffner 1997; Princeton University n.d.). The DSB envisioned that each service would develop and tailor a laser for its own special mission. The resulting GDL program was titled “EIGHTH CARD.” This name originated from seven-card stud poker. The man with an eighth card in a seven-card game would have a distinct advantage, and in the Cold War this was a strategic advantage over the Soviet Union that the U.S. intended to take. In the EIGHTH CARD program three identical carbon dioxide GDLs were to be developed and given to the Navy, Army, and USAF to tailor to their own needs. As a result, the military GDL was dubbed the Tri-Service Laser (TSL), and AFWL was given the lead-lab responsibility for developing the USAF's GDL (Duffner 1997).

8.2.4.1 The Gas Dynamic Laser and Starfire (Sandia) Optical Range

In 1968, the USAF authorized the AFWL to design, build, and fire a GDL capable of engaging targets that were static or in motion. In May 1969, the AEC entered into an agreement with the AFWL to allow for the construction of an optical test range for high-energy laser R&D on Sandia Base lands. The Advanced Radiation Technology Office of the AFWL, which was created to guide research on gas dynamic, electric discharge, and chemical lasers, opened Sandia Optical Range (SOR) to test laser devices and their effects. SOR became fully operational in March 1971 (Duffner 1997).

SOR was the first major USAF high-energy laser R&D facility. The location, then, as now, is bounded on the east, south, and north by the Manzano and Manzanita Mountains on KAFB land; the national forest to the east; and Isleta Indian Reservation to the south (Figure 98: Starfire Optical Range).

The Advanced Radiation Technology Office at AFWL built its TSL at SOR in 1971, naming it the Air Force Laser (AFL). The AFL was an experimental GDL: a high-energy thermally pumped laser in which carbon monoxide was oxidized in a combustion chamber to produce a high temperature and high-pressure carbon dioxide. The photons released from the carbon dioxide were then extruded as optical energy, a laser, as the molecules passed through a supersonic nozzle (Ristvet 1991).

Mating of the AFL and Field Test Telescope (FTT)—the first step toward shooting down an aerial target with a laser—took place in October 1972. The FTT was a three-gimballed, two-gyroscope telescope. The gyroscopes spin in different directions and on different axes and keep their focal point as long as they spin, while the gimbals are movable frames that support the gyroscopes to keep them from rolling, pitching, or turning. The outer gimbal provided coarse azimuth and elevation adjustments while the inner gimbals allowed for fine-tuning of azimuth and elevation (Duffner 1997). Basically the gimbals and gyroscopes kept the telescope stable so it could move with and lock on to a target. The FTT was designed to point the high-energy laser beam generated by the AFL to various targets located at sites east of the AFL with ranges of 350 meters (m), 750 m, and one and two miles, as well as moving targets. Early moving targets included a target board, roughly the size of a wallet-size photo, mounted on a 30-foot rotoplane. Resembling a windmill contraption, the arm of the rotoplane rotated the target 360 degrees at 25 revolutions per minute (Duffner 1997).

The successful mating of the AFL and FTT in 1972 was a milestone in the USAF high-energy laser research. That same year, AFSC assigned responsibility for the USAF's portion of the DoD's high-energy laser program to AFWL. AFWL scientists were determined to use the AFL to shoot down a drone flying over the SOR (Duffner 1997). The success of this program depended on three milestones:

1) An FTT that could track a moving target and accurately point a CO_2 beam to hit the target;
2) A TSL that could produce a high-powered beam with good beam quality (tightly focused);
3) Integration of the TSL and FTT in a manner that could accurately engage a moving target (Duffner 1997).

A year later, in November 1973, the AFWL met the three milestones and succeeded in the first shoot down of an aerial target by a laser. The Drone Experimental Laser Test and Assessment (Project DELTA), which consisted of 14 drone tests, demonstrated that the integrated FTT/AFL system could track, point, and deliver a laser beam to a moving target. The tests used a remote-controlled Northrop MQM-33B Radio Controlled Aerial Target (RCAT). RCAT was over 12 feet long with a weight of 248 pounds and could fly at a speed of 200 miles an hour. In the final Project DELTA test, the laser delivered enough energy to cause the drone's specially fitted fuel tank, resembling that of an F-4 aircraft, to explode. This Project DELTA accomplishment renewed political and military confidence in the development of laser weapons and established the advanced level of the USAF laser programs (Duffner 1997).

8.2.4.2 Airborne Laser Laboratory

When the USAF became involved with lasers, the leadership set up a program of parallel R&D so that they could take advantage of breakthroughs as they occurred. Thus, early USAF laser work was diversified to include solid-state, gas dynamic, and electric discharge lasers, as well as other projects investigating optics, beam diagnostics, and conceptual designs. These diverse laser studies and Project DELTA's successful mating of the AFL with the FTT led AFSC to authorize AFWL to move forward with the development of hardware for an airborne demonstration. While a ground laser could track and engage a moving target, an airborne laser had the added difficulties of vibrations, beam propagation, and pointing a laser from an aerial platform. In order to follow a similar milestone approach that was used for the ground-based laser, Lt. Colonel Lamberson, one of the primary leaders in the laser program, identified three cycles for development of the Airborne Laser Laboratory (ALL).

1) Cycle I: demonstrate that an Airborne Pointer and Tracker (APT) could accurately track a moving aerial target;
2) Cycle II: align a low-power laser with the APT and direct the beam from the aircraft to an aerial target;
3) Cycle III: combine a high-power laser with the APT to shoot down air-to-air missiles (Duffner 1997).

Development of the ALL became the centerpiece of AFWL's laser program in the 1970s. The ALL term was coined in 1972, and the ALL program began with Cycle I testing in 1973 and ended with the completion of Cycle III in September 1983. The ALL was a modified NKC-135 (the equivalent of a commercial Boeing 707) equipped with a GDL and an APT, a tracking system concept that had been pursued by the small laser team at the AFWL as early as 1965 (Figure 99: Airborne Laser Laboratory). The APT included four gimbals and was basically the next-generation and more-complex version of the FTT (Duffner 1997).

The APT modification to the ALL was tested extensively, including many wind tunnel and flight tests (by General Dynamics and Edwards AFB), before being installed on the NKC-135. During the first week of March 1973 the APT and the ALL arrived at KAFB, and three weeks later the APT was installed in the aircraft. During April ground tests of the APT were conducted and in May airborne tests began; these were the first tests with the marriage of the APT and the ALL, as the previous tests had used a "dummy" APT. In November 1973 AFWL leadership determined a platform of APT tracking performance sufficient to officially record the Cycle I milestone as complete (Duffner 1997).

The next step, Cycle II, was to prove that the ALL could focus and direct a 150-watt CO_2 electric discharge laser with enough precision to hold the beam steady on a very small spot on a moving target. To achieve this, AFWL had to direct the beam through the aperture of the APT, a task that was complicated by the vibration of the aircraft. During testing, the four gimbals and their hydraulic action were fine-tuned and mirror mounts inside the APT were stiffened to correct optical misalignments. As with Cycle I, Cycle II was ground-tested. Laboratory testing occurred in the 400 area of KAFB and initial ground tests in hangar 1001, while the hangar at the Advanced Radiation Test Facility (ARTF) at the southeast corner of the runway was being constructed. ARTF was used for later Cycle II ground tests that aimed the APT from the ARTF test pad to a target in the atmosphere in order to calibrate aircraft instruments in preparation for flight tests. These flights tests took place from January to July 1975, with the first "good" beam generation occurring in March. Cycle II testing ended in 1976, and although the airborne tests demonstrated the need to upgrade the tracker, the optical quality of the mirrors, and the stabilization of the APT, they clearly proved that a laser could be accurately pointed in an airborne environment. After 1977, work continued on the ALL as part of Cycle III, which would reach its goal in 1983 (Duffner 1997).

8.3 KAFB, Sandia Base and Manzano Base Merger

In July 1971, the land from both Sandia Base and Manzano Base was incorporated into KAFB. During the early 1970s, KAFB evolved essentially into an R&D installation, hosting other military organizations as space permitted. The Field Command of the Defense Nuclear Agency, successor to the Defense Atomic Support Agency, was relieved of its host duties at Sandia and Manzano Bases and became a tenant on KAFB.

8.3.1 Manzano Storage Area

After 1962, Manzano Base's underground facilities began to be used for other purposes, including testing and storage for Sandia Laboratory. Because weapons were being designed increasingly maintenance-free, the elaborate underground facilities constructed for maintenance and modification of nuclear weapons had become obsolete (Verhaaren 1998).

With the 1971 merger of KAFB, Manzano Base became the Manzano "area" of KAFB. Operations at Manzano remained relatively unchanged, but organizational changes were significant. Air Force Logistics Command (AFLC) assumed maintenance responsibilities through its 3098th Aviation Depot Squadron, replacing the 1094th Aviation Depot Group, which had operated under FC/DASA. Support functions for the area became the responsibility of AFSC's 4900th Air Base Group, and under this group, the 4900th Security Police Squadron (SPS) became directly responsible for Manzano security.

With the merger, it became increasingly less necessary to maintain a separate set of support facilities for the Manzano area, and a number of structures fell into disuse during the 1970s (Verhaaren 1998). For example, the Manzano base exchange building was vacant by 1973, except for a communications facility in the basement (Verhaaren 1998).

Also during 1971, weapons maintenance activities from the four plants at the Manzano area were consolidated into just two plants, Plants 3 and 4, which remained in use until after the end of the Cold War (1991 and 1992, respectively). After the consolidation, part of Plant 1 was used by the security police as a communications center from 1971 through October 1992. Sandia Laboratories, as it had been renamed in 1969, continued to use the underground plants for testing and storage. And Manzano area continued to function as storage and maintenance areas, but for an increasingly diverse array of weapons and other materials (Verhaaren, 1998).

8.3.2 Sandia Laboratory

During the 1960s, Sandia Laboratory had far fewer weapons to design than during the 1950s. Sandia and its partner laboratories had but one new bomb design—the B61. It was a program to design a lightweight tactical thermonuclear bomb. The B61 provided for laydown delivery at low altitudes by high-speed USAF and U.S. Navy aircraft, and multiple-carriage by SAC bombers (Johnson 1997). Much of Sandia Laboratory's later advanced system development projects used the B61 as a building block in novel configurations as a missile warhead or extended range bomb. It was believed that using existing designs would keep development costs and time to a minimum, would not require testing new nuclear packages, and would lower demands on the AEC production complex (Johnson 1997).

Ballistic and antiballistic missiles received top priority throughout the 1960s, as reflected in Sandia Laboratory's weapon engineering programs. Sandia Laboratory performed engineering development for warheads carried by the Minuteman and Titan ICBMs and the U.S. Navy's SLBMs. In the late 1960s, Sandia Laboratory completed the same type of work for the Sprint and Spartan missile warheads for the ABM weapon system known as Safeguard.

In 1965, Sandia Laboratory opened Thunder Range in Coyote Canyon, south of its main technical areas. Thunder Range was created to test missile warhead system components for their vulnerability to damage from enemy antimissile systems. It had reusable steel shock tubes named Thunderpipes, one-shot plywood structures called Thundertubes, and steel-lined boreholes in the ground dubbed Thunderwells. High explosives detonated at one end sent blast shocks through the pipes or tubes to strike the components under test at the far end. The sound of the explosions was like thunder as components for Safeguard ABM systems were being tested (Johnson 1997).

Senior management also sought to diversify Sandia Laboratory's efforts into programs outside its traditional nuclear weapons responsibilities. One of these efforts involved participation in a significant non-weapons project, the Vela Uniform Program (Vela). The Vela program was established so that the U.S. could detect Soviet violations of the moratorium and originally had two objectives: (1) to improve the nation's ability to detect, identify, and locate underground nuclear tests; and (2) to distinguish the associated seismic activity of a nuclear explosion from that of an earthquake (Ogle 1985). Eventually the Vela verification program took three tactics—the detection of secret testing in space, in the atmosphere, and underground—which covered the areas of the 1958 moratorium. Sandia Laboratory played a role in the seismic detection of underground testing and, in a joint program with LASL, worked on developing and installing atmospheric and space nuclear burst detectors and logic systems on Air Force space satellites (Johnson 1997). Vela surveillance satellites were first launched in 1963.

The reflection of this advance into the research vanguard with less emphasis on production responsibilities inspired a name change in 1969. The name Sandia Laboratories was coined to replace Sandia Corporation as the proper organizational name, and replaced Sandia Laboratory as the common moniker (Johnson 1997).

8.3.3 Defense Atomic Support Agency

Under FC/DASA, HQ Sandia Base was responsible for base hosting and housekeeping. Sandia Base Military Police Command was responsible for law enforcement and base security. During the FC/DASA years, the construction of permanent buildings that had begun under AFSWP was completed. This arrangement remained the same during the 1960s, except for a three-year period from 1964 to the summer of 1967. During that time, HQ, Sandia Base and the Sandia Base Military Police Command were absorbed into units directly under FC/DASA operational control. This move was in response to criticism leveled at DASA by Congress for the agency's expanding organizational structure (Figure 100: DASA organization circa late 1960s). On 1 June 1967, HQ Sandia Base resumed physical control of the base. This remained the setup until the base merger with KAFB in 1971 (Alberts and Putnam 1985).

During the 1960s, FC/DASA concerned itself primarily with direction of the military nuclear programs and with running the Nuclear Weapons School at Sandia Base. The school offered initial and refresher training on weapons in the national stockpile to special weapons officers and enlisted technicians from all the armed services (Alberts and Putnam 1985). This training involved virtually every aspect of weapons and weapons handling, including use, maintenance, and transport (Harry Davidson, 12 December 2001 interview with Karen Van Citters and Kristen Bisson). The school made use of lecture, classroom, and demonstration facilities, located adjacent to Sandia Laboratory's Tech Area I. School personnel were assigned to the base permanently from the individual services (Alberts and Putnam 1985). The school also had a highly trained Nuclear Emergency Team (NET), composed primarily of instructors. NET was called on to assist local NET teams in the event of major accidents and to train local and regional NET teams (AFSWC 1970).

In 1965 and 1966, DASA developed common nuclear stockpile reporting standards for all the military services. And in 1966, FC/DASA was given the responsibility of tracking the entire U.S. nuclear stockpile (Defense Special Weapons Agency 1997). The longtime custody battle between the military and the AEC was about to end. In 1967, President Johnson ordered the AEC to deliver all completed weapons to the DoD, ending the era of civilian custody of the nuclear arsenal (Defense Threat Reduction Agency 2001). As a result, in the late 1960s, the JCS authorized the transfer of all war reserve nuclear weapons to service custody. The services began training their own nuclear weapons personnel at other bases.

At Sandia Base, the Nuclear Weapons School became just a briefing and orientation center. With this change, there were many vacated school and office facilities. FC/DASA's role on Sandia Base had become far less intensive than the early days of the FC/AFSWP. Since KAFB was adjacent to Sandia Base's western boundary, it was decided to merge the two bases under USAF control.

In 1971, DASA was reorganized and became the Defense Nuclear Agency (DNA). The new agency was to be solely responsible for sponsoring all future effects tests. Other duties included consolidated management of the DoD nuclear weapons stockpile, management of DoD nuclear weapons testing and nuclear weapons effects research programs, and providing staff advice and assistance on nuclear weapons matters to the government (Defense Threat Reduction Agency 2001).

The same year, Sandia and Manzano Bases were disestablished as DASA units and transferred to KAFB. In 1973, FC/DNA's Nuclear Weapons School was turned over to the USAF for operation (Defense Threat Reduction Agency 2001). By 1975, the number of DASA personnel which had reached 11,000 had declined to about 1,800 (Defense Special Weapons Agency 1997).

8.3.4 The Merger

The merger of Sandia Base, Manzano Base, and KAFB became effective 1 July 1971. According to the "Plan for Merger of KAFB, Sandia, Manzano" (KAFB 1971) officials from both the AFSWC and FC/DASA formed a steering committee in 1970 to handle the details of the merger, including basic policies and procedures. The AFSWC was to assume all of FC/DASA's responsibilities concerning Sandia and Manzano bases. As such, the merger involved extensive transfer of everything from civilian personnel to base vehicles.

Prior to the merger, Sandia Base encompassed approximately 47,000 acres and 4.5 million square feet of structures. Manzano Base and KAFB each had just under 3,000 acres of land. But while Manzano Base had less than 1 million square feet of structures, KAFB had 4.1 million. These assets were officially transferred in July 1971 (KAFB 1971). With the merger, Sandia Laboratories and the newly redesignated FC/DNA became major tenants of KAFB.

8.4 Air Force Contract Management Division

The AFSWC remained in control of KAFB as base host from 1971 until its disestablishment in 1976 (Air Force Research Laboratory, Space Vehicles Directorate, Historical Information Office 1998). Its disbandment was officially announced in November 1974 by then-Secretary of Defense James Schlesinger, who detailed that the AFSWC would be inactivated in 1976. The Air Force Contract Management Division (AFCMD), whose mission was to perform contract management in support of systems acquisition for the AFSC, assumed base host responsibilities (Air Force Contract Management Division 1985).

AFCMD transferred to KAFB in 1972, moving into facilities and workspace vacated by the DASA Nuclear Weapons School on the installation's east side. For 16 months after the 1974 pronouncement, AFCMD prepared for its additional mission. This preparation included transferring the experienced 4900th Air Base Group from AFSWC to AFCMD as the 4900th Air Base Wing (Air Force Contract Management Division 1985).

With the 1976 disestablishment of the AFSWC, AFCMD maintained host duties for KAFB for slightly more than a year until its parent organization, AFSC, asked to be relieved of responsibility for KAFB. Negotiations then took place concerning which major command would assume the host responsibilities for KAFB. In July 1977, the base was transferred from AFSC to MAC and the 4900th Air Base Wing was inactivated (Air Force Contract Management Division 1985).

In 1980, still headquartered at KAFB, the AFCMD administered more than 30,000 USAF contracts, with a face value of nearly $100 billion, for work on fighter, bomber, cargo, and communications aircraft; ballistic and air-launched missiles; radar systems; space vehicles; and jet engines. In order to do their job, the personnel of AFCMD were assigned full-time to the manufacturing facilities of major aerospace corporations throughout the U.S. in order to guarantee the quality of the products ordered by the USAF and the prompt delivery of the products at contract cost (AFSC 1980). By 1987, the AFCMD was handling some 36,000 active contracts with a face value of approximately $245 billion (AFSC 1988).

8.5 Air Force Test and Evaluation Center

In 1974, the Air Force Test and Evaluation Center (AFTEC) was organized at KAFB "to direct and oversee operational testing of emerging Air Force aircraft and systems" (Alberts and Putnam 1985). Pressure on the armed services to prioritize their operational test and evaluation functions had spurred the organization of this independent agency (Department of the Air Force n.d.). It was specified by the USAF that AFTEC would be "independent of those Air Force commands which develop, procure, and use Air Force weapons and subsystems," which would "help insure complete objectivity" (AFOTEC 1999).

The issue of inadequate operational testing and evaluation (OT&E) of military equipment was not limited to just the USAF. A DoD-commissioned study had discovered that in Vietnam, all but one of 22 weapons systems examined in the study had suffered major deficiencies in the field. Critics attributed this to a lack of proper evaluation, as only three of those weapons systems had undergone OT&E before production (AFOTEC 1999; Department of the Air Force n.d.).

The word "operational" was added to the center's title in 1983 to indicate more clearly its mission and to avoid confusion with development testing and evaluation. The Air Force Operational Test and Evaluation Center (AFOTEC) was a separate operating agency that reported to the Air Force Chief of Staff (Bright 1992).

AFOTEC's evaluations of how well systems met operational requirements provided a link between the developer and the user. Operational tests were designed to address critical issues regarding systems' performances in combat-like environments when operated by field personnel.

The purpose of AFOTEC was to answer questions about how safe, effective, reliable, maintainable, compatible, and logistically supportable new USAF systems would be for acquisition purposes.

The F-16 fighter and the cruise missile were among the weapons the center tested in the early 1980s (*Albuquerque Journal* 1981). The KAFB Base Information Resources and Economic Impact statement of FY 1984 reported that AFOTEC was then "evaluating more than 90 major systems. Among them are the Peacemaker missile, the HH-60 helicopter, a new version of the F-15 advanced medium range air-to-air missile, the Maverick air-to-ground missile, TRI-TAC multiservice communication system and the B-1 bomber" (KAFB 1984).

8.6 Rescue and Recovery comes to KAFB

In 1976, shortly after the arrival on base of AFTEC, the 1550th Aircrew Training and Test Wing (ATTW) of MAC's Aerospace Rescue and Recovery Service moved from Hill AFB in Utah to KAFB. The unit brought increased flying activity to the base, which then encouraged its parent organization, MAC, to take on the responsibility for KAFB in 1977 (Alberts and Putnam 1985). The 1550th ATTW was responsible for all USAF advanced helicopter training. The unit also conducted fixed-wing rescue and recovery training in the HC-130 Hercules aircraft, as well as testing new helicopter systems and techniques (Alberts and Putnam 1985).

In the mid-1980s, the wing was equipped with a fleet of 32 aircraft, which included five HC-130 rescue transports, eight H-3 and seven H-53 heavy lift helicopters or "Jolly Green Giants," and six H-1F and six H1-N light lift helicopters or "Hueys." Flying training in the 1550th ATTW included basic aircraft qualifications, instrument and transition flying, aerial refueling of the Jolly Green Giant helicopters by HC-130 tankers, combat tactics, air drops of pararescue personnel and equipment, land-water helicopter hoist training, simulated search missions, and locating and intercepting lost or distressed aircraft (KAFB 1985).

Initial training for all USAF Pararescuemen was also given at KAFB. The training included classes in mountain climbing, survival, navigation, scuba-equipped parachute jumps, hoisting from a helicopter, emergency medicine, combat tactics, and weapons. In 1985, the wing graduated approximately 1,250 students from its 34 formal courses (KAFB 1985).

8.7 New Mexico Air National Guard

In 1964 the New Mexico ANG was reassigned from ADC to TAC. Its aircraft was converted from the F-100A to the F-100C, both day fighters. The F-100C was the USAF's first operational aircraft capable of flying faster than the speed of sound. The F-100C featured advances like an in-flight refueling system, provisions for extra fuel drop tanks and bombs under the wings, and an improved electronic bombing system (United States Air Force Museum n.d.e).

Also during 1964 the group continued increased readiness under Operation BEEF BROTH (Metzgar 1972). Operation BEEF BROTH was the building of a strategic reserve in the U.S. for TAC units in Vietnam. In 1965 the ANG group moved from facilities dispersed throughout KAFB into their permanent headquarters, the current ANG complex. The new complex encompassed 43 acres and was said to "increase efficiency and unity" (*Jet Stream* 1965).

In 1968, President Johnson ordered numerous ANG units to active duty as a result of the Pueblo Crisis. The Pueblo Crisis was the attack and capture of the U.S.S. *Pueblo* by the North Koreans. The officers and crew were held in North Korea for 11 months. New Mexico ANG personnel were deployed to Tuy Hoa Air Base in Vietnam and other bases in South Korea. Between January 1968 and June 1969 the New Mexico ANG group flew over 6,000 combat missions in F-100s. For this the group was awarded more than 630 medals and decorations. The New Mexico ANG was released from federal active duty in June 1969 (Photo Science Inc. 1995).

In June 1970, the USAF asked the NM ANG to take over a largely U.S. Army air defense test and training support mission from the USAF at Holloman AFB. This was specifically to assume the mission of the 4758th Defense Systems Evaluation Squadron. As a result, Detachment I, HQ NM ANG was established at Holloman AFB (*Jet Stream* 1972). This detachment maintained a number of F-100Cs at Holloman to provide tactical training support to the U.S. Army's radar and anti-aircraft schools at Fort Bliss, Texas (Benolkin n.d.). This detachment continues to be based at Holloman AFB and works in cooperation with the U.S. Army.

In 1973 the NM ANG was the first ANG unit to receive the A-7D Corsair II, a single-engine transonic tactical fighter. It was developed primarily as a strike aircraft for close air support of combat troops (*Jet Stream* 1973). It could attack at low levels, had high speed/low altitude maneuverability, and was able to bomb accurately at maximum speeds of 500 mph.

8.8 The Navy continues KAFB Activities

In 1961, the U.S. Navy combined the NASWF with the Naval Nuclear Ordnance Evaluation Unit (NNOEU) that was stationed at China Lake to establish the Naval Weapons Evaluation Facility (NWEF) under the management control of the Bureau of Naval Weapons. NWEF became the U.S. Navy's primary testing and evaluation facility for all naval nuclear weapons and aircraft. At its peak on KAFB, NWEF occupied roughly seven acres and had more then 53,000 square feet of laboratory and administrative space, and 95,000 square feet of hangar space (Naval Air Warfare Center 1993).

Throughout its tenure, the NWEF evaluated weapons systems and aircraft, including air-, surface-, and subsurface-launched nuclear weapons and joint U.S. Army and U.S. Marine Corps amphibious nuclear weapons (Figure 101: Special weapons and aircraft combinations tested by NWEF). Emphasis was on stockpile-to-target support: Every aspect of a weapon's environment was examined, tested and evaluated, from handling and loading onto aircraft to aircraft compatibility, tactics, and safety methods.

In addition to its own facilities at KAFB, the NWEF also used non-naval-owned ranges and facilities for testing and evaluation purposes. The Tonopah Range in central Nevada, operated by Sandia Corporation for the AEC, was suited for studies of high-speed aircraft and ballistic-vehicle trajectory. The WSMR provided NWEF with electronic instrumentation for monitoring flight tests of air-launched weapons tested there. At KAFB, the NWEF took advantage of the

AFSWC's laboratories, as well as AFWL's Transient Radiation Effects on Electronics Test Facility and EMP test facilities. On occasion, NWEF also used the Salton Sea, El Centro, and China Lake ranges in California for flight tests (Naval Air Warfare Center 1993).

With its new designation in 1961, the NWEF's mission expanded to include safety studies on nuclear weapons handling, in addition to its special weapons work. The NWEF conducted extensive studies of nuclear weapons vulnerability. These included the effects on these weapons of environmental extremes, such as heat, cold, shock, and radiation. The results of these tests were used to establish safety standards and handling procedures for the naval fleet. In 1963, the NWEF took responsibility for the U.S. Navy's Nuclear Weapons Safety Program, which involved distributing safety information, investigating accidents, and assisting the Chief of Naval Operations in policy-making related to nuclear weapons (Naval Air Warfare Center 1993).

The NWEF also began setting standards for aviation ordnance safety and weapons compatibility for U.S. Navy and U.S. Marine Corps aircraft. In 1966, the NWEF took responsibility for certification of procedures integrating nuclear weapons with Navy aircraft. The NWEF proposed manuals and checklists for the loading of weapons and ordnance onto aircraft carriers, called Airborne Weapons/Stores Loading Manuals. These joined other publications of the NWEF, including weapons assembly and airborne weapons support equipment manuals.

8.8.1 Naval Weapons Evaluation Facility Departments

By the late 1960s, the NWEF was divided into five main departments:

- Aircraft Projects Department
- Aircraft Ordnance Department
- Weapons Systems Environments Department
- Surface, Subsurface and Amphibious Weapons Department
- Nuclear Safety Department.

The Aircraft Ordnance Department performed test and evaluation of loading and handling equipment and procedures for nuclear and non-nuclear weapons. It also evaluated nuclear weapons suspension and release systems in naval aircraft, and environmental problems related to arming aircraft with nuclear and non-nuclear weapons. In coordination with the Aircraft Projects Department, the Aircraft Ordnance Department also evaluated nuclear weapon suspension and release systems in naval aircraft from shipboard. For example, it conducted in-house as well as shipboard tests to certify a bomb hoist used aboard the U.S.S. *Nimitz* (Naval Air Warfare Center 1993).

NWEF began evaluation of ballistic missiles in the early 1960s. Ballistic missiles, when added to the nuclear-powered submarine, gave the U.S. Navy a greater offensive self-reliant striking power. The nuclear-powered ballistic missile submarine was seen as one of the most powerful symbols of the Cold War (Shiman 1997). The first U.S. Navy ballistic missile system was a nuclear powered submarine with an arsenal of 16 guided missiles armed with nuclear warheads, the Polaris SLBM system.

The Polaris A-1 became operational in late 1960, with the Polaris A-2 becoming operational in 1962 and the A-3 in 1964. In the early 1970s, the Poseidon succeeded the Polaris, and in the mid-1970s the Trident succeeded the Poseidon. Each new missile represented major advances in warheads and accuracy, and considerable testing by the NWEF for features such as vulnerability, weapon handling, loading, and accident prevention. As mentioned previously, this was done in-house at the NWEF and on board naval submarines.

The Aircraft Projects Department worked with aircraft that delivered nuclear weapons. Its studies led to the creation of new design criteria for more advanced aircraft-delivered nuclear weapons. The department planned and coordinated flights of weapons, both nuclear and non-nuclear. Flight-tests evaluated delivery maneuvers, delivery accuracy, aircraft and bomb vibration characteristics, aircraft and bomb arming and releasing systems, and aircraft safe-escape capability (Naval Air Warfare Center 1993).

Between 1967 and 1975, NWEF pilots flew 22 versions of 12 different aircraft types, including the A-3B, A-4E, A-4M, A-5A, A-6A, C-11A, F-4B, and the KA-6D. By 1975, NWEF had accumulated 17,000 accident-free flight hours over the seven-and-a-half year period (Naval Air Warfare Center 1993).

Also in the 1970s, the Aircraft Projects Department of NWEF began working directly with the DNA on aircraft testing. For DNA, NWEF set out to determine the structural response of A-4 aircraft to overpressure, blast, and thermal effects during a simulated 1-kiloton nuclear blast. The project was called Dice Throw. A follow-up project, Misty Picture, tested A-7 capability against a simulated 8-kiloton blast.

The Weapons System Environments Department conducted studies of the vulnerability of nuclear weapons. These included testing the effects of electromagnetic radiation, blast, fragmentation, fire, and nuclear explosions. The department prepared procedures and designed components to be used in the emergency destruction of nuclear weapons. The department’s civilian mathematicians, physicists, and engineers also studied new and advanced weapons for the U.S. Navy.

The Surface, Subsurface and Amphibious Weapons Department worked with weapons carried and launched by ships, with nuclear projectiles and artillery shells, and with atomic demolition devices used by the U.S. Navy and U.S. Marine Corps. The NWEF supported the installation and operation of the nuclear-capable version of the ASROC weapon system in three different launcher configurations on nearly 120 ships, including guided missile cruisers, destroyers, and frigates. The Surface, Subsurface and Amphibious Weapons Department also planned and conducted safety studies for all surface-launched, subsurface-launched and amphibious nuclear weapons systems of interest to the U.S. Navy. This resulted in handbooks and information about nuclear safety (Naval Air Warfare Center 1993).

The Nuclear Safety Department planned and coordinated the Navy Nuclear Weapons Safety Program, which had devolved onto the NWEF in 1963. The program organized safety studies of nuclear weapons systems and conducted symposia on the subject. The department also published a quarterly safety magazine titled *Nuclear Weapons Safety*. By 1968, the mission was to "maintain direct liaison at all levels of command within the Navy and other government agencies with respect to nuclear weapons safety" (Naval Air Warfare Center 1993).

8.8.2 Navy Laser Research

In January 1974, a distinctive partnership was formed under a U.S. Navy-USAF agreement when the first naval officer was assigned to NWEF to work with the USAF high-energy laser project. The Naval Sea Systems Command authorized the NWEF to administer the U.S. Navy's participation in the laser project at the AFWL at KAFB. Other officers soon joined the project. Continuing into the 1980s, this eventually led to the development of a U.S. Navy high-energy laser air weapon project (Naval Air Warfare Center 1993). In March 1978, the U.S. Navy shot down a missile launched near San Juan Capistrano, California with a chemical laser and precision pointer tracker. The laser employed was a 400-kilowatt deuterium fluoride high-energy chemical laser that had been built by TRW. The precision pointer tracker used in the mission had been built by Hughes. The target was a U.S. Army tube launched, optically tracked, wire-guided antitank missile (Duffner 1997).

9.0 A NEW DETERRENCE: JUNE 1977 – NOVEMBER 1989

Activities at KAFB during Phase IV of the Cold War era were varied (Figure 102: Phase IV Cold War Activities at KAFB). President Carter and General Secretary Brezhnev signed the SALT II agreement in the late 1970s, which attempted to attain parity between the superpowers by establishing numerically equal limits on nuclear weapons. These were:

- 2,400 equal aggregate limit on strategic nuclear delivery vehicles (ICBMs, SLBMs, and heavy bombers);
- 1,320 equal aggregate limit on MIRV systems;
- Ban on construction of new land-based ICBM launchers;
- Limits on deployment of new types of strategic offensive arms (Federation of American Scientists n.d.c).

Because of the Soviet invasion of Afghanistan in 1979, Senate ratification of the agreement was delayed, and on 30 January 1980 Carter pulled the treaty from consideration by the Senate. However, both parties promised to abide by the provisions of the treaty until 1986.

In 1980, Carter also reestablished Limited Nuclear War as the official U.S. military strategy through Presidential Directive 59. The strategy was similar to Kennedy's Flexible Response. Carter called his directive "countervailing strategy." This was a strategy that emphasized flexibility in the use of nuclear weapons, and the need to develop military options other than MAD or doing nothing.

President Reagan's election in 1980 dramatically changed foreign policy and military strategy. Carter and Ford had worked to achieve a state of parity between the two superpowers' nuclear arsenals, thereby strengthening the state of deterrence. President Reagan believed that the Soviet Union had been given an advantage through the treaties and suspected it did not adhere to them. So he suspended the SALT limitations and advocated an all-out military buildup as the only way to bargain with the Soviets. This foreign policy sought to exhaust, through an intensive military buildup, rather than to reform the Soviet Union. By destroying parity, Reagan was bordering on offsetting a balanced level of nuclear deterrence, which increased tensions between East and West (Lewis et. al 1995).

In 1982 Reagan began Strategic Arms Reduction Talks (START), which were based on a severe decrease in the number of nuclear weapons deployed. President Reagan believed that steep reductions, rather than limitations in the number of nuclear weapons each side deployed, would be the only reason to resume negotiations with the Soviets. In 1983, the Soviets walked out of START negotiations when they learned the U.S. was deploying Pershing II ballistic missiles and Tomahawk cruise missiles in Western Europe (Lewis et al. 1995).

Also in 1983, Reagan introduced his way to rid the world of ballistic missiles, the ultimate ABM – the SDI, a multi-billion dollar research program to determine if a defensive shield could be built to destroy incoming ballistic missiles and their warheads. It was based on the belief that if incoming missiles could be destroyed before reaching their targets, nuclear weapons would become strategically obsolete. While some believed the system would eliminate the threat of nuclear war by disarming any attempted nuclear strike, others claimed that it would destroy the strategic balance and increase the risk of nuclear war (Lewis et al. 1995). Because SDI proposed defending the U.S. from space, in part with lasers or directed energy beams to knock down nuclear-armed missiles, critics dubbed Reagan's initiative "Star Wars."

In 1985, Mikhail Gorbachev came into power as Soviet General Secretary, and during his tenure reversed the Soviet anti-Western viewpoint by inviting Western advice on the organization of a democratic government and a market economy. That same year, Reagan and Gorbachev issued a joint statement on arms reductions at the Geneva Summit. The goal was for a 50 percent reduction in nuclear arms. However, at the Reykjavik Summit in 1986, talks stalled over Reagan's refusal to limit the SDI research and testing.

By 1987, belief in the feasibility of a space shield was waning. Congress, clearly against it, denied any defense spending for projects that would violate the 1972 ABM Treaty, which was the second agreement of SALT I. Under the ABM Treaty only one missile site and the nation's capitol could be protected by an ABM system, and technological advances on ABM systems were prohibited. The same year, the U.S. and Soviet Union agreed to the Nuclear Risk Reduction Center Agreement and the Intermediate Range Nuclear Forces Treaty, eliminating all mid-range missiles and some short-range missile systems. The following year, 1988, talks resumed in Geneva between the U.S. and Soviet Union, where they were working on a joint draft of START. George Bush was elected president of the U.S. the same year.

In 1989, the Berlin Wall fell and hundreds of thousands of East Germans streamed into West Berlin. This was considered the symbolic end of the Cold War.

9.1 KAFB transfers from AFSC to MAC

Command of KAFB transferred from AFSC to MAC on 1 July 1977. MAC activated the 1606th Air Base Wing to assume base host duties. The 1606th Air Base Wing took over the 4900th Air Base Wing's operational and personnel structure, with some organizational modification. During the same year, the new wing began a major renovation of base housing in order to modernize the facilities (Alberts and Putnam 1985).

9.2 Air Force Space Command and the Air Force Weapons Laboratory

On 1 October 1982, the Air Force Space Technology Center (AFSTC) was established at KAFB to coordinate and manage research into Air Force space systems. It was to plan and execute "Air Force R&D programs in space technology, advanced nonconventional weapons and weapons effects, rocket propulsion and geophysics" (Air Force Research Laboratory, Space Vehicles Directorate, Historical Information Office 1998). The AFSTC operated under the oversight of the Space Systems Division of Air Force Systems Command (AFSC), located at Los Angeles AFB. The AFSTC supervised the AFWL, the Air Force Rocket Propulsion Laboratory at Edwards AFB in California, and the Air Force Geophysics Laboratory at Hanscom AFB in Massachusetts (Air Force Research Laboratory, Space Vehicles Directorate, Historical Information Office 1998).

The announcement for the new center was made two days after Secretary of State Alexander Haig revealed that the Soviet Union had made practice runs with several space weapons, including one that could destroy U.S. satellites (*Albuquerque Tribune,* 21 June 1982). The new AFSTC was responsible for military satellites, the anti-satellite program, military payloads orbited by space shuttles, the tracking of Soviet satellites, and other related programs.

In March 1983, President Reagan announced a major research effort to determine the feasibility of advanced defenses against ballistic missiles. There were four categories of weapons under the SDI program:

1) Space based lasers;
2) Ground based lasers;
3) Neutral particle beams; and
4) Lethality/countermeasures (Air Force Research Laboratory, Office of Public Affairs n.d.).

By fiscal year 1986, Reagan's SDI accounted for more than 60 percent of AFWL's budget (Air Force Research Laboratory, Space Vehicles Directorate, Historical Information Office 1998). Not only did the pace of work speed up, AFWL personnel were facing a greater degree of technical challenge.

The AFSTC's first staffers came from the Deputy for Technology Office at the Space Systems Division. They established the HQ's first technology programs. These were for space vehicle subsystems, advanced warning systems, missile surveillance technology, and advanced sensor demonstration. "Over the years, work continued to focus on spacecraft subsystems, with emphasis on onboard processing and radiation-hardened electronics, cryogenics, communications, and sensor and surveillance technologies" (Air Force Research Laboratory, Space Vehicles Directorate, Historical Information Office 1998).

9.2.1 AFWL Laser Work Continues

In 1979, AFWL achieved a milestone in the development of airborne high-energy laser weapons. The High Energy Laser Radar Acquisition and Tracking System (HELRATS) was designed specifically to track enemy aircraft and missiles. The HELRATS was "a multimode, coherent, x-band radar fire control system incorporating full monopulse tracking" (AFWL, History Office 1988). A computer provided mode and frequency control of the HELRATS' two-axis, electronically scanned phased array antenna.

Installed at North Oscura Peak on the White Sands Missile Range between May and November 1979, HELRATS underwent extensive testing against aircraft and missiles. In 43 tests, HELRATS "detected and tracked F-101, F-4 and T-38 aircraft; 2.75-inch rockets; AIM-4 and AIM-9 air-launched missiles; and Hawk and Ballistic Aerial Target System ground-launched missiles at or beyond desired ranges and in a variety of flight paths" (AFWL, History Office 1988). These tests were critically important steps to developing the DoD's high-energy laser program.

9.2.2 Air Force Weapons Laboratory SDI Research

The militarily strategic value of space became a new focus for AFWL in the early 1980s (Figure 103: AFWL in the 1980s). AFWL became involved in the space mission as an organization under AFSC and AFSTC; this AFWL role increased on 23 March 1983, when President Reagan announced the SDI (Air Force Research Laboratory, n.d.). In the mid-1980s, AFWL made important contributions to the SDI program through its studies of the laser vulnerability of solid- and liquid-fueled ICBM boosters. AFWL used the mid-infrared advanced chemical laser (MIRACL) to demonstrate such vulnerabilities, and successful MIRACL tests destroyed both stationary and rotating reflective targets.

MIRACL was the highest-power chemical laser in the Western Hemisphere (U.S. Army Space and Missile Defense Command n.d.) and began as a U.S. Navy effort. The U.S. Navy first built MIRACL for SEALITE, a shipboard defense program. However, Congress canceled the Navy program in 1983 and required installation of MIRACL at the High Energy Laser Systems Test Facility (HELSTF) at WSMR in order to support a variety of AFWL tests for the DoD; it was used extensively for testing Star Wars concepts during the 1980s (White Sands Missile Range n.d. and Department of Energy n.d.c).

AFWL carried out tests of its Booster Vulnerability Test Program at WSMR. In these tests scientists used MIRACL to destroy a Titan booster under simulated flight loads at WSMR, and the derived data were used to determine the vulnerabilities of representative solid motor cases and liquid boosters to lasers (AFWL, History Office 1988). The AFWL scientists won national attention for this test program on 6 September 1985.

9.2.2.1 Airborne Laser Laboratory

During Phase III of the Cold War, the first two milestones in the ALL program had been met. Cycle I demonstrated that the APT could track a moving aerial target, and Cycle II demonstrated that a low-power laser could be aligned with the APT and directed from the ALL to an aerial target. The next milestone in the program, Cycle III, was to combine a high-powered laser with the APT and ALL to shoot down air-to-air missiles.

During Cycle III the facilities at ARTF were used extensively to verify that laser subsystems would work on the ground before installing them in the ALL. The APT and laser fluid supply system were tested in a metal building test cell that was lined with concrete walls. The cell served as a mockup of the ALL, and elements of the laser subsystems were laid out in the same configuration as they would be in the aircraft. In addition to testing components on the ground, this gave the crew the opportunity to work together prior to being in the ALL (Duffner 1997).

During these ARTF test cell tests many leaks in the fluid supply system were discovered and repaired, and components were redesigned to ensure the system would work properly. By the summer of 1978 AFWL was convinced the ground testing was complete and was ready to install the laser systems in the ALL. By March 1979 the AFWL was ready to begin testing the performance of the fluid supply system in the ALL. This series of tests included ground, taxi, and flight tests. The major concern was how vibrations of the aircraft would affect the system.

As the fluid supply system was being tested at ARTF, the APT was being upgraded and fitted with a new airborne dynamic alignment system (ADAS) at SOR. The SOR alignment work was derived directly from Cycles I and II in which AFWL identified the need to upgrade the optical quality of the mirrors and stabilization of the APT. Before combining a high-powered beam with the APT and the new ADAS, the devices were extensively tested for jitter, or problems with vibrations, in a test cell at SOR. Once the devices were deemed suitable, low- and high-power beams were sent from the test cell to targets on the range. These range tests took place from May to December 1979. The most successful of the tests was one that shot an AIM-9B downrange; the beam in the test cell delivered and locked onto the aim point on the missile dome, causing damage to the dome, guidance, and seeker unit inside the AIM-9B. This test demonstrated that the ALL systems could work as a unit and disable a target (Duffner 1997).

From January to March 1980 AFWL installed the laser in the ALL and connected it to the fluid supply system. A number of tests were then conducted to ensure that the system could handle flow and pressure. In July 1980 a “hot firing” test of the system was made, producing a steady-state supersonic flow. A few days later the first airborne test of the system took place near WSMR at 10,000 feet. A series of airborne systems tests were then made prior to extracting a beam from the ALL. In January 1981 a high-energy laser beam was generated inside the ALL, directed through the APT, and propagated in the air outside the aircraft; this was the first demonstration that the ALL components could work as a unified system and point to a target (Duffner 1997).

After the 1981 proof of beam propagation from the ALL, there was a series of setbacks. Although the program had some difficulties, the third milestone in the program was finally met in 1983. The Cycle III highlight of the ALL program occurred in May, over the Naval Weapons Center Range at China Lake, California, where the laser was combined with a sophisticated pointer and tracker to negate, or disable, five AIM-9 “Sidewinder” missiles. While the missiles did not fall from the sky in pieces, they were disabled to the point that they could no longer locate, track, and strike their target (Dr. Barron Oder, 28 August 2002 interview with Kristen Bisson). The test was hailed in the laser scientific community as an event of major proportions with far-reaching consequences because it proved for the first time that an airborne laser could intercept and destroy an air-to-air missile. Four months later, in September, the beam fired by the ALL negated three U.S. Navy BQM-34A drones over the Pacific near Point Mugu, California. The success of these two demonstrations clearly showed the potential of high-energy lasers as airborne weapons (Duffner 1997).

The ALL aircraft was retired in 1984 and stored in hangar 760 at KAFB. Four years later it took its final flight to Wright Patterson AFB, where it is now on display at the Air Force Museum. Despite its success, weapons planners ignored the ALL because its missions had been categorized as “proof of concept” rather than demonstrations of a viable war tool. Although it had shown that a laser mounted on an aircraft could be a formidable defensive weapon, it was generally viewed as impractical. Its carbon dioxide laser was bulky, dependent on an external power source, and did not generate enough power to be effective at extended ranges. However, almost a decade later, after the Gulf War, the concept of an anti-missile laser was revitalized in the airborne laser (Airborne Laser 2001).

9.2.2.2 The Chemically Pumped Oxygen Iodine Laser

AFWL invented the first chemically pumped oxygen-iodine laser (COIL) in 1977. The COIL was a ground-based system that transmitted beams extremely well when used with advanced optical systems for beam direction. It was considered to be a potentially weapons-grade device. By the mid-1980s, the program's mission was to demonstrate a scalable laser for possible future weapon deployment as a ground-based laser, anti-satellite weapon under the SDI (U.S. Air Force Phillips Laboratory History Office 1992).

COIL lasing occurred for the first time on 1 December 1977. AFWL considered it a scientific breakthrough for two reasons:

> first, it is the world's first demonstration of a cw chemical pumped electronic transition chemical laser, and second, it is the first time that the Air Force Weapons Laboratory has developed any laser starting with analytical screening studies of potential energy curves, and has proved the most promising system through design and fabrication to a demonstration of the laser (AFWL 1979).

By 1978, COIL was producing more than 100 watts of output power (AFWL n.d.). Its wavelength was substantially shorter than other high-energy chemical lasers, so smaller optics and better beam focusing were possible. It was a candidate for the ground-based laser anti-satellite mission. From 1982 to 1990, COIL experiments yielded significant power levels with excellent beam quality (U.S. Air Force Phillips Laboratory History Office 1992).

In 1984, AFWL scientists and engineers conducted an experiment in which the first supersonic COIL, operating at 1.5 kilowatts, produced enough energy with its invisible beam to burn a hole in an intended target. In 1988, AFWL scientists achieved a milestone when they demonstrated a supersonic-flow COIL device with an output of 35 kilowatts, which was an important step forward in the ground-based, anti-satellite laser initiative (AFWL, History Office 1988).

The COIL replaced the ALL's original laser because it was a superior system, resolved many of the doubts planners had about the ALL system, and ultimately demonstrated further technology in support of a ground-based, anti-satellite laser (AFWL, History Office 1988). The COIL had an internal power source, was much more compact than the GDL, was a number of times more powerful than the ALL's GDL, and was capable of producing a lethal beam over long distances (Airborne Laser 2001).

As a result, rather than reviving the retired ALL, the USAF decided to build an altered system, changing not only the laser but also the type of aircraft that would carry it. It was dubbed the Airborne Laser (ABL) and included multiple COIL modules installed in pairs in the rear of a Boeing 747-400 freighter. The sophisticated new optical system was capable of projecting a beam over hundreds of kilometers and compensating for atmospheric disturbances that might exist between the aircraft and target (Airborne Laser 2001). This work continues today.

9.2.2.3 Sandia Optical Range

In 1978, the SOR was inactivated, and it did not reopen until five years later (Ristvet 1991) when President Reagan announced SDI. The establishment of President Reagan's SDI in 1983 shifted R&D efforts to space-based lasers. In 1984, AFWL Commander Colonel Mike Walton renamed the SOR the Directed Energy Experimental Range (DEER) to make it available for future research into other directed-energy technologies. These included microwaves and particle beams (AFWL 1991).

During 1983, the Rocketdyne Advanced Chemical High-Power Laser (RACHL) was installed in existing SOR facilities. During the installation, there were some construction modifications, and a fuel tank area was added. The RACHL was a 150-kilowatt, continuous wave, deuterium-fluoride laser. The USAF and U.S. Army used the RACHL for testing of laser vulnerability and effects on satellite and missile components. The continuous-wave RACHL supported AFWL research at the SOR until 1987 (Ristvet 1991).

In 1985, DEER began hosting the radial-pulse-line accelerator (RADLAC) II, a relativistic electron beam device (Ristvet 1991). During late August 1985, RADLAC II demonstrated for the first time stable electron beam propagation in air. This was a significant move forward in vulnerability and damage effects research in terms of lasers (AFWL 1991). The work illustrated the potential for using charged particle beams to destroy targets through shock, melting, and deposition of X-rays.

In 1988 the range was renamed again, becoming Starfire Optical Range. At that point, work shifted away from RACHL and RADLAC II to the use of a 1.5-meter telescope to conduct short-wavelength laser propagation experiments in support of the DoD's ground-based laser technology development program (AFWL 1991).

9.2.3 Pulsed Power

In 1982, AFWL made numerous modifications to the SHIVA I pulsed power source that had originally been used to produce X-rays to study their effects on U.S. satellites, boosters, and reentry vehicles in the 1970s. At the time, this effort was considered a priority since the Soviet Union was devoting 30 percent of its unclassified fusion energy program to implosion research for X-rays.

As a result, two more capacitor banks were added to the existing four. Its energy source capacity was boosted from 2 mega-joules to 10 mega-joules of energy, which is equal to five pounds of TNT (Air Force Research Laboratory Office of Public Affairs n.d.). It produced a pulse of 120,000 volts for as short as one millionth of a second to produce a power flow equivalent to a terawatt (a trillion watts). These modifications were so extensive, the facility was renamed SHIVA STAR (AFWL, History Office 1988). During the first successful firing in November 1982, temperatures of resulting plasma reached several million degrees and radiated an abundance of X-rays, which was characteristic for such a high temperature (AFWL 1983).

By the mid 1980s, SHIVA STAR was the largest pulse power facility in the U.S. (Air Force Research Laboratory Office of Public Affairs n.d.). SHIVA STAR greatly increased AFWL's ability to study the vulnerability of USAF systems. It also expanded the lab's work on plasma physics at world-record energy density levels, perfected diagnostic techniques, and advanced fuse and fast switch technologies. This work brought national recognition to AFWL as the leader in plasma physics, pulse power physics, and fusion research. These technologies were considered critical "building blocks for developing directed energy weapons of the future" (AFWL, History Office 1988).

9.2.4 Air Force Weapons Laboratory Electromagnetic Pulse Testing

AFWL's Trestle EMP simulator became operational in March 1980, eleven years after it was first conceptualized. It was the only EMP simulator able to test B-52s, C-5As, E-4Bs, and other large aircraft in simulated flight under realistic threat conditions. EMP hardness evaluations of a B-52G strategic bomber began immediately, and many U.S. and foreign systems were tested in the 1980s.

Meanwhile, the HPD and VPD-II EMP facilities continued to be used during the late 1970s and 1980s for vulnerability studies. Both facilities were used for tests on C^3 (command, control, and communications) systems; the U.S. Navy's C-130 TACAMO, an acronym for "Take Charge and Move Out"; and the F-106 (AFWL 1984).

In 1986, AFWL created the Hardness Surveillance Illuminator (HSI) (Figure 104: Hardness Surveillance Illuminator in "differential mode."). It was a low-level, continuous wave EMP facility designed by Kaman Dikewood for testing the integrity of EMP shielding in aircraft and missiles—specifically the B-1B strategic bomber. The HSI provided repeatable, low-level, continuous wave illumination over a wide range of frequencies (AFWL 1986). It was thought that the new simulator would provide insight into how such U.S. systems would stand up to EMP stresses in combat. Because of the existing ground plates it was located at the former ACHILLES test site, which was renamed the Large Electromagnetic System Level Illuminator (LESLI) (Dr. Carl E. Baum 3 April 2002 interview; Steve Langdon, January 2002 interview with Karen Van Citters and Kristen Bisson).

HSI was an antenna structure consisting of a two-wire transmission line diverging radially out from a ground level source point to the top of a pair of support utility poles, then radially converging back to a ground level termination point. Measuring 60 meters wide, 80 meters long, and 20 meters high, the HSI produced vertically polarized electromagnetic fields, and in "common mode" in which both cables were driven against the ground, and horizontally polarized fields in "differential mode" in which the cables were driven against each other (AFWL 1986).

HSI was located south of the runway and was first used as part of AFWL's EMP Test Aircraft (EMPTAC) program (AFWL 1986). EMPTAC was a Boeing 707/720 B cargo plane obtained by AFWL in August 1984. It served as a test bed for EMP research, hardness maintenance equipment, and hardening modifications (AFWL, History Office 1988). AFWL modified the EMPTAC to simulate shielded areas of the B-1B and the EC-135.

In June 1990, a B-1B arrived on base for testing at HSI. AFWL used HSI to "obtain a new hardness surveillance/hardness maintenance baseline that AFLC could use throughout the B-1B's operational life" (AFWL 1991). An identical HSI was then built for Tinker AFB, Oklahoma, where the USAF's B-1B aircraft were maintained (William Prather, 5 April 2002 interview with Kristen Bisson).

9.2.5 Other Defense Initiatives

In the early 1980s, AFWL developed the Improved High Altitude Radiation Detection System (IHARDS), a reliable, inexpensive sensor system that could identify the existence of high altitude nuclear explosions. IHARDS was composed of three sensors and an electronics assembly. It was tested at AFWL's EMP facilities, and then tested against natural lightning on a New Mexico mountaintop. In 1982 and 1983, AFWL installed a prototype system at SAC HQ and an improved version at NORAD's Cheyenne Mountain complex in 1985 (AFWL, History Office 1988).

AFWL also developed and transitioned to the operational USAF the Ground Wave Emergency Network (GWEN), a low-frequency radio system that SAC could use to transmit positive control launch orders to its bombers and tankers across the country (AFWL, History Office 1988) (Figure 105: AFRL's GWEN). It was designed as an ultra-high-powered network intended to survive massive broadband destructive interference produced by nuclear EMP (FAS n.d.c). A national GWEN network was installed in the mid- to late 1980s.

Also in the early 1980s, AFWL created the Recovery Airfield Monitor and Status System (RAMSTAT). RAMSTAT was created to enable aircrew and battle staff to know, in the event of nuclear war, where it would be safe to land, and to coordinate operations of the bombers, tankers, and reconnaissance aircraft that survived an initial exchange (AFWL, History Office 1988).

The system consisted of an overpressure sensor, a fallout detector, and a radio transceiver. Installed at air bases, it could respond to coded inquiries and provide basic information on whether it would be safe for aircraft to land. Following demonstrations of prototypes at Offutt and Kirtland AFBs in 1985 and 1986, SAC HQ made plans to install 500 RAMSTATs nationwide (AFWL, History Office 1988). However, owing to a reorganization of SAC, RAMSTAT was never transitioned to the operational USAF (Dr. Babu Singaraju, July 2002 interview with Steve Watson, AFRL Phillips Research Site Historical Information Office).

9.2.6 Civil Engineering

During the late 1970s, AFWL's civil engineers continued HEST in support of the MX missile program (AFRL, Space Vehicles Directorate 1998). From 1976 on, the principal focus of the Civil Engineering Research Division's nuclear weapons effects testing was on validating Missile-X (MX) basing modes to blast and shock effects.

By the early 1970s, the SAC believed the Minuteman missile to be obsolete. The command began requesting a new missile incorporating the best technology available. In response to this request, the idea for the MX or "Peacekeeper" ICBM was conceived, and designated "Missile X" or MX by the USAF. However, a major stumbling block during the conception phase was the issue of hardened silos versus mobility, i.e. silo-based ICBMs were considered less likely to survive an attack by Soviet missiles whose accuracy had improved considerably by this time. This concern over the MX basing mode led to indecision during both Carter's and Reagan's presidencies. Nevertheless, the USAF held its first successful flight test of the MX missile in June 1983, which led to beginning of missile production in February 1984 (FAS n.d.d).

9.3 Air Training Command

The Interservice Nuclear Weapons School was a joint-service facility under the control of the Air Training Command (ATC), providing courses on the national nuclear weapons program, nuclear medical hazards aspects, and nuclear weapons accident response. Originally the Nuclear Weapons School was run by DASA. In 1973 it was transferred to the USAF and redesignated the 3416th Technical Training Squadron. ATC administered the school, which had two distinct training missions:

1) It was responsible for presenting the complete national nuclear weapons program from conception of weapons design, manufacturing, and testing programs to employment of weapons and weapons effects.
2) The school also reportedly provided detailed instructions on the procedures necessary in the event of a nuclear weapon accident (KAFB 1984).

In the mid-1980s, approximately 4,000 students per year attended the school from all military services. other governmental and nongovernmental agencies. The 1984 school curriculum consisted of the following courses:

- The Nuclear Weapons Orientation, Advanced
- Nuclear Emergency Team Operations
- Nuclear Hazards Training
- Nuclear Emergency Team Exercise
- Senior Officers Nuclear Accident
- Flag Officers Nuclear Accident

9.4 The Manzano area

When MAC became the major command for KAFB in 1977, security for the Manzano Storage Area was reorganized. The 4900th SPS became the 1606th SPS and remained in charge of guarding the weapons area. Just two years later, in 1979, MAC required upgrading the KAFB security force to group status. Consequently, the 1606th Security Police Group was activated, with the components of the 1606th SPS (law enforcement personnel) and 1608th SPS (security specialists) dedicated to the Manzano area. By the end of the decade, the official history of the Manzano area claimed that it was "largest weapons storage area in the free world" (Verhaaren 1998).

Due to MAC's increasing emphasis on protection of special aerospace resources, security of the Manzano area became of prime importance to KAFB officials after 1977. The importance was reflected in the increased number of security personnel, as well as modern equipment and techniques.

9.5 New Mexico Air National Guard

During the 1980s the New Mexico ANG became the only ANG unit to serve as part of the Rapid Deployment Force (RDF), the first group to strike in a combat situation anywhere in the world. The RDF was specific to the USAF and included the Army's 82nd Airborne Division and the NM ANG 150th Tactical Fighter Group (Kappler May 2000 interview with Karen Van Citters).

In December 1990 members of the NM ANG were activated in support of Operation Desert Storm and deployed to Saudi Arabia.

9.6 Naval Weapons Evaluation Facility

On 1 July 1979 the NWEF was transferred to the area command of the Eleventh Naval District, San Diego. On 1 October 1980, when the Naval Districts were disestablished, it was transferred again to the Commander, Naval Base, San Diego (Naval Air Warfare Center 1993).

In the late 1970s, the NWEF began evaluating Tomahawk weapon systems, which used both conventional and nuclear weapons. NWEF performed nuclear safety studies, reviews, and evaluations on the nuclear variant and its interfaces with the surface weapons control systems and submarine combat control systems. NWEF also was part of the Tomahawk technical evaluation team. NWEF fitted the Tomahawk Cruise Missile weapon system in four different launcher configurations on a wide variety of ships, including nuclear-powered attack submarines, guided missile cruisers, destroyers, and battleships. Work also continued on the Trident I and II missile systems throughout the 1980s (Naval Air Warfare Center 1993).

Aircraft systems involved in NWEF studies during the late 1970s and the 1980s included the S-3 Viking jet aircraft, used to hunt and destroy enemy submarines; the F/A-18 Hornet all-weather fighter and attack aircraft; and certain NATO aircraft. This period also saw the completion of assignments on surface/subsurface systems like the Terrier missile and ASROC and SUBROC missiles (Naval Air Warfare Center 1993).

In 1992, the NWEF was consolidated with other Naval facilities into a large multi-site facility. This was the Naval Air Warfare Center Weapons Division, established in 1992 (Naval Air Warfare Center 1993).

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10.0 IDENTIFYING HISTORIC PROPERTIES AT KAFB

The process used to evaluate properties at KAFB is that developed by the NRHP and set forth in *National Register Bulletin 15*. The historic context provided in this document and information in *Coming in from the Cold: Military Heritage in the Cold War* were used as tools in the process of evaluating KAFB properties.

10.1 Historic Themes

The historic themes defined below are a means of using the historic context by organizing it into patterns based on technology, developments, social groups, and environment that have influenced the area that became KAFB. The themes are grouped under NRHP areas of significance. The periods for these themes relate to the time in which events in the area that was to become KAFB took place. The non-military thematic periods may differ from the periods of history developed in the historic context because they are specific to individual events and areas of significance.

Table 9 identifies the historic themes on the East Mesa for the time between the coming of the railroad and the development of the area for military use. Not all themes are represented by extant real property. Some themes are represented by historic and prehistoric archaeological sites that have been identified on the installation by other organizations and reports.

Table 9: Historic themes prior to military

Areas of Significance	Period	Themes	Notes
Agriculture	1862 – 1941	Ranching	Cattle on the east mesa were primarily settled ranches and grazing
		Shepherding	Sheep on the east mesa were primarily nomadic camps and grazing—sites may be prehistoric
Settlement	1862 – 1941	Homesteading	This theme also crosses into agriculture for cattle ranches
Education	1937 – 1942	Education	Sandia School
Industry	1880 – 1941	Commercial Industry	Bottling activities at Coyote Springs
			Mining precious minerals—gold, silver
			Mining industrial minerals—fluorspar, barite, galena
Recreation	1886 – 1941	Outdoor Recreation	Day and overnight trips to Coyote Springs
Health	1880 – 1941	Veteran's Health	VA Hospital
Transportation	1928 – 1941	Early Commercial Aviation	Oxnard Field and associated structures
	1939 – current	Municipal Aviation	Albuquerque Municipal Airport

Table 10 identifies the historic themes after the Army developed a facility at Albuquerque and during World War II, and Table 11 identifies the Cold War themes between 1945 and 1989.

Table 10: World War II historic themes

Military areas of significance	Period	Themes	Notes
Training	1942 – 1945	Advanced Flying Training	19th Bombardment Group: B-17 Four-Engine School: B-24 Bombardier School: AT-11 Transition Training: B-24 and B-17 16th Bombardment Operational Training Wing: B-29
		Air Depot Training	Mechanics school
		Veteran's Training	Sandia School's reuse as Convalescence Center for retraining of veterans
R&D	1942 – 1949	Weapons Testing	Proximity Fuze Testing Manhattan District Police Loading pit Superfortress (B-29)
		Nuclear Weapons Security	
		Nuclear Weapons Testing	

Table 11: Cold War historic themes

Military areas of significance	Themes	Notes
Phase I: Inception of the Cold War (July 1945 – April 1952)		
Atmospheric Testing	Nuclear Weapons Training	58th Bombardment Wing 1st Ordnance Squadron (509th) Armstrong Committee Military Weapons Effects Program 4925th Test Group (Atomic)
	Weapons Assembly	
	Testing and Evaluation	
Air Defense	Aircraft Control and Warning	Civil Air Patrol NM Air National Guard Ground Observer Corps 34th Air Division AC&W Squadrons
	Intercept	
Nuclear Stockpile	Weapons Assembly	Z Division Sandia Laboratory AFSWP Project Water Supply
	Weapons Storage	
	Testing and Evaluation	
Weapons/Delivery System Marriage	Testing and Evaluation	4925th Test Group (Atomic) Naval Air Detachment
Phase II: Nuclear Technology Escalation (April 1952 – April 1961)		
Weapons/Delivery System Marriage	Testing and Evaluation	4925th Test Group (Atomic) Naval Air Detachment
R&D (weapons)	Missile development	ASFWCenter Holloman AFB
Atmospheric Testing		AFSWC 4950th Test Group (Nuclear) 4925th Test Group (Atomic) 4926th Test Squadron (Sampling)
Nuclear Hardening	Civil Engineering	NMERI ASFWCenter
	EMP/Military Systems	

Military areas of significance	**Themes**	**Notes**
Phase II: Nuclear Technology Escalation (April 1952 – April 1961)		
Air Defense	Ready Alert	34th Air Division (Defense) GOC/ADDC/ADCC SAGE 93rd FIS and NM ANG
	Aircraft Control and Warning	
Nuclear Stockpile	Storage	Manzano Base
Phase III: A New Nuclear Readiness (April 1961- June 1977)		
Nuclear Weapons	Missile development	AFSWC AFWL Sandia Laboratories Holloman AFB White Sands Missile Range Operation Paperclip NWEF
	Bomb delivery	
	Test Readiness	
Aircraft	Test and Evaluation	AFSWC 1550th ATTW AFTEC NWEF
	Rescue and Recovery	
Surveillance	Vela Program	AFSWC 58th Weather Reconnaissance Squadron Sandia Laboratories
	Air Sampling	
Vietnam War	Protective Structures	AFWL
	Daisy Cutter Bombs	
Nuclear Stockpile	Maintenance	DASA/DNA Manzano Base
	Storage	
	Nuclear Weapons School	
	Tracking	
Nuclear Hardening	Blast and Shock Effects	AFSWC AFWL CERF NWEF
	EMP/Military Systems	
	Transient Radiation Effects	
Space	Radiation Belt Research	AFWL
	Human Radiation Studies	
Lasers	Ballistic Missile Defense	AFWL Sandia Optical Range ALL
Phase IV: A New Deterrence (June 1977 – November 1989)		
Strategic Defense Initiative	Space R&D	AFSTC AFWL SOR DEER NWEF
	Space-based lasers	
	Ground-based lasers	
	Lethality/countermeasures	

Military areas of significance	Themes	Notes
Phase IV: A New Deterrence (June 1977 – November 1989)		
Nuclear Weapons Effects	Pulsed power	AFWL
	Blast and shock effect	
	EMP/Military systems	
Nuclear Warfare	Detection	AFWL Nuclear Weapons School Interservice Nuclear Weapons School
	Communication	
	Education	
Nuclear Stockpile	Maintenance	Manzano Base DASA/DNA
	Tracking	

10.2 Property Types at KAFB

Table 12 is a list of property types based on the historic themes used to evaluate properties for NRHP eligibility. The non-military property types are those that are typically associated with the historic theme they represent. The military property types were developed from the historic context and the 2001 real property list.

Table 12: Property types

Areas of Significance	Historic Themes	Property Types
1862 - 1941: Pre-Military		
Agriculture	**Ranching**	Ranch House
		Outbuilding
		Windmill
		Fenceline
		Associated Structure
	Shepherding	Historic Camp Site
		Sheep Pen
		Associated Structure
Settlement	**Homesteading**	Residence
		Outbuilding
		Fences
		Associated Structure
Education	**Education**	Classroom Building
		Dormitory
		Staff Housing
		Riding Stable
		Garage
		Associated Structure
Industry	**Commercial Industry**	Plant
		Administrative Office
		Associated Structure
	Mining	Adit
		Camp Site
		Powder Magazine

Areas of Significance	Historic Themes	Property Types
1862 - 1941: Pre-Military cont		
		Tailings
		Prospect Pit
		Cairn
		Associated Structure
Recreation	**Outdoor Recreation**	Hotel
		Riding Stable
		Bathhouse
		Associated Structure
Health	**Veteran's Health**	Hospital
		Laboratory
		Water tower
		Associated Structure
Transportation	**Early Commercial Aviation**	Hangar
		Administrative Office
		Airfield/Runway
		Associated Structure
	Municipal Aviation	Hangar
		Terminal
		Airfield/Runway
		Associated Structure
1941 - 1945: World War II		
Military (Training)	**Advanced Flying School**	Hangar
	19th Bombardment Group (B-17)	Classrooms
	Four-Engine School (B-24)	Administrative Offices
	Bombardier School (AT-11)	Housing
	Transition Training (B-24 and B-17)	Storage
	Air Depot Training	Vehicle Maintenance
	Mechanics School	Open Mess
		Impact Areas/Targets
	**note: types in this category	Training Ranges
	apply to all training schools	Earthen Embankment Magazines
		Metal Igloos
		Loading Pit
		Airfield/Runways
Military (Mission)	**End of World War II**	Hangar
	16th B. Operational Wing (B-29)	Administrative Offices
		Housing
		Storage
		Vehicle Maintenance
		Guard House
		Manhattan District Police Building
		Earthen Embankment Magazines
		Metal Igloos
		Open Mess

Areas of Significance	**Historic Themes**	**Property Types**
		Loading pit
Military (R&D)	**Military Weapons Testing**	Earthen Embankment Magazines
	Proximity Fuze—NMPG	Metal Igloos
		Testing Ranges
		Administrative Offices
		Warehouse
		Hangar
		Housing
		Stable
		Vehicle Maintenance
		Support Building
Military (Health)	**Army Convalescence**	Hospital
		Classrooms
1941 - 1945: World War II		**Property Types**
Military (Health)	**Army Convalescence**	Housing
		Administrative Offices
		Support Building
1945 – 1952: Phase I of the Cold War		**Property Types**
Atmospheric Testing	**Nuclear Weapons Training**	Classrooms
		Training Areas
	Weapons Assembly	Assembly Buildings
		Storage Igloos
	Testing and Evaluation	Headquarters
		Hangars
		Administrative Offices
		Storage Igloos
Air Defense	**Aircraft Control and Warning**	Headquarters
		Hangars
		Ready Alert Facilities
		Observation Posts
		Filter Centers
		Air Defense Detection Centers
		Air Defense Control Centers
Nuclear Stockpile	**(associated with all stockpile)**	Administrative Offices
		Guard Facilities
	Weapons Assembly	Plants
	Testing and Evaluation	Plants
	Weapons Storage	Type A Igloos
		Type B Igloos
		Type C Igloos
		Type D Igloos
Weapons/Delivery System Marriage	**Testing and Evaluation**	Administrative Offices
		Hangars

Areas of Significance	**Historic Themes**	**Property Types**
		Guard Facilities
		Testing Grounds

1952 - 1961: Phase II of the Cold War		**Property Types**
Weapons/Delivery System Marriage	**Testing and Evaluation**	Headquarters
		Hangars
		Guard Facilities
		Proving Grounds
R&D (weapons)	**Missile Development**	Headquarters
		Laboratories
		Proving Grounds
		Hangars
Atmospheric Testing	**Nuclear Weapons Training**	Classrooms
		Training Areas

1952 - 1961: Phase II of the Cold War		**Property Types**
Weapons/Delivery System Marriage cont.	**Weapons Assembly**	Assembly Buildings
		Storage Igloos
	Testing and Evaluation	Headquarters
		Hangars
		Administrative Offices
		Storage Igloos
Nuclear Hardening	**Civil Engineering**	Shock Tubes
		Laboratories
	EMP/Military Systems	EMP Simulation Facilities
		Headquarters
		Laboratories
Air Defense	**Aircraft Control and Warning**	Headquarters
		Hangars
		Ready Alert Facilities
		Observation Posts
		Filter Centers
		Air Defense Detection Centers
		Air Defense Control Centers
		SAGE Center
Nuclear Stockpile	**(associated with all stockpile)**	Administrative Offices
		Guard Facilities
	Weapons Assembly	Plants
	Testing and Evaluation	Plants
	Weapons Storage	Type A Igloos
		Type B Igloos
		Type C Igloos
		Type D Igloos

10.3 Properties Recommended as Eligible

10.3.1 Sandia School

The Sandia School was built in 1936 by former Congresswoman Ruth Hanna McCormick Simms. Simms established the private girls school in 1932 in a home as a way to prepare her daughter and daughter's friends for Eastern preparatory schools. By 1936, Simms required a complex to accommodate 80 day students and 40 boarding students. She purchased 126 acres on the East Mesa in the Parkland Hills addition (Miller 1992).

Simms chose architect John Gaw Meem to design the new school. Meem's designs focused on New Mexico's regional architecture. Thirty years prior to the development of Sandia School there was a strong interest in Spanish and Pueblo styles of architecture; a sense of urgency developed to maintain the style as a statement of New Mexico's regional architecture, and to preserve a sense of place in new construction projects. Several famous New Mexicans started a preservation movement in Santa Fe, which promoted maintaining this sense of place (Bunting 1983:4). By the 1920s, Meem was at the forefront of development of the Spanish-Pueblo Revival Style and its associated variant, the Territorial Revival Style. By the time Meem was named UNM's campus architect, in 1933, he was "preeminent in the state and the best-known Southwest architect" (Wilson 2001).

The Territorial Revival Style was chosen for the Sandia School in an attempt to avoid an overly institutional feeling while maintaining a sense of place (Bunting 1983:112). Simms and Meem had recently finished working together on Los Poblanos, her home in the North Valley, which was a Territorial Revival *hacienda*, which Simms envisioned as an opportunity for Meem to "show Albuquerque what you can do in this line" (Wilson 2001:41).

For Sandia School, Meem designed a series of two-story Territorial Revival style buildings forming a courtyard with adobe-colored stucco walls and red California-style tile roofs. The predominant architectural features of the six buildings were the gabled California-style tile roofs and two-story porches supported by *vigas* with square wood columns and railings. Doors had pedimented lintels, transom, and sidelites, and the windows were double-hung wood sash and frame with shutters (Figure 106: Sandia School). Shortly after construction, two buildings were added north of the main complex. These have since been razed. Sandia School operated until 1942, when WWII forced it to close.

In 1943, the USAAF leased the complex for use as a hospital and began extensive renovation, under Meem's guidance. The porches were enclosed and two of the buildings were connected by an addition (Figure 57).

After WWII, Sandia School became the headquarters for the NMPG (later renamed the NMER). This organization made use of the complex until 1948, when the AEC took it over as a facility for Sandia Laboratory. From 1949 to 1951, the complex was referred to as Sandia West Labs.

From 1951 to 1958, it served as a headquarters for the AEC and two buildings (1902 and 1903) were added to the complex. The complex was transferred back to the USAF in 1958 and served as an officers club, and at that time, Building 1911 was constructed for officers' quarters west of the main complex.

The original buildings have been determined eligible to the National Register under Criteria A and C for their architecture and role as the Sandia School, with the exception of Building 1908, which has a significant loss of integrity. Those buildings added after the Sandia School era do not fall within the period of significance for the complex and have therefore been determined not eligible to the NRHP (Table 13).

Table 13: Sandia School eligibility status

No.	Name	Date	NRHP Status	Notes
1900	Bienvenida	1936	Eligible	Administration
1901	Jornada	1936	Eligible	Classroom
1905	Yerba Buena	1936	Eligible	Dormitory
1908	Garage	1936	Not Eligible	Garage
1909	La Colmena	1936	Eligible	Originally two buildings, a kitchen and servants quarters
1910	Garage	1936	Eligible	Garage
1902	Office	1951	Not Eligible	
1903	Garage	1954	Not Eligible	
1911	Officers Quarters	1965	Not Eligible	

10.3.2 WWII Bombardier Training (Hangar 333)

The USAAF constructed Hangar 333 in 1942 to serve as a Bomb Trainer Building for the Kirtland Field's Advanced Flying School. This hangar was used for the maintenance of the aircraft associated with the Advanced Flying School, AT-11 Kansans and B-18A Bolos, and housed tools and specialized equipment, as well as provided shelter, necessary for day-to-day maintenance operations. As bomber aircraft increased in size, hangars became much larger to accommodate new aircraft and associated ground support equipment.

This hangar is much larger than previous hangars constructed on the base and was a standard size and architectural style (Figure107: Hangar 333 in 2002). It was constructed as a high bay hangar with a low-slope, gable roof and steel structural frame with light-gage metal siding. The large steel truss roof structure forms a clear span, meaning that no columns supported the roof at its mid point. This clear span accommodated large openings at opposite ends and allowed the structure to serve as a multiple-aircraft facility (rolled in nose-to-nose) or a roll-through service bay (rolled in one end and out the other). The roll-through design dictated that ancillary spaces, such as offices, storage rooms, and auxiliary spaces, were located to the sides of the service bay. A large amount of glazing was provided in the sliding doors and along with the clerestory windows at the north and south elevations let in generous amounts of natural light, reducing the need for artificial light sources, which in turn reduced utility and building maintenance costs.

Hangar 333 retains its integrity as a WWII-era hangar. Although the original siding was replaced in 1985 with new light-gage metal, the structure has retained its clerestory windows, high bay doors, and overall massing (Figure 107). It was determined eligible to the NRHP under Criterion A for its role in WWII bombardier training.

10.3.3 29000 Area

The 29000 Area, southeast of the main base area, was built during the 1940s as headquarters of the NMPG. This facility was part of a national military effort to research and develop the proximity fuze, which was referred to after WWII as the second most important weapon to come out of the war. Numerous types of buildings can be found on the former NMPG. These were quickly constructed throughout the war, as funding became available. The buildings are functional, as the persons involved were far more concerned with the mission than the architecture of a temporary worksite for wartime testing.

Most of the buildings were constructed of concrete masonry units (CMU), a very common type of construction in the Albuquerque area at the time. CMU walls were constructed quickly and offered rigid structural stability, good acoustical protection, and an average thermal insulation value twice that of uninsulated frame structures, which were also typical of the time. Typically, the dead air in the block cells provided thermal insulation value. The roof structure was framed using wood 2 by 4s for ease of construction and to provide an attic space.

The oldest buildings remaining were constructed in 1944. These served as a headquarters building (29051), a carpenter shop (29053), and a guards' residence (29042). The headquarters was a shed roof CMU building with exposed rafters and an observation tower at the south elevation. It was characterized by 1/1 double-hung wood sash windows and fixed pane wrap-around windows at two corners. The wrap-around windows provided building occupants with a much larger field of view to better observe operations at the NMPG (Figure 108: HQ building (29051) in 1944).

29051 has undergone some alteration, including the application of stucco to the building, in-fill of windows on the east elevation, and the removal of all windows on the north elevation. A gable roof entry has been added to the east elevation (Figure 109: Building 29051 in 2003).

29053 was constructed as a shop building. It was built using wood frame with minimal tar paper sheathing and vertical wood battens. Large double-hung windows lined both the north and south elevations. It has been stuccoed; the windows removed; and the west elevation entry has been replaced.

29042 was CMU with a wood frame roof structure (Figure 110: The Guards Residence (29042) during construction in 1944). It had double-hung wood sash windows, and a main entry on the south elevation with a front gabled porch with wooden support posts. Many of 29042's windows have been replaced or in-filled; another porch and two doors have been added to the south elevation (Figure 111: Building 29042 in 2003).

A warehouse (29014), hangar (29015), and another carpenter shop (29016) were constructed in 1945. They were pre-engineered metal buildings, which were readily available and required much less time to construct. This type of building required minimal architectural services so the lead-time was much shorter. They were also cheaper than custom-designed and constructed facilities. All three buildings have been altered by the loss of windows and doors.

A series of ammunition igloos was built between 1944 and 1946: numbers 29020 to 29023 and 29025 to 29031. Typically, such igloos were designed of cast-in-place concrete with a semi-cylindrical form, which expedited construction while providing a very secure and sturdy structure. The inherent nature of the cylindrical roof/wall structure eliminated the need for bracing and allowed for maximum utilization of the internal volume. The poured concrete arch was backfilled with native soil and vegetation to act as the building's outer envelope and absorb energy in the case of an accidental explosion of its contents. The metal doors were designed as sacrificial blast panels that would also help reduce damage during an explosion. Because of the high albedo of the native soil, the earth covering also moderated internal temperature fluctuations, thus helping to prolong the useful life of the contents. These igloos share common and repetitive design elements, which allowed for lower per-unit construction costs.

After WWII, NMPG was transferred from UNM to the New Mexico School of Mines and was renamed the NMER. Two buildings were constructed at the site for the NMER in 1946: an apartment building (29040) and a garage (29017). Building 29040 has been moved from its original location, windows have been in-filled, and doors and porches have been removed. The windows of Building 29017 have been boarded up, and a steel tower was added to the north elevation in 1970s.

The 29000 Area has been altered since its period of significance through the razing of many properties and significant alterations to the remaining buildings. As such, the area is not eligible to the NRHP as a historic district. Of the original NMPG properties, only the igloos, headquarters building, and guards' residence (Figures 109 and 110) have retained enough integrity to be determined eligible to the NRHP under Criterion A for their role in proximity fuze testing.

Table 14: 29000 Area eligibility status

No.	**Name**	**Date**	**NRHP Status**	**Notes**
29028	Igloo	1943	Eligible	Concrete
29029	Igloo	1943	Eligible	Concrete
29030	Igloo	1943	Eligible	Concrete
29031	Igloo	1943	Eligible	Concrete
29025	Igloo	1944	Eligible	Concrete
29026	Igloo	1944	Eligible	Concrete
29027	Igloo	1944	Eligible	Concrete
29051	Headquarters	1944	Eligible	CMU
29042	Guards' Residence	1944	Eligible	CMU with wood frame roof
29053	Carpenter Shop	1944	Not Eligible	
29014	Warehouse	1945	Not Eligible	

No.	Name	Date	NRHP Status	Notes
29016	Carpenter Shop	1945	Not Eligible	
29015	Hangar	1945	Not Eligible	
29020	Igloo	c. 1945	Eligible	Concrete
29021	Igloo	c. 1945	Eligible	Concrete
29022	Igloo	c. 1945	Eligible	Concrete
29023	Igloo	c. 1945	Eligible	Concrete
29040	Apartment Building	1946	Not Eligible	
29017	Garage	1946	Not Eligible	

10.3.4 600 Area

The 600 Area is located just south of the runway, across from the 58th Special Operation Wing hangars. The 600 Area hosted three periods of KAFB military history. The first buildings were constructed during WWII for ordnance training activities at Kirtland Field. During the 1960s and mid-1970s, the 600 Area was the site of EMP testing. Two decades later, it became home to AFWL work on chemical lasers. All 600 Area buildings were designed to be constructed quickly and to serve a utilitarian purpose as mission-related facilities and therefore have minimal architectural ornamentation.

10.3.4.1 Ordnance

The original 600 Area was constructed during WWII for munitions assembly (Figure 112: Kirtland Field in 1943). A bomb-loading pit was located just northeast of the area to aid in loading atomic bombs and bomb shapes (mock-ups) onto aircraft (Figure 47, above). By the end of 1945, the site was referred to as the Ordnance Area and included a munitions storage igloo (626), an ammunition assembly and maintenance shop (614), and two base supply and equipment sheds (615, 617).

The bomb-loading pit was used toward the end of WWII to support the U.S. atomic bomb program at Los Alamos. Kirtland Field was the closest capable runway to Los Alamos and was used to transport Los Alamos personnel and materials to various mission-related locations during the war. For this reason, the MED kept a Military Police unit stationed at Kirtland Field (Furman 1990), most likely in the 600 Area. After WWII, AFSWP continued munitions assembly activities in the area, which was still referred to as the Ordnance Area. The bomb-loading pit was upgraded to a hydraulic lift in late 1945 (Furman 1990) (Figure 113: Construction drawing of bomb-loading pit). In 1948, AFSWP added a guard tower (611) to the area for enhanced security of bomb assembly training.

10.3.4.2 EMP Testing

EMP testing was added to the 600 Area in the 1960s and the area was used for such testing until mid-1980s. EMP simulation testing provided data to harden USAF aircraft and equipment to nuclear explosions, a significant Cold War military strategy. AFWL constructed two of the first EMP facilities at KAFB in the 600 Area: the ALECS (622) in 1964, and the VPD-1 (605) in 1971.

ALECS was created for testing Polaris and Minuteman missiles, among other equipment and systems (Figure 114: ALECS EMP facility during testing). The VPD-I was used to test E-3 and E-4A Sentry aircraft, which provided all-weather surveillance, command, control, and communications for air defense. Another EMP facility, the HSI, was constructed at this same site during the mid-1980s for testing on B-1B aircraft.

Also during this period, AFSWC's Flight Test Division used several of the buildings for a Research Communications Station Complex. The Flight Test Division worked on fighter and bomber test aircraft, airborne telemetry, and diagnostic systems. The telemetry facility tracked, received, and recorded telemetry information from aircraft, missiles, and payloads (AFSWC 1970). For this mission, the guard tower was converted to an antenna for a telemetry ground tracking station located in an adjacent building that has since been demolished. Building 613 was connected by corridor to Building 614; both were laboratories for the AFSWC Flight Test Division. Building 621 was added as a laboratory in 1970 (Figure 115: 600 Area circa 1968–1971).

10.3.4.3 Chemical Laser

The third military use of the 600 Area occurred during the 1980s, when a number of buildings were devoted to research on the COIL. The development of chemical lasers was an important step forward in the ground-based, anti-satellite laser initiative, which was part of President Reagan's SDI. For this project, AFWL began to use buildings at the west end of the 600 Area, some of which have since been razed. In 1980, AFWL added Building 625 for chemical laser research.

The 600 Area retains little integrity for either the WWII period or the chemical laser era. Many facilities involved in those eras have been demolished, including the bomb-loading pit; those that remain have undergone significant alteration. As such, the area is not eligible to the NRHP as a historic district. However, specific structures within the area are individually eligible either under Criterion A for their role in nuclear stockpile management or Criteria Consideration G for their role in EMP simulation.

Table 15: 600 Area eligibility status

No.	Name as Built	Date	NRHP Status	Notes
626	Igloo	1942	Eligible	
614	Ammunition Assembly	1944	Eligible	WWII
615	Base Supply Equipment Shed	1944	Not Eligible	
617	Base Supply Equipment Shed	1944	Eligible	
611	Guard Tower	1948	Not Eligible	
622	Physics Laboratory, Dynamics Environmental (ALECS)	1964	Eligible	EMP simulation
613	Weapons Support Training	1964	Not Eligible	
621	Equipment Research Laboratory	1970	Not Eligible	
605 A	VPD-1	1971	Eligible	EMP simulation
625	Physics Science Laboratory	1980	Eligible	
605 B	HSI	1986	Eligible	EMP simulation

10.3.5 AFSWP Headquarters Area

AFSWP, the post-WWII extension of the MED, became host of Sandia Base in 1947. It established headquarters during 1947 and 1948 on the west side of Wyoming Boulevard between D and F Avenues. This area was built as a showcase for the base. The two sets of courtyard buildings feature a unique style that employs a modern design with Southwestern detailing, such as arches, Spanish tiles, and geometric styling. The 20th century regional architecture movement in Santa Fe and John Gaw Meem's influence on architectural style in New Mexico played a role in working Southwestern detailing into the headquarters architecture for Sandia Base. The Southwestern architecture provided more formality than the functional design of the AFSWP training and laboratory facilities and a sense of place for the command gateway to the early Cold War base.

Most of the buildings had flat roofs with overhangs, stuccoed CMU walls, arched entries with Spanish tile accents, and long, banded fenestration patterns with brick sills. Some of the buildings also featured corbelled eve bracket ornamentation and highly stylized perforated masonry balcony screen walls. These details illustrate the intentions of the architect to infuse the typical military architecture of the era with Southwestern accents. The courtyards and stylized architecture added a sense of formality suitable for a headquarters building, while also providing space for ceremony or repose.

This early FC/AFSWP headquarters area consisted of five buildings, four creating a courtyard and one situated across the street, on the east side of Wyoming Boulevard (Figure 116: AFSWP HQ Area, 2002 plan). These buildings were the "Post Administration" building (20200), two "Division Headquarters" buildings (20201, 20202) (Figure 117: 1962 drawing of Building 20202), the Sandia Base Station Hospital (20203) (Figure 118: Building 20203 circa 1970 and Figure 119: Building 20203 in 2003,) and a mess hall (20204). In 1950, an additional courtyard complex was built to the west of the first. Three buildings were constructed: two barracks for enlisted men (20221, 20222), and another division headquarters building (20220) (Figure 120: Building 20220 in 2003) for Sandia Base.

Many of the original headquarters area buildings have been determined eligible to the NRHP, while other buildings in this area have undergone significant renovations. In the first courtyard, the integrity of 20204 was significantly compromised by the replacement of windows and the addition of low-slope pitched roof elements. The integrity of dormitory buildings 20221 and 20222 has been significantly compromised by the addition of low-slope, standing seam metal roofs; the concealment of exterior columns; the addition of numerous geometric, vertical decorative elements at the exterior walkways; the addition of a new railing; and the enclosure of the exterior stairways.

The area does not qualify as a historic district because new buildings have been added and there have been significant alterations to the nearby Sandia Base buildings. However, despite having lost some of their original elements, such as the windows, buildings 20200, 20201, 20202 (Figure 117), 20203 (Figure 118 and 119), and 20220 (Figure 120) retain their overall character and association as headquarters of early Sandia Base and were determined eligible to the NRHP under Criterion A for that role.

Table 16: Sandia Base Headquarters eligibility status

No.	Name as Built	Date	NRHP Status	Notes
20200	Post Administration	1947	Eligible	
20201	Division Headquarters	1948	Eligible	
20202	Division Headquarters	1948	Eligible	
20203	Hospital	1948	Eligible	
20204	Hospital Mess Hall	1948	Not Eligible	
20220	Division Headquarters	1950	Eligible	
20221	Dormitory	1950	Not Eligible	
20222	Enlisted Men’s Barracks	1950	Not Eligible	

10.3.6 Additional AFSWP Headquarters Area

Between 1951 and 1952, an additional FC/AFSWP headquarters area was constructed south of the main area, on H Avenue between Pennsylvania Street and Wyoming Boulevard. This series of five buildings was constructed in a row running from east to west. There were two post headquarters buildings (20360, 20364), two division headquarters buildings (20362, 20363), and a barracks for enlisted men (20361).

These three-story buildings were designed in the International style with flat roofs, smooth facades, and cubic shapes. They were constructed with a cast-in-place concrete structural frame system, and CMU in-fill to form end walls and low walls below the horizontally banded, steel sash windows. The second and third floor slabs are post-tensioned, cast-in-place concrete.

This type of standard low-rise construction was in keeping with military construction budgets and time constraints, yet it evokes an architectural style. Buildings 20360, 20362, 20363, and 20364 have suffered a loss of integrity owing to the replacement and infill of the original windows and the furring out of exterior walls, thereby negating the International Style components of the original design (Figure 121: Building 20361 retains integrity, in contrast to Building 20362). Only Building 20361 retains its integrity and was determined eligible to the National Register under Criterion C for its architectural detailing.

Table 17: AFSWP Headquarters area buildings eligibility status

No.	Name	Date	NRHP Status	Notes
20361	Enlisted Men’s Barracks	1951	Eligible	
20362	Division Headquarters	1951	Not Eligible	
20364	Post Headquarters	1951	Not Eligible	
20360	Post Headquarters	1952	Not Eligible	
20363	Division Headquarters	1952	Not Eligible	

10.3.7 AFSWP/DASA Weapons Training Area

The current 377th Air Base Wing headquarters area, located on the east side of Wyoming Boulevard between H Avenue and Hardin Boulevard, was built in the early 1950s by the AFSWP as a training center for nuclear weapons assembly. AFSWP operated under a charter that authorized training in the assembly and employment of atomic weapons. FC/AFSWP provided bomb assembly for Sandia Laboratory throughout the late 1940s and early 1950s, a period when the U.S. was focused on expanding its nuclear weapons stockpile. The first buildings constructed were simple temporary metal structures. As AFSWP's training program became more established, AFSWP began constructing buildings that were more permanent.

Between 1951 and 1952, FC/AFSWP personnel numbers reached a record high of 11,000 (Office of the Assistant to the Secretary of Defense (Atomic Energy) 1978). By 1952, FC/AFSWP began training military personnel from each of the military services in weapons assembly and maintenance. It is not clear when the Nuclear Weapons School was officially established, but training began in this area during the 1950s. By 1964, the training area contained 15 buildings.

In 1951, AFSWP constructed the first "General Instruction" buildings. These were a group of eight metal buildings configured in three rows (20673–20681). The following year, a long, rectangular CMU warehouse (20676) was constructed just to the east of the metal buildings. Two years later, the site expanded to the west and to the north with the construction of five more buildings (20602, 20683, 20685, 20686, 20687). These buildings were constructed with flatroofs, a cast-in-place concrete structural frame, and painted CMU infill between cast-in-place concrete columns. Four functioned as training buildings and the fifth as a warehouse (south of and adjacent to the first warehouse).

In 1964, a rectangular building (20604) similar to building 20602 was constructed south of and adjacent to building 20602. It served as a school building. Both 20602 and 20604 featured classrooms, auditoriums, electronics shops and bays, and weapons bays and formed the basis for the school at the time. Since these buildings were designed as educational facilities, CMU walls were used to provide thermal and acoustic insulation values, as well as a low per-square-foot construction cost. By the mid-1960s, AFSWP was redesignated DASA and the FC/DASA Nuclear Weapons School was one of the primary activities at Sandia Base (Figure 122: The Defense Atomic Support Agency's Nuclear Weapons School circa 1970).

Many of the early metal buildings have been razed. Today, 20602 and 20604 have lost much of their integrity, as well as 20686, 20687, 20683 and the early metal buildings constructed for "General Instruction" (20673–20681). Because there are so few buildings with integrity and others were razed, this area does not retain the degree of integrity to qualify as a historic district. Buildings 20685 and 20676 are the only buildings that retain integrity and were determined eligible to the NRHP under Criteria Consideration G for their AFSWP/DASA role.

Table 18: AFSWP Training Area eligibility status

No.	Name as Built	Date	NRHP Status	Notes
20673	General Instruction	1951	Not Eligible	
20674	General Instruction	1951	Not Eligible	
20675	General Instruction	1951	Not Eligible	
20677	General Instruction	1951	Not Eligible	
20678	General Instruction	1951	Not Eligible	
20679	General Instruction	1951	Not Eligible	
20680	General Instruction	1951	Not Eligible	
20681	General Instruction	1951	Not Eligible	
20676	General Purpose Warehouse	1952	Eligible	
20602	General Instruction	1953	Not Eligible	
20683	General Purpose Warehouse	1953	Not Eligible	
20685	Emergency Training Facility	1953	Eligible	
20686	Emergency Training Facility	1953	Not Eligible	
20687	Emergency Training Facility	1953	Not Eligible	
20604	School	1964	Not Eligible	

10.3.8 Shock Tube Facility

The Air Force Shock Tube Facility, or the 57000 Area, was first established in 1961. The first shock tube was relocated from Gary, Indiana, and set up on Sandia Base by the AFSWC's Structures Division. It was used to study the effects of simulated shock waves from a nuclear explosion on aboveground and underground structures. AFSWC contracted with UNM to run the new facility. The facility was renamed the Eric H. Wang Civil Engineering Research Facility in 1965, after it was transferred from the AFSWC to AFWL. During the 1960s, it was used to test Minuteman silos and the NORAD blast valve.

The first buildings (57001, 57002) were completed in 1961. They were constructed using a steel tube or I-beam column structural system with a steel joist and purlin roof assembly forming the gable roof. The cladding for both the roof and walls was light-gage galvanized corrugated sheet metal (Figure 83). Some of the buildings were designed to incorporate the shock tube assemblies within their structural framework. This construction method was fast, inexpensive, and allowed for reconfiguration ease as the mission of the building changed or to gracefully accommodate changes in technology. By mid-1964, the complex included seven shock tubes of various sizes.

Buildings 57001, 57003, 57004, and 57012 served as laboratories, retain integrity, and were determined eligible to the NRHP under Criteria Consideration G for their role in nuclear effects testing. The remaining buildings either have lost integrity or served only as support facilities. This area did not qualify as a historic district owing to the loss of shock tubes (horizontal and vertical) and numerous alterations of buildings.

Table 19: Shock Tube Facility buildings eligibility status

No.	Name	Date	NRHP Status	Notes
57001	Soil Engineering Science Lab	1961	Eligible	
57002	Soil Engineering Science Lab	1961	Not Eligible	
57004	Civil Engineering Science Lab	1963	Eligible	
57005	Bottled Gas Storage	1963	Not Eligible	
57003	Soil Engineering Science Lab	1964	Eligible	
57006	Base Paint and Sealer Storage	1968	Not Eligible	
57008	Storage Igloo	1969	Not Eligible	
57010	Civil Engineering Science Lab	1969	Not Eligible	
57012	Civil Engineering Science Lab	1969	Eligible	
57007	Vehicle Maintenance Shop	1972	Not Eligible	
57009	Civil Engineering Science Lab	1973	Not Eligible	
57011	Civil Engineering Science Lab	1979	Not Eligible	

10.3.9 900 Area (Air Defense)

The 900 Area, on the east side of Truman Street near the Truman Gate, was built in the early 1950s for Cold War air defense (Figure 123: The 900 Area today). Until 1960, it served as the headquarters for the 34th Air Division (Defense) that directed air defense radar alert and interception for New Mexico, Arizona, west Texas, and most of Colorado and Utah. This was part of a national Cold War effort by the USAF to protect American skies from invasion by Soviet bombers.

Operating under the ADC, the 34th Air Division (Defense) directed nine AC&W radar stations, manned by AC&W radar squadrons in New Mexico, Arizona, and Texas, and FIS in ready alert mode. The AC&W and FIS were located remotely from the ADC area on KAFB; the 93rd FIS first operated out of its alert hangar (1030) at the end of the primary runway (Figure 124: Hangar 1030). The 690th AC&W radar squadron stationed at KAFB was set up in temporary Jamesway huts. Two such huts are located just east of the 900 Area, across San Mateo Boulevard on New Mexico Regional Federal Medical Center property, and were likely the huts used by the 690th AC&W radar squadron.

The architectural firm of Holabird, Root & Burgee from Chicago designed the five buildings constructed for the 34th Air Division (Defense) headquarters. The firm handled the design and engineering of similar Air Divisions (Defense) posts around the country and, in 1949, finalized standard plan drawings for ADCCs and ADDCs, which were the main control centers for Air Divisions (Defense). These centers were “proto-hardened and designed for limited protection from atomic, biological and chemical attacks” (Weitze 2001).

ADCCs were designed to be windowless, with inner and outer air locks, and decontamination chambers having shower and contaminated clothes areas. Power stations accompanied most ADDCs and ADCCs at Air Division (Defense) headquarters (Weitze 2001). Since this was a highly specialized building type, no local architectural firms had first-hand knowledge of their design. By using a standardized building design and out-of-state design firm with the appropriate knowledge, the facilities were constructed in a timely and more predictable manner.

The 34th Air Division (Defense) site was referred to as "KAFB Training Facilities Site 1" (KAFB 1949). Owing to the secrecy of the mission, the complex included an entrance guard shack and a perimeter security fence; both have since been demolished (Figure 125: Entrance to the headquarters of the 34th Air Division circa 1953). Building 909 served as the ADCC at KAFB. The original building, now the western portion, is a concrete structural frame with CMU infill. To preclude surveillance, the building had no windows. Building 909 had two additions built on the east side, in 1966 and 1970, respectively. The additions are steel structural frame with painted corrugated metal siding, but they do not affect the west or front elevation.

Building 910 served as a power station for the complex. It has a low-bay and a high-bay, resulting in a stepped flat roof with an overhang. The walls are CMU and the windows are steel sash. An overhead door has been added to the north elevation, but the building retains its original massing and windows.

Building 911 was constructed as a storehouse. It has CMU walls and a hipped asphalt shingle roof that forms the overhang. The roof appears to have been added after the original construction. In 1952, Building 911 was converted to office space. The windows have been filled in and hollow metal doors have been added. While the integrity of Building 911 has been compromised, it contributes to the complex as a whole.

Buildings 912 and 913 served as utilitarian, temporary housing for 34th Air Division (Defense) personnel (Figure 126: Original drawing for Building 912). Each "house" had a bedroom, study, living room, and bath. These two buildings are L-shaped and have CMU walls and flat roofs with overhang, steel sash awning windows, and decorative steel pipe rail trellises from the overhang to the stoop at the north elevation. Buildings 912 and 913 retain many original features but have hollow core wood replacement doors.

The 900 Area retains overall integrity as an early 1950s Air Defense Command headquarters and was determined eligible as a historic district to the National Register under Criterion A for its Cold War air defense role.

The 900 Area also served as an R&D site for EMP testing during the 1970s and 1980s. Several buildings were added to the site in the early 1970s. AFRL constructed Building 914 in 1971 as a Nuclear Engineering Testing Building, and it is referred to on architectural drawings as the Survivability Vulnerability Test Simulator Facility, including an EMP laboratory. Building 914 has a flat roof; its side walls are tilt-up concrete panels with "punched in" aluminum-framed, fixed windows forming vertical elements. The end walls are CMU infill. The south elevation has an entrance canopy with a shed roof and decorative perforated block screen wall adjacent to the parking lot (Figure 127: Building 914 in 2002). Building 914 has been determined individually eligible under Criteria Consideration G for its association with EMP testing.

Table 20: 34th Air Division Defense Headquarters buildings eligibility status

No.	Name as Built	Date	NRHP Status	Notes
909	Standardized Control Center	1952	Contributing	ADCC building
910	Power station	1952	Contributing	
911	Storehouse	1952	Contributing	
912	General Quarters	1952	Contributing	
913	General Quarters	1952	Contributing	
907	Base Supply Equipment Warehouse	1970	Not Eligible	
914	Nuclear Engineering Testing Building	1971	Eligible	EMP laboratory
906	Laboratory Nucleonics Science	1975	Not Eligible	

10.3.10 New Mexico Air National Guard Area

The current NM ANG Area was established in the early 1950s for the 93rd FIS. The FIS was the ready alert group in support of the 34th Air Division (Defense), located then in what is now the 900 Area.

Hangar 1030 was the 93rd FIS's alert hangar and was first located near buildings 1028 and 1029, which served as the 93rd FIS flight simulator and readiness crew dormitory, respectively (Figure 128: ANG Area circa 1968). After KAFB lengthened its east-west runway in 1955 to 13,373 feet, hangar 1030 was moved to its current location (Figure 124). New support facilities accompanied the hangar, including a maintenance hangar (1043) in 1957, a supply and issue shop (1045) in 1958, and a new readiness crew dormitory (1047) in 1959. An armament shop has since been razed. A base rocket assembly storage facility (1042) was located nearby in 1957.

In 1960, the 34th Air Division (Defense) was disestablished, and the 93rd FIS's alert facilities were taken over by the NM ANG, a common practice around the country. This change resulted in a flurry of new construction. In 1961, the NM ANG built a woodworking shop (1053), and an aircraft inspection and repair shop (1051). The following year, a base supply and equipment shop (1052) was constructed. In 1965 and 1966, four more buildings were constructed in the NM ANG Area. These were a training building (1055), a lounge/dayroom (1054), another base supply and equipment warehouse (1056), and an auto maintenance shop (1058).

Buildings 1030 and 1043 were determined eligible to the National Register under Criterion A and Criteria Consideration G, respectively, for their role in Cold War Air Defense. Other buildings have undergone significant architectural renovations, resulting in loss of integrity; still others did not possess exceptional significance. This area did not qualify as a historic district.

Table 21: ANG buildings eligibility status

No.	Name	Date	NRHP Status	Notes
1030	Alert Hangar	1952	Eligible	
1043	Maintenance Hangar	1957	Eligible	

No.	Name	Date	NRHP Status	Notes
1047	Crew Readiness	1959	Not Eligible	Loss of integrity
1042	Base Rocket Storage Assembly	1957	Not Eligible	
1053	Woodworking Shop	1961	Not Eligible	
1051	Aircraft Engine Inspection and Repair	1961	Not Eligible	
1052	Base Supply Equipment Shed	1962	Not Eligible	
1055	Training, Reserve Force Operational	1965	Not Eligible	Loss of integrity
1054	Dayroom Lounge	1965	Not Eligible	
1056	Base Supply Equipment Warehouse	1965	Not Eligible	
1058	Auto Maintenance Shop	1966	Not Eligible	

10.3.11 Flightline Hangar Area

Hangars 1000, 1001, and 1002 were built between 1952 and 1955 as support facilities for the AFSWC and for NASWF (Figure 129: 1000 Area hangars circa the mid-1970s). Hangar 1001 was constructed to serve the AFSWC's mission to provide atomic weapons modification of the Convair B-36, which arrived at KAFB in 1947. Hangar 1000, built three years later, also supported AFSWC activities. These hangars were a typical roll-through design with clear-span roof structures and large sliding doors to accommodate aircraft entry and exit. Ancillary spaces were located to each side of the work bays to accommodate multiple aircraft.

Hangar 1002 was constructed in 1955 in support of NAWSF, the U.S. Navy's version of the AFSWC. The NASWF's mission at KAFB was to provide the U.S. Navy's aircraft with nuclear weapons capability. Like the AFSWC, the NASWF had been directed to work with Sandia Laboratory, the AFSWP, and the AEC for this mission.

All three hangars retain integrity and have been determined eligible to the NRHP: Hangar 1001 under Criterion A, and Hangars 1000 and 1002 under Criteria Consideration G for their role in the AFSWC mission.

Building 1013, located to the north of the hangars, was constructed in 1952 as a heating plant for the site. It was constructed to house large boilers and the associated heat distribution equipment. Typically, this equipment is tall and must be housed in a building with a perimeter structural system. The International Style was selected because it gracefully accommodates the scale of the equipment and provides a sleek, modern façade. This building has three stories, is one of the taller buildings on base, and has been determined eligible under Criterion C for its International Style architecture. It has a flat roof with metal coping, scored 8 × 8 × 16 painted CMU block walls which give the illusion of an 8 × 8 × 8 cubic block and vertical fenestration bays with metal sash awning windows.

Table 22: Flightline hangar eligibility status

No.	Name	Date	NRHP Status	Notes
1013	Heating Plant	1952	Eligible	
1001	Science Laboratory, Outdoor Environment	1952	Eligible	

No.	Name	Date	NRHP Status	Notes
1000	Hangar	1955	Eligible	
1002	Maintenance Hangar	1955	Eligible	

10.3.12 400 Area

The 400 Area developed in the early 1960s in the northwest corner of the base, just east of Albuquerque International Airport (Sunport) (Figure 88). The AFWL, precursor to AFRL, was established in 1964, and this area became the headquarters for both administration and R&D.

W.C. Krueger Architects, a local firm whose architectural vocabulary focused on modern styles, designed the first building in the area, Building 413, which was a nuclear weapons research facility for the AFSWC. W. C. Krueger's firm designed many of the lab buildings at Los Alamos and had the experience and history to complete military-related R&D facilities. The building was constructed in 1957 with a flat roof, painted CMU walls, and steel sash four-pane awning windows with cast-in-place concrete band window sills and shade overhangs. In the early 1960s, AFWL added a group of buildings to the southwest of 413, and all were of similar construction: painted CMU walls with flat roofs. The new buildings were built as laboratories, with the exception of one storage facility.

In 1966, AFWL added Building 405, an arming and fuzing laboratory designed in the New Formalism architectural style, which combines influences from both the International style and classical architecture. New Formalism buildings are generally symmetrical, freestanding blocks, with columns and arches in stylized modern shapes. Building 405 was constructed two years after AFWL was established and was likely envisioned as a showcase laboratory building for the organization, explicating the greater emphasis on its design.

Building 405 has a cast-in-place concrete post-and-beam structure with painted CMU infill walls. The roof structure is flat, precast concrete single tees. The entrance vestibule shares the same precast concrete single tee roof construction, however the horizontal members of the tees are canted to form a "Y" and add an interesting saw-tooth roofline. The entrance vestibule is painted CMU wall construction with glass entrance doors. The west wall of the entry vestibule is fieldstone masonry construction on both interior and exterior faces (Figure 130: Architectural rendering of the New Formalism entrance vestibule of Building 405).

In 1968, AFWL added Building 400, a laser science laboratory also designed in the New Formalism style. Similar to Building 405, it is cast-in-place concrete post-and-beam structure with painted CMU infill walls. The roof is flat with a precast concrete single tee structural deck. The entrance vestibule shares the same precast concrete single tee roof construction, with the horizontal members of the tees canted to form a saw-tooth roofline. The entrance vestibule is painted CMU wall construction with glass entrance doors. Unlike Building 405, the east elevation of the vestibule is accented with a plant-cast concrete panelized pebble-faced wall system. This construction method for both building shells was fast and provided a structurally sturdy facility with suitable acoustic insulation and thermal insulation values, as well as a very low per-square-foot price.

That same year, AFWL constructed Building 412, a nuclear engineering testing building with painted CMU walls and a flat roof. This building was very similar in architectural style to Building 413 and served as a computation facility with large computer and data reduction rooms.

The 400 Area continued to develop throughout the 1970s, 1980s, and 1990s (Figure 131: AFWL Area circa 1968–1971 and Figure 132: AFWL Area circa 1980s). During this time, buildings were added to the complex, architects designed connectors to create a long series of buildings from individual structures, and alterations were made to the original architecture. Only three of the early AFWL buildings remained virtually untouched.

Buildings 400, 405, and 413 retain integrity and were determined eligible to the NRHP under Criteria Consideration G for their significance as early laser laboratories. The other early laboratory buildings, though significant for their early mission, have undergone significant loss of integrity from renovations, including the addition of stucco wall-finish systems, the replacement of windows and doors, and the alteration of interior spaces.

Table 23: 400 Area eligibility status

No.	Name	Date	NRHP Status	Notes
413	Nuclear Engineering Testing	1957	Eligible	New Formalism
419	Technical Library	1961	Not Eligible	
411	Refuse Incinerator	1962	Not Eligible	
416	Physics Science Lab	1962	Not Eligible	
414	Physics Science Lab	1962	Not Eligible	
415	Physics Science Lab	1962	Not Eligible	
417	Physics Science Lab	1962	Not Eligible	
405	Armament Research Engineering	1966	Eligible	
418	Physics Science Lab	1966	Not Eligible	
400	Laser Science Lab	1968	Eligible	New Formalism
412	Nuclear Engineering Testing	1968	Not Eligible	
406	Laser Science Lab	1973	Not Eligible	
407	Laser Science Lab	1975	Not Eligible	
421	Laser Science Lab	1975	Not Eligible	
410	Research Data Services Center	1977	Not Eligible	
402	Data Processing Installation	1985	Not Eligible	

10.3.13 ALL Optics Laboratory (Building 243)

Building 243, located to the west of the AFRL 400 Area, was an AFWL optics laboratory used to develop the Cycle I Airborne Pointer Tracker (APT) for the ALL project (Duffner 1997). The APT was an important milestone in the ALL program, which paired an NKC-135 with a GDL and APT tracking system. The ALL was used to shoot down missiles, illustrating the viability of lasers as airborne weapons.

Building 243 was constructed in 1970 as a base supply and equipment warehouse, but it was redesignated by 1974 as a laser science laboratory. The building has a low gable roof with exposed ductwork; metal fascia; corrugated, light-gage sheet metal wall siding; and hollow metal doors. It retains integrity and, as such, was determined eligible to the NRHP under Criteria Consideration G for its association with AFWL Laser Programs.

10.3.14 Advanced Radiation Test Facility

The ARTF, or Hangar 760, was constructed in the mid-1970s for AFWL development of the ALL. The ALL was a modified NKC-135 aircraft outfitted with a laser and a tracking system. The highlight of the ALL program occurred in 1983, when the ALL disabled five airborne AIM-9 “Sidewinder” missiles.

Hangar (760) was specially designed for the ALL, and the site included a laboratory/test cell, an aircraft pad and calorimeter structure, and a remote target and associated storage facility. The laboratory/test cell (765) was used as a mockup of the ALL in order to test the ALL’s laser subsystems, including the APT. The calorimeter building (2635), adjacent to the aircraft pad (2634), was referred to as the “white elephant” clean room.

The hangar has a metal gable roof and corrugated, light-gage metal siding with large sliding doors. The laboratory/test cell building also has a metal gable roof with corrugated, light-gage sheet metal siding and metal overhead doors. The calorimeter structure is steel frame with light-gage sheet metal siding. The primary remote target (776) is a CMU wall that was used for laser testing (Figure 133: ARTF circa the mid-1970s). Its associated instrumentation building (774) is a gable roof structure with CMU structural walls. It originally held state-of-the-art instrumentation equipment for measuring the accuracy of the laser beams and determining the beam characteristics. The second target was a diagnostic plane parked approximately 700 meters from ARTF.

Of the six buildings and structures remaining from the ALL era, all were determined eligible to the NRHP under Criteria Consideration G for their role in AFWL Laser Programs.

Table 24: ALL properties eligibility status

No.	Name	Date	NRHP Status	Notes
760	Armament Research Test Facility	1976	Eligible	Hangar
765	Test Cell	1976	Eligible	
2634	Dangerous Cargo Pad	1974	Eligible	
2635	Dangerous Cargo Pad	1974	Eligible	
776	Butt, Firing In	1974	Eligible	
774	Storage, Research Equipment	1974	Eligible	

10.3.15 Starfire Optical Range

In 1970, construction began on the Kirtland Laser Propagation Test Annex, which served as a laser experiment facility for the AFWL. It is located north of the 29000 Area and east of Manzano Base; it was isolated because of the importance and volatility of its mission. This complex is known today as the Starfire Optical Range, but when it opened as a fully operational facility it was designated the Sandia Optical Range. It was the first USAF high-energy laser research and development facility.

Most of the SOR buildings were constructed on the side of a large hill, with a guardhouse located at the base of the hill (Figure 134: SOR circa the mid-1970s). The construction of the primary building is painted CMU walls and the ancillary buildings are pre-engineered metal. Domes were added to some buildings circa the 1990s for the high-power telescope research currently ongoing at SOR.

Building 66001 was the centerpiece of SOR and housed the USAF's first GDL, which was integrated into the AFWL's ALL. Building 66001 is a painted CMU structure with a flat roof on a structural metal deck supported by steel open-web joists. Support facilities include an electric power station (66005), a guardhouse (66006), and a support facility (66007), which are all pre-engineered metal with either painted or galvanized corrugated metal siding. The supply and equipment shed (66008) is a Quonset hut with galvanized metal siding/roofing.

Buildings added after the initial construction development include a storage facility (66011,) a painted CMU structure for rocket fuel propellant, a laser laboratory (66019) housing the Field Tracking Telescope for the ALL (66019), and two laboratories in support of the ALL project (66041 and 66042). Three revetments were constructed (66015, 66016, 66061) as targets for laser experiments.

By the mid-1980s, the site was renamed DEER. Experiments ongoing at the site included RACHL, RADLAC II, and GWEN. RACHL was a project to determine laser effects on satellite and missile components. RADLAC II was an experiment in stable electron beam propagation, and the GWEN was a low-frequency radio system that was created to survive extreme broadband interference.

Buildings 66001, 66019, 66041, and 66042 have undergone some modification, but they retain their association to early laser testing and have been determined eligible to the NRHP under Criteria Consideration G for their role in AFWL Laser Programs.

Table 25: Surviving SOR/DEER buildings in 2003

No.	Name	Date	NRHP Status	Notes
66001	Laser Science Laboratory	1970	Eligible	
66005	Electric Power Station	1970	Not Eligible	
66006	Security Police Sentry House	1970	Not Eligible	
66007	Laser Science Laboratory	1970	Not Eligible	

No.	Name	Date	NRHP Status	Notes
66008	Base Supply Equipment Shed	1970	Not Eligible	
66015	Revetment Pre-Engineered	1973	Eligible	
66016	Revetment Pre-Engineered	1973	Eligible	
66019	Laser Science Laboratory	1973	Eligible	
66011	Propulsion Research Lab	1975	Not Eligible	
66041	Laser Science Laboratory	1976	Eligible	
66042	Device Building	1976	Eligible	
66061	Revetment Pre-Engineered	1976	Eligible	
66029	Headquarters Specified	1981	Not Eligible	

10.3.16 Shiva Hangar (322)

AFWL constructed Hangar 322 in 1972 to house SHIVA I, a pulsed power source that produced intense X-rays and was built to study the threat that such X-rays posed to satellites and reentry vehicles passing through a nuclear environment in space. It was an important Cold War alternative to expensive underground testing of the same nuclear effects. Hangar 322 is a high-bay hangar with a low-slope gable roof, metal fascia, aluminum skin walls, and large overhead doors on the east and west ends (Figure 135: Building 322 in 2002). The large structure was designed to house the expansive pulsed power source.

The building retains its character-defining features, including its original massing, slightly gabled roof, and entrance vestibule. Hangar 322 currently houses SHIVA Star, the more powerful successor to SHIVA I (Figure 136: SHIVA Star). AFWL built SHIVA Star in 1982 as the largest pulse power facility in the country. The experiments conducted in Hangar 322 earned national recognition for AFWL as a leader in pulse power physics. Hangar 322 has been determined eligible to the NRHP under Criteria Consideration G for its role in nuclear effects testing.

10.3.17 1550TH ATTW Training Area

The 1550th ATTW, now called the 58th Special Operations Wing, moved to KAFB from Hill Air Force Base in 1976. It was a unit of MAC's Aerospace Rescue and Recovery Service and brought more flying activity to the base. It was responsible for USAF advanced helicopter training, which included fixed-wing rescue and recovery training, and testing new helicopter systems and techniques. Rescue and recovery was an essential component of strategy for rapid deployment and international mobility, one of the elements of deterrence and a focus of U.S. Cold War strategy.

Building 955 was constructed for the 1550th ATTW in 1977 as a flight simulator bay for rescue and recovery training employing the MH-53 and H-3 helicopters. A second flight simulator bay, 956, was built in 1981 (Figure 137: Flight simulator bays 955 and 956 in 2002) for training on the C-130P Hercules aircraft.

Both flight simulator bays retain character-defining features, such as their original massing, metal siding, large bay doors, and interior high-bay spaces, and were determined eligible to the NRHP under Criteria Consideration G for their role in Cold War Training.

10.3.18 EMP Simulation Historic District

The EMP Simulation Historic District comprises several sites for EMP testing: Trestle, ARES, HPD, and VPD-II. EMP testing was a significant Cold War research effort on the part of the military community to provide data to harden aircraft and equipment to the effects of EMP, a byproduct of nuclear explosions. Each EMP test site was composed of the EMP test structure surrounded by one or more support structures, sometimes underground to provide maximum protection from EMP.

ARES was built in the late 1960s to test missiles, including the Minuteman and Poseidon. It became operational in 1970 (Figure 91, above). The site included a support building (20754), the EMP structure itself (20753), and an underground data acquisition area and tunnel (20752) (KAFB 1970).

HPD (20561), located northwest of ARES, was constructed in 1974 (Figure 92). A former horse stables clubhouse (20560) was converted into an operations building for HPD. HPD exposed large aircraft in ground alert mode to EMP effects. The E-3A, E-4B, B-52, C-130, F-16, and A-7E aircraft were tested there (AFWL 1981).

VPD-II (20563) was constructed on the same site two years later (Figure 93). For that EMP facility, an underground storage area (20562) was built to serve as an electrical chase and data-collection area (KAFB 1976). VPD-II also tested aircraft in ground alert mode, but it had the additional capability of illuminating aircraft in flight. The E-3A, E-4B, B-52, C-130, F-16, and A-7E were tested at VPD-II.

In the mid-1970s, south of HPD/VPD-11 and southwest of ARES, construction began on the Trestle facility (Figure 94). The Trestle area included the structure itself (20796), a support and operations building (20797), several utilities facilities (20794, 20789, 20790), and a guardhouse (20792) and was operational by 1980. The Trestle was the equivalent of a ten-story building and was made entirely of wood, including nuts, bolts, and any other fasteners. Because wood is nonconductive, in contrast to steel or concrete, it would not distort the EMP test results. The Trestle was the only EMP simulator with the capacity able to test full-scale large aircraft in simulated flight under realistic threat conditions. Testing there involved B-52s, C-5As, E-4Bs and B-1s.

These facilities carried on EMP testing into the mid- to late 1980s. The structures themselves retain much of their integrity. While some of the support facilities have been modified, the area retains integrity. It has been determined eligible to the NRHP as a historic district under Criteria Consideration G for its role in EMP Simulation.

Table 26: EMP Simulation Historic District

No.	Name	Date	NRHP Status	Notes
20752	Electronic Equipment Facility	1970	Eligible	
20753	Working Volume Test Area	1970	Eligible	
20754	Electronic Equipment Facility	1970	Eligible	
20757	Concrete Slab	1970	Not Eligible	
20749	Electronic Research Laboratory	1975	Eligible	
20560	Electronic Research and Testing	1961	Eligible	
20561	Horizontally Polarized Dipole	1974	Eligible	
20562	Research Equipment Storage	1976	Eligible	
20563	Research Equipment Storage (VPD-II)	1976	Eligible	
20792	Traffic Check House	1975	Contributing	
20794	Water Tower	1975	Contributing	
20796	Trestle	1975	Contributing	
20797	Electronic Research Laboratory	1975	Contributing	
20789	Special Tower	1975	Contributing	
20790	Special Tower	1975	Contributing	

10.3.19 EMP Simulation Site (Building 736)

Building 736 was constructed in 1968 as a Nuclear Engineering Testing Building. It was used as a high-altitude simulation-testing site by the AFWL EMP Branch. Little detail is known of what specific types of EMP testing took place in this area, but Building 736 has been determined eligible under Criteria Consideration G, because of its association with EMP high-altitude testing.

10. 4 Conclusion

KAFB has changed a great deal since its establishment as a U.S. Army airfield in 1941. It has evolved from a hastily constructed training and testing facility necessitated by the onset of World War II to a significant USAF center for R&D. What began as a 2,000-acre air base has grown into a 51,800-plus-acre facility.

The first buildings on the installation were simple wood-frame structures constructed quickly in order to fulfill the country's urgent need for trained pilots to fight the war. Some of these buildings are extant, but have all been altered to such a degree that they are no longer recognizable as WWII facilities.

When WWII ended, it was not clear whether Kirtland Field would be closed or become a permanent USAF facility. The transformation of the Air Depot Training Station into Sandia Base, home to Sandia Laboratory and the AFSWP, kept the facility open and ultimately determined its fate. Kirtland Field was renamed KAFB, and it became the USAF's main facility for integrating new weapons designs produced by Sandia Laboratory with operational USAF aircraft and equipment.

During the early 1950s, both KAFB and Sandia Base began constructing permanent facilities to replace the WWII temporary structures. These new buildings were generally utilitarian, flat-roofed, CMU buildings with little attention to aesthetics or decorative features. However, Sandia Base incorporated the International Style and Southwestern detailing into their headquarters buildings to provide a sense of place and a higher level of formality befitting the command.

Also during the early 1950s, weapons training facilities were established at Sandia Base in pre-engineered metal buildings that were quickly and easily constructed to support the AFSWP's bomb assembly training mission. A number of these early Cold War facilities have been razed, whereas others remain in use, though they have lost their integrity through significant renovations including the replacement of roofs, windows, and doors. Eventually, more permanent CMU buildings were constructed to serve as classroom buildings for a formalized nuclear weapons school. These weapons school facilities remain at KAFB but have had significant alterations and no longer represent their early Cold War role.

In the late 1940s, Sandia Base took over the nearly 50,000-acre former NMPG. The NMPG had been hastily constructed with a variety of building types in order to support WWII proximity fuze testing. Many of the original NMPG buildings have been razed; of those that remain, most have been altered to the extent that they do not reflect their period of significance.

In the early 1950s, KAFB constructed numerous hangars to accommodate the AFSWC's B-36 bombers and the NASWF's aircraft, as well as alert facilities for the ADCs 34th Air Division (Defense). These alert facilities included both operations buildings for the ADC and hangars for early air defense aircraft, such as the F-86 Sabre jets. In the early 1960s, when the 34th Air Division (Defense) was disestablished, the NM ANG set up permanent headquarters in the former ADC flightline alert area. NM ANG added numerous facilities, consisting mainly of CMU buildings for headquarters, training, and support.

The AFWL was established during the 1960s as a major USAF organization with an R&D mission. The laboratories and headquarters for the early AFWL were generally flat-roofed CMU utilitarian buildings with little extraneous decoration, with the exception of two laboratories designed in the New Formalism architectural style. This style was considered cutting-edge and included pre-cast concrete tee roof structures and stone masonry accents at the entrances.

Also during the 1960s, AFWL missions necessitated the building of test sites for various research projects, including blast and shock effects and EMP simulation. These sites were established with functional buildings and structures that were devoid of detailing. Numerous shock tube test structures were built in the 57000 Area and were primarily constructed of CMU or metal with steel shock tubes extending from the structures. EMP facilities or test structures involving ground planes, test stands, and pulsers were built in the 600 Area and what became known as the Trestle Area. They were typically constructed with wood or steel poles that supported EMP cables. The cables created the volume in which aircraft and other systems were tested for EMP effects. The Trestle is the largest EMP structure in the world, equivalent in height to a ten-story building, and was constructed entirely of wood, including the nuts and bolts.

By the early 1970s, AFWL began to focus on laser R&D. The USAF's first high-energy laser research facility was constructed southeast of the main base area and is known today as the Starfire Optical Range. The facilities are utilitarian and constructed of pre-engineered metal buildings and flat-roofed, simple CMU buildings.

During the same period, the ARTF was constructed south of the main base to support development of the ALL, a highlight of AFWL's 1970s laser mission. Facilities for ARTF were light-gage metal and included a standard metal hangar for the ALL NKC-135 aircraft, and a metal test cell building and an additional building located west of the 400 Area, but also associated with the ALL project.

Pulsed power, considered an alternative to more expensive underground testing, was another focus of AFWL study during the 1970s. During this period, Hangar 322 was constructed to house AFWL's SHIVA I, a large pulsed power source. The light-gage, metal-sided high-bay hangar was constructed south of the main AFWL headquarters area. Like facilities for laser research, Hangar 322 is purely functional in its design and devoid of architectural detailing.

During the mid-1970s, the 1550th ATTW moved from Hill AFB to KAFB. The 1550th ATTW focused on advanced helicopter training, and to accommodate this mission, KAFB constructed two metal flight simulator bays.

By the mid-1970s, Manzano Base and a significant portion of the Sandia Base land was integrated into the KAFB installation. KAFB continued its role as an R&D installation and hosted other military organizations depending on space availability. With the change in land ownership, DNA, the successor to what originated as the AFSWP, relinquished host responsibilities for Sandia Base and became a tenant at KAFB. Sandia Laboratories continued its activities with ownership of its properties on the main base and in ancillary areas to the south. Some of the former AFSWP/DASA training buildings that were later occupied by the AFSWC have become home to the 377th Air Base Wing, the current host of KAFB.

The hastily constructed WWII installation at Albuquerque has developed into an important R&D center for the USAF. The architecture associated with KAFB for the most part is functional in design with a focus on the mission for which the facilities were constructed and little attention to aesthetics. Thus the facilities that were constructed with specific design intent and styling tend to stand out. The architectural styles at KAFB include International Style, New Formalism, Territorial Style, and military headquarters with Southwestern detailing.

GLOSSARY

1st New Mexico Infantry

The New Mexico National Guard unit that was at Camp Funston, a World War I training camp at the University of New Mexico.

34th Air Division (Defense)

A 1950s unit stationed at KAFB that protected the air defense area encompassing New Mexico, Arizona, the majority of Colorado and Utah, and some of West Texas.

antiballistic missile

Missile designed to intercept and destroy incoming ballistic missiles.

Armed Forces Special Weapons Project

An interservice agency that was established to discharge all military functions relating to atomic energy and functioned from 1947 to 1958.

arming system

That portion of a weapon that serves to arm or disarm the firing and fuzing systems

Arnold, Henry "Hap"

Chief of the Army Air Corps during WWII

atmospheric testing

Nuclear tests conducted aboveground or above water; i.e. in the open air.

atomic bomb

An explosive device whose destructive power is due to the uncontrollable release of energy from the fission of heavy nuclei by neutrons sustaining a chain reaction.

Atomic Energy Commission

A civilian board created in 1947 to oversee American nuclear policies and weaponry.

ballistic missile

A missile that gains its altitude through a source of propulsion, usually a rocket motor, rather than by the aerodynamic lift of its wings.

Berlin Crisis

A 1948 Soviet blockade of land routes into West Berlin through East Germany.

bombardier

A member of a military aircraft crew releases bombs.

Bombardier School

The World War II training facility at Kirtland Field that taught bombardier skills.

Bombardier Pilot School

The World War II training facility at Kirtland Field that taught pilots how to fly bombers and work with the bombardiers, as during actually bombing, the bombardiers had control of the aircraft.

Civil Air Patrol

A volunteer network of private pilots and aviators used for coastal patrol, search and rescue, and cargo flights.

Cold War

Term used to describe the shifting struggle for power and prestige between the Western powers and the Communist bloc from the end of World War II until 1989—a struggle between democracy and communism.

cruise missile

A low-flying, continuously powered offensive missile designed to evade defense systems missile that gains altitude from aerodynamic lift; usually continuously propelled by a jet engine. The cruise missile is a relatively inexpensive method for delivering weapons over long distances with pinpoint accuracy. The missile, which flies at altitudes of about 50 ft, has a range of up to 2,000 mi. It uses internally stored computerized maps of its route to follow the contour of the terrain and can deliver conventional or nuclear weapons.

Defense Atomic Support Agency

This is the agency successor to the Air Force Special Weapons Project from 1958 to 1973.

Department of Defense

Created by the National Security Act of 1947 by combining the Departments of War and Navy and was called the National Military Establishment; became the DoD when the act was amended in 1949.

deterrence

This was the forefront of strategy and policy during the Cold War—a theory that strength in military technology would deter war.

Eniwetok Atoll

This was the site of numerous atmospheric tests, which was located in the Pacific Ocean's Marshall Islands.

Fat Man

An implosion type nuclear bomb developed by the Manhattan Project and dropped on Nagasaki, Japan.

Flexible Response

Policy allowing for multiple levels of response to nuclear threat, giving policymakers wider choices than Mutually Assured Destruction.

Flying Fortress

B-17 bomber, the first of the big bombers used during World War II.

Four-Engine School

The World War II training facility at Kirtland Field that taught pilots how to fly B-24s so they could ferry them to England.

fission

Process by which a nucleus of an atom splits into two when struck by a neutron; process releases large amounts of energy and further neutrons causing a chain reaction.

Frye, Jack

The president of TWA; he operated the Four-Engine School at Kirtland Field during World War II.

fusion

Formation of a heavier nucleus from two lighter ones; as with fission it only occurs with particular isotopes of elements, most notably tritium and deuterium (isotopes of hydrogen).

Great Depression

U.S. economic crisis beginning with the stock market crash of 1929 and continuing through the 1930s.

Ground Observer Corps

Network of civilian volunteers formed in the early 1950s to assist with air defense surveillance.

Groves, Leslie

U.S. Army general who headed the Manhattan Project from 1942 until 1947, when atomic energy affairs were turned over to the newly created civilian Atomic Energy Commission.

hardening

The process of making military equipment resistant to the effects of nuclear explosions.

Homestead Act

An act of Congress passed in 1862 that promised 160 acres of public land to a citizen who lived on the land and cultivated it for 5 years.

Illuminate

To expose to radiation.

Intercontinental Ballistic Missile
A long-range ballistic missile with a target range of many thousands of miles.

igloo
A dome-shaped building for the storage of rockets or other munitions.

Interservice
A group or unit established that involves several United States military services—in this context, usually the Army, Navy and Air Force.

Intermediate Range Ballistic Missile
An intermediate range ballistic missile that can reach targets up to 1,500 nautical miles away.

Killian Report
List of recommendations presented to the NSC for building the U.S. military; urged R&D of new technologies including long-range nuclear missiles, dispersal of the country's bomber force and development of early warning radar systems.

Kirtland, Roy
Pioneer army aviator famous for piloting the first airplane from which a machine gun was fired in 1912. At the time of his death in 1941, he was the third oldest military pilot in the Army.

Korean War
Conflict between Communist and non-Communist forces in Korea from June 1950 to July 1953.

Lashup
Temporary radar system built by the USAF in the early 1950s; employed aircraft control and warning squadrons.

Limited Test Ban Treaty
The 1963 treaty banning nuclear testing in the atmosphere, in outer space or underwater.

Little Boy
U.S. atomic bomb, designed at Los Alamos, and dropped on Hiroshima, Japan.

Manhattan Engineering District
The formal name for the Manhattan Project.

Manhattan Project
A top-secret research and development project that led to the first successful detonation of an atomic weapon.

Manzano Base

National Weapons Storage site built 1948 near Sandia Base and Kirtland Field.

Mark

A Cold War code word for bomb.

marriage

The process of fitting aircraft with nuclear weapons.

materiel

The supplies, equipment and weapons associated with a military force.

McNarys-Watres Act of 1930

An amendment to the Kelly Act, under which airmail carriers were paid according to the weight of the mail carried. The new law changed this so the contractors would be paid according to the available cargo space. In addition, a bonus would be paid to operators flying multi-engine aircraft equipped with the latest instruments. This was clearly an incentive for the operators to fly larger aircraft. It was also an attempt to provide a subsidy (a monetary government grant to a person or company to assist an enterprise advantageous to the public) to the airlines for carrying passengers as well as mail. The McNary-Watres Act also authorized the Postmaster General to extend or combine airmail routes.

Military Weapons Effects Program

The program under which the series of 1950s nuclear atmospheric tests were conducted.

Mining Act of 1872

An act of Congress designed to encourage settlement of the West, which allowed mining companies to purchase land for $2.50 per acre.

MIRVs

Ballistic missiles can be equipped with Multiple Independently Targetable Reentry Vehicles [MIRVs], which permit one booster to carry several warheads, each guided to a separate target.

missile

A rocket-propelled vehicle carrying a warhead or warheads.

Mutually Assured Destruction

Theory that a first strike with nuclear weapons by either the U.S. or the Soviet Union would result in retaliation with destruction on both sides.

navigator

The member of an aircraft crew responsible for plotting a course and determining the position of an aircraft.

negate

To damage the system components of a missile in order to prevent it from completing its combat mission.

neutron

Particle which carries no electrical charge that forms part of the nucleus of an atom.

New Look

President Eisenhower's policy of maximum military power through the use of nuclear weapons, air defense and maintenance of economic and military stability in Europe.

New Mexico Experimental Range

Second incarnation of the New Mexico Proving Ground after its transfer from UNM to the New Mexico School of Mines.

New Mexico Proving Ground

Site for the World War II testing of the proximity fuze; currently part of the land owned by KAFB.

Norden bombsight

Mechanical analog computer used on World War II aircraft to determine the exact moment bombs had to be dropped to accurately hit targets.

North American Aerospace Defense Command

Joint U.S.-Canadian installation, located inside a mountain in Colorado, that links a variety of radar and satellite monitoring systems and is alerted immediately of potential enemy attack; facility then alerts the president and secretary of defense for appropriate response.

North Atlantic Treaty Organization

Organization formed in 1949 to defend 10 nations of western Europe located in an arc from Norway to Italy.

nuclear

Early in the Cold War this term referred only to the hydrogen bomb (thermonuclear weapons/fusion), but has come to mean both atomic and hydrogen (fission and fusion).

NSC-68

Document urging U.S. building of a thermonuclear bomb as well as buildup of conventional military capabilities in response to Soviet detonation of an atomic bomb.

Operation CROSSROADS

Second and third tests of atomic bombs, following Trinity.

Operation Paperclip

Post World War II direct recruiting of German military scientists to aid in the development of U.S. military weaponry, especially rockets.

Oppenheimer, J. Robert

University of California physicist who served as director of the laboratory in Los Alamos where scientists working on the Manhattan Project developed the atomic bomb during World War II.

ordnance

Military weapons systems, including supplies for their use and equipment for their maintenance.

Oxnard Field

The first airfield in Albuquerque; it was initially used for commercial aviation and after 1941 for military purposes.

Project Water Supply

Late 1940s project to build national nuclear weapons storage sites.

proximity fuze

A design for detonating a charge, as in a projectile, within a predesignated radius of a target. It is also called variable time fuze, VT fuze.

Public Works Administration

New Deal government agency established in 1933 by the Congress as the Federal Administration of Public Works, pursuant to the National Industrial Recovery Act. In the hope of promoting and stabilizing employment and purchasing power, President Franklin Delano Roosevelt brought about the creation of this agency to administer the construction of various public works, such as public buildings, bridges, dams, and housing developments, and to make loans to states and municipalities for similar projects. The PWA was liquidated in the 1940s.

Re-entry vehicle

Component of a long-range ballistic missile that re-enters the atmosphere, and which contains the warhead with terminal guidance equipment.

Sandia Base

Name of the base (1946-1971) adjacent to Kirtland Field that housed Sandia Laboratory and the Armed Forces Special Weapons Project (and their successors) during the Cold War.

Section 110

A section in the National Historic Preservation Act of 1966, as amended which requires Federal agencies to identify historic properties under their jurisdiction.

Section T

A section of the National Defense Research Committee formed to develop a radio or proximity fuze that would detonate a shell when it reached the lethal proximity to its target. This section was named after its director, Merle Tuve.

Section T-4

The subsection of Section T, to which Everly Jack Workman was assigned. This is the section in Albuquerque that was given the task of testing the electrical components of the proximity fuze for ruggedness.

Semi-Automatic Ground Environment

Computerized electronic air defense system developed by MIT's Lincoln Laboratory in the 1950s.

Silverplate bombers

B-29s that were specially fitted for training, testing and dropping the atomic bomb.

Site Able

Original name of Manzano Base.

Site Y

Los Alamos, the site of the Manhattan Project.

special weapons

"Special weapons" is a term that developed in the early Cold War to include atomic, nuclear, biological and chemical weapons.

Stalin, Joseph

General secretary of the Communist Party from 1922 to 1953 and premier of the USSR from 1941-1953.

stockpile to target sequence

The order and activities involved in removing an atomic weapon from storage and assembling, testing, transporting and delivering it to a target.

Strategic Defense Initiative (SDI)

President Reagan's 1983 plan for a multibillion-dollar research program to determine if a defensive shield could be built to destroy incoming ballistic missiles and their warheads.

sublimit

A limit or ceiling placed on a subdivision of a larger category, especially the number of nuclear weapons.

Superfortress (B29) bomber

Heavy bomber used in incendiary bombing raids on Japan during World War II.

Tech Area I

The first classified area at Sandia Base used for Z Division research. The buildings were originally part of the World War II Air Depot.

Tech Area II

The second Sandia Base classified area developed for weapons assembly a half mile south of Tech Area 1. Construction began in 1948 and included two identical assembly buildings and a control building completed in 1949.

Thermonuclear

Of, relating to, or characterized by the use of atomic weapons based on fusion; i.e. hydrogen bombs.

Tingley, Clyde

Two-time chairman of the Albuquerque City Commission or ex-officio Mayor of Albuquerque, and governor of New Mexico from 1935 to 1939.

Transition Training

The final step of Army Air Corps flight training after primary, basic and advanced flying training. Those who graduated from advanced flying school were usually assigned to two months of transition training in the type of plane they were to fly in combat.

Trinity

Site near Alamogordo, New Mexico of the first atomic bomb detonation.

Truman Doctrine

Doctrine calling for U.S. economic aid to postwar Europe in order to stem Soviet influence.

V-1

Germany's Vergeltungswaffe; a World War II jet powered pilotless bomb.

variable timing fuze

See proximity fuze.

Vietnam War

A conflict, starting in 1954 and ending in 1975, between South Vietnam (later aided by the U.S., South Korea, Australia, the Philippines, Thailand, and New Zealand) and the Vietcong and North Vietnam.

Works Progress Administration

U.S. government agency, established in 1935 by executive order of President Franklin Delano Roosevelt as the Works Progress Administration; it was renamed the Work Projects Administration in 1939, when it was made part of the Federal Works Agency. Created when unemployment was widespread, the WPA—headed by Harry L. Hopkins until 1938—was designed to increase the purchasing power of persons on relief by employing them on useful projects. WPA’s building program included the construction of 116,000 buildings, 78,000 bridges, and 651,000 mi (1,047,000 km) of road and the improvement of 800 airports.

W-47 Project

Wartime operation at Wendover Army Air Base to train the 509th Composite Group to drop atomic bombs on Japan.

Z Division

Organized just prior to the completion of the Trinity Project, it was a subgroup of Los Alamos named after its chief, Dr. Jerrold Zacharias, with a mission to manage the engineering design, production, assembly and field-testing of the non-nuclear components associated with nuclear weapons.

REFERENCES CITED

768th AC&W Squadron Veterans cyberbase. n.d. Photograph of AC&W Radar Squadron east of Moriarity. <http://768th.freeyellow.com/sphoto.htm>

A-3 Skywarrior Association. 2001. Douglas A-3 (A3D) Skywarrior. Excerpts taken from: *McDonnell Douglas aircraft since 1920,* by Rene J. Francillon. <www.a3skywarrior.com/a3histor.html>

Ackerly, Neal W. 1997. An Overview of the Historic Characteristics of New Mexico's Mines. Santa Fe: Dos Rios Consultants.

Airborne Laser Website. 2001. Airborne Laser Program Background. <www.airbornelaser.com>

Air Defense Radar Veterans Association. n.d. Ground Observer Corps. <www.radomes.org/acwrons/documents/GOC.html>

Air Force Contract Management Division. 1980. Press Release Detailing the Completion of the Trestle EMP Simulator, February 29. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1985. Air Force Contract Management Division: Vital Link between Government and Industry, 4 January 1965–4 January 1985. Albuquerque. Air Force Research Laboratory Phillips Research Site Historical Information Office

Air Force History Support Office. n.d. "Evolution of the Department of the Air Force. <www.airforcehistory.hq.af.mil/PopTopics/Evolution.htm>

Air Force Magazine Online. n.d. Air-2 Genie. <www.afa.org/magazine/gallery/air-2.asp>
———. 1996. Up from Kitty Hawk. <www.afa.org/magazine/kittyhawk/1940-45.html>

Air Force Operational Test and Evaluation Center. 1999. AFOTEC Taking Care of the Warfighter: 25 Years. On file, AFOTEC Headquarters, Kirtland Air Force Base, New Mexico.

Air Force Research Laboratory. Office of Public Affairs. n.d. Fact Sheet: Air Force Research Laboratory's Directed Energy Directorate High Power Microwave Division.
———. 1998. Space Vehicles Directorate, Historical Information Office. Fifty Years of Air Force Research and Development Excellence at Kirtland AFB.
———. 2002. Fact Sheet: High Power Systems Branch. Albuquerque.

Air Force Special Weapons Center. 1953. "Air Force Special Weapons Center Facilities." Albuquerque. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1956. "Air Force Special Weapons Center and Kirtland A.F.B." Albuquerque. Harry Davidson files, 377th Air Base Wing History Office.

———. 1960. “Pulse Power Laboratory in Operation at the Air Force Special Weapons Center.” Air Force Research Laboratory Phillips Research Site Historical Information Office
———. August 1970. “Joint USAF-DASA Study for Consolidation of Support Activities, Sandia Base, Manzano Base, Kirtland Air Force Base, New Mexico.”
———, Office of History. 1971. “History of the Air Force Weapons Laboratory for 1 January – 31 December 1966, Volume I: Narrative.” Air Force Research Laboratory Phillips Research Site Historical Information Office

Air Force Special Weapons Command. 1951. “Chart Book, Special Weapons Command.” Albuquerque. Air Force Research Laboratory Phillips Research Site Historical Information Office

Air Force Systems Command, Office of History. 1980. Air Force Systems Command brochure. Air Force Research Laboratory Phillips Research Site Historical Information Office, AFSC folder.
———. 1986. Vulcan’s Forge: The Making of an Air Force Command for Weapons Acquisition, 1950–1986.
———. 1988. USAF Fact Sheet: Air Force Systems Command.

Air Force Weapons Laboratory. n.d. AFWL Oxygen-Iodine Chemical Laser.
———. 1965(a) Air Force Weapons Laboratory Organization and Functions, Kirtland Air Froce Base, New Mexico. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1965(b) Air Force Weapons Laboratory, Kirtland Air Force Base, New Mexico, Information Package. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1966. Wang Civil Engineering Research Facility (Engineering Addition) Military Construction Program FY 70. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1971. History of the Air Force Weapons Laboratory for 1 January – 31 December 1966. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1972. History of the Air Force Weapons Laboratory for 1 January – 31 December 1971. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1976. History of the Air Force Weapons Laboratory for 1 January – 31 December 1968. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1977. History of the Air Force Weapons Laboratory for 1 January – 31 December 1977: SHIVA. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1978. History of the Air Force Weapons Laboratory from 1 January – 31 December 1969, Volume I: Narrative. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1979. History of the Air Force Weapons Laboratory for 1 January – 31 December 1978. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1981. AFWL EMP Test Facilities User’s Planning Guide. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1983. History of the Air Force Weapons Laboratory for 1 July – 30 September 1983. Air Force Research Laboratory Phillips Research Site Historical Information Office

———. 1983–1984. History of the Air Force Weapons Laboratory for 1 October 1983 – 30 September 1984. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1984. History of the Air Force Weapons Laboratory for 1 October 1983 – 30 September 1984. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1986. History of the Air Force Weapons Laboratory for 1 October 1984 – 30 September 1986. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1988. History of the Air Force Weapons Laboratory for 1 October 1986 – 30 September 1988. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1987. Organizational Charts, Air Force Weapons Laboratory, May 1963 – January 1987. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1989. AFWL Test Facilities and Capabilities Handbook. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1991. Terminal History of the Weapons Laboratory (AFSC) (U) 1 October 1988 – 13 December 1990. Air Force Research Laboratory Phillips Research Site Historical Information Office
———, History Office. n.d.(a) Air Force Special Weapons Center: A Brief History. Air Force Research Laboratory Phillips Research Site Historical Information Office
———, History Office. n.d.(b) History of the AFWL Civil Engineering Research Division. Draft. Air Force Research Laboratory Phillips Research Site Historical Information Office
———, History Office. 1988. The Silver Anniversary: 25 Years of Excellence. Air Force Research Laboratory Phillips Research Site Historical Information Office

Air Materiel Command. 1947. General Orders No. 37 Section 1: Transfer of Command Jurisdiction of Muroc Army Air Field, California and Kirtland Field, New Mexico; Section 2: Transfer of 4144th AAF Base Unit (Flt Test) and 428th AAF Base Unit (Sp). From AAFWFTC Album of Station Information, Kirtland Field, 1941-1944, Air Force Research Laboratory Phillips Research Site Historical Information Office.

AJ Software & Multimedia. n.d.(a) Photograph of Leslie Groves. <www.atomicarchive.com/Bios/Groves.shtml>
———.n.d. (b) Photographs of Fat Man and Little Boy. <www.atomicarchive.com/photos/index.shtml>
———.1998–2001 (a) Atomic Archive: Edward Teller. <www.atomicarchive.com/Bios/Teller.shtml>
———. 1998–2001 (b) Atomic Archive: General Groves report on Trinity Test. <www.atomicarchive.com/Docs/Groves.shtml>

Alberts, Don E. 1981. Kirtland Air Force Base: Its Origins and Activities. Albuquerque: Albuquerque Museum, History Division.
———. 1987. From Balloons to Bombers: Aviation in Albuquerque, 1882–1945. Albuquerque: Albuquerque Museum.

Alberts, Don E., and Allan E. Putnam. 1985. A History of Kirtland Air Force Base. Albuquerque: Kirtland Air Force Base.

Albuquerque Museum. 1944. Albuquerque historic photograph collection.

Albuquerque Journal. 17 February 1942. Call It 'Air Depot' Colonel Advises. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 11 June 1942. RKO to Film *Bombardier* at Albuquerque Air Base. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 7 August 1942. Glider Pilot Replacement Set Up at Air Base Here. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 11 August 1942. Jimmy Stewart Arrives at Base to Fly Bomber. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 11 August 1942. Land Condemned for Air Base. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 19 October 1942. *Bombardier* Stars Arrive Here. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 17 February 1943. Call It 'Air Depot,' Colonel Advises. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 12 May 1943. ADTS Founded Just Year Ago. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 13 May 1943. Soldiers Visit WAC Quarters. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 17 May 1943. Greasy Little Man Keeps 'Em Flying. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. August 1943. Four-Engine Pilot Training Program to Open at Kirtland. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 12 October 1943. Sandia School Buildings in Use as ADTS Hospital. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 21 April 1944. First Patients for Convalescent Center Arrive. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 12 May 1944. Birthday Cake for Kirtland WACs. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. June 1944 (no day listed). Forest Park Guest Ranch Turned Over to Army for Convalescent Soldiers. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 20 August 1944. Convalescent Center Rehabilitates Airmen. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. February 1945. 143 Bombardiers Graduated in Final Kirtland Field Class. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 1 March 1945. Col. Proper, Staff Officers Transferred from Kirtland. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 2 October 1945. Colonel Kurtz Leaves Kirtland. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 20 December 1945. Retain Kirtland Field; Few Hundred to Stay; More Acreage Sought. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 31 January 1946. 4th Air Force Takes Kirtland Field Feb. 1. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.

———. 2 February 1946. Col Hoisington Heads B-29 Project at Kirtland. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 13 February 1981. Kirtland Air Base Highly Important. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. 19 September 1982. 100 Years: Pages of Progress. On file, New Mexico State Records Center and Archives, World Wars I and II Collection.
———. July 1995. Special Reprint: Proving Ground. <www.abqjournal.com/trinity3.pdf>

Albuquerque Progress. March 1941. Air Base Construction Nearly Completed. Albuquerque: Albuquerque National Bank. On file, 377th Air Base Wing History Office.
———. 1955. Ground Observer Corps Serves as First Line of Civil Defense, November. On file, 377th Air Base Wing History Office.

Albuquerque Tribune. 5 October 1945. Fuze Perfected Here Stopped Buzz Bomb. On file, 377th Air Base Wing History Office.
———. 6 May 1966. Off the Beaten Path. On file, 377th Air Base Wing History Office.
———. 21 June 1982. Kirtland Named as Site for Space Technology Center. 377th Air Base Wing SPTG/CEVQ.
———. 18 May 1989. Airport 89 Special Section. On file, 377th Air Base Wing History Office.

Alexander, Frederic C. 1963. "History of Sandia Corporation through Fiscal Year 1963." Albuquerque: Sandia National Laboratories. Center for Southwest Research, General Library, University of New Mexico.

American Airpower Heritage Museum. n.d. Norden Bombsight. <www.airpowermuseum.org/trnorden.html>

Arkin, William, Robert Norris and Joshua Handler. 1998. *Taking Stock: Worldwide Nuclear Deployments*. Washington D.C.: Natural Resources Defense Council.

Armstrong, Ruth. 1984. "Albuquerque Chamber of Commerce, 1917–1984." Albuquerque: Public Service Company of New Mexico. Center for Southwest Research, General Library, University of New Mexico.

Atomic Flyer. 15 November 1957. "AFSWC: The Air Force's Weapon Idea Factory." Courtesy of personal files of Edward Giller.

Balcomb, Kenneth. 1980. *A Boy's Albuquerque, 1898-1912.* Albuquerque: University of New Mexico Press and Albuquerque Historical Society.

Barnes, Jeff. n.d. The SAGE Site. <www.togger.com>

Baum, Dr. Carl E. 1978. EMP Simulators for Various Types of Nuclear EMP Environments: An Interim Categorization.
———. 1992. From the Electromagnetic Pulse to High-Power Electromagnetics.
———. 2002. Interview with Karen Van Citters and Kristen Bisson, April 3.

Bellafaire, Judith. n.d. The Women's Army Corps: A Commemoration of World War II Service. <www.army.mil/cmh-pg/brochures/wac/wac.htm>

Benolkin, Michael. n.d. The New Mexico Air National Guard: A Brief History of the 150th Fighter Group/188th Fighter Squadron. <http://cybermodeler.com/nmang/nmang1.shtml>

Biebel, Charles. 1981. Depression and Dollars: The Impact of the Federal Government on Albuquerque, New Mexico, 1930–1940. Albuquerque: Albuquerque Museum History Division.

Boeing Company. 2001 (a) The History Beneath Our Wings: The War Years, 1939 to 1945. <www.boeing.com/companyoffices/history/boeing/war.htm>
———. 2001 (b) Gargoyle/Genie.
<www.boeing.com/companyoffices/history/mdc/gargoyle.htm>

Boone Publications, Inc. 1969. "Welcome Guide." Center for Southwest Research, General Library, University of New Mexico.

Bossi, Richard. 2001. USAF Installation History: Kirtland AFB. <www.i5ive.com/article.cfm/12308/72029>

Boston Latin School. n.d. WWII Recruitment Poster <www.learntoquestion.com/data/countrys-sake.jpg>

Boyle, Lucille. 1949. "Economic History of Albuquerque, 1880–1893." Master's thesis, University of New Mexico.

Boyne, Dr. Walter J. 1999. The Rise of Air Defense. <www.afa.org/magazine/1299rise.html>

Brigham, Robert K. n.d. Battlefield Vietnam: A Brief History. <www.pbs.org.battlefieldvietnam/history/>

Bright, Charles D., ed. 1992. *Historical Dictionary of the U.S. Air Force*. Westport, Connecticut: Greenwood Press.

Buchonnet, Daniel. 1976. MIRV: A Brief History of Minuteman and Multiple Reentry Vehicles. Livermore, California: Lawrence Livermore Laboratory.

Bunting, Bainbridge. 1983. *John Gaw Meem, Southwestern Architect.* Santa FE: School of American Research.

Bushnell, George E. 1902. Report on the Climatic and Sanitary Conditions of Las Vegas and Albuquerque for the Purpose of Determining the Location of a Military Post in New Mexico. U.S. Army. Center for Southwest Research, University of New Mexico.

Chase, Charles Monroe. 1882. *The Editor's Run in New Mexico and Colorado, Embracing*

Twenty Eight Letters on Stock Raising, Agriculture, Territorial History. Montpelier: The Argus and Patriot Steam Book and Job Printing House.

Cheyenne Mountain Operations Center. n.d. The Design. <www.cheyennemountain.af.mil/thedesign.htm>

City of Albuquerque Planning Department. 2001. Population Statistics. Albuquerque.
CNN Interactive. n.d. The Cold War Episode 3: Marshall Plan. <www.cnn.com/SPECIALS/cold.war/episodes/03/documents/vyshinsky/>

Coates, Michael A. 2000. Automobile History. <www.trentyne.com/driventodrive/autohistory.htm>

Collins, Mary Kay. 1996. The Built Environment – A Sense of Place: A Community Called Kirtland. Albuquerque: Hy and Joan Rosner. <www.cabq.gov/aes/s2krt.html>

Columbia Electronic Encyclopedia. 2000 (a) Homestead Act. <www.encyclopedia.com/articles/06006.html>
———. 2000 (b) World War I. <www.encyclopedia.com/articles/14006.html>

Commercial Club. 1908. Reproduction of brochure by H. B. Hening and E. Dana Johnson, published by the City of Albuquerque and the Albuquerque Commercial Club in cooperation with the new Mexico Bureau of Immigration. Reproduced from the UNM General Library Special Collections.

Compton, Karl T. 1946. Memorandum from the Commander Joint Task Force One, USS Mt. McKinley (AGC 7) Flagship, to President from Karl T. Compton, Chairman, July 13. 16-10, 22-11, Series 2 353 Crossroads – Test Able c. 1/28/46 – 9/5/46; Los Alamos National Laboratory Archives.

Costa Mesa Historical Society. 2001. Santa Ana Army Air Base. <http://webs.lanset.com/cmhistory/saaab/default.htm>

Davidson, Harry. 12 December 2001. Interview with Karen Van Citters and Kristen Bisson.

Davis, Richard G. 1997. *Hap: Henry H. Arnold, Military Aviator.* Air Force History and Museums Program.

Defense Special Weapons Agency. 1997. Defense Special Weapons Agency: 1947-1997, The First 50 Years of National Service. 377th Air Base Wing History Office, Kirtland Air Force Base.

Defense Threat Reduction Agency. 2001. "Defense's Nuclear Agency: History of AFSWP to DSWA 1947–1997." Draft. Dulles, Virginia. On file with Defense Threat Reduction Agency, Kirtland Air Force Base, New Mexico.

Denny, Wagoner & Associates. 1964. "New Air Force Nuclear Effects Simulator." Portland:

Denny, Wagoner & Associates. Air Force Research Laboratory Phillips Research Site Historical Information Office.

Department of the Air Force. n.d. USAF Fact Sheet: Air Force Operational Test and Evaluation Center. <www.af.mil/news/factsheets/Air_Force_Operational_Test_an.html>
———. 1949. Air Force Regulation No. 22-3: Organization – Headquarters USAF, USAF Field Office for Atomic Energy. Washington D.C.
———. 1972. AFSC Regulation 23-11: Air Force Special Weapons Center Organization and Mission—Field. Air Force Research Laboratory Phillips Research Site Historical Information Office.

Department of Defense. 1994. "Coming in from the Cold: Military Heritage in the Cold War." Department of Defense, Legacy Cold War Project.

Department of Energy. n.d.(a) "History of the 1900 Complex, Kirtland AFB, New Mexico." Albuquerque. On file, 377th SPTG/CEVQ, Sandia School files.
———. n.d.(b) Plowshare Program Summary. <www.osti.gov/osti/opennet/>
———. n.d.(c) Drilling with Light: A Special Report. <www.fe.doe.gov/oil_gas/drilling/laser_types.shtml>
———. 1997. Openness Press Conference Fact Sheets: Vela-Uniform Participation in Operation Nougat and Gnome Event. <www.osti.gov/opennet/factsfin.html>

Department of State. 1965. Airgram from Buenos Aeres to Scott and McClellan AFBs outlining Project QUICKDIP. <www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB7/ae11-1.htm>

Designation Systems.net. 2002. <www.designation-systems.net/dusrm/index.htm>

Duffner, Robert W. 1997. *Airborne Laser: Bullets of Light.* New York: Plenum Press.

Eckland, K. O. n.d. Aerofiles Capsule Biographies: Katherine and Marjorie Stinson. <http://aerofiles.com/bio_s.html>

Edwards, Paul. 1996. *The Closed World: Computers and the Politics of Discourse in Cold War America.* Cambridge: MIT Press.

81st Fighter Wing Association. n.d. 81st Fighter Wing Association Newsletter. <www.geocities.com/CapeCanaveral/1525/newsletter2.htm>

Everett, R. R., C. A. Zraket, and H. D. Bennington. n.d. SAGE: A Data Processing System for Air Defense. <http://ed-thelen.org/sage.html>

Federation of American Scientists. n.d.(a) The First Nuclear Weapons. <www.fas.org/nuke/hew/Nwfaq/Nfaq8.html>
———. n.d.(b) Nuclear Weapon Radiation Effects. <www.fas.or/nuke/intro/nuke/radiation.htm>
———. n.d.(c) Emergency Network: GWEN Ground Wave.

<www.fas.org/nuke/guide/usa/c3i/gwen.htm>
———. n.d.(d) LGM-118A Peacekeeper. <www.fas.org/nuke/guide/usa/icbm/1gm-118.htm>

Fergusson, Erna. 1942. Diary Entry 1942. Huning-Fergusson Family Papers 1812-1950. Center for Southwest Research, General Library, University of New Mexico.

Fitzpatrick, George, and Harvey Caplin. 1975. *Albuquerque: 100 Years in Pictures, 1875–1975.* Albuquerque: Bank Securities Inc. and Calvin Horn.

Flaxman, Philip T. 1958. “The 34th Air Division (Defense) Directory and Guide.” Colorado Springs: Philip Flaxman. Air Force Research Laboratory Phillips Research Site Historical Information Office.

Focus. 1984. Historic Site Rededicated, 7 December. Albuquerque: Newspaper Printing Corp. 377th SPTG/CEVQ, Sandia School file.
———. 1989. A Step into the Past, 20 October. Albuquerque: Newspaper Printing Corp. 377th SPTG/CEVQ, Sandia School file.

Frommer’s. 2000. *Frommer’s Portable Los Angeles.* New York: Hungry Minds, Inc.

Furman, Necah Stewart. 1990. *Sandia National Laboratories: The Postwar Decade.* Albuquerque: University of New Mexico Press.

Gaither, Steve. 1997. “Looking between Trinity and the Wall: Army Materiel Command Cold War Material Culture within the Continental United States.” Plano, Texas: Geo-Marine.

Giles, J. C. 2001. “Worldwide High-altitude Electromagnetic Pulse Simulators.” Los Alamos: Los Alamos National Laboratory.

Global Security.Org. 2002. <http://198.65.138.161/wmd/facility/manzano.htm>

Greene, Warren E., and Ward Alan Minge, Master Sergeant William A. Evans, and Martha J. Yost. 1957. “History of the Air Force Special Weapons Center for 1 July – 31 December 1956.” Albuquerque: Historical Division, Office of Information Services, Air Force Special Weapons Center. Defense Threat Reduction Information Analysis Center, Kirtland Air Force Base.

Hardison, Major John D. 1990. *The Megaton Blasters: Story of the 4925th Test Group (Atomic).* Arvada: Boomerang Publishers.

Harvey, Jim. 1957. “The Nuclear Cloud Became His Laboratory.” ARDC News Review 1(6). Air Force Research Laboratory Phillips Research Site Historical Information Office.

Hauser, Capt. Marty. 1993. Army Air Forces Aircraft. <www.airforcehistory.hq.af.mil/headquarters/aircraft.htm>

Hawkins, David, Edith Truslow, and Ralph Carlisle Smith. 1983. *Project Y, The Los Alamos*

Story. Los Angeles: Tomash Publishers.

Heavy Bombers. 2001. 19th Bombardment Group. <www.heavybombers.com/19thbg.html>

Hening, H. B., and E. Dana Johnson. 1908. "Albuquerque: Chief City of a New Empire in the Great Southwest." On file, Center for Southwest Research, University of New Mexico.
———. 1912. "Albuquerque. Chief City of the New Sunshine State." Albuquerque: Press of the Morning Journal. On file, Center for Southwest Research, University of New Mexico.

Hess, Gary R. 1973. *America and Russia: From Cold War Confrontation to Coexistence*. New York: Thomas Y. Crowell.

Hirrel, Leo and William T. Dod, J. Hampton Tucker and Deborah K. Cannan. 1994. "Historic Context for Department of Defense Facilities World War II Permanent Construction." Prepared by R. Christopher Goodwin & Associates, Inc. for U.S. Army Corps of Engineers, Baltimore District.

Holloman Air Force Base. n.d. Holloman AFB History. <http://www.holloman.af.mil/hafb/basehistory.html>

Hume, William II. 1988. Comments given at memorial service for Dr. William D. Crozier. On file, New Mexico Institute of Mining and Technology library.

Hurt, Amy Passmore. 1973. "Canyon Recalled" Letter to the Editor. *Albuquerque Tribune,* 9 October. On file, Center for Southwest Research, University of New Mexico.

Jenning, Ed. N.d. Crosley's Secret War Effort. Crosley Automobile Club Inc. website. <www.ggw.org/~cac/Proximity_Fuze.html>

Jet Stream. 15 May 1965. "Air Guard Occupies Permanent Quarters." On file, NM ANG Headquarters.
———. 12 March 1972. "History of the New Mexico Air National Guard." On file, NM ANG Headquarters.
———. 14 October 1973. "A7-D Arrives Here!!" On file, NM ANG Headquarters.

Johnson, Byron, and Sharon Johnson. 1983. "The Night the Lights Came on in Albuquerque." *Albuquerque Journal.*

Johnson, Byron, and Robert Dauner. 1981. *Early Albuquerque: A Photographic History, 1870–1918.* Albuquerque: Albuquerque Journal Publishing. On file, Center for Southwest Research, University of New Mexico.

Johnson, Leland. 1997. "Sandia National Laboratories: A History of Exceptional Service in the National Interest." Albuquerque: Sandia National Laboratories.

Jones, Vincent. 1985. "Manhattan: The Army and the Atomic Bomb." Washington D.C.: U.S.

Army Center of Military History

Jones, Major Marshall, Lt. Colonel William B. Dollahon, Lt. Colonel George Myers, and Betty Francisco. 1976. A Chronological History of Nuclear Readiness. Air Force Research Laboratory Phillips Research Site Historical Information Office.

Kammer, David. 1997. The Development of the Early to Mid-century Growth of Albuquerque, New Mexico. National Register Nomination Form.

Kappler, Matthew. May 2000. Interview of Sergeant Matthew Kappler of the Air National Guard by Karen Van Citters.

KCET Hollywood. n.d. Chasing the Sun: The History of Commercial Aviation Seen Through the Eyes of its Innovators. <www.pbs.org/kcet/chasingthesun/companies/twa.html >

Kirtland Air Force Base. n.d. "Investigation of Abandoned Mine Excavations." Albuquerque. On file, 377th Air Base Wing, SPTG/CEVQ files.
———. 1949. "Headquarters, Special Weapons Command, Kirtland Air Force Base, New Mexico." Air Force Research Laboratory Phillips Research Site Historical Information Office.
———. 1949-1950. History of Kirtland Air Force Base, New Mexico for 1 December 1949 to 30 June 1950. Captain Rich H. McLeRoy and Sgt. Edward Davis. 377th Air Base Wing History Office, Kirtland Air Force Base.
———. 1950. History of Kirtland Air Force Base, New Mexico 1 December 1949 to 30 June 1950. Captain Richard H. McLeRoy and Sgt. Edward Davis. 377th Air Base Wing History Office, Kirtland Air Force Base.
———. 1951. History: Kirtland Air Force Base New Mexico 1 July 1950 through 31 December 1950. 377th Air Base Wing History Office, Kirtland Air Force Base.
———. 1968. Kirtland Air Force Base: Heart of New Mexico's Nuclear Community. Center for Southwest Research, General Library, University of New Mexico.
———. 1971. Plan for the Merger of Kirtland Air Force Base, Sandia Base and Manzano Base, 27 May 1971. 377th Air Base Wing History Office, Kirtland Air Force Base.
———. 1984. KAFB Base Information Resources and Economic Impact Statement of FY 1984. 377th Air Base Wing, SPTG/CEVQ files.
———. 1985. Economic Resource Impact Statement, September 1985. Zimmerman Library, University of New Mexico.
———. 2000. Kirtland History. <www.kirtland.af.mil/history/Kirtland%20AFB%20History.htm>
———. 2002. Kirtland AFB History. <www.kirtland.af.mil/History/Kirtland_history.htm>

Kirtland Army Air Field. 1944. Album of Station Information: Kirtland Field. Albuquerque: Headquarters, Kirtland Field. Air Force Research Laboratory, Phillips Research Site Historic Information Office.
———. 1948. Narrative Histories of KAAF: April to December 1946, July to December 1947. 377th Air Base Wing History Office, Kirtland Air Force Base.

Kunsman, David M. and Douglas B. Lawson. 2001. Sandia Report SAND2001-0053: A Primer on U.S. Strategic Nuclear Policy. <www.nti.org/e_research/official_docs/labs/prim_us_nuc_pol.pdf >

Lang, T. H., and James Moore. 1981. *Early Albuquerque: A Photographic History, 1870–1918.* Albuquerque Journal Publishing and City of Albuquerque, Albuquerque Museum.

Langdon, Steve. January 2002. Interview with Karen Van Citters and Kristen Bisson.

Leslie, Stuart W. 1993. The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford. New York: Columbia University Press. <www.earthscape.org/p3/leslie/index.html>

Lewis, Karen, and Katherine Roxlau, Lori Rhodes, Paul Boyer, and Joseph Murphey. 1995. “A Systemic Study of Air Combat Command Cold War Material Culture, Volume I: Historic Context and Methodology for Assessment.” Fort Worth: United States Army Corps of Engineers.

Lewis, Karen, and Katherine Roxlau and David Staley. 1997. “A Systemic Study of Air Combat Command Cold War Material Culture, Volumes II–X: A Baseline Inventory of Cold War Material Culture at Holloman Air Force Base.” Fort Worth: United States Army Corps of Engineers.

Lindsey, Washington E., Governor. 1918. List and correspondence concerning tubercular soldiers discharged. New Mexico State Archive & Records Center, Governor Washington E. Lindsey folder, file 210.

Los Alamos National Laboratory. n.d. Groves Takes Command: “We are in the Soup!” <www.lanl.gov/worldview/welcome/history/04_groves-command.html>

Los Angeles Air Force Base. n.d. Historical Sketch of Los Angeles AFB and Fort MacArthur. <http://www.losangeles.af.mil/ABG/history.htm>

Mangum, Neil. 1990. In the Land of Frozen Fires: A History of Occupation in El Malpais Country. <www.nps.gov/elma/hist/hist.htm>

March Field Air Museum. n.d. North American F-86L Sabre. <www.marchfield.org/f86l.htm>

McIlhargey, A. L. 1906. “Albuquerque.” On file, Center for Southwest Research, University of New Mexico.

McIntyre, Wade. 1995. “State Fair: The Biggest Show in New Mexico.” Albuquerque. Center for Southwest Research, General Library, University of New Mexico.

McKenna, Tech Sgt. Pat. 1999. “The Heart of the Antimatter.” *Airman,* March. 377th Air Base Wing, History Office.

Medalia, Jonathan. 1996. Congressional Research Service Report 92099: Nuclear Weapons Testing and Negotiation of a Comprehensive Test Ban Treaty.
<http://www.fas.org/spp/starwars/crs/92-099.htm>

Medema, Tech Sgt. William. 2000. "Kirtland AFB Testers Reactivate World War II Training Base." *Nucleus,* July 14. 377th Air Base Wing, History Office.

Miller, Kristie. 1992. *Ruth Hanna McCormick: A Life in Politics 1880-1944*. Albuquerque: University of New Mexico Press.

MITRE. n.d. Semi-Automatic Ground Environment (SAGE) Beginnings.
<www.mitre.org/pubs/showcase/sage/sage_feature.html>

Moffett Field Museum. n.d. The Army Era: 1935 - 1943.
<www.moffettfieldmuseum.org/history/army/army_era.html>

Money, Mary Lee. 1998. "Vision + Perseverance = Knowledgeable Nurses." *The University of New Mexico Foundation Newsletter,* Winter.

Morris, Juddi. 1994. *The Harvey Girls.* New York: Walker and Company.

Mueller, Robert. 1989. "Air Force Bases, Volume 1: Active Air Force Bases within the United States of America on 17 September 1982." Washington D.C.: United States Air Force, Office of Air Force History.

Napolin, Mark J., ed. n.d. "F-Troop 58th Weather Squadron: KAFB 1953-1974." 377th Air Base Wing History Office, Kirtland Air Force Base.

National Air and Space Museum. 2001. Boeing B-29 Superfortress.
<www.nasm.edu/nasm/aero/aircraft/boeing_b29.htm>

National Park Service. 1995. "National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation." Washington D.C.: National Park Service.
———. 1999. Recreation and Tourism of the Moon Region, 1924–1942.
<www.nps.gov/crmo/hcs8a.htm>

National Security Council. 1960. Memorandum for the National Security Council Re: U.S. Policy on Continental Defense.
<www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB43/doc4.pdf>

Naval Air Warfare Center. 1993. "History of the Naval Weapons Evaluation Facility, Albuquerque, New Mexico, 1948–1993." Air Force Research Laboratory, Phillips research Site Historical Information Office.

Naval Historical Center. 1998. Operation Crossroads: Composition of Joint Task Force One.
<www.history.navy.mil/faqs/faq76-2.htm>

———. 2001a. Recollections of the Sinking of USS Indianapolis by Capt. Lewis L. Haynes. <www.history.navy.mil/faqs/faq30-1.htm>
———. 2001b. Development of Proximity Fuzes (VT) for Projectiles-VT Fuzes Mks 32 to 60. <www.history.navy.mil/faqs/faq96-1.htm#anchor1191195>

NCBI n.d. Training Command reunion website. <http://members.ncbi.com/_XCM/ww2arc/US/US.htm>

New Mexico Alumnus. November 1945. "Workman at Work." Albuquerque: New Mexico. 377th Air Base Wing SPTG/CEVQ files.

Northwestern University. 2002. World War II posters. <www.library.northwestern.edu>

Nucleus. 15 September 1967. Kirtland AFB Born during World War II. Lucien A. File Papers, Folder 269 Inhabited Towns, New Mexico State Records Center and Archives.
———. 16 October 1970. White Sands Missile Range: More Than a Name to Kirtland Now.

Office of the Assistant to the Secretary of Defense (Atomic Energy). 1978. "History of the Custody and Deployment of Nuclear Weapons (U) July 1945 through September 1977." <www.gwu.edu/~nsarchiv/news/19991020/04-01.htm>

Ogle, William E. 1985. "An Account of the Return to Nuclear Weapons Testing by the United States after the Test Moratorium, 1958–1961." Nevada: U.S. Department of Energy.

Oppenheimer, Alan. 1962. "The Historical Background of Albuquerque, New Mexico." Albuquerque: City Planning Department On file, Center for Southwest Research, University of New Mexico.

Ortiz, Colonel Ezequiel. 1995a. "A Look Back in Time: First New Mexico Infantry Regiment. World War I." *Round the Roundhouse,* 30 March – 27 April.
———. 1995b. "A Look Back in Time: Battery A. 66th Field Artillery Brigade." *Round the Roundhouse,* 27 April – 25 May.

Parsch, Andreas. 2002. Douglas MB-1/AIR 2 Genie. <www.designation-systems.net/dusrm/r-2.html>

Photo Science Inc. 1995. "The New Mexico Air National Guard Master Plan, Albuquerque International Airport, Kirtland AFB, Albuquerque, NM." Lexington, KY. Located at NM ANG Headquarters. 377th Air Base Wing, SPTG/CEVQ history files.

Popular Mechanics. 2000. A Century of Warfare. <http://popularmechanics.com/science/military/2000/1/century_of_warfare_1/index3.phtml>

Powell, Stewart. 2000. Air Force Medics in Peace and War. *Air Force Magazine,* January.

Price, V. B. 1992. *A City at the End of the World.* Albuquerque: University of New Mexico

Press.

Primary Sources Workshops in American History. n.d. The Cold War, Walter Lippman. <www.learner.org/channel/workshops/primarysources/coldwar/docs/lippman.html>

Princeton University. n.d. "Princeton University Laser Safety Training Guide." Princeton: Princeton University.

Pringle, Peter, and James Spigelman. 1981. *The Nuclear Barons.* New York: Holt, Rinehart & Winston.

Ravenstein, Charles A. 1986. "The Organization and Lineage of the United States Air Force." Washington, D.C.: United States Air Force Office of Air Force History. <http://www.airforcehistory.hq.af.mil/Publications/fulltext/organization_lineage_usaf.pdf>

Redman, C. E. 1941. "Pictorial Albuquerque." Albuquerque. On file, Center for Southwest Research, University of New Mexico.

Ristvet, Lt. Colonel Byron L. 1991. "Environmental Assessment for the U.S. Air Force/Phillips Laboratory Starfire Optical Range Facility." Albuquerque: Phillips Laboratory. On file, Center for Southwest Research, University of New Mexico.

Roberts, William. C., ed. 2001. Facts and Ideas from Anywhere. <www.baylorhealth.com/proceedings/14_2/14_2_roberts.htm>

Roosevelt, Franklin D. 1938. Letter to Clyde Tingley Regarding the End of Tingley's Governorship of New Mexico. Correspondence Between Franklin D. Roosevelt and Clyde Tingley. Center for Southwest Research, General Library, University of New Mexico.

Roswell Daily Record. 30 June 1942. Flying Experience Not Required To Be Glider Pilots. On file, New Mexico State Records Center and Archives, World Wars I and II collection.

Sachs, Lucinda Lucero. 1966. "Clyde Tingley's Little New Deal for New Mexico." Master's Thesis, University of New Mexico.

Sandia National Laboratories. 2000. SNL Operational History. <www.nwer.sandia.gov/wlp/er/SNLHistory.htm>
———. 2001. Readiness Program Exhibit. Sandia History/Archives Program Newsletter, September.

Sargeant, Kathryn, and Mary Davis. 1986. *Shining River, Precious Land: An Oral History of Albuquerque's North Valley.* Albuquerque: Albuquerque Museum.

Scurlock, Dan. 1995. "Before Kirtland Air Force Base: A History of the Manzano Bajada and Foothills." Albuquerque: Mariah Associates, Inc. On file, 377th Air Base Wing, SPTG/CEVQ.

Searle, Lloyd. 1989. "The Bombsight War: Norden vs. Sperry." *Crosshairs* Official Newsletter of The Bombardiers Inc., 4(4), December.

Shiman, Dr. Philip. 1997. USACERL Special Report 97/77: *Forging the Sword: Defense Production During the Cold War*.

Simmons, Mark. 1982. *Albuquerque: A Narrative History*. Albuquerque: University of New Mexico Press.
———. 1988. *New Mexico: An Interpretive History*. Albuquerque: UNM Press.

Society for the Historical Preservation of the Manhattan Project. n.d. The Planes of the 509th. <http://www.childrenofthemanhattanproject.org/HISTORY/H-07a3.htm>

Speakman, Frank. 1965. *History of the Albuquerque Airport: 1928 to 1942*. Centennial Science and Engineering Library, University of New Mexico.

Stanley, F. 1963. The Duke City: Story of Albuquerque, New Mexico, 1706–1956. Unpublished manuscript. On file, Center for Southwest Research, University of New Mexico.

Strategic Air Command. n.d. SAC's Original Bomb Groups. <www.strategic-air-command.com/Wings/original-bomb-groups.htm>

Swan, A. M. 1900. *Albuquerque Illustrated.* Albuquerque: Democratic Publishing Co. On file, Center for Southwest Research, University of New Mexico.

Tagg, Martyn. 1998. Holloman Air Force Base Cultural Resources Publication No. 6: *Airplanes, Combat and Maintenance Crews, and Air Bases*. Holloman Air Force Base: Air Combat Command, United States Air Force, United States Department of Defense.

Trans World Airlines Master Executive Council. n.d. Western Air Express. <http://twapilots.alpa.org/history/waepart1.htm>

Twenty-Niner, Kirtland's Weekly Newspaper. February – December 1945. On file, Center for Southwest Research, University of New Mexico.

Ullrich, Rebecca. 1998. "Tech Area II: A History. Albuquerque: Sandia National Laboratories." Albuquerque: Sandia National Laboratories.

United States Air Force. n.d.(a) Biography: Major General Perry M. Hoisington III. <www.af.mil/news/biographies/hoisington_pm.html>
———. n.d.(b) Biography: Major General Osmond J. Ritland. <www.af.mil/news/biographies/ritland_oj.html>
———. n.d.(c) Biography: Lieutenant General Donald L. Putt. <www.af.mil/news/biographies/putt_dl.html>

United States Air Force Museum. n.d.(a) Beech AT-11 “Kansan.” <www.wpafb.af.mil/museum/early_years/ey20.htm>
———. n.d.(b) WWII Bombardiers. <www.wpafb.af.mil/museum/history/wwii/bomb.htm>
———. n.d.(c) Staff Sgt. Alva L. Harvey. <www.wpafb.af.mil/museum/history/ep/ep-2a.htm>
———. n.d.(d) Martin EB-57B “Canberra.” <www.wpafb.af.mil/museum/modern_flight/mf43.htm>
———. n.d.(e) North American F-100 “Super Sabre,” YF-100, -A and –C. <www.wpafb.af.mil/museum/research/fighter/f100c.htm>

U.S. Air Force Phillips Laboratory History Office. 1991. “Terminal History of the Air Force Weapons Laboratory for 1 October 1988 – 13 December 1990.” Albuquerque. Air Force Research Laboratory Phillips Research Site Historical Information Office
———. 1992. “History of the Phillips Laboratory, 1 October 1989 – 30 September 1991.” Air Force Research Laboratory Phillips Research Site Historical Information Office

U.S. Army Space and Missile Defense Command. n.d. High Energy Laser Systems Test Facility: Unique Laser Testing Capability. <www.smdc.army.mil/FactSheets/HELSTF.html>

U.S. Congress, Office of Technology Assessment. 1989. *The Containment of Underground Nuclear Explosions, OTA-ISC-414.* Washington D.C.: U.S. Government Printing Office.

Verhaaren, Bruce T. 1998. “A Cultural Resources Inventory of the Manzano Storage Area. Part II: Cold War Resources.” Argonne: Argonne National Laboratory.
———. 1999. “The 29000 Area: The New Mexico Proving Ground.” The New Mexico Experimental Range and the Development of Kirtland Air Force Base. Argonne: Argonne National Laboratory.

Veterans Administration Medical Center. 1982. “1932–1982 — A History. Albuquerque: VA Medical Center”. On file, Veterans Administration Medical Center.

Weigley, Russell F. 1973. *The American Way of War: A History of United States Military Strategy and Policy*. Bloomington: Indiana University Press.

Weitze, Karen. 1997. “Guided Missiles at Holloman Air Force Base: Test Programs of the United States Air Force in Southern New Mexico, 1947–1970.” Alamogordo: Holloman Air Force Base.

Western Air Express. 1930. WAE Schedules and Tariffs Effective March 16, 1930. <www.timetableimages.com/ttimages/wa.htm>

White Sands Missile Range. n.d. High Energy Laser Systems. <www.wsmr.army.mil/paopage/Pages/laser.htm>
———. 2002. Electromagnetic Pulse Testing. Alamogordo. <www.wsmr.army.mil/paopage/Pages/WU%2312.htm>

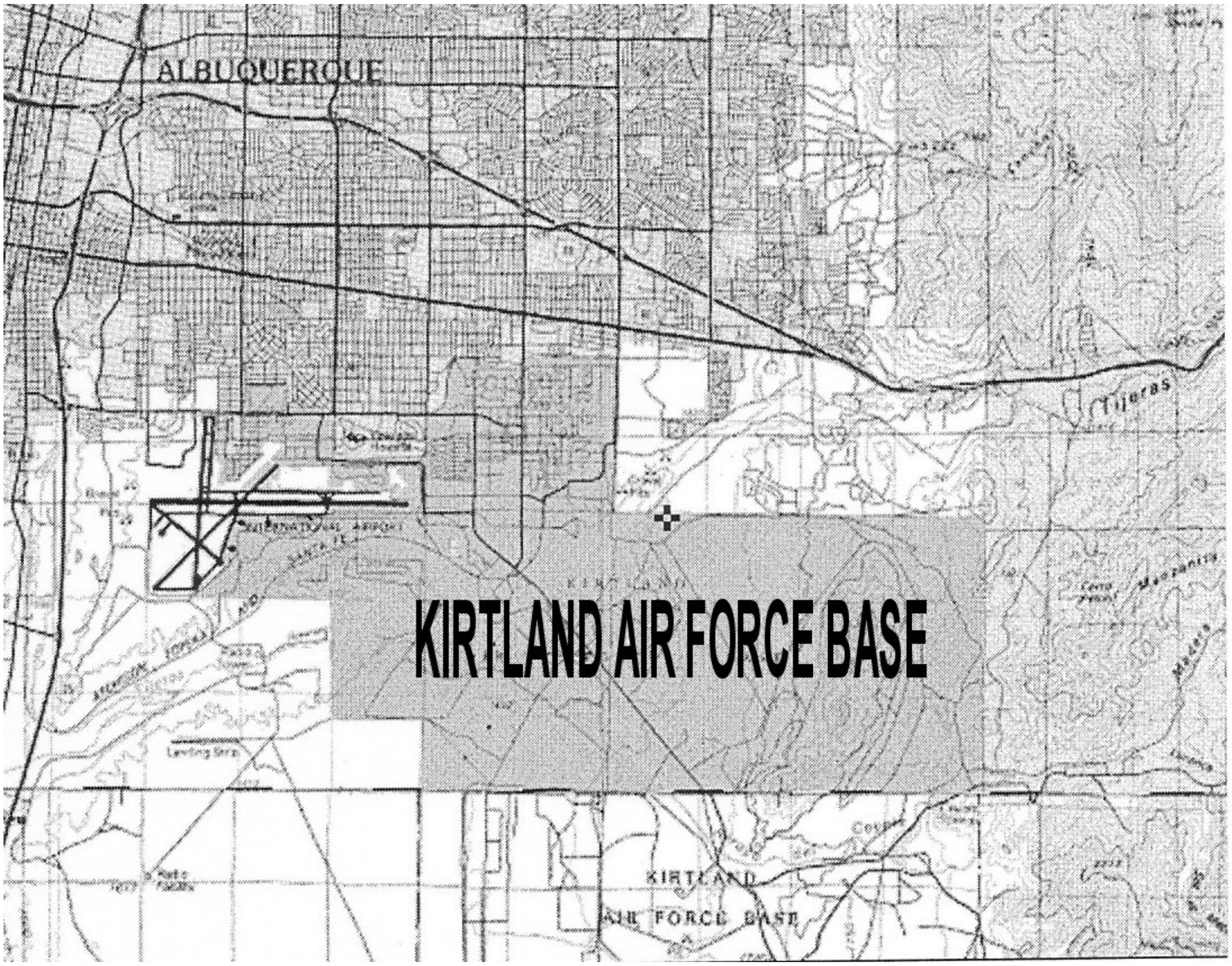
Wikipedia. n.d. Daisy Cutter. <www.wikipedia.org/wiki/Daisy_Cutter>

Williams, Jerry, ed. 1986. *New Mexico in Maps.* Albuquerque: University of New Mexico Press.

Wilson, Chris. 1986. The Historic Railroad Buildings of Albuquerque. <www.wheelsmuseum.org/wilson0.html>
———. 2001. *Facing Southwest: The Life and Houses of John Gaw Meem*. New York: W.W. Norton & Company, Inc.

Winkler, David F. 1997. "Searching the Skies: The Legacy of the United States Cold Defense Radar Program." United States Air Force Air Combat Command. <www.fas.org/nuke/guide/usa/airdef/searching_the_skies.htm>

Workman, Everly Jack. 28 July 1975. Speech on the New Mexico School of Mines just after the Second World War: Personal Reminiscences. Socorro: New Mexico School of Mines. 377th air Base Wing SPTG/CEVQ files.



Frontispiece

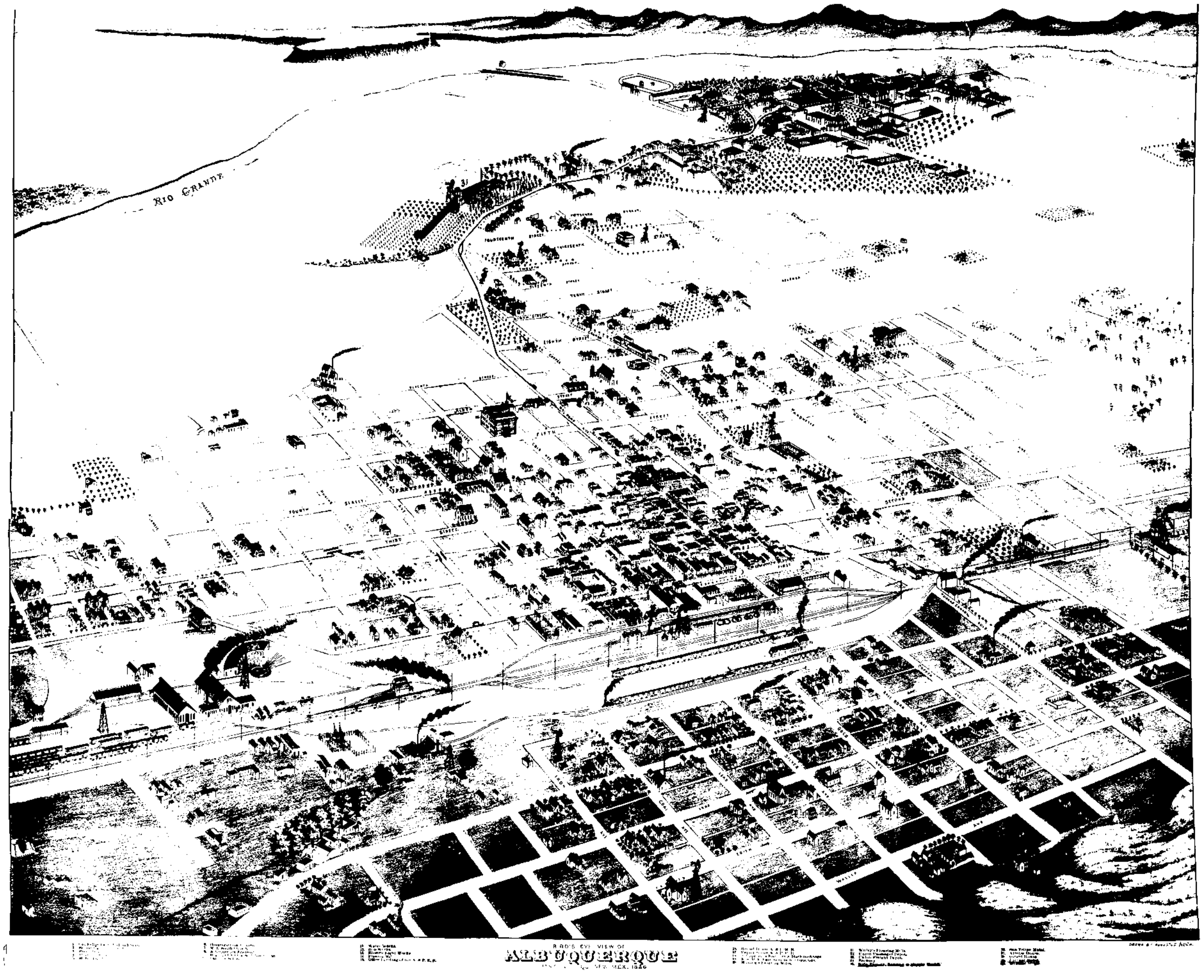


Figure 1: Bird's eye view of Albuquerque in 1886

Source: Courtesy UNM MAGIC

Figure 2: The locomotive General J.A. Williamson in Albuquerque

Source: Courtesy Albuquerque Museum

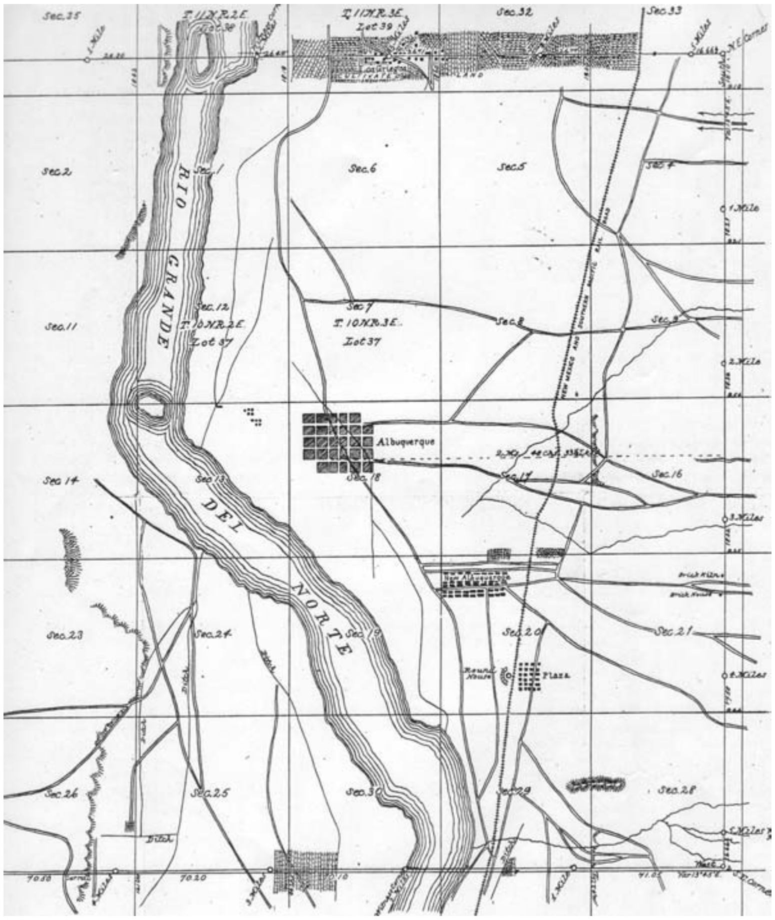
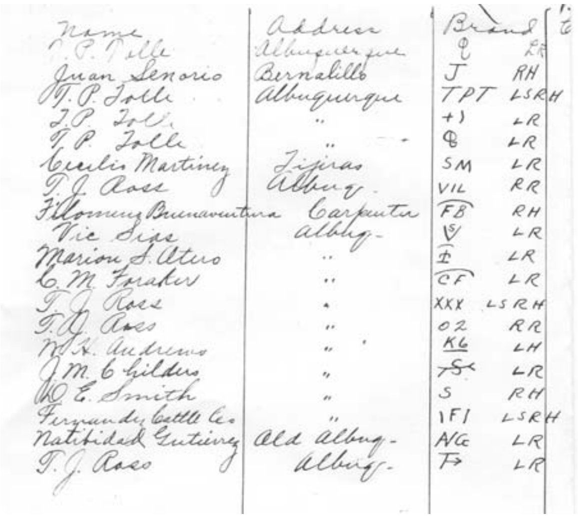


Figure 3: Plat of Albuquerque showing Old Town and New Town

Source: Courtesy UNM MAGIC

Figure 4: The interior of an Albuquerque saloon (possibly the White Elephant)

Source: Courtesy Albuquerque Museum



Name	Address	Brand	
T. P. Tolle	Albuquerque	♀	LR
Juan Senorio	Bernalillo	J	RH
T. P. Tolle	Albuquerque	TPT	LSRH
T. P. Tolle	"	+)	LR
T. P. Tolle	"	Φ	LR
Cecilio Martinez	Tijeras	SM	LR
T. J. Ross	Albuq.	VIL	RR
Filomeno Buenaventura	Carpenter	FB	RH
Vic Sips	Albuq.	V	LR
Marion S. Otero	"	±	LR
C. M. Foraker	"	CF	LR
T. J. Ross	"	XXX	LSRH
T. J. Ross	"	02	RR
W. H. Andrews	"	K6	LH
J. M. C. Gilders	"	7S	LR
W. E. Smith	"	S	RH
Fernandez Cattle Co.	"	1F1	LSRH
Natividad Gutierrez	Old Albuq.	NG	LR
T. J. Ross	Albuq.	F→	LR

Figure 5: Bernalillo County shepherds and brands, 1914

Source: Courtesy New Mexico State Records Center and Archives, Governor McDonald files

Figure 6: Shepherding in Coyote Canyon

Source: Courtesy Albuquerque Museum

Figure 7: Gross, Kelly & Co. wagon train

Source: Courtesy Albuquerque Museum

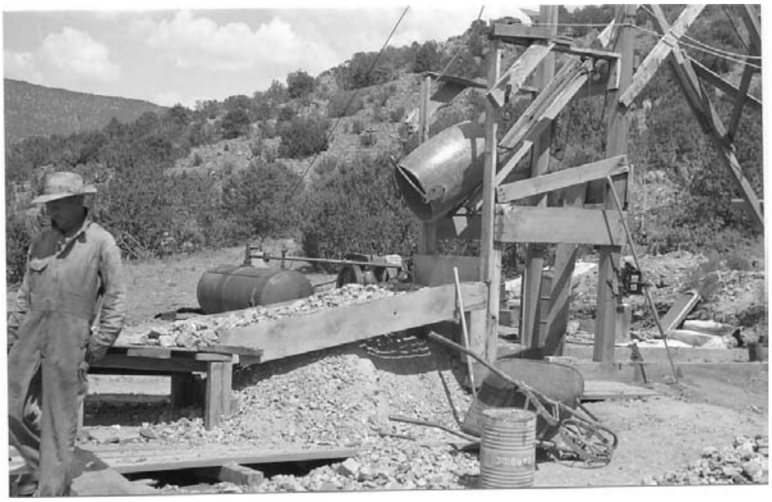


Figure 8: Blackbird Mine headworks

Source: Courtesy USGS Photographic Library, Denver

Figure 9: Southwestern Presbyterian Sanatorium, circa 1913

Source: Courtesy Albuquerque Museum

Figure 10: Albuquerque Commercial Club

Source: Courtesy Albuquerque Museum

Figure 11: Alvarado Hotel

Source: Courtesy Albuquerque Museum

THERE IS NOTHING SO
REFRESHING AS A
DRINK OF SODA WATER
manufactured from pure cane
sugar and true fruit flavor
made only by the

Coyote Springs
Mineral Water Co.

Try a case of Orange, Lemon, Lime,
Strawberry, and Raspberry Squeeze.
We also have Snappy Near Beer and
Coyote Springs Water.
We deliver.
Phone 29-W 502-506 N. First St.

Figure 12: Coyote Springs mineral water advertisement

Source: Courtesy Center for Southwest Research, Zimmerman Library, UNM

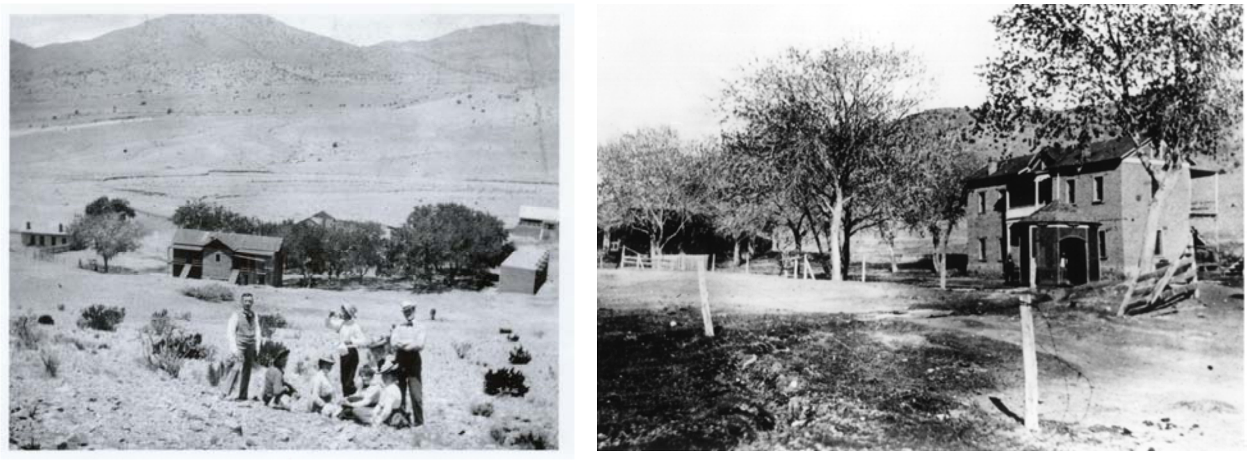


Figure 13: Coyote Springs (circa 1900 on right)

Source: Courtesy Center for Southwest Research, Zimmerman Library, UNM and Albuquerque Museum

Figure 14: Tijeras Canyon

Source: Courtesy Center for Southwest Research, Zimmerman Library, UNM

Figure 15: Albuquerque City Council in 1901

Source: Courtesy Albuquerque Museum

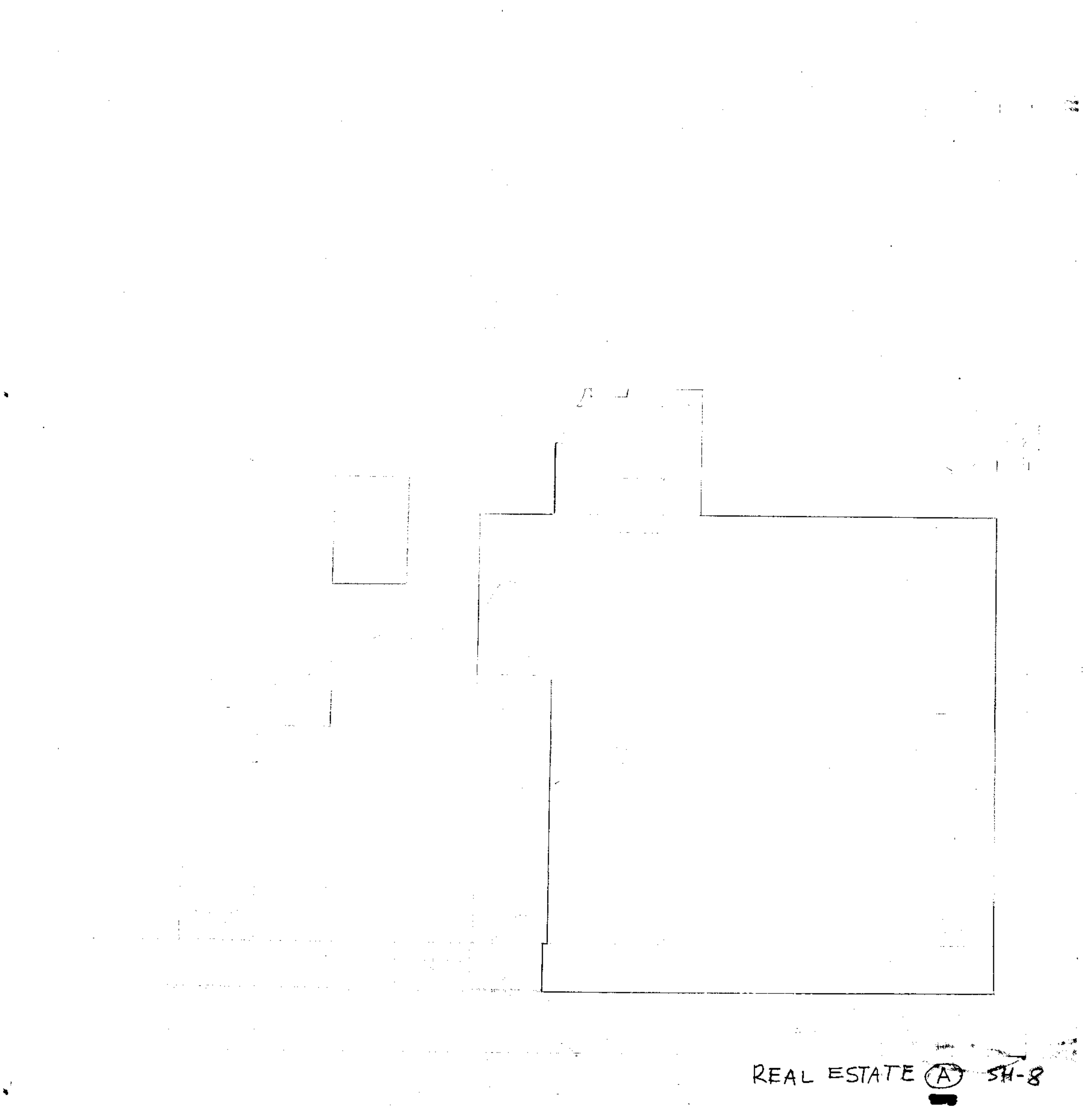


Figure 16: Albuquerque and the East Mesa in 1939

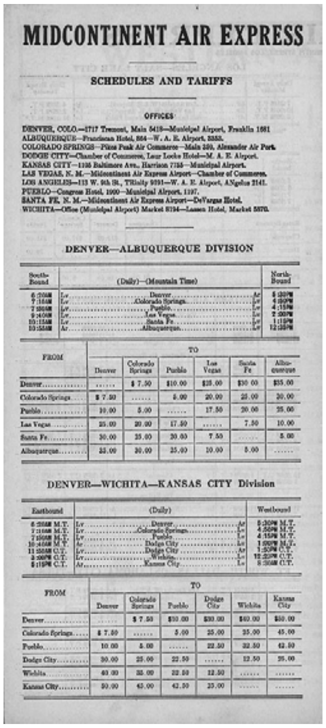
Source: Courtesy KAFB, 377th Air Base Wing CES map room

Figure 17: 1st New Mexico infantry from Camp Funston in Albuquerque, 1917

Source: Fitzpatrick and Caplin 1975

Figure 18: Western Air Express 1930 schedule

Source: Western Air Express 1930



MIDCONTINENT AIR EXPRESS

SCHEDULES AND TARIFFS

OFFICES

DENVER, COLO.—1717 Tremont, Main 5419—Municipal Airport, Franklin 1661
ALBUQUERQUE—Franciscan Hotel, 864—W. A. E. Airport, 3353.
COLORADO SPRINGS—Pikes Peak Air Commerce—Main 260, Alexander Air Port.
DODGE CITY—Chamber of Commerce, Lear Locke Hotel—M. A. E. Airport.
KANSAS CITY—1125 Baltimore Ave., Harrison 7135—Municipal Airport.
LAS VEGAS, N. M.—Midcontinent Air Express Airport—Chamber of Commerce.
LOS ANGELES—113 W. 9th St., TRinity 9091—W. A. E. Airport, ANgelus 2141.
PUEBLO—Congress Hotel, 1900—Municipal Airport, 1197.
SANTA FE, N. M.—Midcontinent Air Express Airport—DeVargas Hotel.
WICHITA—Office (Municipal Airport) Market 8194—Lassen Hotel, Market 5870.

DENVER—ALBUQUERQUE DIVISION

FROM	TO Denver	Colorado Springs	Pueblo	Las Vegas	Santa Fe	Albuquerque
Denver	......	$ 7.50	$10.00	$25.00	$30.00	$35.00
Colorado Springs	$ 7.50	......	5.00	20.00	25.00	30.00
Pueblo	10.00	5.00	......	17.50	20.00	25.00
Las Vegas	25.00	20.00	17.50	......	7.50	10.00
Santa Fe	30.00	25.00	20.00	7.50	......	5.00
Albuquerque	35.00	30.00	25.00	10.00	5.00	......

DENVER—WICHITA—KANSAS CITY Division

FROM	TO Denver	Colorado Springs	Pueblo	Dodge City	Wichita	Kansas City
Denver	......	$ 7.50	$10.00	$30.00	$40.00	$50.00
Colorado Springs	$ 7.50	......	5.00	25.00	35.00	45.00
Pueblo	10.00	5.00	......	22.50	32.50	42.50
Dodge City	30.00	25.00	22.50	......	12.50	25.00
Wichita	40.00	35.00	32.50	12.50	......	......
Kansas City	50.00	45.00	42.50	25.00	......	......

Figure 19: Charles Lindbergh and Clyde Tingley at the Albuquerque Airport in 1929

Source: Courtesy Albuquerque Museum

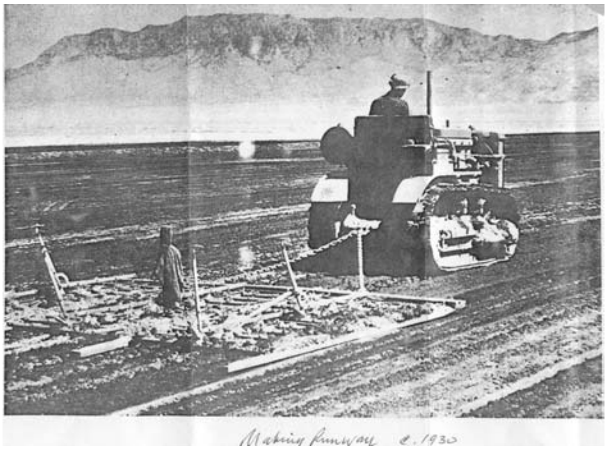


Figure 20: Regrading the runway, circa 1930

Source: Courtesy National Atomic Museum

Figure 21: Albuquerque Airport, 1929

Source: Courtesy KAFB 377th Air Base Wing SPTG/CEVQ files

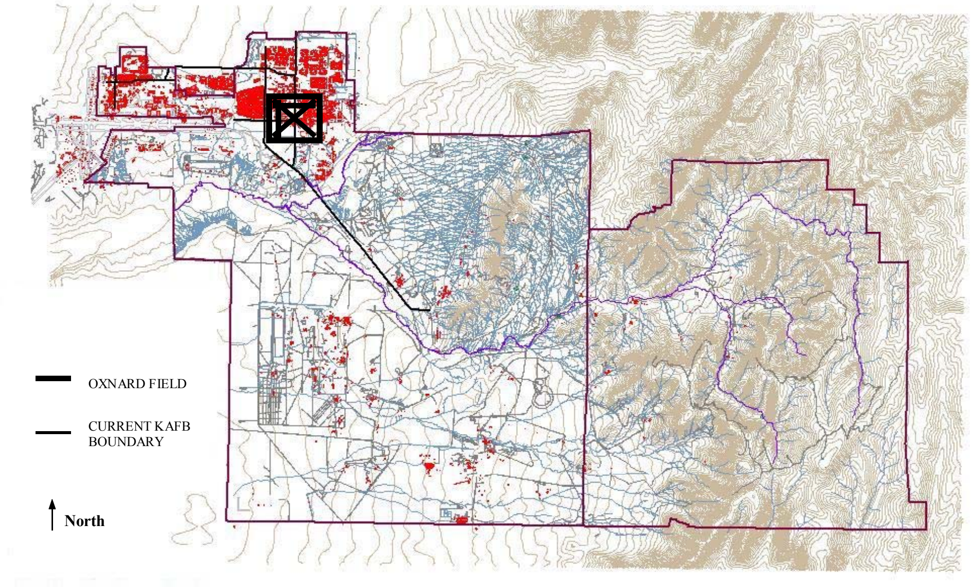


Figure 22: Oxnard Field in 1928, overlaid onto modern KAFB map

Source: Developed by Karen Van Citters using KAFB maps and sources reference in this chapter

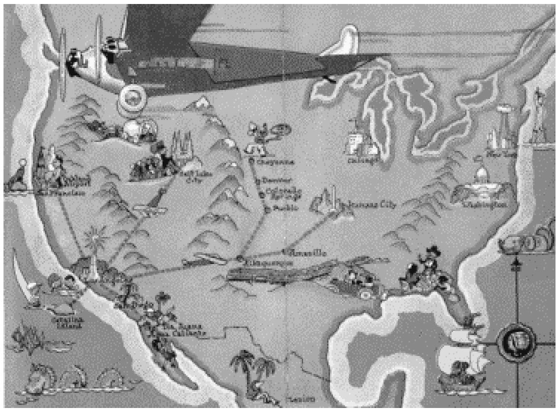


Figure 23: WAE 1930s air route map

Source: TWA Master Executive Council n.d.

Figure 24: TAT's western headquarters at the Albuquerque Airport

Source: KAFB 377th Air Base Wing SPTG/CEVQ files

Figure 25: U.S. Veterans Administration Hospital in the early 1930s

Source: Courtesy Albuquerque Museum

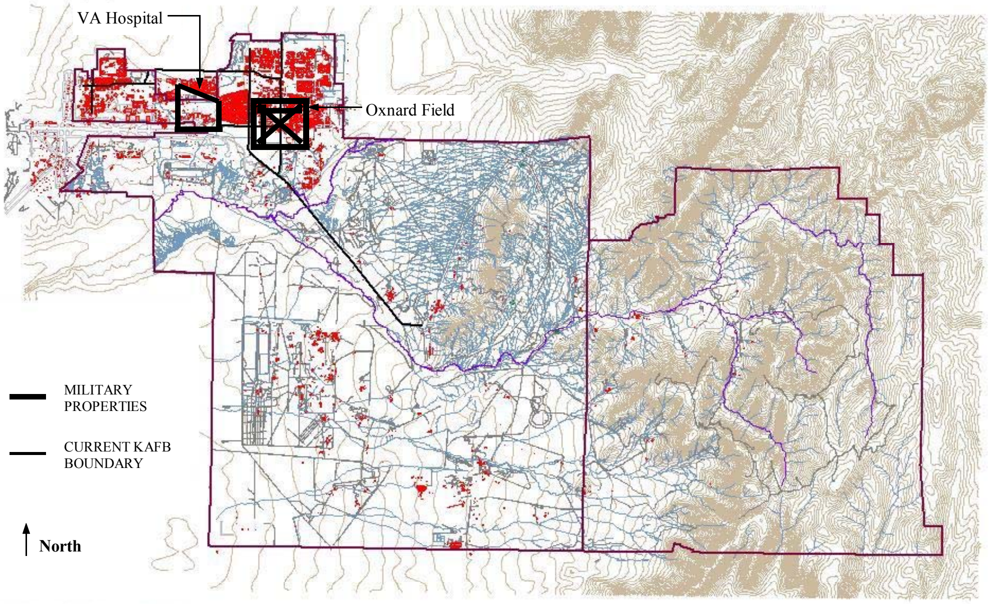


Figure 26: Veteran's Administration & Oxnard Field properties, overlaid on current KAFB map

Source: Developed by Karen Van Citters using KAFB maps and sources reference in this chapter

WPA Form 301
(Revised Sept. 1936)

Page 1 of 5 pages

WORKS PROGRESS ADMINISTRATION

PROJECT PROPOSAL

Amount requested, $ .... WPA Work Project No. ....

Amount approved, $ .... Serial No. .... Date ....

(Sponsor not to write above line)

Sponsor's proposal No. 23 — Date of proposal July 23, 1936

Last operated as .... (CWA, ERA, WPA) Project No. .... (If WPA, give O. P. No.)

TO: Works Progress Administration of Albuquerque (Local) Three (District) New Mexico (State)

1. Request is hereby made that the following proposal be reviewed and that a formal application be made for an allotment of funds for this project under the rules and regulations of the Works Progress Administration.

From: City of Albuquerque (Sponsoring agency) Albuquerque (Official address—city, town, village) Bernalillo (County)

2. Location of project: 5 miles S.E. of Albuquerque Albuquerque (City, town, village) Bernalillo (County)

Detailed location: ....

3. Description of project: Construction of a modern Municipal Air Port, including hanger, workshop, administration building, hard surfaced runways, grading and leveling of field, lighting, enclosing fences to meet requirements, and extension of municipal water line. Hanger to be constructed of brick, hollow tile, concrete, and steel. Administration building and workshop to be constructed of adobe.

All work to be done on City owned property

4. Summary of estimated costs:

Item of cost (1)	Federal funds (2)		Sponsor's funds (3)		Total (4)	
	Amount (dollars)	%	Amount (dollars)	%	Amount (dollars)	%
a. Labor:						
1. Unskilled	$230,880.00	44.36			$230,880.00	32.75
2. Intermediate	29,962.40	5.76			29,962.40	4.25
3. Skilled	25,742.50	4.95	3,731.20	2.02	29,473.70	4.18
4. Professional and technical	1,040.00	0.19	6,091.20	3.30	7,131.20	1.01
Subtotal (a)	$287,624.90	55.26	9,822.40	5.32	297,447.30	42.19
b. Superintendence	7,840.00	1.51	5,200.00	2.82	13,040.00	1.85
Subtotal (a) plus (b)	$ 295,464.90	56.77	15,022.40	8.14	310,487.30	44.04
c. Material, equipment, and other costs:						
1. Material and supplies	$198,051.50	38.05	73,005.59	39.57	271,057.09	38.45
2. Equipment rentals	26,468.00	5.09	8,470.00	4.59	34,938.00	4.96
3. Other direct costs	500.00	0.09	88,000.00	47.70	88,500.00	12.55
Subtotal (c) only	$225,019.50	43.23	169,475.09	91.86	394,494.59	55.96
Total cost of project	$520,484.40	100	$184,497.49	100	$704,981.89	100
Total cost apportioned		%		%	100%	x x

Figure 27: WPA Project Proposal for Municipal Airport

Source: Courtesy New Mexico State Records Center & Archives, Governor Tingley files

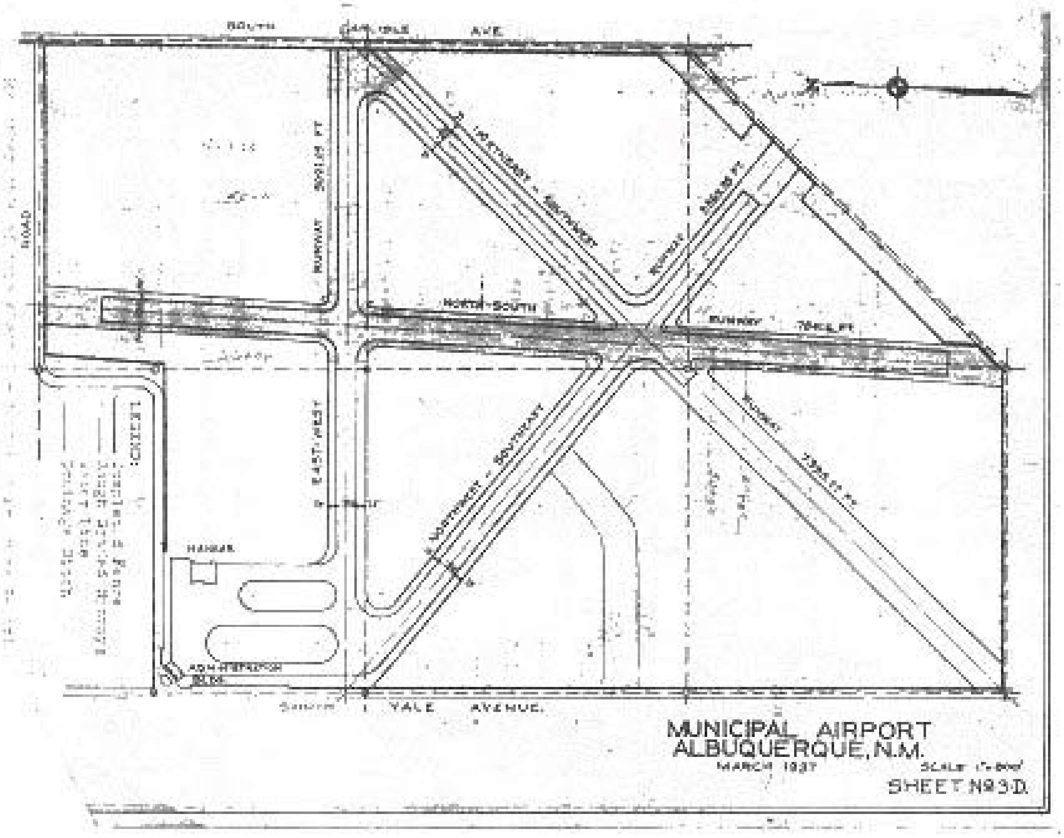


Figure 28: Original WPA plan for airport

Source: Courtesy New Mexico State Records Center and Archives, Governor Tingley files

Figure 29: Clyde Tingley with military personnel

Source: Courtesy Albuquerque Museum

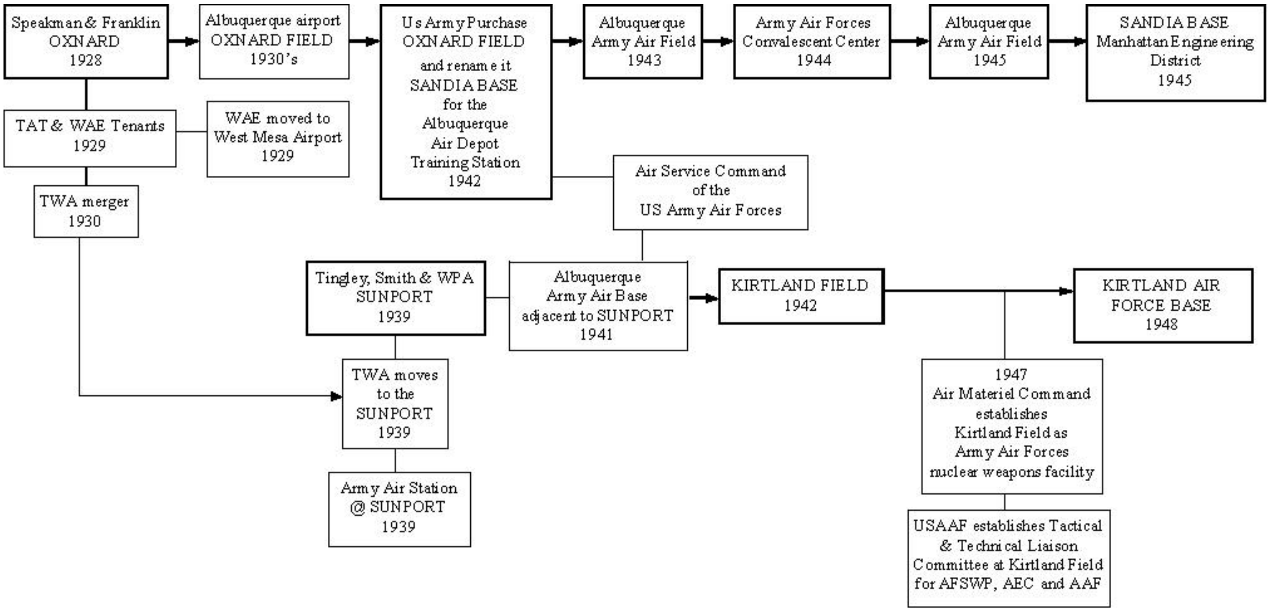


Figure 30: Development from airfield to KAFB

Developed and drawn by Karen Van Citters

Figure 31: Army personnel in downtown Albuquerque

Source: Courtesy Albuquerque Museum

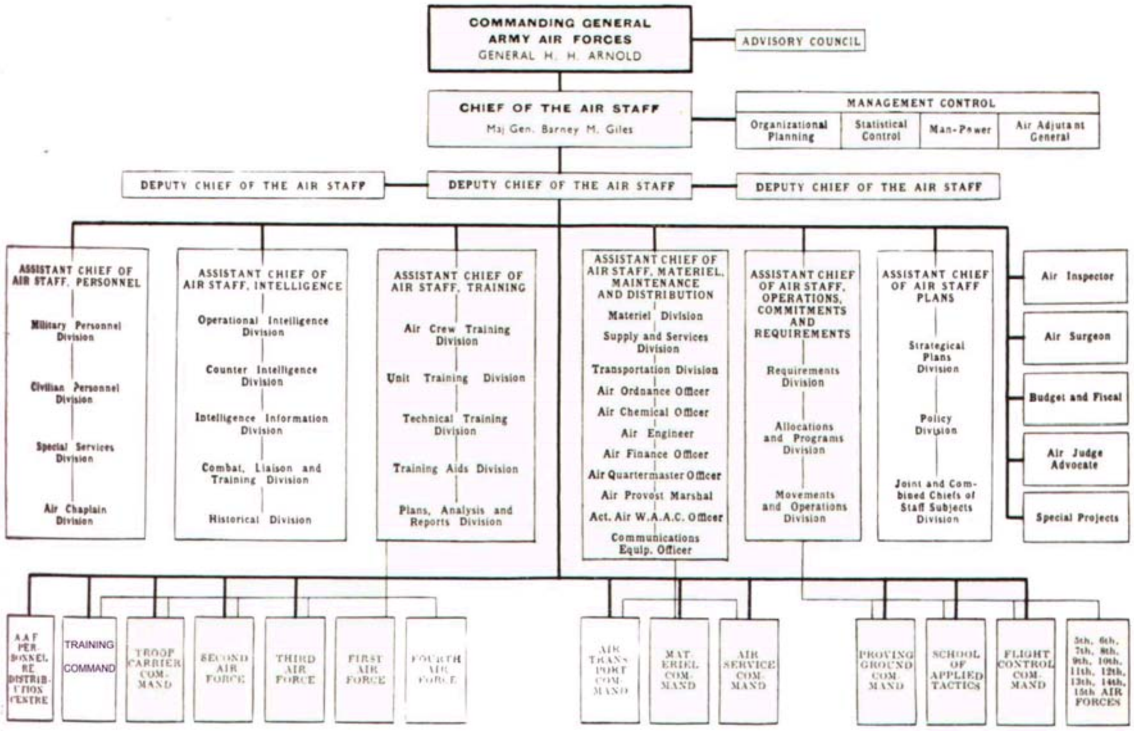


Figure 32: Organizational chart for the USAAF

Source: NCBI n.d.

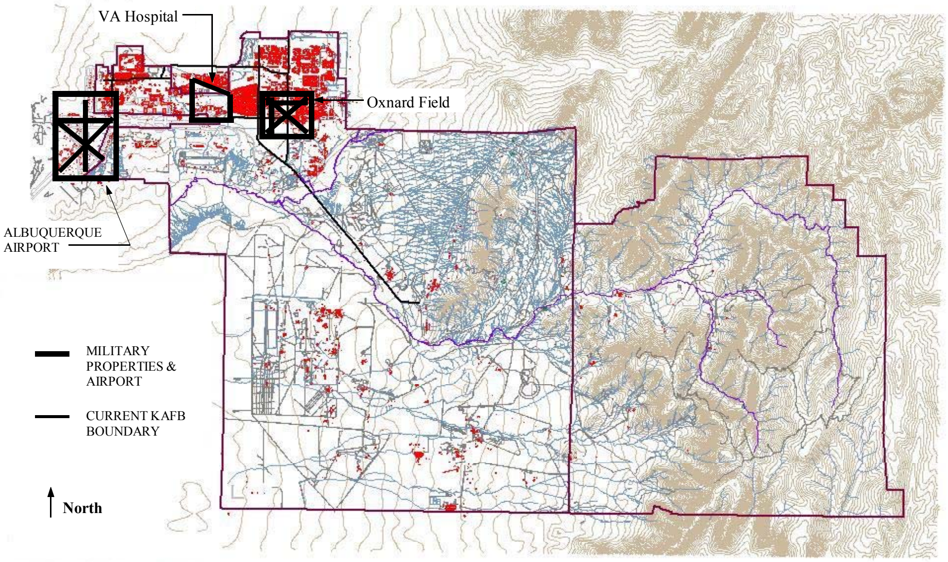


Figure 33: Military and airport properties overlaid on current KAFB map

Source: Developed by Karen Van Citters using KAFB maps and sources referenced in this chapter

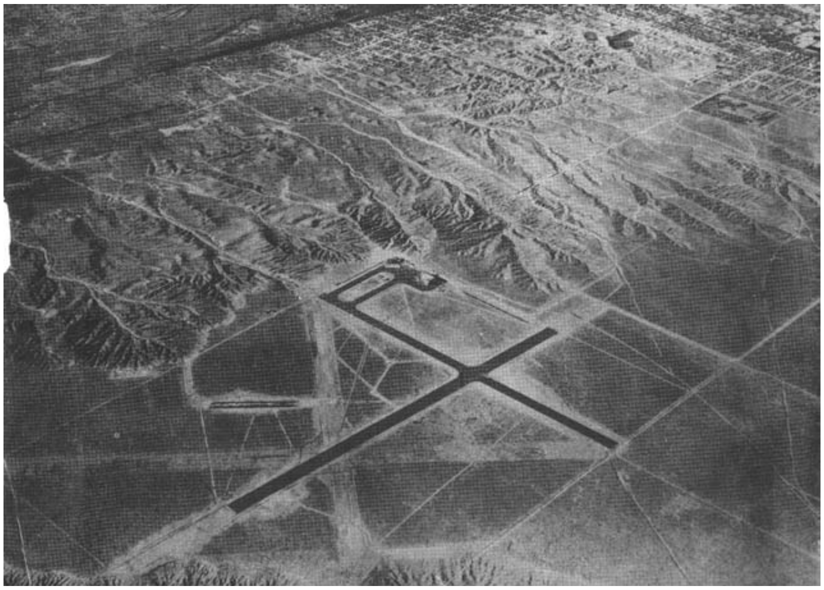


Figure 34: Aerial view of Albuquerque Municipal Airport in 1939

Source: Courtesy KAFB 377th Air Base Wing SPTG/CEVQ aerial photo files

Figure 35: Albuquerque Army Air Base in 1943

Source: Courtesy Albuquerque Museum

Figure 36: USAAF World War II poster

Source: Northwestern 2002

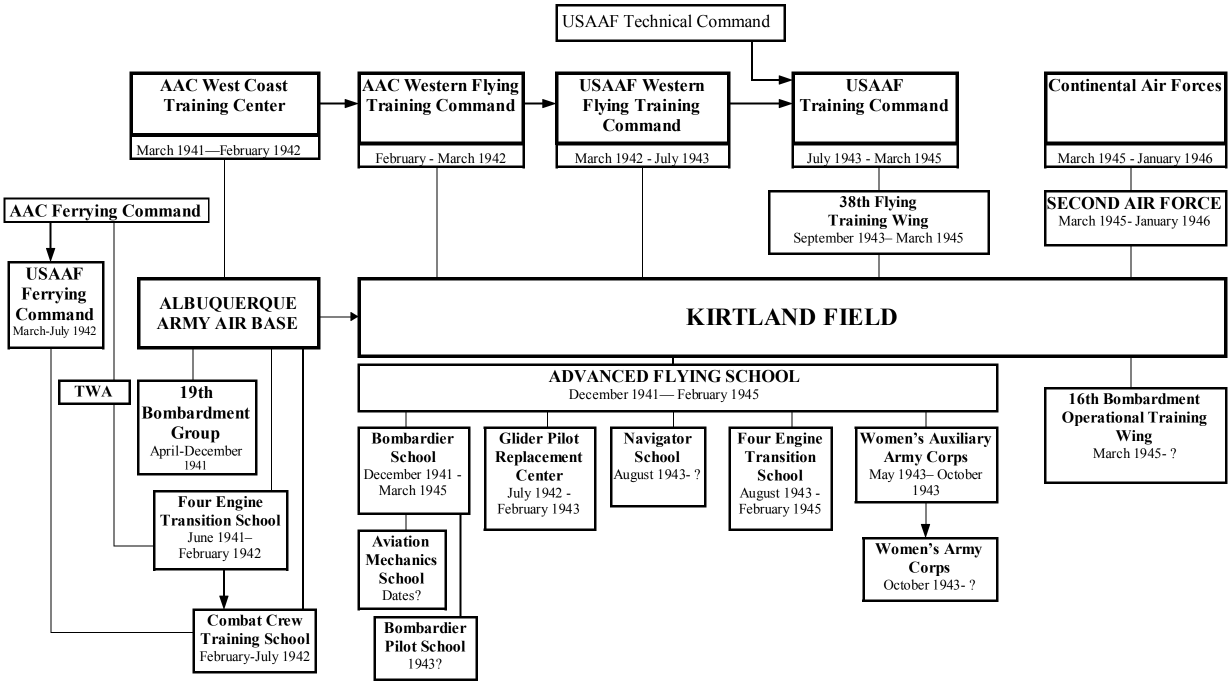


Figure 37: Training commands at the airfield in World War II

Source: Developed and drawn by Kristen Bisson from sources in this chapter

Figure 38: Roy Kirtland (at right)

Source: Courtesy KAFB website

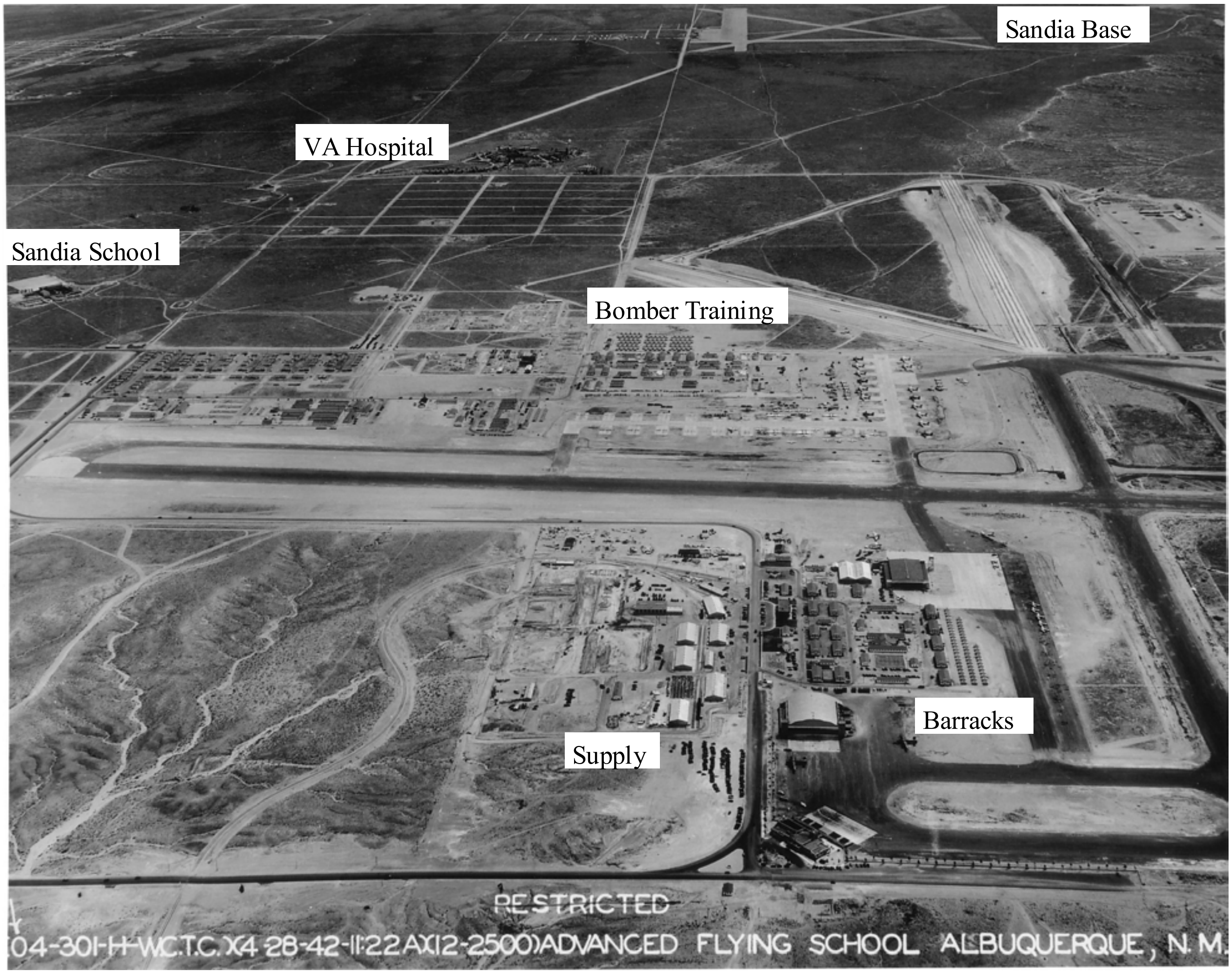


Figure 39: Kirtland Field in 1942

Source: KAFB 377th Air Base Wing SPTG/CEVQ aerial photo files

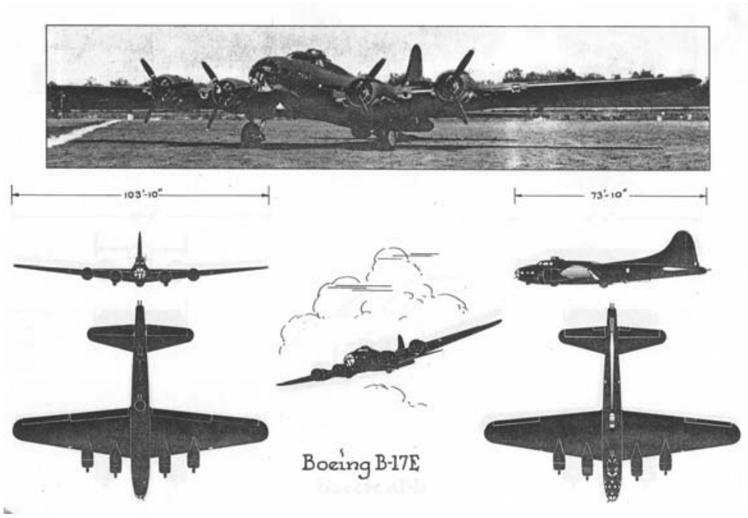


Figure 40: The Flying Fortress (B-17) used by the 19th Bombardment Group

Source: Courtesy New Mexico State Records Center and Archive, George C. Lusk Collection

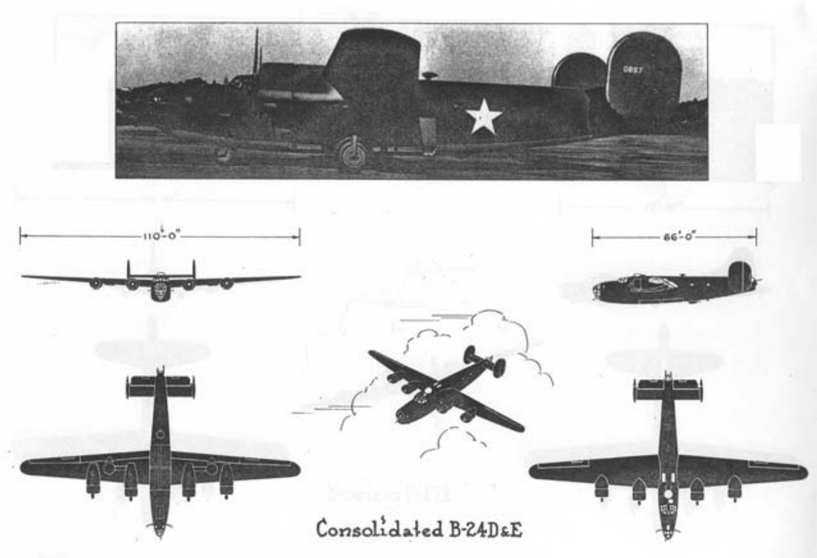


Figure 41: The Liberator (B-24), the aircraft used at the Four-Engine School

Source: Courtesy New Mexico State Records Center and Archive, George C. Lusk Collection

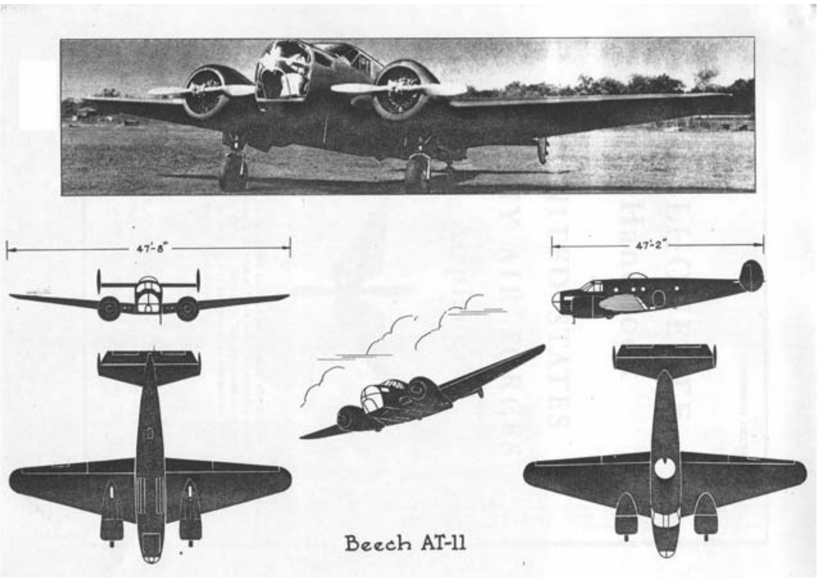


Figure 42: Bombardier trainer (AT-11) used at Kirtland

Source: Courtesy New Mexico State Records Center and Archives, George C. Lusk Collection

Figure 43: Poster encouraging women to enlist

Source: Courtesy Boston Latin School

Figure 44: The Superfortress (B-29)

Source: Courtesy USAF Museum

The 'Swoose' Comes Home

THE GRAND OLD 'SWOOSE', one of 35 Flying Fortresses of the 19th Bombardment Group to leave Kirtland Field for the Philippines in the fall of 1941, was home to roost for a short time last week, with the flags of 32 countries she has visited painted on her side. Immortalized in the book, ''Queens Die Proudly,'' she was Col. Frank Kurtz' ship through the early days of the war and was the only Fort of the original 35 ever to return to the States. She's now engaged in flights clothed in secrecy, so her mission here was undisclosed.

Figure 45: Colonel Kurtz's B-17, *The Swoose*

Source: Center for Southwest Research, Zimmerman Library, UNM, *Twenty-niner* files

The Twenty-niner

V-E EXTRA

V-E EXTRA

ON TO TOKYO

Nazi Surrender Hastens Jap Defeat

V·E EXTRA

European War Officially Ends Today at 4:01 p. m., MWT

BULLETIN

A "TAIL" OF WOE FOR TOKYO

Figure 46: *Twenty-niner* headline announcing Nazi surrender

Source: Courtesy Center for Southwest Research, Zimmerman Library, UNM, *Twenty-niner* files

Figure 47: Bomb-loading pit at Kirtland Field

Source: Courtesy National Atomic Museum

Figure 48: Major General Leslie Groves

Source: A.J. Software & Multimedia. n.d.a

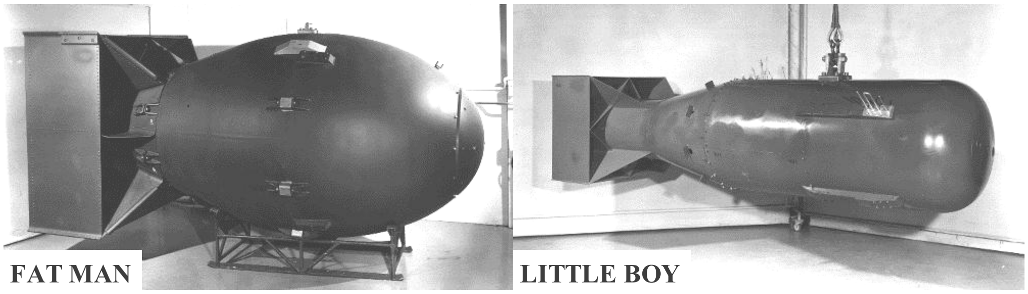


Figure 49: Atomic bombs developed in Los Alamos

Source: A.J. Software & Multimedia. n.d.b

''Y-E-O-U-W!! The war's over!'' Just down from a training mission over the deserts of New Mexico, this Kirtland Field Superfort crew cuts loose with a super-celebration upon hearing the news. Crew which dropped bombs upon Japan were Second Air Force-trained just like this one, which includes: Sec Lt. John Masson, Merchantville, N. J.; Sec. Lt. Wayne Penrod, Dougola, Ill.; Flight Officer George T Paris, Oak Park, Ill.; First Lt. Earl E. Chapman, Glendora, Calif; Flight Officer Randy Poonarian, Brook lyn, N. Y.; First Lt. Richard E. Hart, Paragould, Ark.; Sgt. George T. Richards, Haverford, Pa.; Sgt George W. Walker, Kalamazoo, Mich.; and Cpl. Leo D Estabrooks, Stoughton, Mass.

Figure 50: Kirtland Field airmen celebrating end of war

Source: Courtesy Center for Southwest Research, Zimmerman Library, UNM, Twenty-niner files

Figure 51: Proximity fuze diagram and typical shells

Source: Jennings n.d.

Figure 52: Jack Workman

Source: Courtesy New Mexico Institute of Mining and Technolocy

Figure 53: Replica aircraft on test tower at NMPG in 1944

Source: KAFB 377th Air base Wing SPTG/CEVQ electronic photograph files

Figure 54: General Patton and Brigadier General Jimmy Doolittle, reportedly at Kirtland Field, circa 1942

Source: Courtesy Albuquerque Museum

Figure 55: Aircraft maintenance training at the Air Depot Training Station

Source: Courtesy Albuquerque Museum

Figure 56: Air Depot Training Station in 1944

Source: Courtesy National Atomic Museum

Figure 57: Convalescent Center at the former Sandia School in 1944

Source: Courtesy Albuquerque Museum

Figure 58: Occupational therapy at the Convalescent Center in 1944

Source: Courtesy Albuquerque Museum

Figure 59: Sandia Base and graveyard for decommissioned aircraft

Source: Courtesy Albuquerque Museum

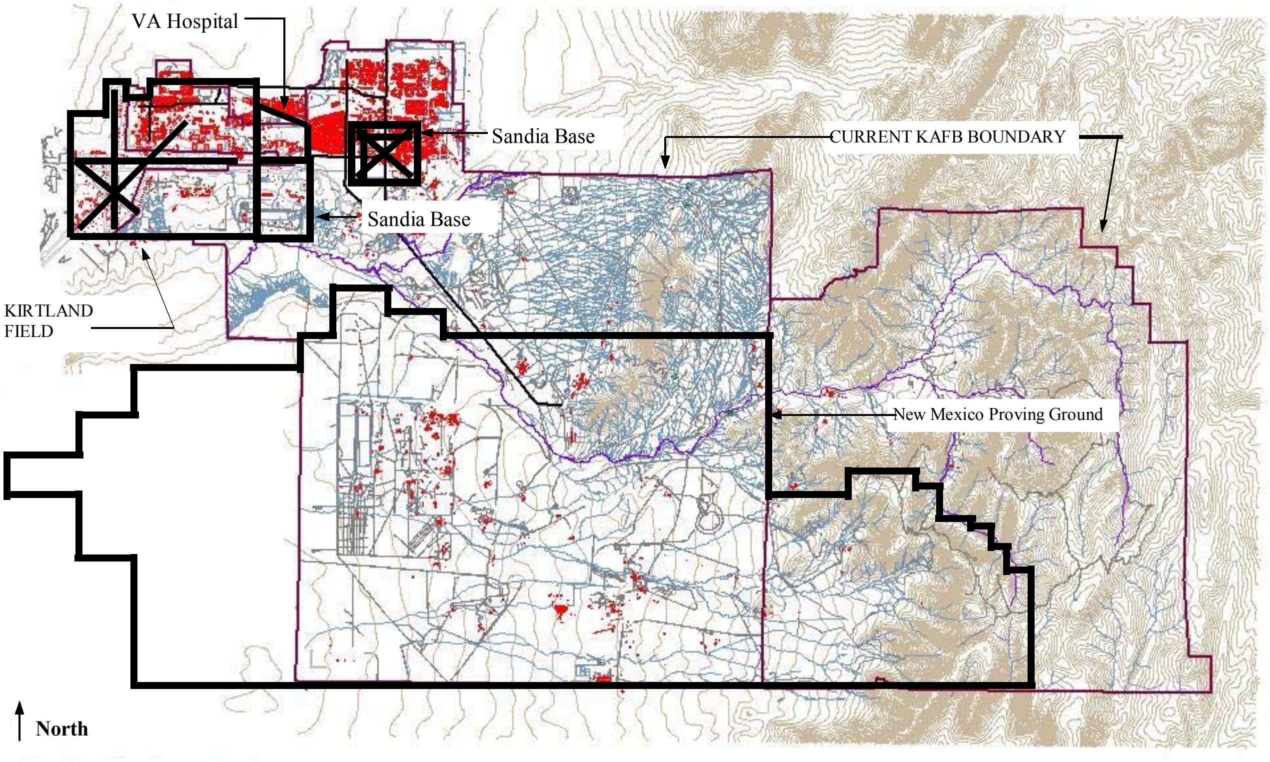


Figure 60: Sandia Base, Kirtland Field and NMPG in 1946, overlaid on current KAFB map

Source: Developed by Karen Van Citters from KAFB maps and references from this chapter

Figure 61: Hap Arnold and Colonel Kurtz at Kirtland in 1945

Source: Center for Southwest Research, Zimmerman Library, UNM, *Twenty-niner* files

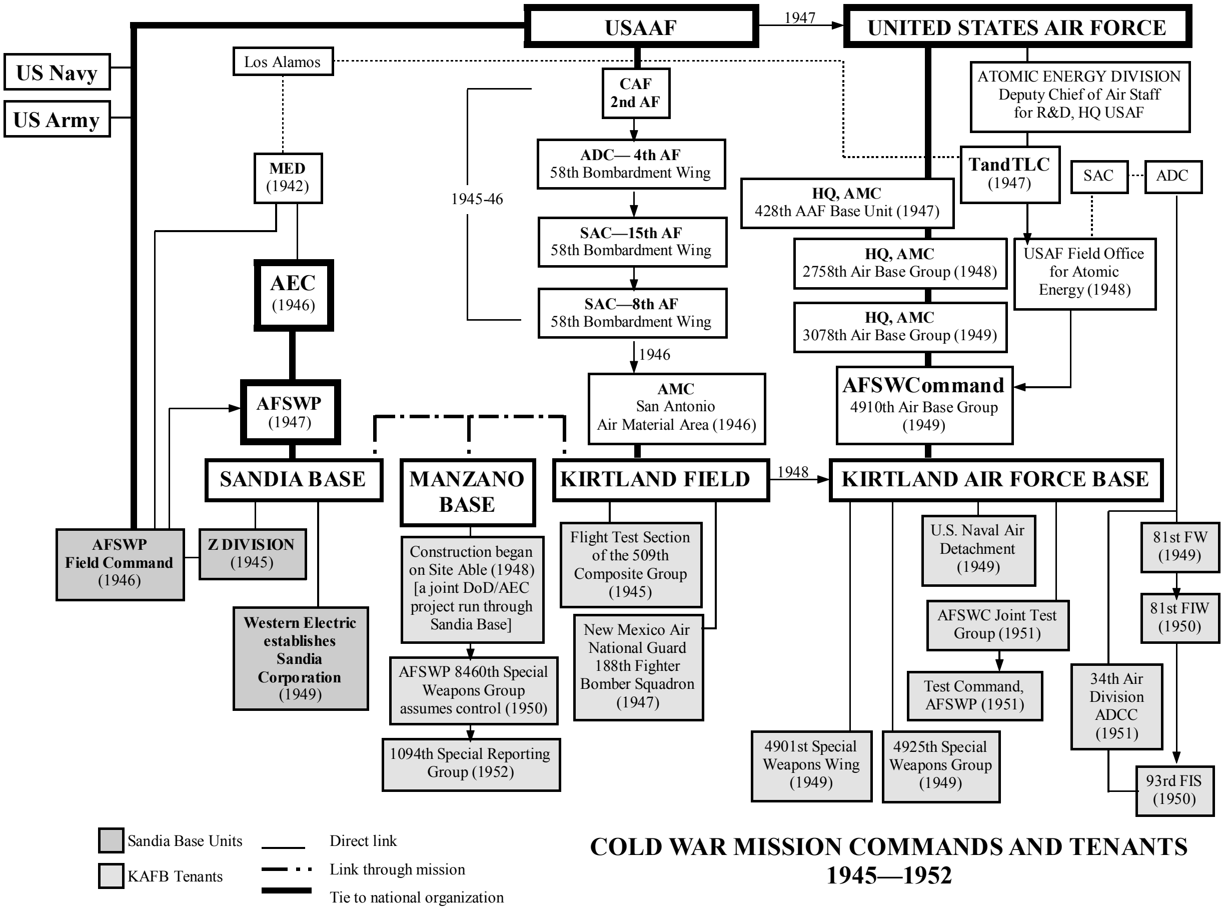


Figure 62: Chart of Phase I Cold War Activities at Kirtland

Source: Drawn by Karen Van Citters from references cited in this chapter

MAJ. GEN. WILLIS H. HALE (left), commanding general of the Fourth Air Force, was greeted by Col. Perry M. Hoisington (right), Kirtland Field's new commander, when the general conferred here Tuesday on plans for the post. Kirtland recently was transferred from the Second Air Force.

Figure 63 Colonel Hoisington (right) takes command

Source: Courtesy New Mexico State Records Center and Archive, Kirtland AAF Files

Figure 64: Sandia Base Tech Area I

Source: Courtesy Sandia Laboratories files

Figure 65: Air Depot buildings used by Z Division

Source: Courtesy National Atomic Museum

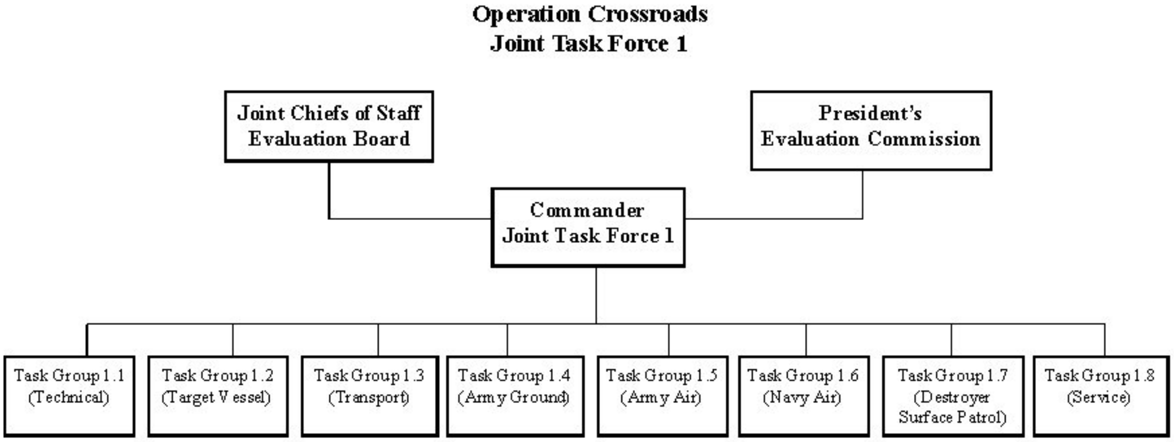


Figure 66: Organizational chart for Task Force ONE

Source: Drawn by Kristen Bisson from information provided by Naval Historical Center website

Figure 67: Crossroads crews after hours

Source: Courtesy Sandia National Laboratories

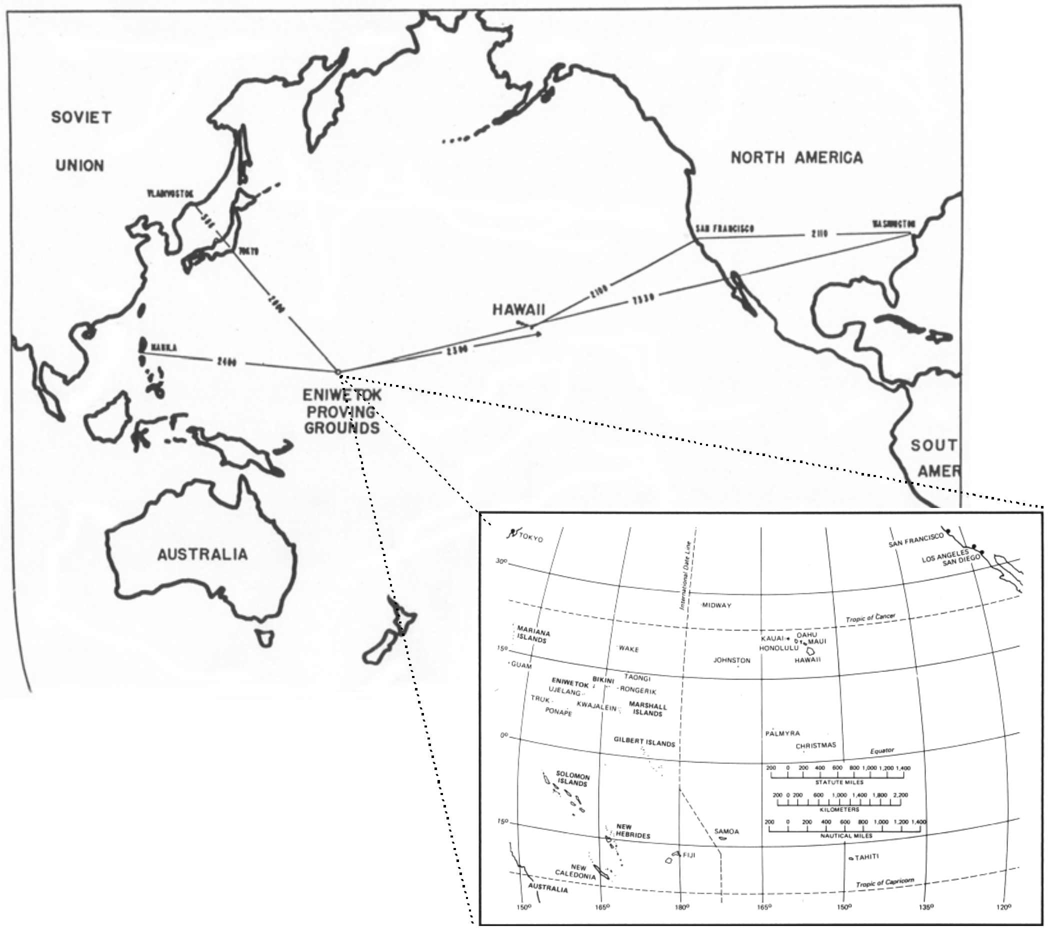


Figure 68: Eniwetok Proving Ground

Source: Greene et al. 1957

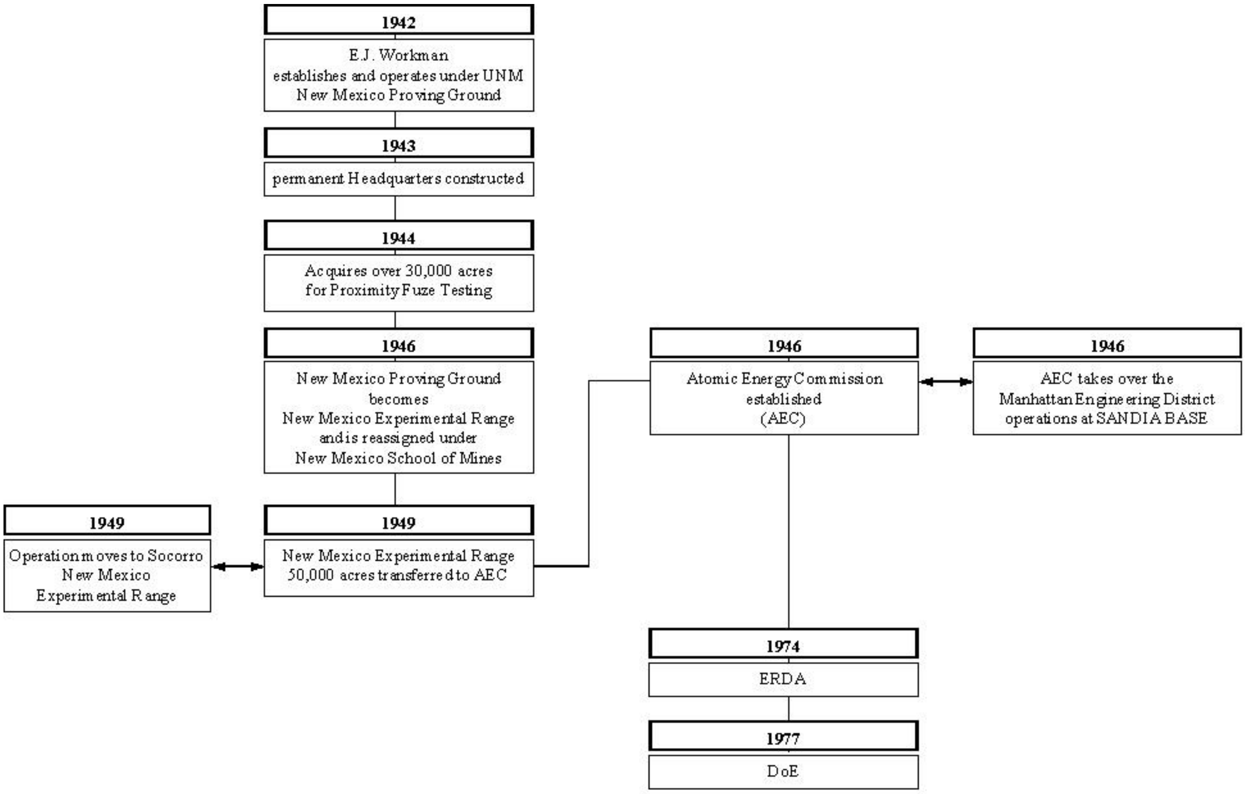


Figure 69: NMPG chart

Source: Developed and drawn by Karen Van Citters from sources in this chapter

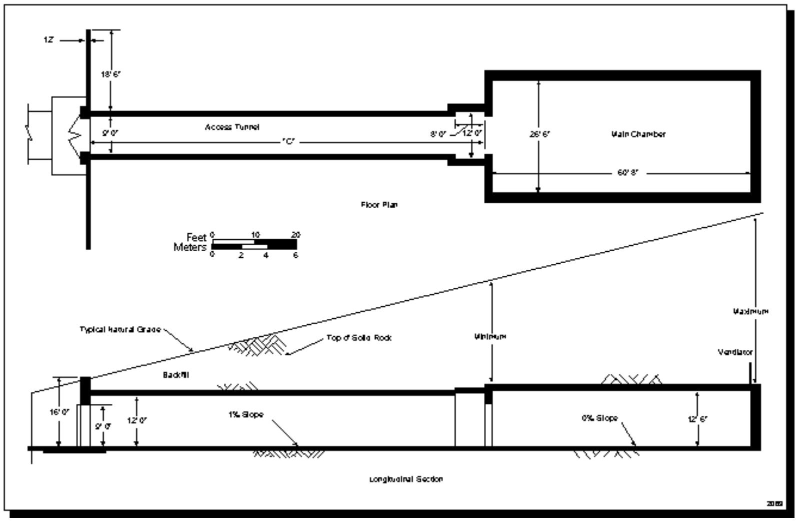


Figure 70: Type D igloo

Source: Global Security.Org

Figure 71: 4925th Test Group (Atomic)

Source: Courtesy 377th Air Base Wing History Office

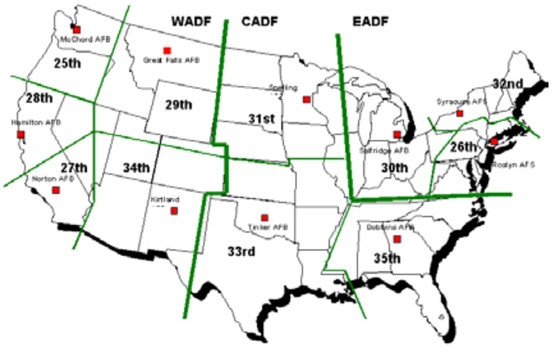


Figure 72: ADC Air Divisions, 1952

Source: Air Defense Radar Veterans Association

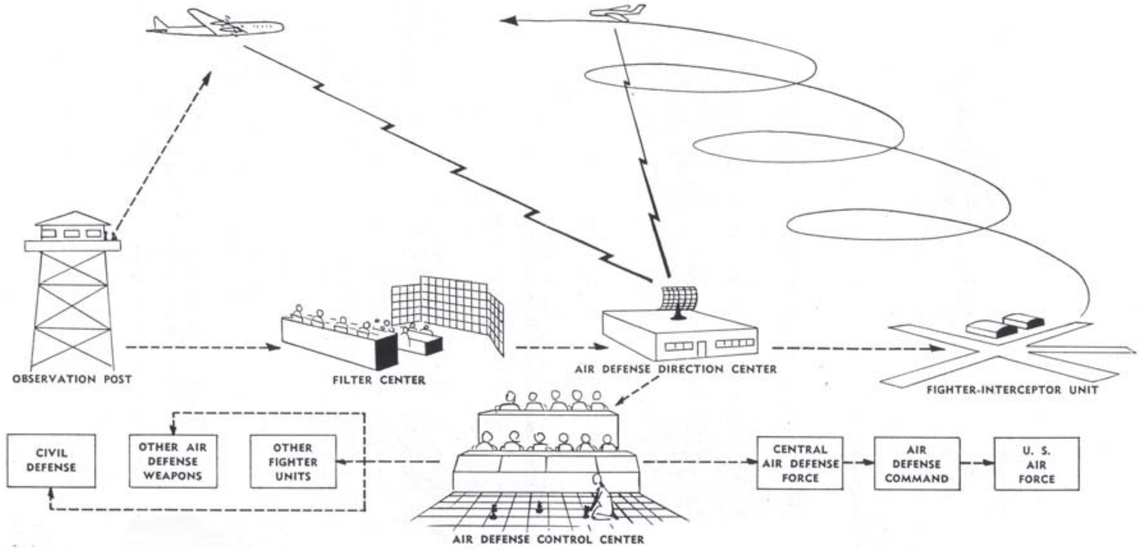


Figure 73: Diagram showing GOC operations

Source: Flaxman 1958

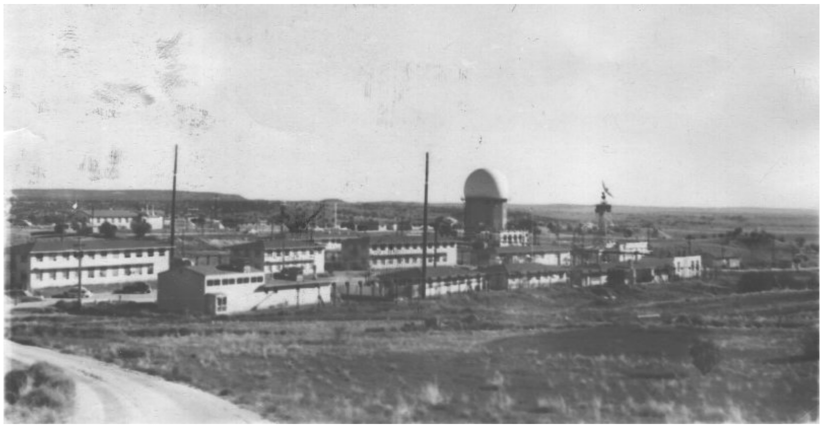


Figure 74: AC&W station east of Moriarty

Source: 768th AC&W Squadron Veterans n.d.

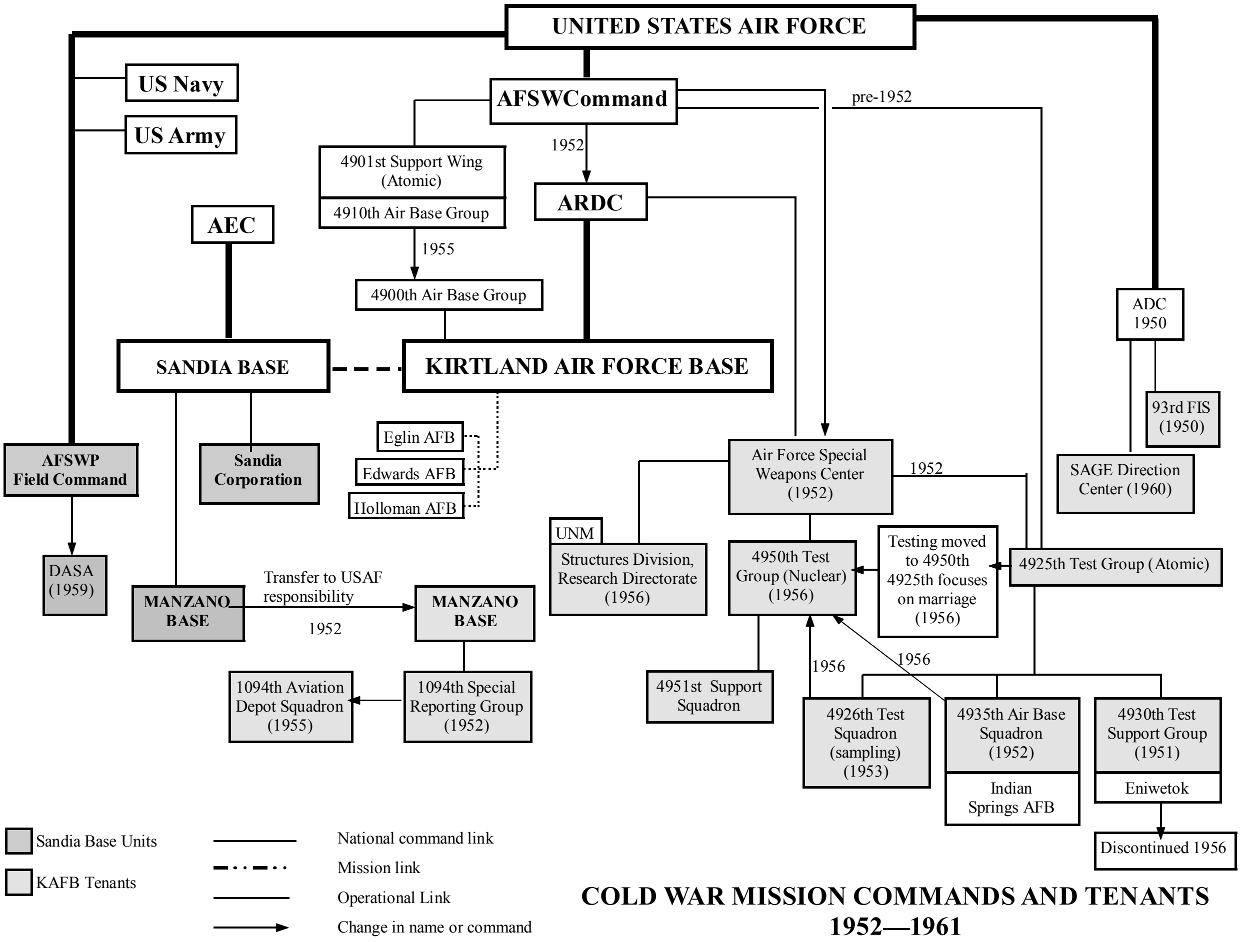


Figure 75: Chart of Phase II Cold War Activities at Kirtland

Source: Drawn by Karen Van Citters from sources cited in this chapter

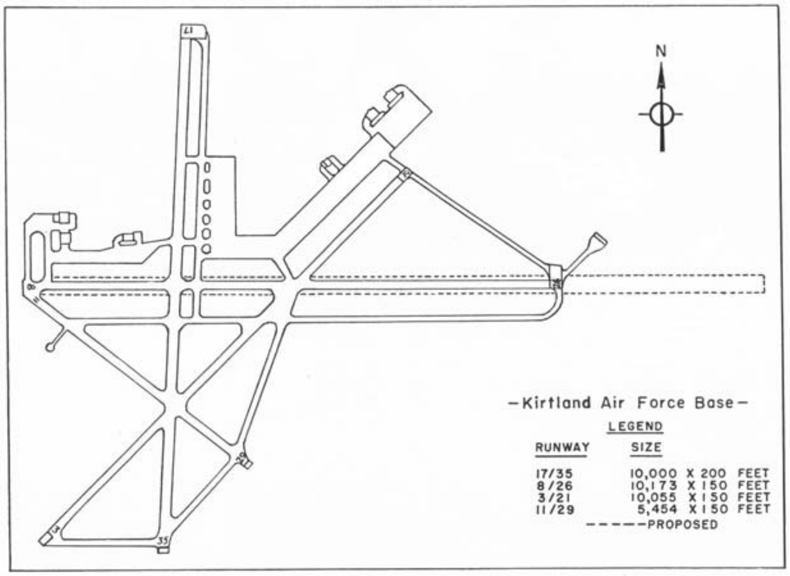


Figure 76: 1955 runway expansion plan

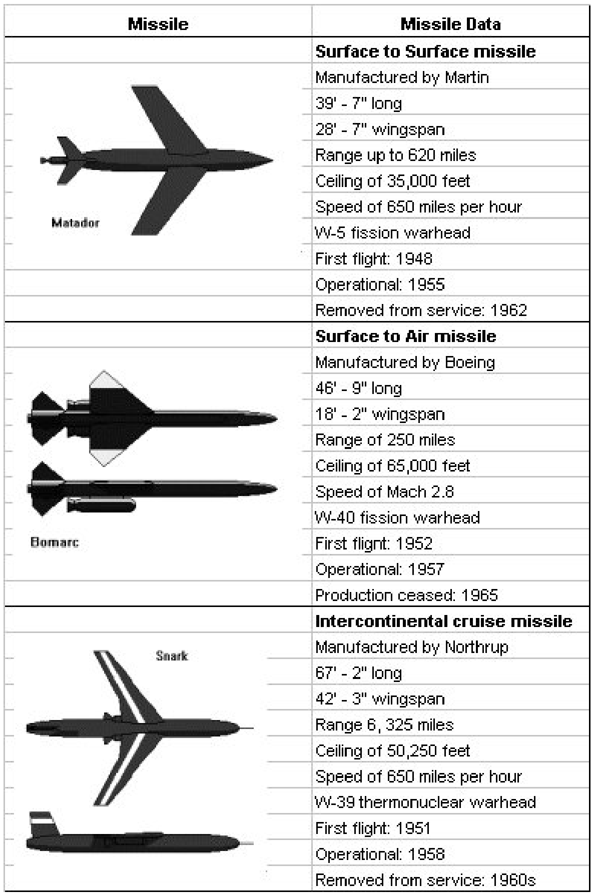
Source: Courtesy AFRL Phillips Research Site Historical Information Office: Air Force Special Weapons Center Facilities, c. 1953

Figure 77: Genie being launche-106 Delta Dart

Source: U.S. Air Force photo by Frank Garzelnick

Figure 78: A sample of missile delivery systems developed by ARDC at KAFB

Source: United States Air Force Museum; Customized Services Management Inc.; Designation-Systems.Net



Missile	Missile Data
	Surface to Surface missile
	Manufactured by Martin
	39' - 7" long
	28' - 7" wingspan
	Range up to 620 miles
	Ceiling of 35,000 feet
	Speed of 650 miles per hour
Matador	W-5 fission warhead
	First flight: 1948
	Operational: 1955
	Removed from service: 1962
	Surface to Air missile
	Manufactured by Boeing
	46' - 9" long
	18' - 2" wingspan
	Range of 250 miles
	Ceiling of 65,000 feet
	Speed of Mach 2.8
	W-40 fission warhead
Bomarc	First flight: 1952
	Operational: 1957
	Production ceased: 1965
	Intercontinental cruise missile
Snark	Manufactured by Northrup
	67' - 2" long
	42' - 3" wingspan
	Range 6, 325 miles
	Ceiling of 50,250 feet
	Speed of 650 miles per hour
	W-39 thermonuclear warhead
	First flight: 1951
	Operational: 1958
	Removed from service: 1960s

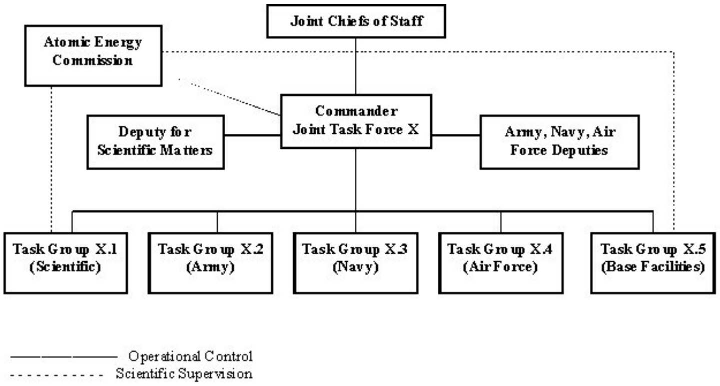


Figure 79: Diagram of Typical Joint Task Force

Source: Drawn by Kristen Bisson from information in Greene et al. 1957

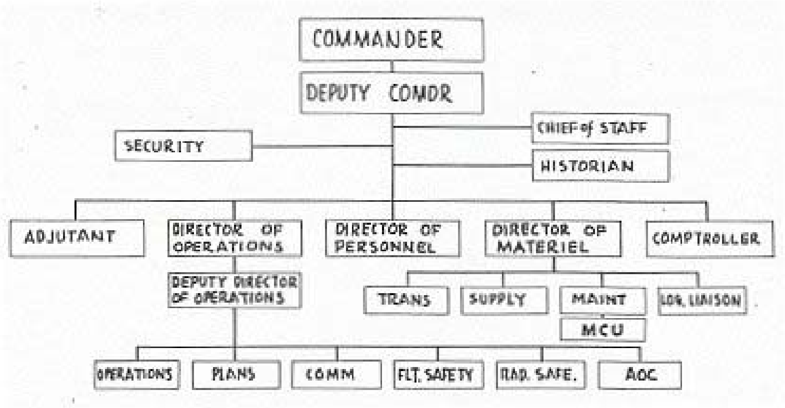
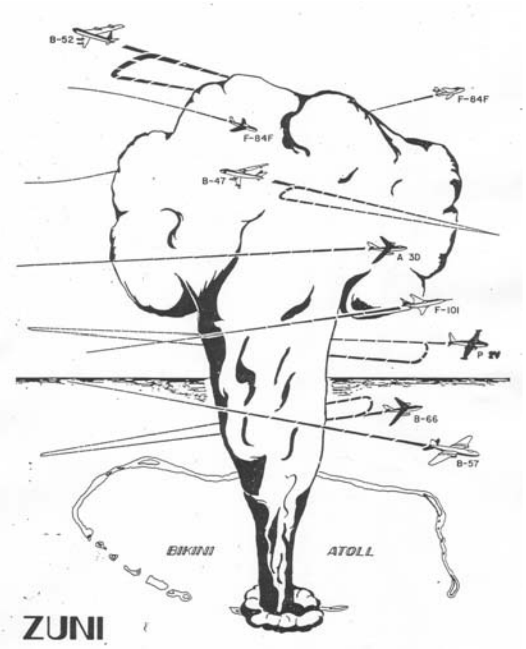


Figure 80: Typical early USAF Air Task Group

Source: Greene et al. 1957

Figure 81: Diagram of test during REDWING

Source: Greene et al. 1957



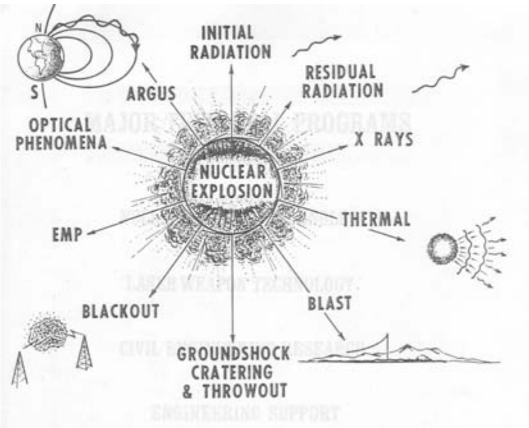


Figure 82: Diagram showing nuclear blast effects

Source: AFWL 1971

Figure 83: Shock Tube Facility

Source: Courtesy AFRL Phillips Research Site Historical Information Office

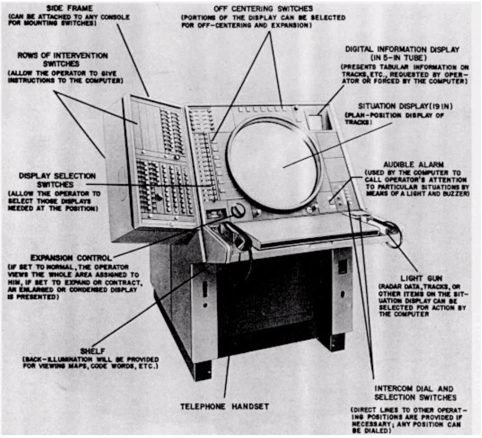


Figure 84: SAGE computerized console

Source: Barnes n.d.

Figure 85: SAGE Direction Center

Source: Barnes n.d.

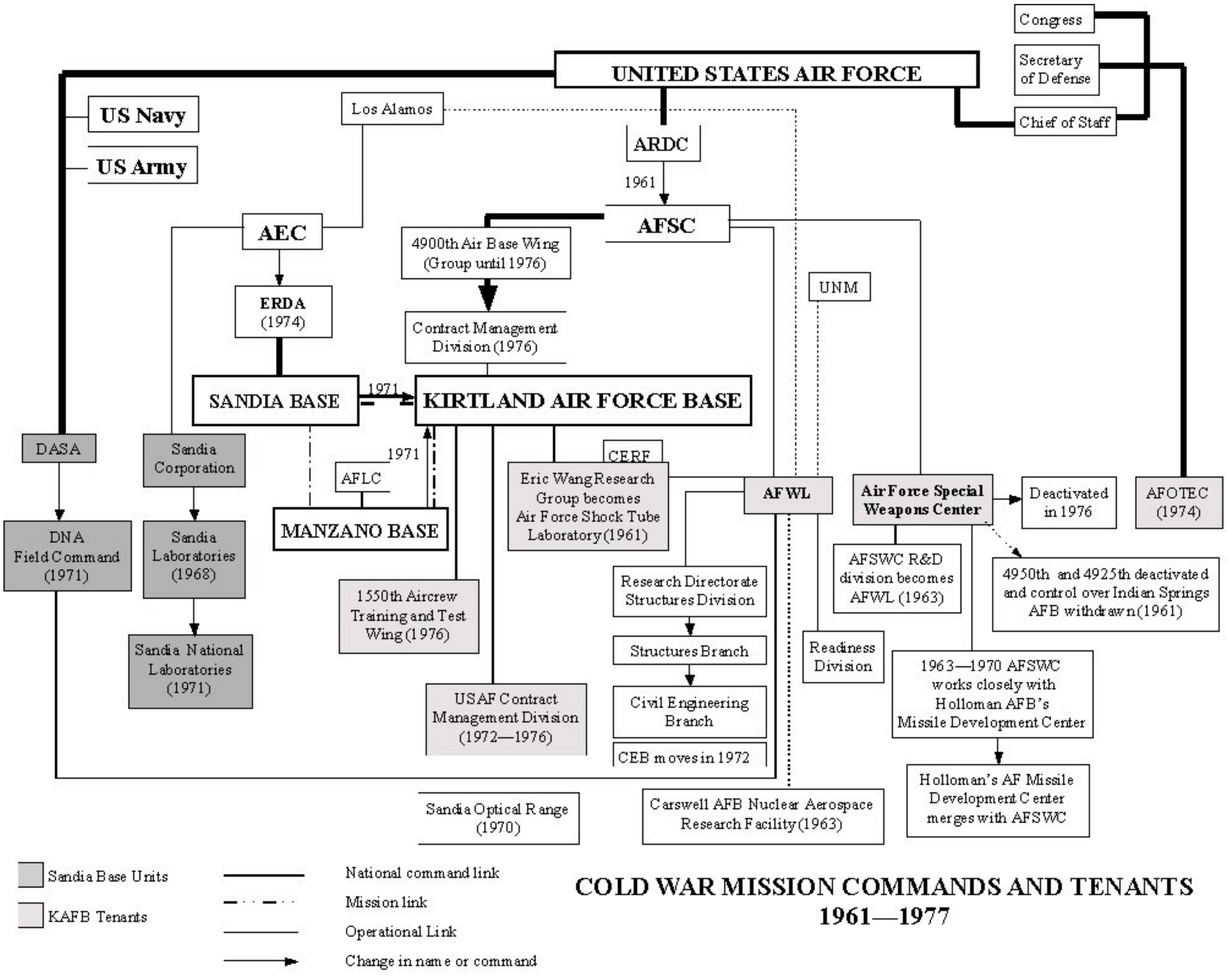


Figure 86: Chart of Phase III Cold War Activities at Kirtland

Source: by Karen Van Citters from references cited in this chapter

Figure 87: Kennedy visits Sandia Base in 1962

Source: Courtesy 377th Air Base Wing History Office

Figure 88: AFWL buildings in 1963

Source: Courtesy AFRL Phillips Research Site Historical Information Office

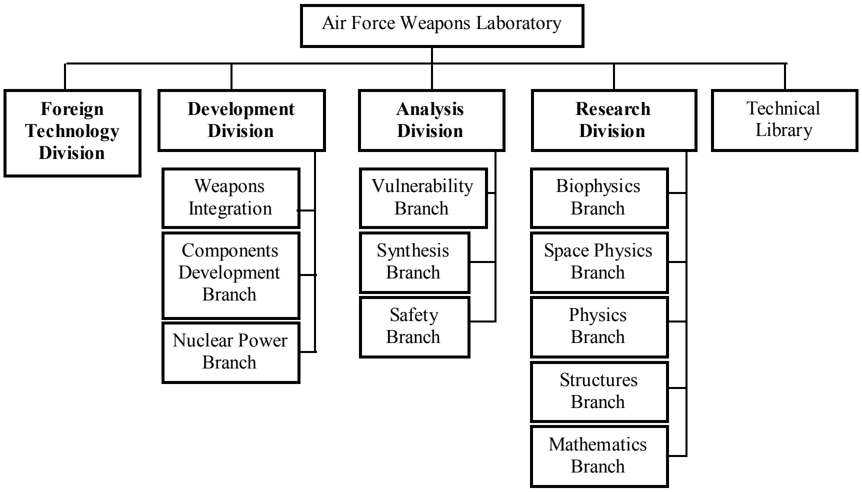


Figure 89: Typical Organizational Chart for AFWL during Phase III

Source: AFWL 1987

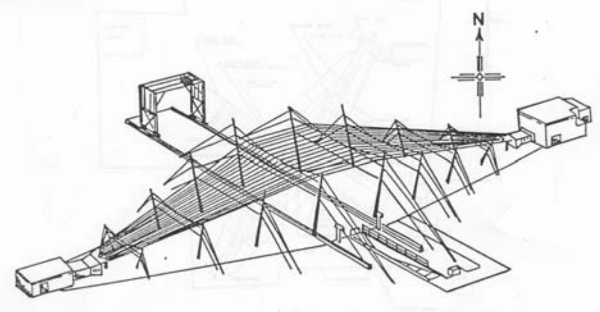


Figure 90: ALECS Diagram

Source: AFWL 1981

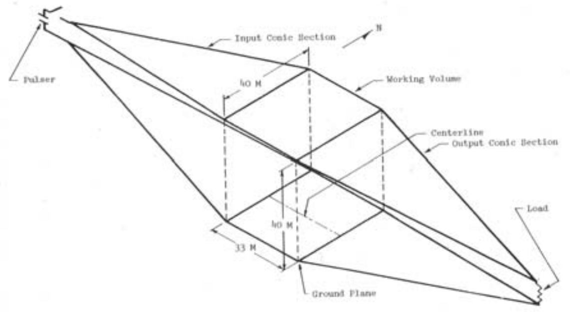


Figure 91: ARES facility

Source: Courtesy Dr. Carl Baum, AFRL Directed Energy Directorate, High Power Microwave Division

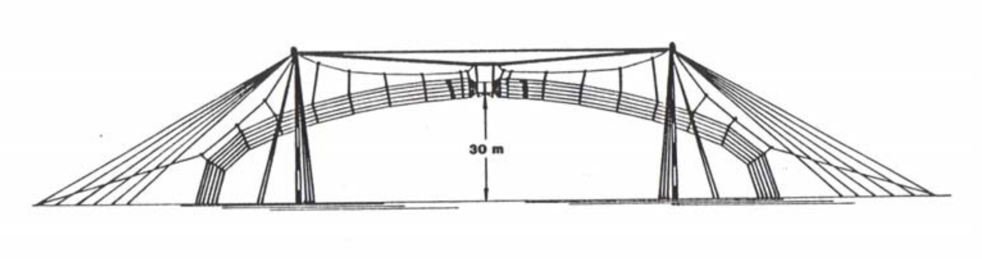


Figure 92: HPD diagram

Source: AFWL 1981

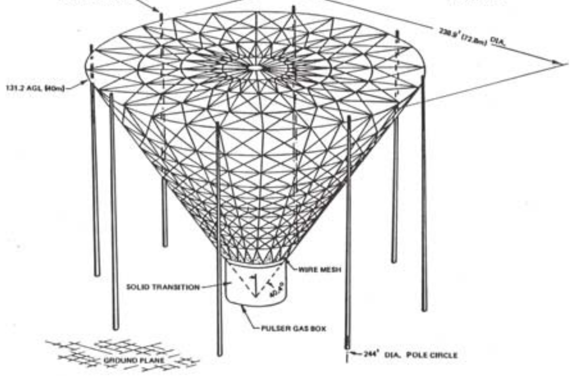


Figure 93: VPD-II Diagram

Source: AFWL 1981

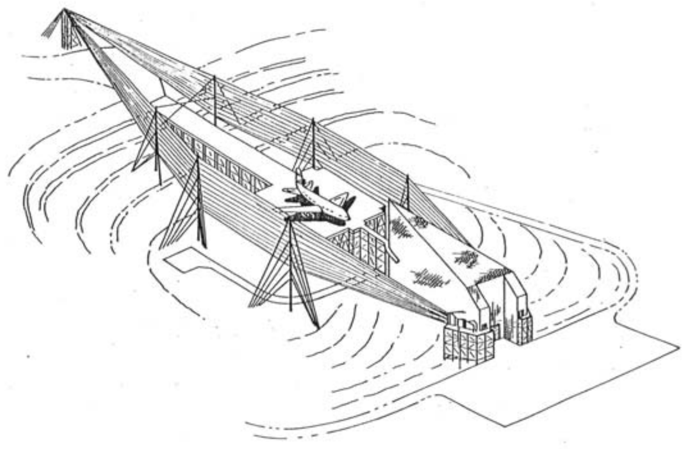


Figure 94: Diagram of the Trestle in testing mode

Source: Courtesy Dr. Carl Baum, AFRL Directed Energy Directorate, High Power Microwave Division

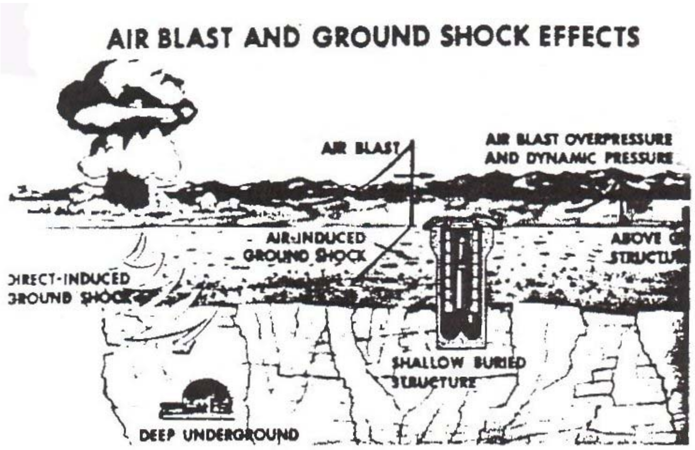


Figure 95: Blast and shock effects diagram

Source: Courtesy AFRL Phillips Research Site Historical Information Office

Figure 96: HEST testing

Source: Courtesy AFRL Phillips Research Site Historical Information Office

Figure 97: Gemini IV

Source: Courtesy AFRL Phillips Research Site Historical Information Office

Figure 98: Starfire Optical Range

Source: Courtesy AFRL Phillips Research Site Historical Information Office

Figure 99: Airborne Laser Laboratory

Source: Courtesy AFRL Phillips Research Site Historical Information Office

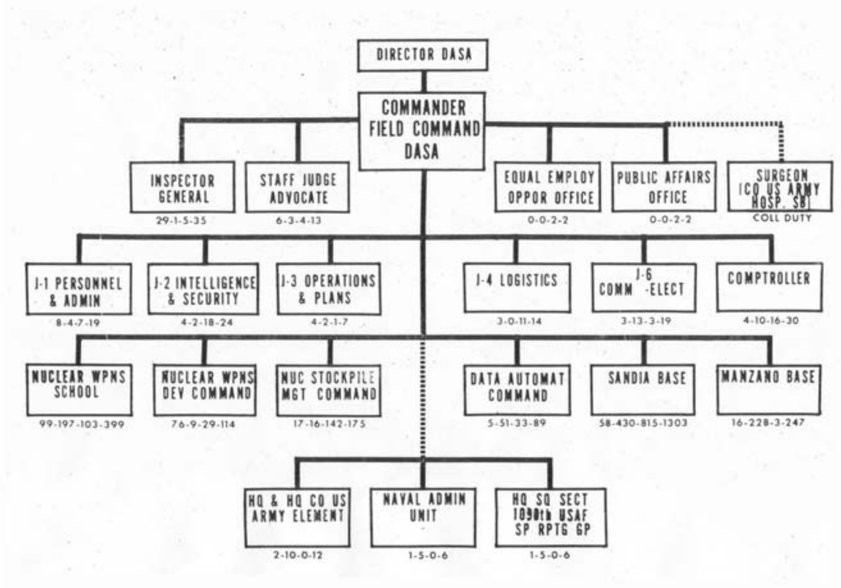
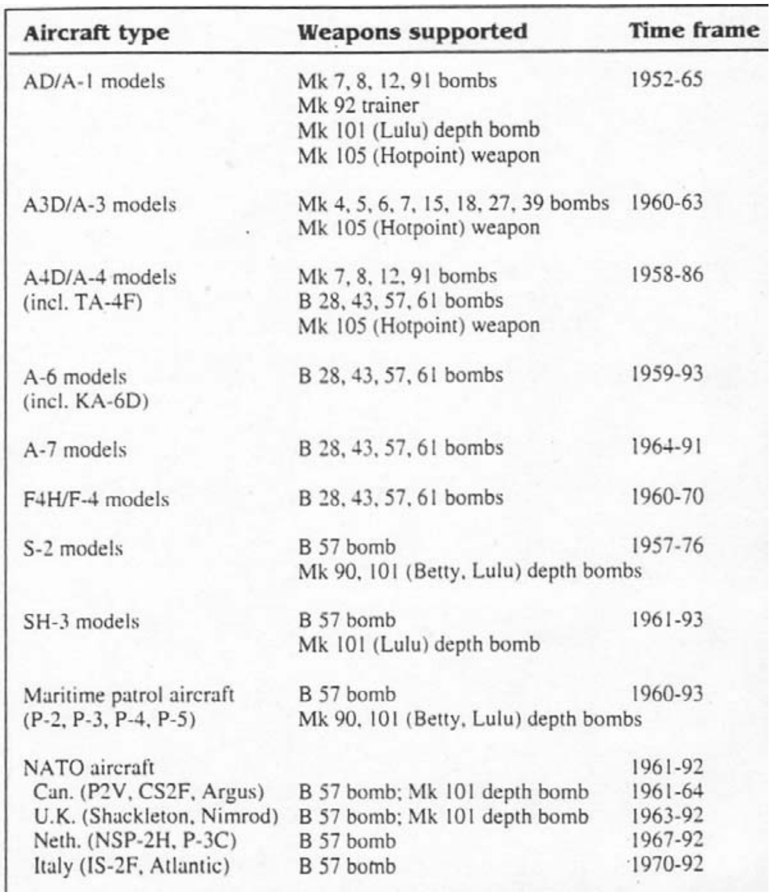


Figure 100: DASA organization circa late 1960s

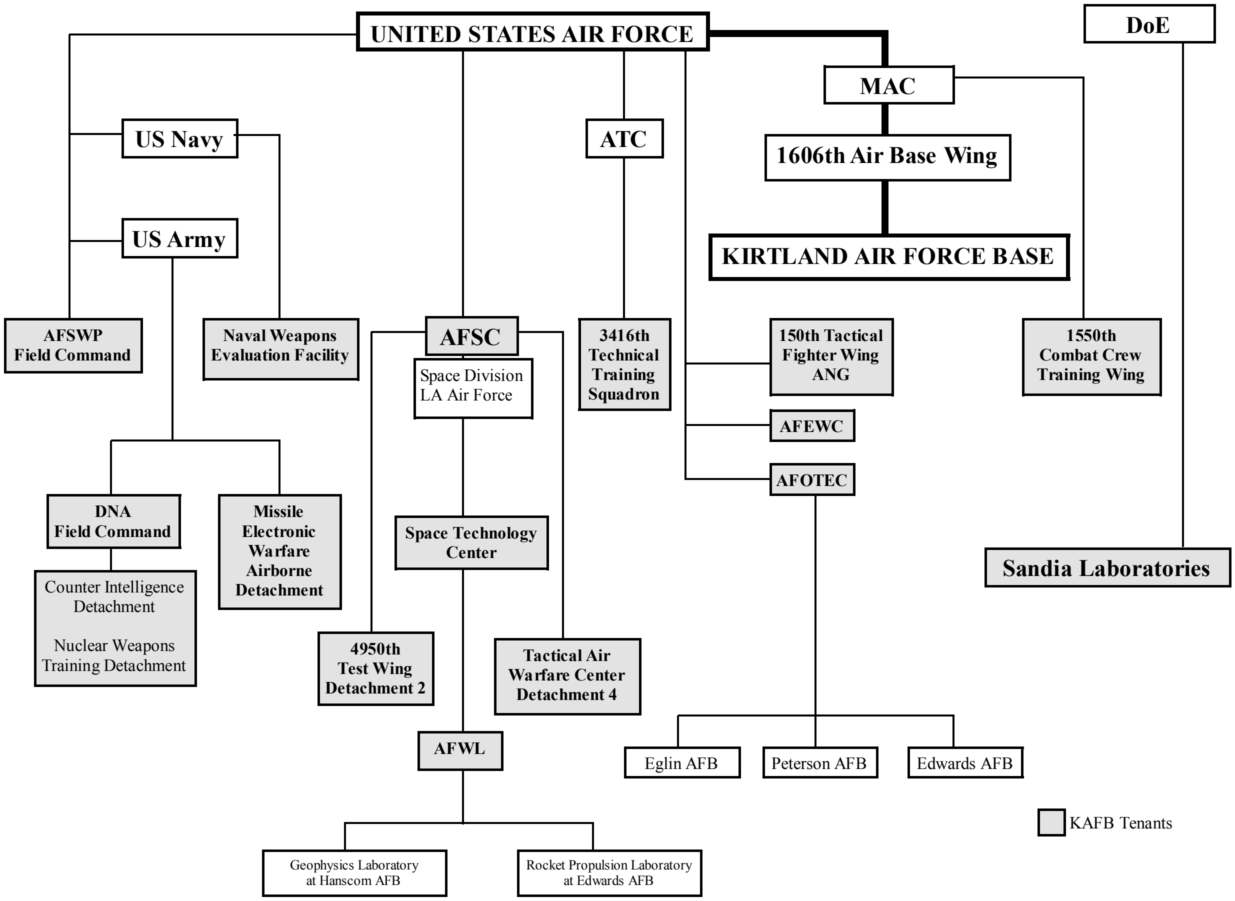
Source: AFSWC 1970



Aircraft type	Weapons supported	Time frame
AD/A-1 models	Mk 7, 8, 12, 91 bombs Mk 92 trainer Mk 101 (Lulu) depth bomb Mk 105 (Hotpoint) weapon	1952-65
A3D/A-3 models	Mk 4, 5, 6, 7, 15, 18, 27, 39 bombs Mk 105 (Hotpoint) weapon	1960-63
A4D/A-4 models (incl. TA-4F)	Mk 7, 8, 12, 91 bombs B 28, 43, 57, 61 bombs Mk 105 (Hotpoint) weapon	1958-86
A-6 models (incl. KA-6D)	B 28, 43, 57, 61 bombs	1959-93
A-7 models	B 28, 43, 57, 61 bombs	1964-91
F4H/F-4 models	B 28, 43, 57, 61 bombs	1960-70
S-2 models	B 57 bomb Mk 90, 101 (Betty, Lulu) depth bombs	1957-76
SH-3 models	B 57 bomb Mk 101 (Lulu) depth bomb	1961-93
Maritime patrol aircraft (P-2, P-3, P-4, P-5)	B 57 bomb Mk 90, 101 (Betty, Lulu) depth bombs	1960-93
NATO aircraft		1961-92
Can. (P2V, CS2F, Argus)	B 57 bomb; Mk 101 depth bomb	1961-64
U.K. (Shackleton, Nimrod)	B 57 bomb; Mk 101 depth bomb	1963-92
Neth. (NSP-2H, P-3C)	B 57 bomb	1967-92
Italy (IS-2F, Atlantic)	B 57 bomb	1970-92

Figure 101: Special weapons and aircraft combinations tested by NWEF

Source: Naval Air Warfare Center 1993



COLD WAR MISSION COMMANDS AND TENANTS
1977—1989

Figure 102: Phase IV Cold War Activities at KAFB

Source: Drawn by Karen Van Citters from sources cited in this chapter

Figure 103: AFWL in the 1980s

Source: Courtesy AFRL Phillips Research Site Historical Information Office

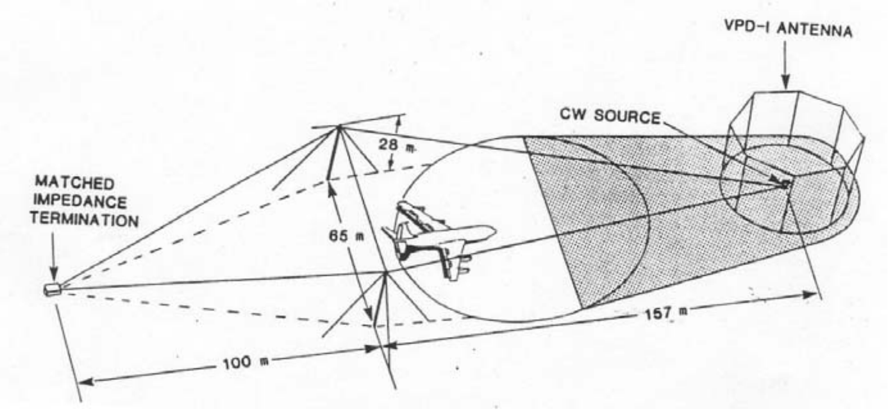


Figure 104: Hardness Surveillance Illuminator in "differential mode."

Source: AFRL Phillips Research Site Historical Information Office: History of AFWL 1 October 1984 – 30 September 1986.

Figure 105: AFRL's GWEN

Source: Courtesy AFRL Phillips Research Site Historical Information Office

Figure 106: Sandia School

Source: Courtesy Sandia Preparatory School

Figure 107: Hangar 333 in 2002

Source: Photo by Karen Van Citters

Figure 108: HQ building (29051) in 1944

Source: Source: Courtesy 377th Air Base Wing SPTG/CEVQ

Figure 109: Building 29051 in 2003

Source: Photo by Karen Van Citters

Figure 110: The Guards Residence (29042) during construction in 1944

Source: Source: Courtesy 377th Air Base Wing SPTG/CEVQ

Figure 111: Building 29042 in 2003

Source: Photo by Karen Van Citters

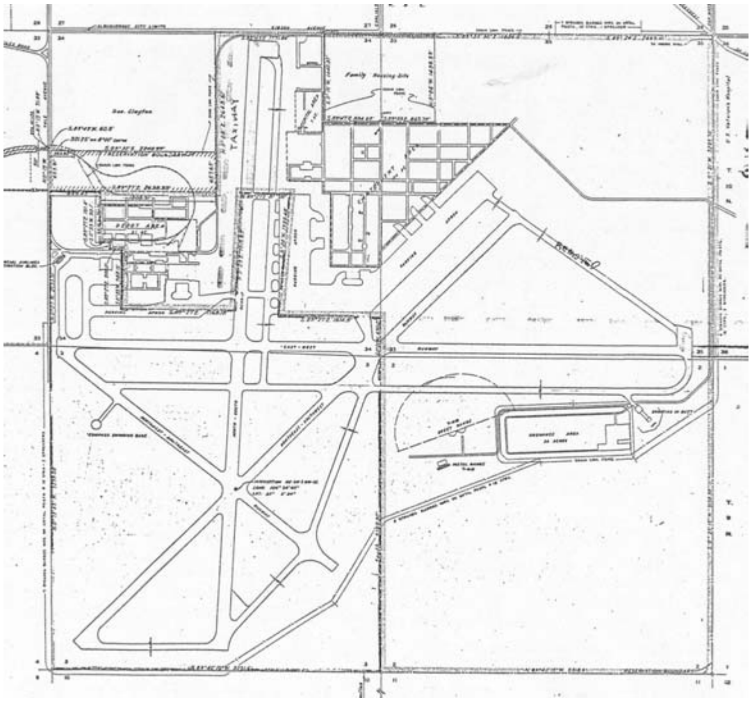


Figure 112: Kirtland Field in 1943; note Ordnance Area just south of runway in southeast quarter of map

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

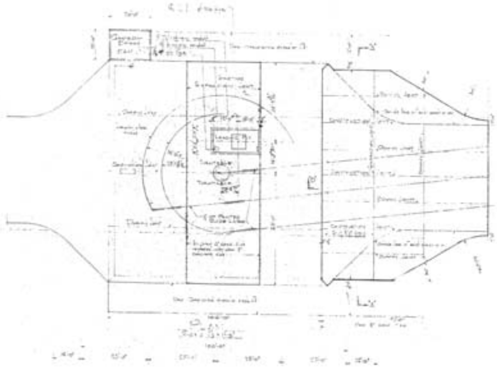


Figure 113: Construction drawing of bomb-loading pit

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

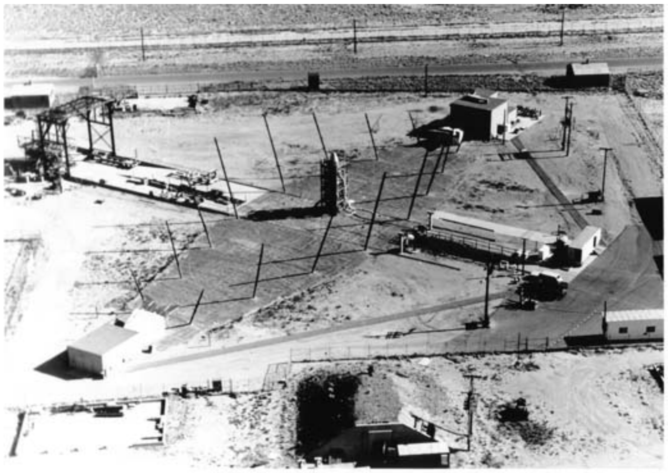


Figure 114: ALECS EMP facility during testing

Source: Courtesy AFRL Phillips Research Site Historical Information Office

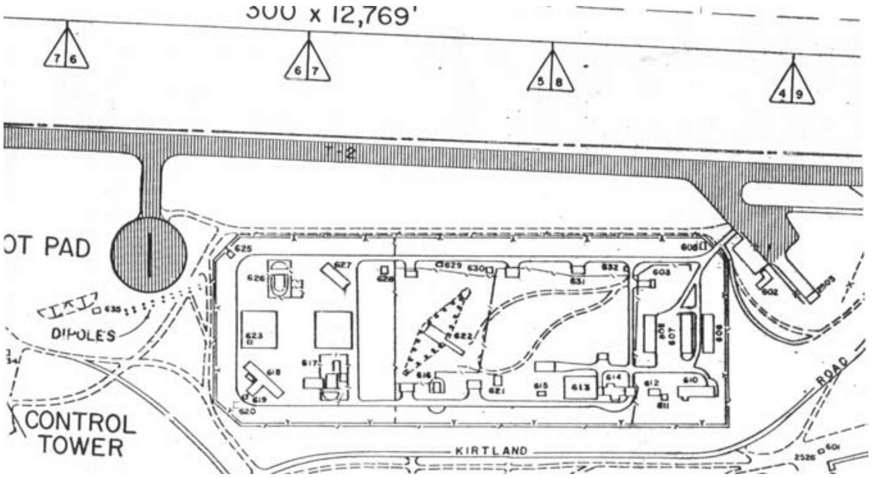


Figure 115: 600 Area circa 1968 – 1971

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

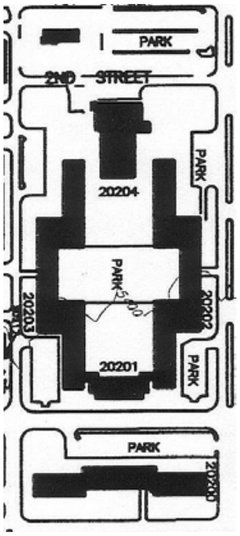


Figure 116: AFSWP HQ Area, 2002 plan

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

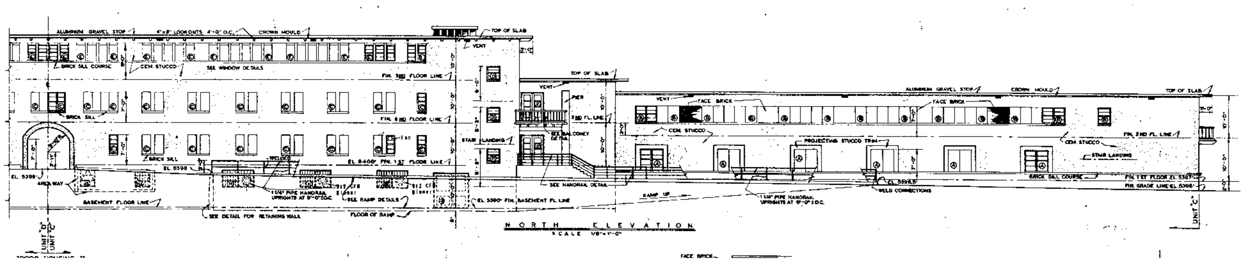


Figure 117: 1962 drawing of Building 20202

Source: Courtesy 377th Air Base Wing Civil Engineering, drawing files

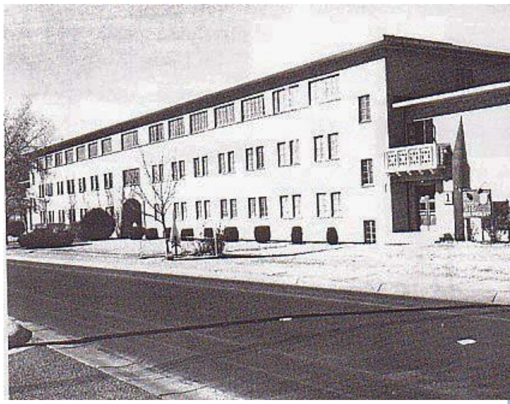


Figure 118: Building 20203 circa 1970

Source: AFRL Phillips Research Site Historical Information Office

Figure 119: Building 20203 in 2003

Source: Photo by Karen Van Citters

Figure 120: Building 20220 in 2003; note original geometric patterned balcony

Source: Photo by Karen Van Citters

Figure 121: Building 20361 (left) retains integrity, in contrast to building 20362 below

Source: Photos by Karen Van Citters

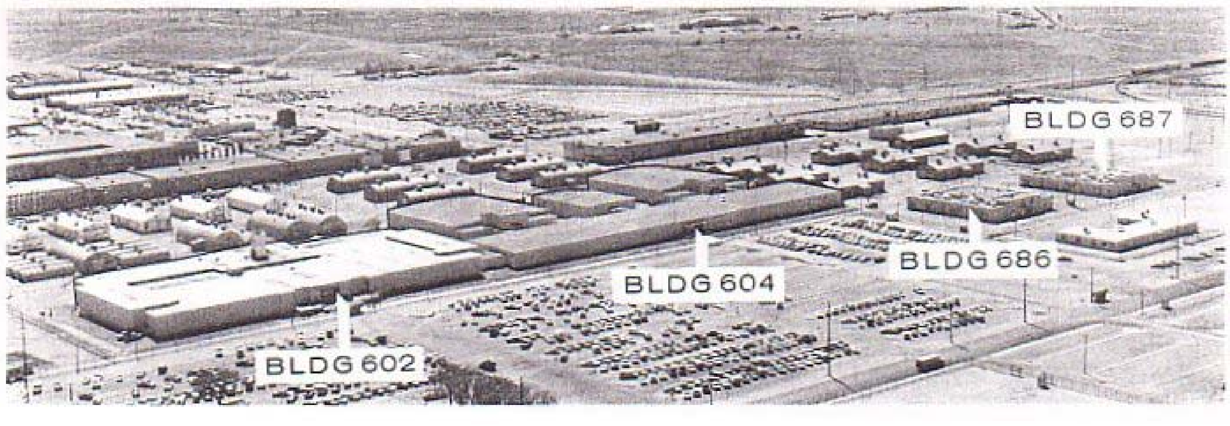


Figure 122: The Defense Atomic Support Agency's Nuclear Weapons School circa 1970

Source: Courtesy 377th Air Base Wing Real Property

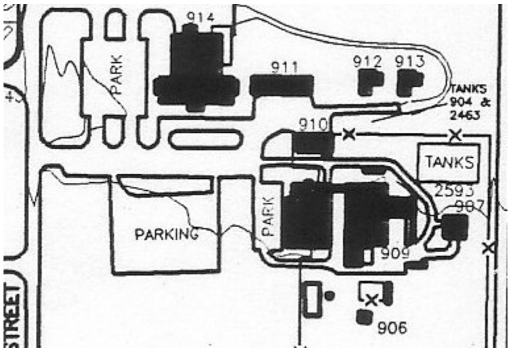


Figure 123: The 900 Area today – the original buildings remain in their 1950s configuration

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

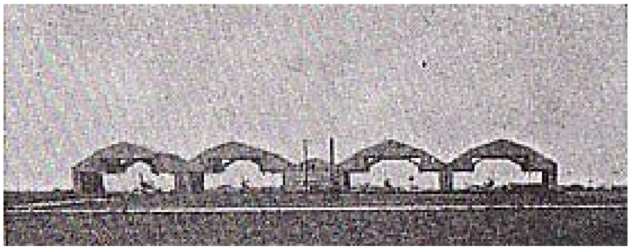


Figure 124: Hangar 1030, the 93rd FIS's alert hangar

Source: Courtesy AFRL Phillips Research Site Historical Information Office

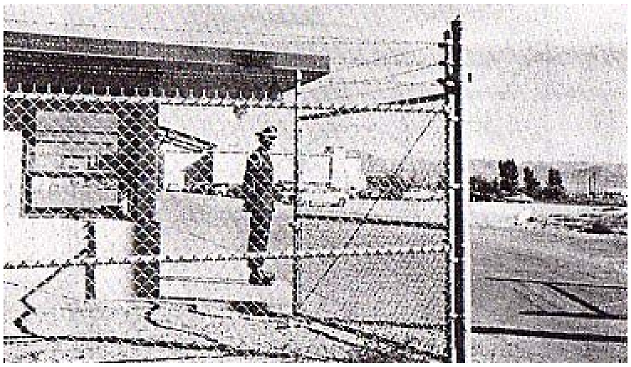


Figure 125: Entrance to the headquarters of the 34th Air Division (Defense) circa 1953. Building 909 is in the background

Source: Courtesy AFRL Phillips Research Site Historical Information Office

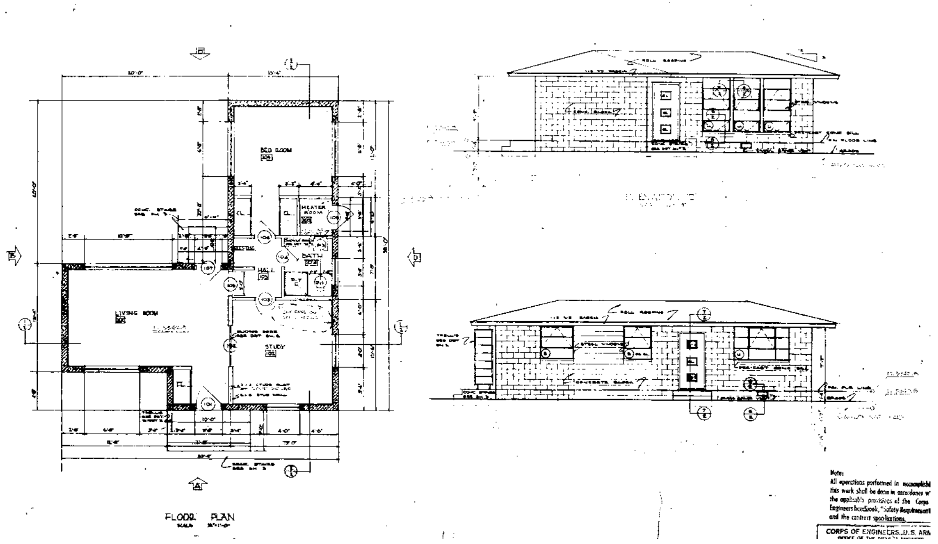


Figure 126: Original drawing for building 912, a General Quarters facility

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

Figure 127: Building 914 in 2002

Source: Photo by Karen Van Citters

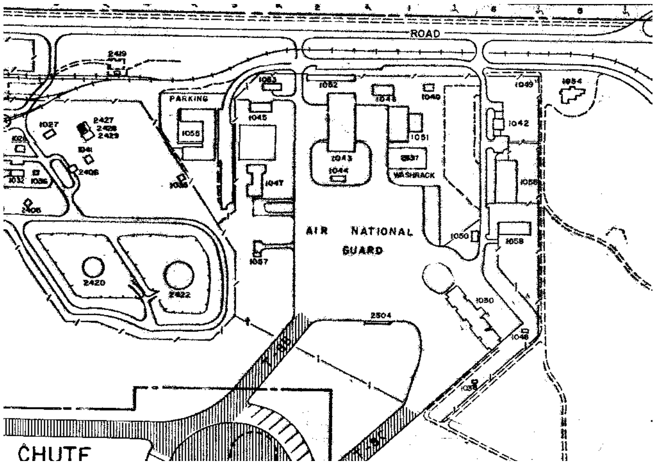


Figure 128: NM ANG Area c. 1968

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

Figure 129: 1000 Area hangars circa the mid-1970s

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

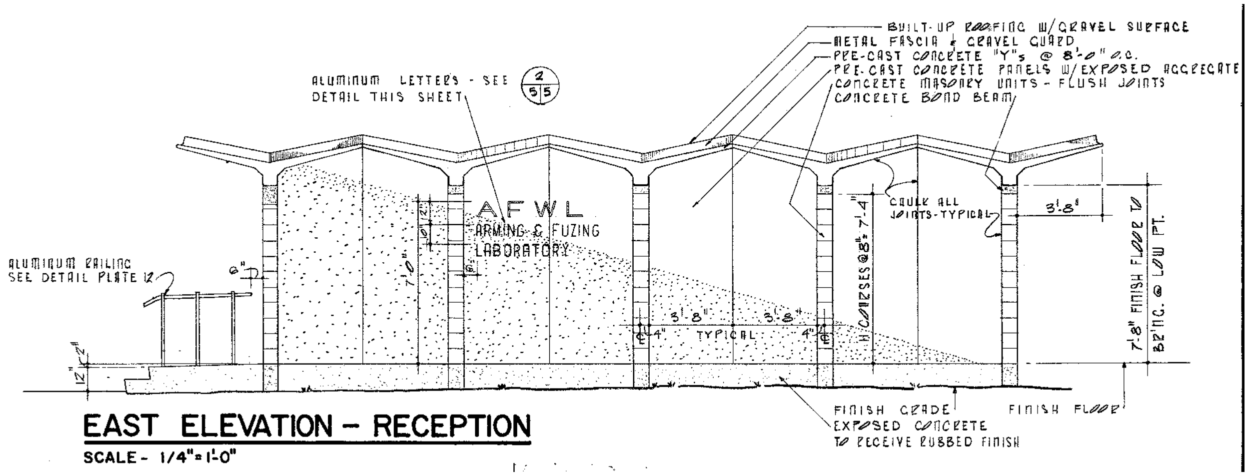


Figure 130: Architectural drawing of the New Formalism entrance vestibule of building 405

Source: Courtesy 377th Air Base Wing Civil Engineering, drawing files

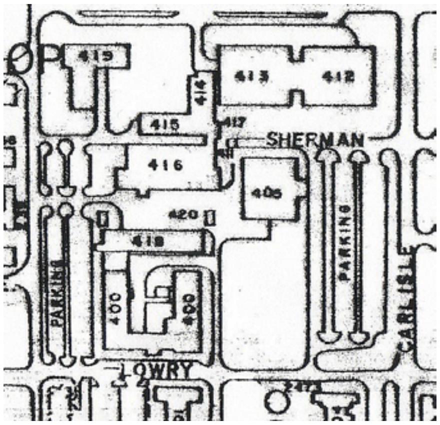


Figure 131: AFWL area circa 1968 – 1971

Source: Courtesy 377th Air Base Wing Civil Engineering drawing files

Figure 132: AFWL area circa 1980s

Source: Courtesy AFRL Phillips Research Site Historical Information Office

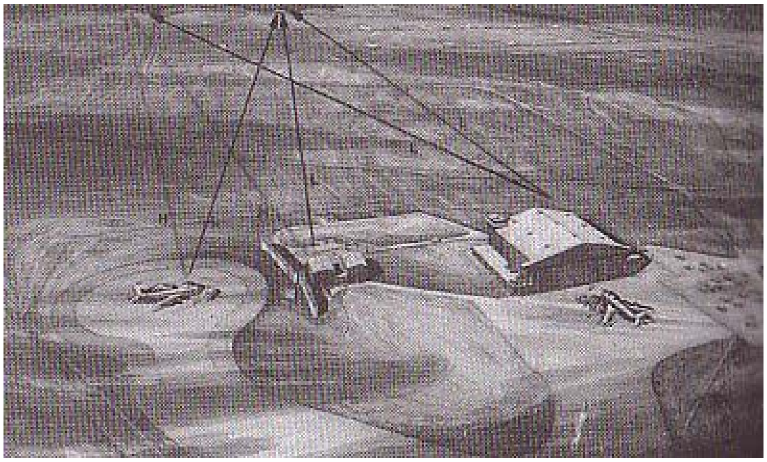


Figure 133: ARTF circa the mid-1970s showing hangar and targets

Source: *Airborne Laser: Bullets of Light* by Robert Duffner

Figure 134: SOR circa the mid-1970s

Source: *Airborne Laser: Bullets of Light* by Robert Duffner

Figure 135: Building 322 in 2002

Source: Photo by Karen Van Citters

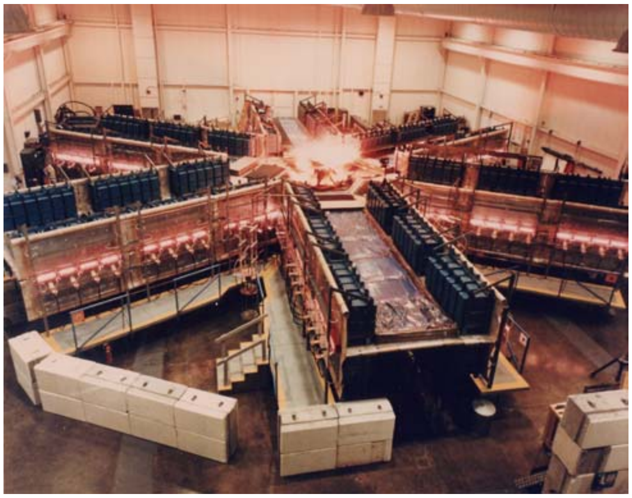


Figure 136: SHIVA Star

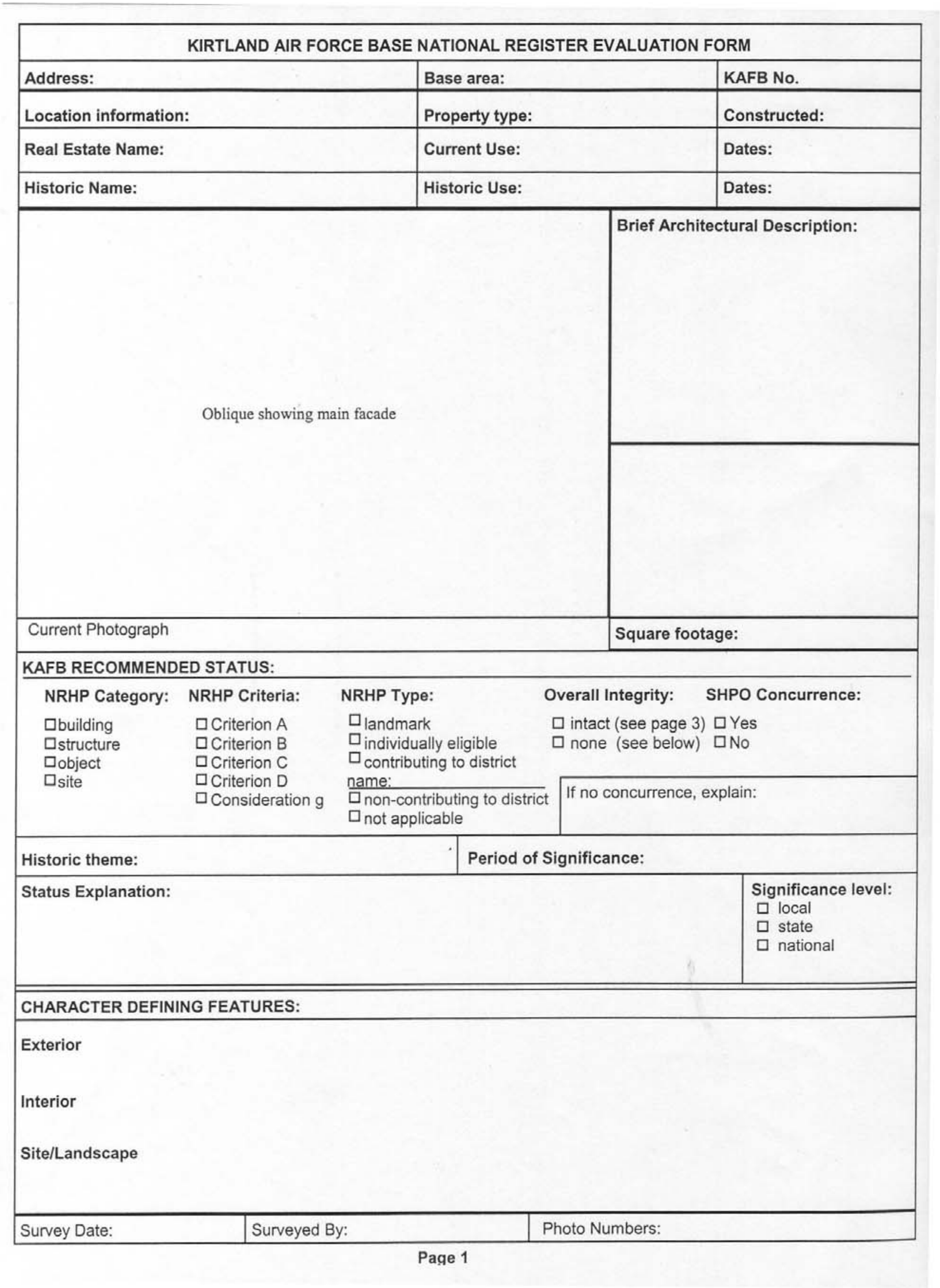
Source: AFRL Phillips Research Site Historical Information Office

Figure 137: Flight simulator bays 955 (left) and 956 in 2002

Source: Photo by Karen Van Citters

APPENDIX A

SURVEY FORM AND INSTRUCTIONS



KIRTLAND AIR FORCE BASE NATIONAL REGISTER EVALUATION FORM

Address:	**Base area:**	**KAFB No.**
Location information:	**Property type:**	**Constructed:**
Real Estate Name:	**Current Use:**	**Dates:**
Historic Name:	**Historic Use:**	**Dates:**

Oblique showing main facade

Current Photograph

Brief Architectural Description:

Square footage:

KAFB RECOMMENDED STATUS:

NRHP Category:	**NRHP Criteria:**	**NRHP Type:**	**Overall Integrity:**	**SHPO Concurrence:**
☐building	☐ Criterion A	☐ landmark	☐ intact (see page 3)	☐ Yes
☐structure	☐ Criterion B	☐ individually eligible	☐ none (see below)	☐ No
☐object	☐ Criterion C	☐ contributing to district		
☐site	☐ Criterion D	name:		
	☐ Consideration g	☐ non-contributing to district	If no concurrence, explain:	
		☐ not applicable		

Historic theme:

Period of Significance:

Status Explanation:

Significance level:
- ☐ local
- ☐ state
- ☐ national

CHARACTER DEFINING FEATURES:

Exterior

Interior

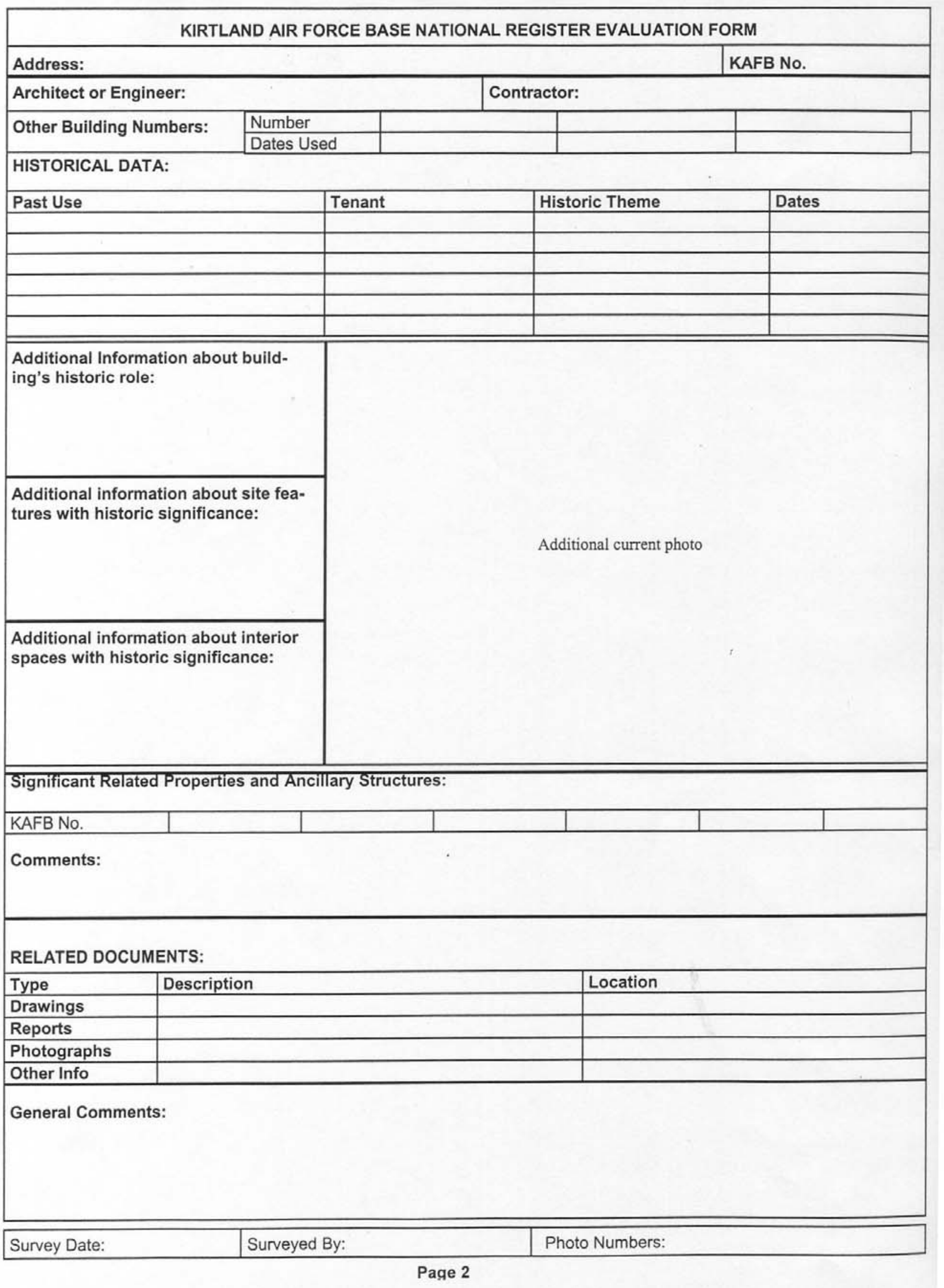
Site/Landscape

Survey Date:

Surveyed By:

Photo Numbers:

Page 1



KIRTLAND AIR FORCE BASE NATIONAL REGISTER EVALUATION FORM

Address:

KAFB No.

Architect or Engineer:

Contractor:

Other Building Numbers:

Number			
Dates Used			

HISTORICAL DATA:

Past Use	Tenant	Historic Theme	Dates

Additional Information about building's historic role:

Additional information about site features with historic significance:

Additional information about interior spaces with historic significance:

Additional current photo

Significant Related Properties and Ancillary Structures:

KAFB No.							

Comments:

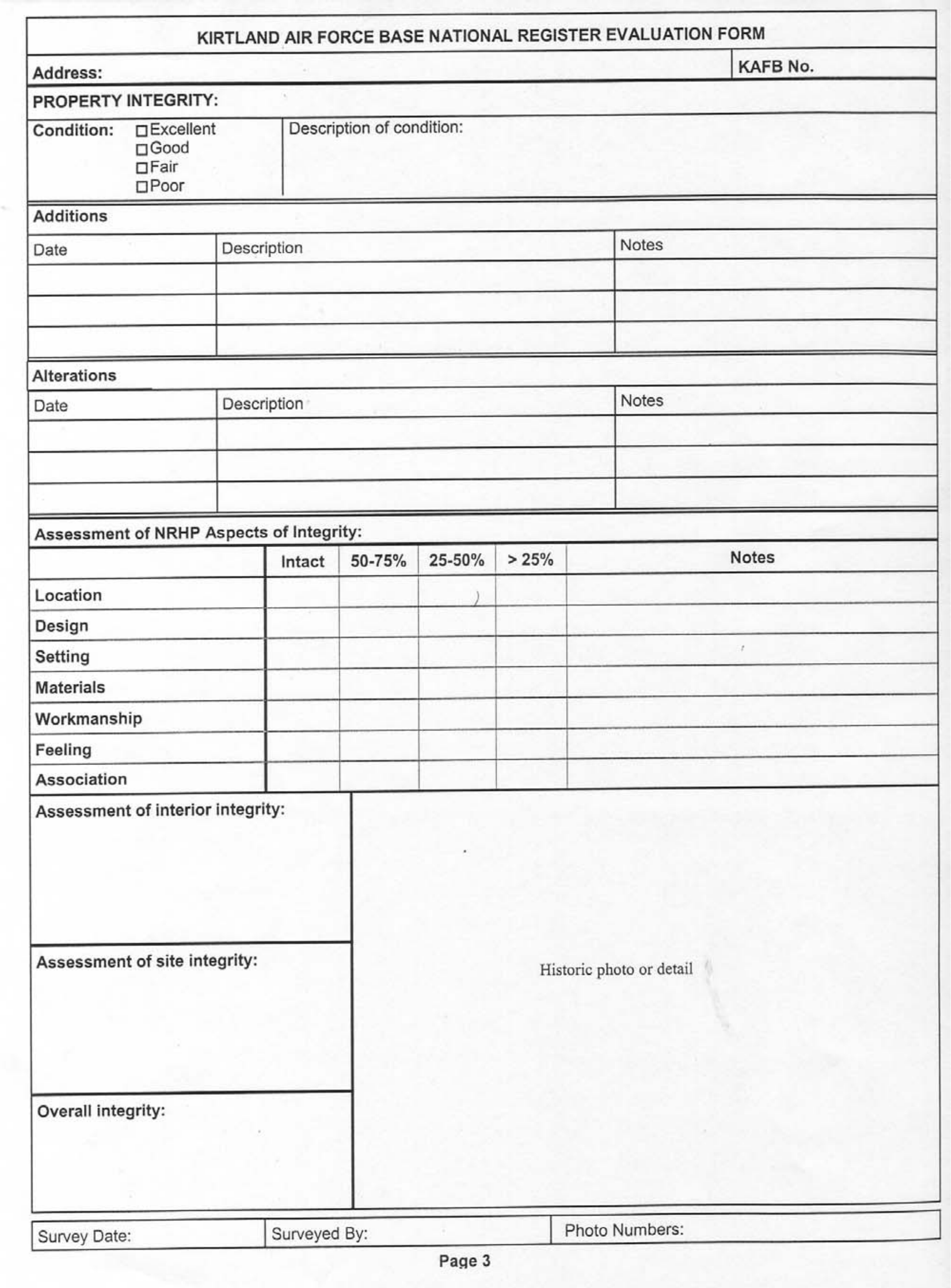
RELATED DOCUMENTS:

Type	Description	Location
Drawings		
Reports		
Photographs		
Other Info		

General Comments:

Survey Date:	Surveyed By:	Photo Numbers:

Page 2



KIRTLAND AIR FORCE BASE NATIONAL REGISTER EVALUATION FORM

Address:	**KAFB No.**

PROPERTY INTEGRITY:

Condition: ☐Excellent ☐Good ☐Fair ☐Poor	Description of condition:

Additions

Date	Description	Notes

Alterations

Date	Description	Notes

Assessment of NRHP Aspects of Integrity:

	Intact	**50-75%**	**25-50%**	**> 25%**	**Notes**
Location					
Design					
Setting					
Materials					
Workmanship					
Feeling					
Association					

Assessment of interior integrity:

Assessment of site integrity:

Overall integrity:

Historic photo or detail

Survey Date:	Surveyed By:	Photo Numbers:

Page 3

KIRTLAND AIR FORCE BASE NRHP EVALUATION FORM

INVENTORY FORM PAGE 1	
DATA FIELD	***How to fill out data field***
Address	The current address as noted in the KAFB real estate database.
Base area	Annex or common name of area on the facility where the building is located.
KAFB No.	The current property number as noted in the KAFB real estate database. Note: Other building numbers that were used in the past for the property will be noted on page 2 of the survey form.
Property Type	The property type from chapter 10 for which the property is considered significant and NRHP eligible is entered here. If the property is not eligible the type that the building served as for the longest period of time is entered.
Constructed	Date of construction as noted on the real estate property card. This is usually more accurate than the real property database, as this database often lists the date of construction as the date the USAF came into ownership.
Real Estate Name	Name noted on the 2001 real estate property printout.
Current use	Current use as determined from the real property card with field verification.
Dates	Bracket dates for current use as determined through archival research, real estate records and interviews. If they are estimated from the research, circa was used.
Historic Name	Name of the property noted on the original real estate card.
Historic Use	For buildings that are recommended as eligible, the use from the period of significance as determined from research. For buildings that are not recommended eligible, the original use as identified on the real estate cards.
Dates	Bracket dates identified during research for the historic use.
Brief Architectural Description	Succinct description of architectural features and character of the building in its current configuration and use.
Photograph	An oblique photo of property showing primary elevation and massing.
Square Footage	Enter square footage as noted on real estate inventory list.
KAFB RECOMMENDED STATUS	
NRHP Category	**BUILDING** **A building, such as a house, barn, church, hotel, or similar construction, is created principally to shelter any form of human activity. "Building" may also be used to refer to a historically and functionally related unit, such as a courthouse and jail or a house and barn.** Buildings eligible for the National Register must include all of their basic structural elements. Parts of buildings, such as interiors, facades, or wings, are not eligible independent of the rest of the existing building. The whole building must be considered, and its significant features must be identified. If a building has lost any of its basic structural elements, it is usually considered a "ruin" and is categorized as a site.

INVENTORY FORM PAGE 1 continued	
DATA FIELD	***How to fill out data field***
NRHP Category Cont.	**STRUCTURE** **The term "structure" is used to distinguish from buildings those functional constructions made usually for purposes other than creating human shelter.** Structures nominated to the National Register must include all of the extant basic structural elements. Parts of structures cannot be considered eligible if the whole structure remains. For example, a truss bridge is composed of the metal or wooden truss, the abutments, and supporting piers, all of which, if extant, must be included when considering the property for eligibility. If a structure has lost its historic configuration or pattern of organization through deterioration or demolition, it is usually considered a "ruin" and is categorized as a site. **OBJECT** **The term "object" is used to distinguish from buildings and structures those constructions that are primarily artistic in nature or are relatively small in scale and simply constructed. Although it may be, by nature or design, movable, an object is associated with a specific setting or environment.** Small objects not designed for a specific location are normally not eligible. Such works include transportable sculpture, furniture, and other decorative arts that, unlike a fixed outdoor sculpture, do not possess association with a specific place. Objects should be in a setting appropriate to their significant historic use, roles, or character. Objects relocated to a museum are inappropriate for listing in the National Register. **SITE** **A site is the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archeological value regardless of the value of any existing structure.** A site can possess associative significance or information potential or both, and can be significant under any or all of the four criteria. A site need not be marked by physical remains if it is the location of a prehistoric or historic event or pattern of events and if no buildings, structures, or objects marked it at the time of the events. However, when the location of a prehistoric or historic event cannot be conclusively determined because no other cultural materials were present or survive, documentation must be carefully evaluated to determine whether the traditionally recognized or identified site is accurate. A site may be a natural landmark strongly associated with significant prehistoric or historic events or patterns of events, if the significance of the natural feature is well documented through scholarly research. Generally, though, the National Register excludes from the definition of "site" natural waterways or bodies of water that served as determinants in the location of communities or were significant in the locality's subsequent economic development. While they may have been "avenues of exploration," the features most appropriate to document this significance are the properties built in association with the waterways.

INVENTORY FORM PAGE 1 continued	
DATA FIELD	***How to fill out data field***
NRHP Criteria	The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, association, and: **A.** That are associated with events that have made a significant contribution to the broad patterns of our history; or **B.** That are associated with the lives of significant persons in our past; or **C.** That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction. **Criteria Considerations** Ordinarily properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within certain categories. At Kirtland we expect to find properties that have achieved significance in the past 50 years and meet the following criteria consideration: **G.** A property achieving significance within the past 50 years if it is of exceptional importance.
NRHP Type	This section provides the recommendation whether a property meets the criteria as a National Historic Landmark, an individual NRHP eligible property, a contributing or non-contributing property within a district (and the name of the district or potential district), or is not eligible. If there is a district, provide name on line.
Overall Integrity	**Integrity is the ability of a property to convey its significance.** This section will summarize the overall integrity of a property using the NRHP aspects of integrity and the full evaluation on page 3. This evaluation sheet should be used for properties that appear to be eligible. If the final recommendation is that they are not eligible, only the first page will be submitted as the final form. But, the evaluation completed to determine integrity should be summarized in the "if not eligible" box. To be listed in the National Register of Historic Places, a property must not only be shown to be significant under the National Register criteria, but it also must have integrity. The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property's physical features and how they relate to its significance. Historic properties either retain integrity (this is, convey their significance) or they do not. Within the concept of integrity, the National Register criteria recognize seven aspects or qualities that, in various combinations, define integrity. To retain historic integrity a property will always possess several, and usually most, of the aspects. The retention of specific aspects of integrity is paramount for a property to convey its significance. Determining which of these aspects are most important to a particular property requires knowing why, where, and when the property is significant.

INVENTORY FORM PAGE 1 continued	
DATA FIELD	***How to fill out data field***
SHPO Concurrence	When the SHPO responds to the KAFB recommendation for eligibility the response should be checked here to show whether there was concurrence or not. If not, briefly explain why. This field provides a link to the KAFB compliance database.
Period of Significance	Enter bracket dates during which the property attained its significance that qualifies it for the NRHP.
Historic Theme	Identify the historic theme or event under which the historic property attained its significance.
Status Explanation	Explain why a property is or is not eligible. For example, if not eligible, it doesn't meet NRHP criteria, it has lost integrity, etc. If eligible, in a sentence or two, explain how the property meets the NRHP criteria. Draw upon the facts of the history that the property reflects to make the case for the property's historic significance and integrity. If the property is not eligible, then all portions of the form that need to be completed have been.
Significance Level	Check box for level of historic significance.
Character defining features	List architectural features and elements that provide the building or structure with its historic significance. Those features that, should they be lost, would result in a loss of integrity. This list will serve as a basic evaluation tool for undertakings to determine whether they may affect the overall character or significance of a building.
Survey date	Date the fieldwork was completed.
Surveyed by	Last name of the person completing form.
Photo numbers	Roll and exposure numbers used to document the property. These are for the black and white film and will match the numbers on the photologs in the photo notebook.
INVENTORY FORM PAGE 2	
Architect or Engineer	Name of the primary designer of original construction documents for the property. This information will primarily be found on the original drawings. If there is a second designer who should be mentioned, note this in the general comment area.
Contractor	Name of the general contractor who originally constructed the property. This information may not always be available, but might be found in the real estate records or the drawing files. If it is not available, leave blank.
Other building numbers	Identify other numbers that were used historically for the property. Include the dates they were used if the information is available.
HISTORICAL DATA	
Past Use	There may have been a number of uses for the building. In this space provide a very brief description of what that use was for each specific period of time.
Tenant	Identify what activity (tenant) was using the building at the time.

Historic Theme	Complete this field only for uses that relate to historic themes. For example, if the building was a vehicle maintenance shop and all that ever occurred there was changing oil, then there will not be a historic theme with which the use is associated.

INVENTORY FORM PAGE 2 continued

DATA FIELD	***How to fill out data field***
Dates	Identify the bracket dates for the use. If unable to determine the dates, leave blank.
Additional information about building's historic role	If there is information about the historic use or significance of the building that has not been noted elsewhere on the form, include it in this field.
Additional information about historic site features	On the first page, note site features that are significant. Describe why these features are important in this field.
Additional information about historic interior spaces	On the first page, note building interiors and interior features that are significant. Describe why those features are of significance in this field.
Additional photo	Insert an oblique photograph from the opposite corner from that which was used on the first page, or other view that provides more information about the property.
Significant Related Associated properties	Note the KAFB real estate number for properties that are NRHP significant in their own right and directly associated with the property being recorded on this form. This can be used to group properties that might be considered under a multiple property view within the historic context of the base or those within a district.
Comments	Provide additional information about associated properties or ancillary structures here, including use and how they relate to the property being recorded on this form.

RELATED DOCUMENTS

This section very briefly outlines resources found during the course of research, such as drawings, reports, photographs and other pertinent information.

Description	Briefly describe document or source of information found during the course of research about this property.
Location	Note location of related document (library, office, etc).
General Comments	Include information that may have been discovered during the course of research, but does not fit into another category or field on the form. Provide any additional insights that might be useful.

INVENTORY FORM PAGE 3

PROPERTY INTEGRITY

Condition	Enter a visual assessment of the overall condition of the building in this field.

Excellent	The building is new or has been renovated to "like new" condition.
INVENTORY FORM PAGE 3 continued	
DATA FIELD	***How to fill out data field***
Good	The building has been well maintained, but may have minor repair needs, such as deteriorated paint or other finishes.
Fair	The building needs more than superficial repair, but is not severely deteriorated.
Poor	The building requires significant repair to rehabilitate and may require structural repairs.
Description of Condition	If additional information about the condition is needed, describe in this field.
Additions	Note portions of the building added after the original construction.
Date	Enter date the addition was constructed.
Description	Describe the general shape, use and location.
Notes	Add information that may be useful in the evaluation of the building addition.
Alterations	Note substantial changes made to the building, such as new stucco over existing brick or a pitched roof added to a building that originally had a flat roof.
Date	Enter date the alteration was installed.
Description	Describe the alteration.
Notes	Add information that will be useful in the evaluation of the building, such as how the alteration affected the overall character and integrity of the building.
Assessment of NRHP Aspects of Integrity	In this section quantify the 7 NRHP aspects of integrity using information in NRHP Bulletin 15.
Intact	Check this box if no alterations have been made to building since the period of significance.
50 – 75%	Check this box if minor alterations have been made since the period of significance, which do not significantly affect the overall aspect of integrity.
25 – 50%	Check this box if significant alterations have been made since the period of significance.
> 25%	Check this box if extensive alterations have been made since the period of significance that cause a loss of integrity.
Notes	Use this field to further qualify why the percentage was chosen.
Assessment of Interior integrity	Use this field only if the interior included an activity or a design that would identify the space as NRHP eligible. Briefly describe why the interior space are eligible and evaluate its integrity.
Site integrity	Use this field only if the site originally included features that are NRHP eligible. Briefly describe why the site features are eligible and evaluate their integrity.

Overall integrity	Briefly discuss the information provided in the integrity table above, interior and site features to make the argument for the determination on integrity that will be used on the first page of the form (i.e.- intact or none).
Photo	Add photo providing additional information about the building (different from that shown in the obliques), such as architectural features or a detail.

APPENDIX B:

PROPERTIES DETERMINED NRHP-ELIGIBLE

Eligible Properties Report

Historic Theme: AFWL Laser Programs

KAFB No	Constructed	Historic Name	NRHP Category / Criteria / Consideration / Type: Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
400	1968	Science Laboratory, Laser	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 400 is not 50 years old, but meet NRHP requirements for Criteria Consideration G. It was built as a laser and optics research laboratory in 1968, during the formative years of Air Force Weapons Laboratory laser research. The building also retains its architectural integrity. As such, it is recommended as eligible to the National Register.
243	1970	Base Supply and Equipment Warehouse	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 243 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. From the description in "Airborne Laser: Bullets of Light" by Robert Duffner, this building was the Air Force Weapons Laboratory's optics laboratory that was used to develop the Cycle I Airborne Pointer Tracker (APT) for the Airborne Laser Laboratory (ALL) project. The APT was an important milestone in the ALL program and as such, this building should be considered eligible to the National Register.
66001	1970	Laboratory, Laser, Science	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 66001 is not 50 years old but meets NRHP requirements for Criteria Consideration G. It is significant because it was the centerpiece building of the early Sandia Optical Range, the first USAF high energy laser research and development facility. It housed the USAF's first gas dynamic laser and was the site of numerous early laser experiments. As such, it is recommended as eligible to the National Register.
66019	1973	Laboratory, Laser, Science	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 66019 is not 50 years old but meets NRHP requirements for Criteria Consideration G. It is significant as part of the early Sandia Optical Range, the first USAF high energy laser research and development facility. It housed the USAF's Field Tracking Telescope, an essential component of the USAF's Airborne Laser Laboratory, a research project that illustrated the viability of lasers as airborne weapons. As such, it is recommended as eligible to the National Register.
66015	1973	Revetment Pre-Engineered	Structure	☐	☐	☐	☐	☑	☑	☐	☐		☑	No Response Yet	☐	Structure 66015 is not 50 years old but meets NRHP requirements for Criteria Consideration G. It is significant as part of the early Sandia Optical Range, the first USAF high energy laser research and development facility. It was used as a target for the USAF's Airborne Laser Laboratory, a research project that illustrated the viability of lasers as airborne weapons. As such, it is recommended as eligible to the National Register.
66016	1973	Revetment Pre-Engineered	Structure	☐	☐	☐	☐	☑	☑	☐	☐		☐	No Response Yet	☐	Structure 66016 is not 50 years old but meets NRHP requirements for Criteria Consideration G. It is significant as part of the early Sandia Optical Range, the first USAF high energy laser research and development facility. It was used as a target for the USAF's Airborne Laser Laboratory, a research project that illustrated the viability of lasers as airborne weapons. As such, it is recommended as eligible to the National Register.

KAFB No	Constructed	Historic Name	NRHP Category / Criteria / Consideration / Type										Overall Integ. Intact	SHPO Concurrence.	Form Complete	Status Explanation
			Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name				
2634	1974	Pad, Dangerous Cargo	Structure	☐	☐	☐	☐	☑	☑	☐	☐		☐	No Response Yet	☑	Cargo pad 2634 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It is significant for its association with Air Force Weapons Laboratory laser development. It was built as an aircraft loading area for the Airborne Laser Laboratory, which illustrated the viability of lasers as airborne weapons by the early 1980s. As such, it is recommended as eligible to the National Register.
2635	1974	Pad, Dangerous Cargo	Structure	☐	☐	☐	☐	☑	☑	☐	☐		☐	No Response Yet	☑	Structure 2635 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It is significant for its association with Air Force Weapons Laboratory laser development. It was built as a calorimeter instrumentation facility for the Airborne Laser Laboratory, which illustrated the viability of lasers as airborne weapons by the early 1980s. As such, it is recommended as eligible to the National Register.
776	1974	Butt, Firing In	Structure	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Structure 776 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It was built as a firing in butt in 1974, as part of a target site for the Advanced Radiation Test Facility, where the Airborne Laser Laboratory was developed. It was one of the targets used to test the laser sent from building 765, the ALL test cell. As such, it has served in a support capacity, and is recommended as eligible to the National Register.
774	1975	Storage, Research Equipment	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Bulding 774 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It is significant for its association with Air Force Weapons Laboratory laser research. It was built as part of a small target area for the research experiment, the Airborne Laser Laboratory, which illustrated the viability of lasers as airborne weapons by the early 1980s. As such, it is recommended as eligible to the National Register.
66042	1976	Device Building	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 66042 is not 50 years old but meets NRHP requirements for Criteria Consideration G. It is significant as a laser laboratory for the Sandia Optical Range. It was built as a laboratory and administrative center in support of the research experiment the Airborne Laser Laboratory, which illustrated the viability of lasers as airborne weapons by the early 1980s. It also housed the Rocketdyne Advanced Chemical High-Power Laser (RACHL) during the mid 1980s for testing of laser vulnerability and laser effects on satellite and missile components. As such, it is recommended as eligible to the National Register.
66061	1976	Revetment Pre-Engineered	Structure	☐	☐	☐	☐	☑	☑	☐	☐		☐	No Response Yet	☐	Structure 66061 is not 50 years old but meets NRHP requirements for Criteria Consideration G. It is significant as part of the early Sandia Optical Range, the first USAF high energy laser research and development facility. It was used as a target for the USAF's Airborne Laser Laboratory, a research project that illustrated the viability of lasers as airborne weapons. As such, it is recommended as eligible to the National Register.
760	1976	Armament Research Test Facility	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 760 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It is significant for its association with Air Force Weapons Laboratory laser development. It was built to house the research experiment the Airborne Laser Laboratory, which illustrated the viability of lasers as airborne weapons by the early 1980s. As such, it is recommended as eligible to the National Register.

KAFB No	Constructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Overall Integ. Intact	SHPO Concurrence.	Form Complete	Status Explanation
765	1976	Test Cell	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 765 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It is significant for its association with Air Force Weapons Laboratory laser research. It was built as a test cell for the the research experiment, the Airborne Laser Laboratory, which illustrated the viability of lasers as airborne weapons by the early 1980s. As such, it is recommended as eligible to the National Register.
66041	1976	Laboratory, Laser, Science	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 66041 is not 50 years old but meets NRHP requirements for Criteria Consideration G. It is significant as a laser laboratory for the Sandia Optical Range. It was built as a laboratory and administrative center in support of the research experiment the Airborne Laser Laboratory, which illustrated the viability of lasers as airborne weapons by the early 1980s. As such, it is recommended as eligible to the National Register.

Historic Theme: Blast and Shock Effects

KAFB No	Constructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Overall Integ. Intact	SHPO Concurrence.	Form Complete	Status Explanation
57001	1961	Soil Engineering Science Laboratory	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	This facility was used for shock tube tests to simulate the effects of nuclear explosions on missile silos and other buildings. This was an important mission during the Cold War. As such, building 57001 is recommended as eligible to the National Register under NRHP Criteria Consideration G for its relationship to Cold War themes of nuclear testing.
57004	1963	Civil Engineering Science Laboratory	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	This facility was used for shock tube tests to simulate the effects of nuclear explosions on missile silos and other buildings. This was an important mission during the Cold War. As such, building 57004 is recommended as eligible to the National Register under NRHP Criteria Consideration G for its relationship to Cold War themes of nuclear testing.
57003	1964	Engineering Science Laboratory	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	This facility was used for shock tube tests to simulate the effects of nuclear explosions on missile silos and other buildings. This was an important mission during the Cold War. As such, building 57003 is recommended as eligible to the National Register under NRHP Criteria Consideration G for its relationship to Cold War themes of nuclear testing.
57012	1969	Civil Engineering Science Laboratory	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	The building was used for civil engineering testing involving rocks and a test tube. It was associated with the overall Cold War civil engineering survivability mission of the 57000 area, meets Criteria Consideration G, and therefore is recommended as eligible to the National Register.

Historic Theme: Cold War Air Defense

KAFB No	Constructed	Historic Name	NRHP Category / Criteria / Consideration / Type										Over-all Integ. Intact	SHPO Concurrence.	Form Complete	Status Explanation
			Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name				
911	1951	Storehouse	Building	☑	☐	☐	☐	☐	☐	☑	☐	34th Air Division (	☑	Yes	☑	Building 911 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a storehouse for the headquarters of the 34th Air Division (Defense) which directed air defense radar alert and interception for New Mexico, Arizona, most of Colorado and Utah, and west Texas. This was part of a national Cold War effort by the USAF to protect American skies from invasion. Although it has had a loss of architectural integrity, its massing and presence contribute to the 34th Air Division (Defense) area. As such, it is recommended as eligible to the National Register.
1030	1952	Alert Hangar	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Hangar 1030 is 50 years old and meets NRHP requirements for Criterion A. It was built as an alert hangar for the 34th Air Division Defense, a 1950s Cold War Air Defense Command division headquarters. The hangar housed the 93rd Fighter Interceptor Squadron on alert status for enemy aircraft sightings from 1952 to 1960. As such, the hangar is recommended as eligible to the National Register.
913	1952	General Quarters	Building	☑	☐	☐	☐	☐	☐	☑	☐	34th Air Division (	☑	Yes	☑	Building 913 is 50 years old and meets NRHP requirements for Criterion A. It was built as temporary housing for the headquarters of the 34th Air Division (Defense) which directed air defense radar alert and interception for New Mexico, Arizona, most of Colorado and Utah, and west Texas. This was part of a national Cold War effort by the USAF to protect American skies from invasion. As such, it should be contributing to the recommended 34th Air Division (Defense) district.
912	1952	General Quarters	Building	☑	☐	☐	☐	☐	☐	☑	☐	34th Air Division (	☑	Yes	☑	Building 912 is 50 years old and meets NRHP requirements for Criterion A. It was built as temporary housing for the headquarters of the 34th Air Division (Defense) which directed air defense radar alert and interception for New Mexico, Arizona, most of Colorado and Utah, and west Texas. This was part of a national Cold War effort by the USAF to protect American skies from invasion. As such, it should be contributing to the recommended 34th Air Division (Defense) district.
910	1952	Heating Facility Building	Building	☑	☐	☐	☐	☐	☐	☑	☐	34th Air Division (	☐	Yes	☑	Building 910 is 50 years old and meets NRHP requirements for Criterion A. It was built as a power station for the headquarters of the 34th Air Division (Defense) which directed air defense radar alert and interception for New Mexico, Arizona, most of Colorado and Utah, and west Texas. This was part of a national Cold War effort by the USAF to protect American skies from invasion. As such, it is recommended as eligible to the National Register.
909	1952	Standardized Control Center	Building	☑	☐	☐	☐	☐	☐	☑	☐	34th Air Division (	☑	Yes	☑	Building 909 is 50 years old and meets NRHP requirements for Criterion A. It was one of the first Air Defense Command Centers built for early Cold War air defense. The original building, now the western portion, served as the headquarters for the 34th Air Division (Defense) which directed air defense radar alert and interception for New Mexico, Arizona, most of Colorado and Utah, and west Texas. This was part of a national Cold War effort by the USAF to protect American skies from invasion. As such, it is recommended as eligible to the National Register.
1043	1957	Maintenance Hangar	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 1043 is not 50 years old but does meet NRHP requirements for Criteria Consideration G. It was built as an alert maintenance hangar for the 34th Air Division Defense, a 1950s Cold War Air Defense Command division headquarters. The hangar was operated by the 93rd Fighter Interceptor Squadron on alert status for enemy aircraft sightings from 1957 to 1960. The New Mexico Air National Guard took over the facility and operated on alert status from 1960 to 1962. As such, the hangar is recommended as eligible to the National Register.

Historic Theme: Cold War Command

KAFB No	Const ructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
20200	1947	Post Administration Building	Building	☑	☐	☑	☐	☐	☑	☐	☐		☑	Yes	☑	Building 20200 is over 50 years old and meets NRHP requirements for Criteria A and C. It was built in 1947 as a headquarters facility for the Field Command of the Armed Forces Special Weapons Project, the commanding agency for Sandia Base. Because Sandia Base was the site of significant atomic weapon research and development, the building has exceptional Cold War significance. The architecural character of the building is unusual on this facility and its overall integrity is intact. As such, it is recommended as eligible to the National Register.
20202	1948	Division Headquarters	Building	☑	☐	☑	☐	☐	☑	☐	☐		☑	Yes	☑	Building 20202 is more than 50 years old, and meets NRHP requirements for Criteria A and C. It served as a headquarters building for Sandia Base operations from 1948 to 1971. The Sandia Base command agency the Armed Forces Special Weapons Project supported much of U.S. nuclear policy research and testing during the Cold War. Architecturally, the building retains much of its original integrity, and represents an intent on the part of the architects to combine Southwest design details into military buildings during the early development of Sandia Base. As such, it is recommended as eligible to the National Register.
20201	1948	Division Headquarters Building	Building	☑	☐	☑	☐	☐	☑	☐	☐		☑	Yes	☑	Building 20201 50 years old and meets NRHP requirements for Criteria A and C. It was built in 1948 as a division headquarters facility for the Field Command of the Armed Forces Special Weapons Project, the commanding agency for Sandia Base. Because Sandia Base was the site of significant atomic weapon research and development, the building has exceptional Cold War significance. Its architectural detailing is fairly unusual on this facility and the overall integrity is intact. As such this property is recommended as eligible to the National Register.

Historic Theme: Cold War Functional Support

KAFB No	Const ructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
20203	1948	Sandia Base Station Hospital	Building	☑	☐	☑	☐	☐	☑	☐	☐		☑	Yes	☑	Building 20203 meets NRHP requirements for Criteria A and C. It served as a hospital for Sandia Base from 1948 to 1971. The Sandia Base command agency the Armed Forces Special Weapons Project supported much of U.S. nuclear policy research and testing during the Cold War. Architecturally, its integrity remains intact and its design represents the intent of the architects to incorporate Southwestern design details into military buildings during the early phases of Sandia Base development. As such, it is recommended as eligible to the National Register.
20220	1950	Division Headquarters for Sandia Base	Building	☐	☐	☑	☐	☐	☑	☐	☐		☑	Yes	☑	Building 20220 is more than 50 years old and is one of the few properties on base with stylistic architectural features. Its massing, horizontal banding of windows and flat roof overhang are reminiscent of the Prairie Style, while its clean lines are characteristic of the 1950s military penchant for the International Style. Because the architecture of this 1950 structure is intact, it should be considered eligible to the National Register under Criterion C.
20361	1951	Enlisted Men's Barracks with Mess	Building	☐	☐	☑	☐	☐	☑	☐	☐		☑	Yes	☑	Building 20361 is more than 50 years old, and meets NRHP requirements for Criterion C. The building retains its International Style character through its massing and horizontal banding of steel awning windows. It represents the early Cold War military architecture of Sandia Base, and is one of the remaining buildings with integrity. As such, it should be considered eligible to the National Register.
1001	1952	Science Laboratory Outdoor/Environment	Building	☑	☐	☐	☐	☐	☑	☐	☐		☐	Yes	☑	Building 1001 was constructed to house the B-36 bomber and has a special B-36 standard plan cantilevered roof construction. Kirtland Air Force Base's Air Force Special Weapons Center made modifications to the B-36 in order to fit it with nuclear weapons, as the B-36 was an important means of deterrence during the Cold War of the 1950s. In addition, during the 1970s the airborne laser underwent initial ground tests in this hangar. As such, the building is recommended as eligible to the National Register.

KAFB No	Const ructed	Historic Name	NRHP Category / Criteria / Consideration / Type										Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
			Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name				
1013	1952	Heating Plant	Building	☐	☐	☑	☐	☐	☑	☐	☐		☑	Yes	☑	Building is 50 years old and is recommended eligible under Criterion C for its architectural style. The property is one of the taller facilities on base (approximately 3 stories), retains its original vertial bands of awning windows and the CMU has not been stuccoed. Its architecture is based on the International Style and because its architectural integrity is intact it shoudl be considered eligible for the National Register.
1002	1955	Maintenance Hangar	Building	☐	☐	☐	☐	☑	☑	☐	☐		☐	Yes	☑	Building 1002 was built in 1955 for the Naval Air Special Weapons Facility (NASWF), the Naval organization dedicated to providing its forces with nuclear capability. The NASWF and its successor, the Naval Weapons Evaluation Facility, operated the hangar until after the Cold War. As such, it meets NRHP requirements for Criteria Consideration G, and is recommended as eligible to the National Register.
1000	1955	Hangar	Building	☐	☐	☐	☐	☑	☑	☐	☐		☐	Yes	☑	Building 1000 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. The hangar's architectural integrity is intact, and as a facility for aircraft maintenance, it supported Air Force Special Weapons Center flight activities, which involved the marriage of nuclear weapons to aircraft, during the early Cold War. As such, it is recommended as eligible to the National Register.

Historic Theme: Cold War Research Laboratories

KAFB No	Const ructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
617	1944	Base Supply and Equipment Shed	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 617 is significant for its association with Air Force Weapons Laboratory research and development of the chemically pumped oxygen-iodine laser (COIL). The COIL was an important step forward in the ground-based, anti-satellite laser initiative, which was part of President Reagan's Strategic Defense Initiative. As such, it is exceptionally significant and should be considered eligible for the National Register.
413	1957	Nuclear Engineering Test Building	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 413 was designed by W.C. Krueger to serve as a nuclear weapons research facility for the Air Force Special Weapons Center, the group responsible for tracking the new development of nuclear weapons for USAF use. The building retains integrity and should be considered eligible to the National Register.
405	1966	Armament Research Engineering	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Information about this propery is classified, but it was called the Arming and Fuzing building upon its construction in 1966. It was most likely associated with the arming and fuzing devices for AFWL designed weapons and as such is recommended as eligible to the NRHP.
322	1972	Laboratory, Dynamics Environment Science	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 322 is significant for its association with SHIVA I and its successor SHIVA Star, a pulsed power source that produces intense X-rays. Building 322 houses SHIVA Star, which was created to study the threat X-rays posed to satellites and reentry vehicles passing through a nuclear environment in space. It was an important Cold War alternate to expensive underground testing of the same nuclear effects. As such, it is recommended as eligible to the National Register.

KAFB No	Const ructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
625	1980	Laboratory, Science, Physics	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 625 is significant for its association with the research and development of chemical lasers. The development of chemical lasers was an important step forward in the ground-based, anti-satellite laser initiative, which was part of President Reagan's Strategic Defense Initiative. As such, it is exceptionally significant and should be considered eligible for the National Register.

Historic Theme: Cold War Training

KAFB No	Const ructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
20685	1953	Emergency Training Facilities	Building	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Building 20685 is 50 years old, and meets NRHP requirements for Criterion A. It was built as a nuclear weapons training facility for the Armed Forces Special Weapons Project during the early development of Sandia Base. The Armed Forces Special Weapons Project was the continuation of the wartime Manhattan Engineering District. The building ratains integrity and, as such, it is recommended as eligible to the National Register.
955	1977	Flight Simulator Training	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 955 is significant for Cold War support training. It was used as a flight simulator bay for the MH-53 and H-3 helicopters by the 1550th Aircrew Training and Test Wing for rescue and recovery training. Rescue and recovery was necessary for international mobility, one of the elements of deterrence and a focus of U.S. Cold War strategy. It is recommended as potentially eligible to the National Register under NRHP Criteria Consideration G.
956	1981	Flight Simulator Training Facility	Building	☑	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 956 is significant for Cold War support training. It was used as a flight simulator bay for C-130P Hercules aircraft by the 1550th Aircrew Training and Test Wing, which conducted fixed-wing rescue and recovery training in the C-130. Rescue and recovery was necessary for international mobility, one of the elements of deterrence and a focus of U.S. Cold War strategy. It is potentially eligible to the National Register under NRHP Criteria Consideration G.

Historic Theme: Education

KAFB No	Const ructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
1905	1936	Sandia School	Building	☑	☐	☑	☐	☐	☐	☑	☐	Sandia School	☑	Yes	☑	Building 1905 is more than 50 years old and meets NRHP requirements for Criteria A and C. It was a dormitory building of the Sandia School, a private school for girls built in 1936 and designed by John Gaw Meem. It has had architectural changes, but the overall form and character are intact. As such, this property should be considered eligible to the National Register as a contributing feature to the original Sandia School.
1900	1936	Sandia School	Building	☑	☐	☑	☐	☐	☐	☑	☐	Sandia School	☑	Yes	☑	Building 1900 is more than 50 years old and meets NRHP requirements for Criterion A and C. It was the main building of the Sandia School, a private school for girls built in 1936. It has had architectural changes, but the overall form and character of John Gaw Meem's design are intact. As such, this property should be considered eligible to the National Register as a contributing feature to the original Sandia School.

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			Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name				
1909	1936	Sandia School	Building	☑	☐	☑	☐	☐	☐	☑	☐	Sandia School	☑	Yes	☑	Building 1909 is more than 50 years old and meets NRHP requirements for Criterion A and C. It was designed by John Gaw Meem and built as two distinct buildings separated by a service yard for the Sandia School. When the USAF leased the complex in 1943, the two buildings were connected by an addition in the location of the original east wall of the service yard. The building has lost integrity, but should be considered eligible as a contributing feature to the district as the west boundary of the courtyard.
1910	1936	Garage	Building	☑	☐	☑	☐	☐	☐	☑	☐	Sandia School	☑	Yes	☑	Building 1910 is more than 50 years old and meets requirements for NRHP Criteria A and C. It was built in 1936 as part of the private Sandia School for girls and designed by John Gaw Meem. It has had architectural changes, but the overall form and character are intact. As such, this property should be considered eligible to the National Register as a contributing feature to the original Sandia School.
1901	1936	Sandia School	Building	☑	☐	☑	☐	☐	☐	☑	☐	Sandia School	☑	Yes	☑	Building 1901 is more than 50 years old and meets NRHP requirements for Criteria A and C. It was the classroom building of the Sandia School, a private school for girls built in 1936. It has had architectural changes, but the overall form and character are intact. As such, this property should be considered eligible to the National Register as a contributing feature to the original Sandia School.

Historic Theme: EMP Simulation

KAFB No	Constructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Overall Integ. Intact	SHPO Concurrence.	Form Complete	Status Explanation
626	1942	Storage Igloo	Structure	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 626 is significant for its association with EMP simulation testing. It served as a storage igloo for EMP pulsers and equipment used at adjacent EMP sites. As such it is recommended as eligible to the National Register.
20560	1961	Club House	Building	☐	☐	☐	☐	☑	☐	☑	☐	EMP Simulation H	☑	Yes	☑	Building 20560 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. Built in 1961 as the Sandia Base riding academy clubhouse, it was renovated in 1974 to serve as base operations for the Horizontally Polarized Dipole, an EMP testing facility of exceptional Cold War significance. In 1976, it also took on base operations for the Vertically Polarized Dipole II. As such, it is recommended as a contributing feature to the EMP Simulation Historic District.
622	1964	Science Lab, Dynamics Environmental	Site	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	This facility was used for bounded-wave EMP testing of major U.S. weapons and communications systems. Systems tested included the Atlas and Poseidon missiles, a scale-model B-1 strategic bomber, AGM-122A "Sidearm" missile, and Aircraft Alerting Communication EMP Detector. This facility should be considered eligible for its role in EMP testing during the Cold War.
736	1968	Nuclear Engineering Testing Building	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 736 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It was used as a high altitude simulation testing site by the Air Force Weapons Laboratory's Electromagnetic Pulse (EMP) Branch. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. As such, it is recommended as eligible to the National Register.

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20753	1970	Working Volume Test Area	Structure	☐	☐	☐	☐	☑	☑	☑	☐	EMP Simulation H	☑	No Response Yet	☑	Structure 20753 is not 50 years old, but does meet NRHP requirements for Criteria Consideration G. It was built in 1970 as the AFWL/RAND EMP Simulation testing facility, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. As such, it is recommended as a contributing feature to the EMP Simulation Historic District.
20752	1970	Electronic Equipment Facility	Structure	☐	☐	☐	☐	☑	☑	☐	☐		☑	No Response Yet	☐	Building 20752 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It served as an underground data acquisition and calibration facility for the AFWL/RAND EMP Simulator, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. As such, this property is recommended as eligible to the National Register as contributing to the EMP area.
20754	1970	Electrical Equipment Facility	Building	☐	☐	☐	☐	☑	☐	☑	☐	EMP Simulation H	☑	No Response Yet	☑	Building 20754 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It was built as a facility for electrical equipment for the AFWL/Rand Electromagnetic Pulse Simulator, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. As such, this property is recommended as a contributing feature to the EMP Simulation Historic District.
914	1971	Nuclear Engineering Testing Building	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	Building 914 is not 50 years old, but does meet NRHP requirements for Criteria Consideration G. It was built in 1971 as a Survivability/Vulnerability Test Simulation Facility specifically for electromagnetic pulse (EMP) testing. It contained laboratories for EMP, as well as electrical and mechanical laboratories. The survivability of missiles and aircraft in the event of a nuclear explosion and subsequent EMP was an important element of Cold War research. As such, it is recommended as eligible to the National Register.
605 A	1971	VPD-1	Site	☐	☐	☐	☐	☑	☑	☐	☐		☐	Yes	☑	The electromagentic pulse site contains the first vertical dipole EMP test facility. The VPD-1 was an antenna structure supported by eight telephone poles, extending 90 feet upward and with a diameter of 130 feet used to test the effects of simulated EMP on aircraft. Facility should be considered eligible for its role in EMP testing during the Cold War.
20561	1974	Horizontally Polarized Dipole	Structure	☐	☐	☐	☐	☑	☑	☑	☐	EMP Simulation H	☑	Yes	☑	The Horizontally Polarized Dipole (HPD) is not 50 years old, but meets requirements for NRHP Criteria Consideration G. HPD was built for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. As such, this property is recommended as eligible to the National Register and as a contributing element to the EMP area.
20797	1975	The Wedge	Building	☐	☐	☐	☐	☑	☐	☑	☐	EMP Simulation H	☑	Yes	☑	Building 20797 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It was built as the control center for the Trestle, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. B-52s underwent EMP testing at the Trestle. As such, this property is recommended as eligible to the National Register and as a contributing element to the EMP Simulation Historic District..
20796	1975	The Trestle	Structure	☐	☐	☐	☐	☑	☑	☑	☐	EMP Simulation H	☑	Yes	☑	Structure 20796 is not 50 years old, but does meet NRHP requirements for Criteria Consideration G. It was built in 1975 as the Trestle EMP testing facility, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. B-52s underwent EMP testing at the Trestle. As such, it is recommended as eligible as a contributing feature to the EMP Simulation Historic District.

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20749	1975	Electronic Research Laboratory	Building	☐	☐	☐	☐	☑	☑	☐	☐	EMP Simulation H	☑	No Response Yet	☑	Building 20749 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It served as an adminstration building for the AFWL/RAND EMP Simulator, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. As such, this property is recommended as a contributing feature to the EMP Simulation Historic District.
20794	1975	Water Tower	Structure	☐	☐	☐	☐	☑	☐	☑	☐	EMP Simulation H	☐	Yes	☐	Structure 20794 is not 50 years old, but does meet NRHP requirements for Criteria Consideration G. It was built in 1975 as a water tower for the Trestle EMP testing facility, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. B-52s underwent EMP testing at the Trestle. As such, it is recommended as a contributing feature to the EMP District and eligible to the National Register.
20789	1975	Special Tower	Structure	☐	☐	☐	☐	☑	☐	☑	☐	EMP Simulation H	☑	No Response Yet	☑	Structure 20789 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It was built as a tower for the Trestle, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. B-52s underwent EMP testing at the Trestle. As such, this property is recommended as a contributing element to the EMP Simulation Historic District.
20792	1975	Traffic Check House	Building	☐	☐	☐	☐	☑	☐	☑	☐	EMP Simulation H	☐	Yes	☑	Building 20792 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It was built as a guard house for the Trestle, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. B-52s underwent EMP testing at the Trestle. As such, this property is recommended as contributing element of the EMP Simulation Historic District.
20790	1975	Special Tower	Structure	☐	☐	☐	☐	☑	☐	☑	☐	EMP Simulation H	☑	No Response Yet	☑	Structure 20790 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It was built as a tower for the Trestle, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. B-52s underwent EMP testing at the Trestle. As such, this property is recommended as contributing to the EMP Simulation Historic District.
20563	1978	Storage, Research Equipment	Structure	☐	☐	☐	☐	☑	☑	☑	☐	EMP Simulation H	☑	Yes	☑	Structure 20563 is not 50 years old, but meets NRHP requirements for Criteria Consideration G. It was built as the Vertically Polarized Dipole II, a site for electromagnetic pulse (EMP) testing at KAFB. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. As such, it is recommended as individually eligible and as a contributing feature to the EMP Simulation Historic District.
20562	1978	Storage, Research Equipment	Building	☐	☐	☐	☐	☑	☑	☐	☐	EMP Simulation H	☐	Yes	☑	20562 provided shelter from EMP for testing equipment. The study of EMP effects, a byproduct of a nuclear explosion, on USAF equipment was essential to U.S. defense strategy during the Cold War. It was used to shelter Vertically Polarized Dipole II trailers during simulations, and should be considered eligible to the National Register as a contributing structure to the EMP Area under Criteria Consideration G.
605 B	1986	HSI	Site	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	The EMP site contains the Hardness Surveillance Illuminator (HSI). HSI is an antenna structure with a two-wire transmission line with support utility poles. It measures the shielding of EMP hardened systems. The facility should be considered eligible for its role in EMP testing during the Cold War.

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Historic Theme: Nuclear Stockpile Management																
614	1944	Base Supply and Equipment Warehouse	Building	☑	☐	☐	☐	☐	☑	☐	☐		☐	Yes	☑	Building 614 is significant for its association with the atomic bomb. It was used by Kirtland Army Air Field during WWII for munitions assembly, and was located close to the base's bomb loading pit. Post war it was taken over by the Armed Forces Special Weapons Project for training the military in nuclear bomb assembly in support of early Cold War bomb production at the Z Division (later Sandia National Laboratories). This early training program was a tactic used by the AFSWP in endeavoring to earn custody over the nuclear stockpile from the Atomic Energy Commission.
20676	1955	General Purpose Warehouse	Building	☐	☐	☐	☐	☑	☑	☐	☐		☑	Yes	☑	In 1976 this warehouse was converted into a computer center for nuclear stockpile management under the Field Command/Defense Nuclear Agency. The FC/DNA has had responsibility for the entire U.S. nuclear stockpile since 1966 (then known as DASA). In 1981, this computer center was integrated into the Worldwide Military Command and Control System and is recommended as eligible for its role in managing the nuclear stockpile.
Historic Theme: Proximity Fuze Testing																
29030	1943	Storage Igloo	Structure	☐	☑	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29030 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo in 1943 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29029	1943	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29020 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo in 1943 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29031	1943	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29031 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloin 1943 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29028	1943	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29028 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo in 1943 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29026	1944	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29026 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo in 1944 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.

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29025	1944	Storage Igloo	Structure	☐	☑	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29025 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo in 1944 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29027	1944	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29027 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo in 1944 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29042	1944	Guards' Residence	Building	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Building 29042 is more than 50 years old, and meets NRHP requirements for Criterion A. It It was built in 1944 as part of the New Mexico Proving Ground, where the WWII proximity fuze was developed. The proximity fuze helped to defeat German V-1 rockets, which had wreaked havoc in London. It has been referred to as the second most important weapon to come out of WWII. As such, the building is recommended as eligible to the National Register.
29051	1944	Headquarters	Building	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Building 29051 is more than 50 years old and meets NRHP requirements for Criterion A. It was built in 1944 as the headquarters for the New Mexico Proving Ground, where the WWII proximity fuze was developed. The proximity fuze helped to defeat German V-1 rockets, which had wreaked havoc in London. It has been referred to as the second most important weapon to come out of WWII. As such, the building is recommended as eligible to the National Register.
29020	c, 1945	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29020 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo circa 1945 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29021	c. 1945	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29021 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo circa 1945 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29022	c. 1945	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29022 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo circa 1945 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.
29023	c. 1945	Storage Igloo	Structure	☑	☐	☐	☐	☐	☑	☐	☐		☑	Yes	☑	Structure 29023 is more than 50 years old, and meets NRHP requirements for Criterion A. It was built as a munitions storage igloo circa 1945 for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze. As such, it is recommended as eligible to the National Register.

Historic Theme: WWII Functional Support

<table>
<tr><th rowspan="2">KAFB No</th><th rowspan="2">Constructed</th><th rowspan="2">Historic Name</th><th colspan="10">NRHP Category / Criteria / Consideration / Type</th><th rowspan="2">Over-all Integ. Intact</th><th rowspan="2">SHPO Concur-ence.</th><th rowspan="2">Form Com-plete</th></tr>
<tr><th>Cat.</th><th>A</th><th>B</th><th>C</th><th>D</th><th>G</th><th>Ind. Elig.</th><th>Cont. to District</th><th>Non-Cont. to District</th><th>District Name</th></tr>
<tr><th colspan="16">Status Explanation</th></tr>
<tr><td>333</td><td>1942</td><td>Base Operations</td><td>Building</td><td>☑</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☑</td><td>☐</td><td>☐</td><td></td><td>☑</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Structure 333 was constructed as a Bomb Trainer Building, and is significant for its association with the World War II activities of KAFB. As a hangar, it contributed to base operations, and the base's flight training mission as an Advanced Flying School. Although the cement asbestos corrugated siding was replaced in 1985 with aluminum, the structure retained its clerestory windows, high bay doors and overall massing. It still reads as a WWII hangar and as such, it is recommended as eligible to the National Register.</td></tr>
</table>

APPENDIX C:

PROPERTIES DETERMINED NRHP-INELIGIBLE

Non-Eligible Properties Report

KAFB No	Constructed	Historic Name	NRHP Category / Criteria / Consideration / Type										Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
			Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name				
Historic Theme: Education																
1908	1936	Sandia School	Building	☐	☐	☐	☐	☐	☐	☐	☑	Sandia School	☐	Yes	☑	Building 1908 is more than 50 years old but does not meet NRHP requirements for Criterion A or C. It was part of the Sandia School, a private school for girls built in 1936. It was built as a garage, but an addition was added during the 1950s enlarging the original facility, and the building bears no resemblance to its original design due to numerous architectural changes. It is recommended as non-contributing to the Sandia School district, and as such, this property should not be considered eligible to the National Register.
Historic Theme: None																
20600	1929	TAT Depot	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20600 was built in 1929 as a Transcontinental Air Transport depot, a significant event in the development of aviation in Albuquerque. However, the building has experienced a significant loss of architectural integrity. It has all new windows and doors, it's been restuccoed, and a very large addition was added to the east in 1983. As such, it retains none of its original appearance and is recommended as not eligible to the National Register.
709	1941	Small Arms Storage Range	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 709 is more than 50 years old, but has suffered a significant loss of architectural integrity. The original siding and windows have been replaced. As such, it is recommended as not eligible to the National Register.
707	1941	Small Arms Range	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 707 is more than 50 years old, but has suffered a loss of architectural integrity. The original roof and siding on the west half of the building have been replaced. It no longer reads as a WWII military building. As such, it is recommended as not eligible to the National Register.
437	1942	Administrative Office	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	The original clapboard walls have been stuccoed and windows replaced; as such the building has no integrity and is recommended as not eligible for its WWII role. Building has served as a pararescue training facility since 1976. This is not an important Cold War theme; property is recommended as not eligible under Criteria Consideration G.
334	1942	Heating Facility Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 334 was constructed as a heating plant for hangar 333. It was originally constructed with corrugated asbestos siding which has been replaced with fluted aluminum siding and the doors have been replaced. The building does not exemplify WWII, the architectural changes have caused a loss of integrity, and as such it is recommended as not eligible to the National Register.

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401	1942	Administrative Office	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 401 has had a significant loss of integrity; as such, it is recommended as not eligible to the National Register. The building originally had wood siding and asphalt roofing. The new roof, stucco siding, loss of windows, and change of window type and roof vents has caused a loss of architectural integrity. Building 401 no longer resembles a WWII facility. While it was using during the Cold War to support the AFWL, it operated as administrative offices and has no exceptional Cold War significance.
436	1942	Administrative Office	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	This building originally had wood clapboard siding and is now stuccoed. The windows have been replaced with anodized aluminum. The roof was originally covered with rolled roofing and is now shingled. The building has lost architectural integrity and as such is recommended as not eligible for the NRHP.
460	1942	Operations Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 460 was constructed during WWII, is more than 50 years old, but has suffered a considerable loss of architectural integrity as a WWII structure. In 1965, the original wood siding was stuccoed, and the rolled roofing was replaced with asphalt shingles. The original double hung wood windows were replaced in 1985 with anodized aluminum. As such, it is recommended as not eligible to the National Register.
20338	1942	Motor Repair Shop	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Structure 20338 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C due to the number of alterations to the structure. 20338's integrity has been severely compromised by the infill of all of the original two rows of windows from the front elevation. It does not retain its original appearance. As such, it is recommended as not eligible to the National Register.
404	1942	Dependent Nursery School	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 404 has a significant loss of integrity; as such it is recommended as not eligible to the National Register. The building originally had wood siding and an asphalt shingle roof. The metal roof, stucco, new windows and Post Modern entrance have caused a loss of architectural integrity to the extent that the building no longer represents a WWII facility. During the Cold War it was used as administrative offices and has no exceptional Cold War significance.
278	1943	Heating Facility Building	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 278 is more than 50 years old, but does not meet requirements for NRHP Criterion A. It was constructed as a heating facility for hangar 277. Its original corrugated asbestos cement siding was replaced with fluted aluminum siding, and the doors have been replaced. The building does not exemplify WWII, the architectural changes have caused a loss of integrity and as such, this building is recommended as not eligible to the National Register.
277	1943	Base Engineer Maintenance Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 277 was constructed as a Bomb Trainer Building and is associated with WWII, but has undergone architectural alterations that have compromised its integrity to the extent that it does not meet NRHP criteria. Many of the windows have been removed, the high bay hangar doors have been removed and a wall constructed at the opening, and the corrugated asbestos cement siding replaced with fluted aluminum. With the significant loss of integrity, this building is recommended as not eligible to the National Register.
511	1944	Police Control & Identification	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 511 is 50 years old and associated with World War II, but with the addition of the standing seam metal hipped roof with the large overhang, anodized metal windows and doors, and stucco coating, the structure has lost integrity. It is therefore recommended as not eligible to the National Register.

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615	1944	Shed, Supply and Equipment Base	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 615 has been used for storage since its construction in 1944, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
481	1945	Hangar Maintenance	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Hangar 481 is significant for its association with WWII B-29 training at Kirtland Air Force Base. However the overall architectural character of the hangar as it was constructed has been lost. A 1985 renovation removed the structure's primary character defining features including the B-29 tail opening, the 12/12 double hung wood windows, the true divided light fixed windows in the sliding hangar doors, and a series of large rectangular roof vents. As such, it is recommended as ineligible to the National Register.
482	1945	Hangar, Maintenance, Field	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Hangar 481 is significant for its association with WWII B-29 training at Kirtland Air Force Base. However the overall architectural character of the hangar as it was constructed has been lost. A 1985 renovation removed the structure's primary character defining features including the B-29 tail opening, the 12/12 double hung wood windows, the true divided light fixed windows in the sliding hangar doors, and a series of large rectangular roof vents. As such, it is recommended as ineligible to the National Register.
29016	1945	Carpenter Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 29016 is more than 50 years old, but does not meet NRHP requirements for Criterion A. It was built as a carpenter shop for the New Mexico Proving Ground, site of WWII proximity fuze testing. However, it has undergone significant architectural changes including the replacement of the original windows and infill of the original overhead door on the south elevation, which have resulted in a loss of feeling and association. As such, it is recommended as not eligible to the National Register.
29014	1945	Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 29014 is more than 50 years old, but does not meet NRHP requirements for Criterion A. It was built as a warehouse for the New Mexico Proving Ground, site of WWII proximity fuze testing. However, it has undergone significant architectural changes including the infill of the original windows and doors on the south elevation, which have resulted in a loss of feeling and association. As such, it is recommended as not eligible to the National Register.
26014	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 26014 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is not architecturally significant and is in a conventional weapons storage area. As such, it is recommended as not eligible to the National Register.
29040	1946	Apartment Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 29040 is more than 50 years old, but does not meet NRHP requirements for Criterion A. It was built as part of the New Mexico Experimental Range. Unlike numerous buildings in the area, it was not part of the New Mexico Proving Ground, site of proximity fuze testing during WWII. It has also been moved from its original location and has undergone significant architectural changes including infill of many of the windows and removal of porches. As such, it is recommended as not eligible to the National Register.
29015	1946	Hangar	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	No	☑	Building 29015 is more than 50 years old but does not meet requirements for NRHP Criterion A. It was built in 1946 as part of the New Mexico Experimental Range. Unlike numerous buildings in the area, it was not associated with the New MExico Proving Ground, a WWII proving ground for the testing of the proximity fuze. Therefore, it falls out of the range of the period of significance for the area, and as such is recommended as not eligible to the National Register.

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26015	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 26015 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is not architecturally significant and is in a conventional weapons storage area. As such, it is recommended as not eligible to the National Register.
26013	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 26013 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is not architecturally significant and is in a conventional weapons storage area. As such, it is recommended as not eligible to the National Register.
26012	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 26012 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is not architecturally significant and is in a conventional weapons storage area. As such, it is recommended as not eligible to the National Register.
26010	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26010 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
26009	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26009 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
26008	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26008 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
26007	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26007 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
26006	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26006 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.

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26005	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26005 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
26004	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26004 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
26003	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26003 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
26002	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26002 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
26001	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 26001 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was used to store conventional weapons. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
20299	1946	Base Flag Pole	Object	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Although the Real Property database lists the date of construction as 1947, the 80-plus--foot brushed aluminum pole appears to date from the late 1980s to 1990s. If put in place during the Cold War, the pole would not be exceptionally significant, and as such it is recommended as not eligible to the National Register.
26016	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 26016 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is not architecturally significant and is in a conventional weapons storage area. As such, it is recommended as not eligible to the National Register.
26011	1946	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 26011 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is not architecturally significant and is in a conventional weapons storage area. As such, it is recommended as not eligible to the National Register.

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<tr><th rowspan="2">KAFB No</th><th rowspan="2">Const ructed</th><th rowspan="2">Historic Name</th><th colspan="10">NRHP Category / Criteria / Consideration / Type</th><th rowspan="2">Over-all Integ. Intact</th><th rowspan="2">SHPO Concur-ence.</th><th rowspan="2">Form Com-plete</th></tr>
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<tr><th colspan="16">Status Explanation</th></tr>
<tr><td>29017</td><td>1947</td><td>Garage</td><td>Structure</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">This building is more than 50 years old, but does not meet NRHP requirements for Criterion A. It was built as part of the New Mexico Experimental Range. Unlike other historic facilities in the 29000 area, it was not part of the New Mexico Proving Ground, site of proximity fuze testing during WWII. It has also undergone significant architectural changes, including the addition of a steel tower during the 1970s. As such, it is recommended as not eligible to the National Register.</td></tr>
<tr><td>20606</td><td>1947</td><td>Base Flag Pole</td><td>Object</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Although the Real Property database lists the date of construction as 1947, the 80-plus-foot brushed aluminum pole appears to date from the 1980s - 1990s. If put in place during the Cold War, the pole would not be exceptionally significant, and as such it is recommended as not eligible to the National Register.</td></tr>
<tr><td>611</td><td>1948</td><td>Security Guard Tower</td><td>Structure</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 611 was used by Kirtland Army Air Field during WWII for security of atomic weapons activity south of the runway. All but two of those facilities involved have been razed. The demolition of the complex has caused a significant loss of setting, feeling and association to the extent that this structure is recommended as not eligible to the NRHP.</td></tr>
<tr><td>20344</td><td>1948</td><td>Hangar</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 20344 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. Though the hangar was built in 1928 for the first airport in Albuquerque, little remains of the original design and materials. During multiple renovations of the building, the hangar doors and most of the original windows were removed, the walls were mostly replaced, and it was reroofed. The setting, association, design, materials, feeling and workmanship have all been severely affected. As such, it is recommended as not eligible to the National Register.</td></tr>
<tr><td>20204</td><td>1948</td><td>Hospital Mess Hall</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 20204 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It functioned first as a theatre and then as library. Its architectural integrity has been compromised by the replacement of its windows, and the addition of the hipped roof elements. As such, it is recommended as not eligible to the National Register.</td></tr>
<tr><td>20210</td><td>1948</td><td>Fire Station</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 20210 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a fire station since its construction in 1948, but has been stuccoed, had the addition of the the clock tower, new overhead doors, and replacement of windows and doors. This building has had a significant loss of integrity, and as such, it is recommended as not eligible to the National Register.</td></tr>
<tr><td>20440</td><td>1949</td><td>Crafts Shop</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 20440 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a crafts shop since its construction in 1949, and is not Cold War significant. It has suffered a loss of architectural integrity due to the loss of numerous windows, and the replacement of a large door on the west elevation with aluminum siding and paired personnel doors. As such, it is recommended as not eligible to the National Register.</td></tr>
<tr><td>20341</td><td>1949</td><td>General Storehouse</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 20341 was constructed in 1949, and is more than 50 years old. It is a standard Butler building and does not meet NRHP Criterion C for its architectural significance. During World War II it served first as a storehouse and then for vehicle maintenance, so it doesn't have a significant association with WWII events. As such, it is recommended as not eligible to the NRHP.</td></tr>
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20411	1949	General Purpose Warehouse	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20411 is more than 50 years old but does not meet NRHP requirements for Criteria A or C. It has served as a warehouse storage facility since its construction. Its architectural integrity has been compromised by the replacement of overhead doors and restuccoing of the building. As such, it is recommended as not eligible to the National Register.
20412	1949	General Purpose Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20412 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. Historically, it served as a warehouse storage facility; now it is a ready shelter. Its architectural integrity has been compromised by the replacement of overhead doors, the filling in of the windows, and restuccoing of the building. As such, it is recommended as not eligible to the National Register.
20413	1949	General Purpose Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20413 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. Historically it served as a warehouse storage facility. Its architectural integrity has been compromised by the replacement of overhead doors and restuccoing of the building. As such, it is recommended as not eligible to the National Register.
20414	1949	General Purpose Warehouse	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 20414 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a warehouse storage facility since its construction in 1949. Its architectural integrity has been compromised by the replacement of overhead doors and restuccoing of the building. As such, it is recommended as not eligible to the National Register.
20415	1949	General Purpose Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20415 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a warehouse storage facility since its construction in 1949. Architecturally its integrity has been compromised by the replacement of overhead doors and restuccoing of the building. As such, it is recommended as not eligible to the National Register.
26050	1950	Guard and Watch Towers	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 26050 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is a guard tower that was used to support a conventional weapons storage area and is a standard plan. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
20351	1950	Enlisted Men Barracks	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20351 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a dormitory since its construction in 1950, and is not Cold War significant. Its architectural integrity has been compromised by a new roof, the encapsulation of exterior columns and addition of numerous geometric decorative elements on the exterior, a new railing and the enclosure of the exterior stairways. As such, it is recommended as not eligible to the National Register.
22002	1950	Bachelor Officer's Quarters	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 22002 is more than 50 years old, but does not meet NRHP requirements for Criterion A or C. It has served as a housing facility since its construction in 1950. The building has suffered a loss of architectural integrity with the addition of a new standing seam metal roof, new stucco walls and CMU base course and new windows. As such, it is recommended as not eligible to the National Register.

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20451	1950	Laundry	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20451 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. Neither function as a laundry first and then as administrative offices is Cold War significant. Architecturally, the building has lost integrity with the addition of the cementitious pebble overhang and anodized aluminum windows. As such, it is recommended as not eligible to the National Register.
20599	1950	Receiver Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20599 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a support facility, a communications receiver, since its construction in 1950. Architecturally, it has undergone renovations, including the replacement of windows with glass block. As such, it is recommended as not eligible to the National Register.
22003	1950	Bachelor Officer's Quarters	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 22003 is 50 years old but incurred a significant loss of integrity in 1997 with replacement of windows, new stucco and replacement of roof. Architectural character changed from horizontal banding to vertical elements. Building 22003 serves as a dormitory and has no Cold War theme association. As such it is recommended as not eligible to the National Register.
21000	1950	Dependent Grade School	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 21000 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has always been a school and as such is not Cold War significant, and has lost architectural integrity with the replacement of windows, and the addition of Post Modern detailing on the north and east elevations.
21002	1950	Provost Marshal and Military Police Administ	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 21002 is 50 years old and associated with the Cold War, but with the addition of the standing seam metal hipped roof with the large overhang, anodized metal windows and doors, and stucco coating, the structure has lost integrity. It is therefore recommended as not eligible to the National Register.
22000	1950	Officer Mess	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 22000 is 50 years old but has undergone significant architectural changes that have caused a loss of integrity including stucco, new parapet, new windows and doors, addition of ramps, sidewalk and wall on north end, and additions to the east and south. As such, it is recommended as not eligible to the National Register.
22001	1950	Bachelor Officer's Quarters	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 22001 is 50 years old but incurred a significant loss of integrity in 1997 with replacement of windows, new stucco, roof and addition of reveals that extend above roofline. Architectural character changed from horizontal banding to vertical elements. Building 22001 serves as a dormitory and has no Cold War theme association. As such, it is recommended as not eligible to the National Register.
26053	1950	Guard Tower	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 26053 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is a guard tower that was used to support a conventional weapons storage area and is a standard plan. During the Cold War, Sandia Laboratory stored some chemicals here, but most special weapons were located at Manzano Base. As such, this property should be considered not eligible to the National Register.
20356	1950	Dispatch Office	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20356 is 50 years old, is not architecturally significant and was used as a vehicle operations structure, not an important Cold War function. As such, the property doesn't meet the requirements for Criteria A or C and is recommended as not eligible to the National Register.

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20352	1950	Enlisted Men Barracks	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20352 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a dormitory since its construction in 1950, and is not Cold War significant. Its architectural integrity has been compromised by a new roof, the encapsulation of exterior columns and addition of numerous geometric decorative elements on the exterior, a new railing and the enclosure of the exterior stairways. As such, it is recommended as not eligible to the National Register.
20452	1950	PM ADM Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20452 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. Neither its architecture or use as a jail since its construction is Cold War significant. As such, it is recommended as not eligible to the National Register.
20340	1950	Unknown	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20340 was constructed in 1950, and is more than 50 years old. It is a standard Butler building and does not meet NRHP Criterion C for its architectural significance. Its function at the time of construction until the 1970s is not known, however it was located between a training facility and a general storehouse, so it is likely to have been a standard base operations building without Cold War significance. As such, it is recommended as not eligible to the NRHP.
20221	1950	Dormitory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20221 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a dormitory since its construction in 1950 and is not Cold War significant. Its architectural integrity has been compromised by a new roof, the encapsulation of exterior columns and addition of numerous geometric decorative elements on the exterior, a new railing and the enclosure of the exterior stairways. As such, it is recommended as not eligible to the National Register.
20222	1950	Enlisted Men Barracks	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20222 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a dormitory since its construction in 1950, and has been architecturally compromised by a new roof, the encapsulation of exterior columns and addition of numerous geometric decorative elements on the exterior, a new railing and the enclosure of the exterior stairways. This building has a lack of integrity and as such, it is recommended as not eligible to the National Register.
20225	1950	Theatre with Stage	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20225 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a movie theatre since its construction in 1950, and does not have exceptional Cold War significance. It has suffered a loss of architectural integrity due to the replacement of windows and doors, restuccoing of the building and the addition of the entry portico structure with marquee and molded cove overhang. As such, it is recommended as not eligible to the National Register.
20228	1950	Gymnasium	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20228 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has been a gymnasium since its construction, and is not exceptionally significant. It has also suffered a loss of architectural integrity due to the restuccoing of walls, replacement of windows, and the construction of additions on the east and south, each having elaborate post modern entrances. As such, it is recommended as not eligible to the National Register.
20339	1950	General Education Development Facility	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20339 was constructed in 1950, and is more than 50 years old. It is a standard Butler building and does not meet NRHP Criterion C for its architectural significance. During the Cold War it served first as a training facility and then as a thrift shop; it does not have Cold War significance. As such, it is recommended as not eligible to the NRHP.

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<tr><th rowspan="2">KAFB No</th><th rowspan="2">Const ructed</th><th rowspan="2">Historic Name</th><th colspan="10">NRHP Category / Criteria / Consideration / Type</th><th rowspan="2">Over-all Integ. Intact</th><th rowspan="2">SHPO Concur-ence.</th><th rowspan="2">Form Com-plete</th></tr>
<tr><th>Cat.</th><th>A</th><th>B</th><th>C</th><th>D</th><th>G</th><th>Ind. Elig.</th><th>Cont. to District</th><th>Non-Cont. to District</th><th>District Name</th></tr>
<tr><th colspan="16">Status Explanation</th></tr>
<tr><td>20350</td><td>1950</td><td>Enlisted Personnel Mess Building</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 20350 is more than 50 years old. It has undergone significant architectural changes including additions, new stucco, new windows, and the large stair on the south. With this loss of integrity it doesn't meet the NRHP requirements for Criterion C. The building has served as a dining hall since 1950, does not have a significant association with WWII events, and does not meet the NRHP requirements for Criterion A. As such, it is recommended as not eligible to the National Register.</td></tr>
<tr><td>20348</td><td>1950</td><td>Oxnard Field Hangar</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 20348 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. Though the hangar was built in 1928 for the first airport in Albuquerque, little remains of the original design and materials. The original adobe walls were replaced with wood frame stucco, an annex was removed as well as the east and west hangar doors and rails. The setting, association, design, materials and feeling have all been severely affected. As such, it is recommended as not eligible to the National Register.</td></tr>
<tr><td>28004</td><td>1951</td><td>Storage Igloo</td><td>Structure</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Igloo 28004 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.</td></tr>
<tr><td>20674</td><td>1951</td><td>Maintenance Shop</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building is more than 50 years old, but does not meet Criteria A or C. It is a prefabricated metal building and was used for maintenance. As such this property is recommended as not eligible to the National Register.</td></tr>
<tr><td>28002</td><td>1951</td><td>Storage Igloo</td><td>Structure</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Igloo 28002 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.</td></tr>
<tr><td>20675</td><td>1951</td><td>General Instruction Building</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>Yes</td><td>☑</td></tr>
<tr><td colspan="16">Building 20675 is more than 50 years old but does not meet NRHP requirements for Criteria A or C. It is a prefabricated metal building and is not architecturally significant. Though it was used for assembly training during the early development of Sandia Base, the feeling and association of the original complex that included other assembly buildings as well as the Interservice Nuclear Weapons School is not intact due to the renovation of many of the original buildings. As such, it is recommended as not eligible for the NRHP.</td></tr>
<tr><td>20677</td><td>1951</td><td>General Instruction</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>No Response Yet</td><td>☑</td></tr>
<tr><td colspan="16">Building 20677 is more than 50 years old but does not meet NRHP requirements for Criteria A or C. It is a prefabricated metal building and is not architecturally significant. Though it was used for assembly training during the early development of Sandia Base, the feeling and association of the original complex that included other assembly buildings as well as the Interservice Nuclear Weapons School is not intact due to the renovation of many of the original buildings. As such, it is recommended as not eligible for the NRHP.</td></tr>
<tr><td>20678</td><td>1951</td><td>General Instruction Building</td><td>Building</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td></td><td>☐</td><td>No Response Yet</td><td>☑</td></tr>
<tr><td colspan="16">Building 20678 is more than 50 years old but does not meet NRHP requirements for Criteria A or C. It is a prefabricated metal building and is not architecturally significant. Though it was used for assembly training during the early development of Sandia Base, the feeling and association of the original complex that included other assembly buildings as well as the Interservice Nuclear Weapons School is not intact due to the renovation of many of the original buildings. As such, it is recommended as not eligible for the NRHP.</td></tr>
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20680	1951	General Instruction	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Building 20680 is more than 50 years old but does not meet NRHP requirements for Criteria A or C. It is a prefabricated metal building and is not architecturally significant. Though it was used for assembly training during the early development of Sandia Base, the feeling and association of the original complex that included other assembly buildings as well as the Interservice Nuclear Weapons School is not intact due to the renovation of many of the original buildings. As such, it is recommended as not eligible for the NRHP.
20679	1951	General Instruction Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Building 20679 is more than 50 years old but does not meet NRHP requirements for Criteria A or C. It is a prefabricated metal building and is not architecturally significant. Though it was used for assembly training during the early development of Sandia Base, the feeling and association of the original complex that included other assembly buildings as well as the Interservice Nuclear Weapons School is not intact due to the renovation of many of the original buildings. As such, it is recommended as not eligible for the NRHP.
1902	1951	Atomic Energy Commission Regional Office	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1902 is more than 50 years old, but does not meet NRHP requirements for Criteria Consideration A or C. It was built as office space for the Atomic Energy Commission, and has served as officers' quarters, and then administration again. Architecturally, it has had a loss of integrity, due to the replacement of the original windows and doors. As such, it is recommended as not eligible to the National Register.
28010	1951	Storage Igloo	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28010 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.
28005	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28005 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.
28011	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28011 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.
20681	1951	General Instruction	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Building 20681 is more than 50 years old but does not meet NRHP requirements for Criteria A or C. It is a prefabricated metal building and is not architecturally significant. Though it was used for assembly training during the early development of Sandia Base, the feeling and association of the original complex that included other assembly buildings as well as the Interservice Nuclear Weapons School is not intact due to the renovation of many of the original buildings. As such, it is recommended as not eligible for the NRHP.
28008	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28008 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.

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28009	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28009 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.
28003	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28003 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.
20364	1951	Post Headquarters for Sandia Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20364 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has lost much of its integrity due to the replacement and infill of the original banded windows, and the furring out of the exterior walls, negating the International Style design of the original building. Though this was one of a complex of Sandia Base headquarters buildings from the early 1950s, the workmanship, feeling and association have been severely affected by the renovation of four of the five buildings. As such, it has lost integrity and it is recommended as not eligible to the National Register.
28012	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28012 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.
28013	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28013 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.
28014	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28014 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended as not eligible to the National Register.
28015	1951	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Igloo 28015 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It is a standard plan earthen embankment weapons storage facility, and was built to store conventional weapons. Since circa the 1960s, the igloo has been used to store a variety of nonexplosive materials. As such, this property is recommended not eligible to the National Register.
20226	1951	Enlisted Men Service Club	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20226 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has served as a club for enlisted men, then as an open mess hall, and now as a recreation center, and does not have exceptional significance. It has also suffered a loss of architectural integrity due to the replacement of doors and windows, and the addition of a post modern entry. As such, it is recommended as not eligible to the National Register.

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20362	1951	Division Headquarters for Sandia Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20362 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has lost much of its integrity due to the replacement and infill of the original banded windows, and the furring out of the exterior walls, negating the International Style design of the original building. Though this was one of a complex of Sandia Base headquarters buildings from the early 1950s, the workmanship, feeling and association have been severely affected by the renovation of four of the five buildings. As such, the integrity has been lost and it is recommended as not eligible to the National Register.
20673	1951	General Instruction	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20673 is more than 50 years old but does not meet NRHP requirements for Criteria A or C. It is a prefabricated metal building and is not architecturally significant. Though it was used for assembly training during the early development of Sandia Base, the feeling and association of the original complex that included other assembly buildings as well as the Interservice Nuclear Weapons School is not intact due to the renovation of many of the original buildings. As such, it is recommended as not eligible for the NRHP.
918	1952	Dormitory, Airmen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 918 is not yet 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has been a dormitory since its construction in 1952, and is not exceptionally significant. In addition, the architectural integrity has been compromised through the addition of the roof, new stucco, enclosed stairs and angled piers. As such, it is recommended as not eligible to the National Register.
1015	1952		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1015 was constructed as a warehouse, has no significant architectural features or military function. It does not meet NRHP Criteria A or C and as such, is recommended as not eligible to the National Register.
20349	1952	Unknown	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	This property is 50 years old and was constructed as a garage. This was not an important Cold War use, the property doesn't exemplify the Cold War and doesn't meet the requirements for NRHP Criteria A or C. As such, it is recommended as not eligible to the National Register.
20358	1952	Unknown	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Building 20358 is 50 years old but does not meet NRHP requirements for Criterion A or C. It was built in 1952 as a repair facility for 90mm anti-aircraft guns, and was then used for storage -- both support functions -- before being converted into a museum in 1969. The building has suffered a significant loss of integrity. The windows and the original wood overhead doors have been stuccoed over. Some doors have been replaced by metal overhead doors. As such, it is recommended as not eligible to the National Register.
20360	1952	Post Headquarters for Sandia Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20360 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It has lost much of its integrity due to the replacement and infill of the original banded windows, negating the International Style design of the original building. Though this was one of a complex of Sandia Base headquarters buildings from the early 1950s, the workmanship, feeling and association have been severely affected by the renovation of four of the five buildings. As such, the integrity is lost and it is recommended as not eligible to the National Register.
20363	1952	Division Headquarters for Sandia Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20363 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It has lost much of its integrity due to the replacement and infill of the original banded windows, and the furring out of the exterior walls, negating the International Style design of the original building. Though this was one of a complex of Sandia Base headquarters buildings from the early 1950s, the workmanship, feeling and association have been severely affected by the renovation of four of the five buildings. As such, the integrity has been lost and it is recommended as not eligible to the National Register.

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1044	1952	Unknown	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1044 is more than 50 years old but does not meet NRHP requirements for Criterion A or C. The real property file shows no data prior to 1981. The 1952 date of construction is noted in the real property database. If the property was constructed in 1952, it was thoroughly renovated in 1981 with new broken block veneer, 1/1 anodized aluminum windows and new doors. As such, it cannot retain integrity and is recommended as not eligible to the National Register.
48055	1952	Laboratory, Science, Radiation	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 48055 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. During the 1950s and 1960s, it served as a laboratory for the Kirtland Ionization Radiation Complex, where testing was conducted on animals. However, the complex did not have a significant Cold War function. The building is not architecturally significant, and the site has changed dramatically since the era of the Radiation Annex. As such, it is recommended as not eligible to the National Register.
20449	1952	Telephone Exchange Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20449 is 50 years old, but does not meet NRHP requirements for Criteria A or C. The building has been used as a communications facility since 1952, and is not exceptionally significant. It has also suffered a loss of architectural integrity due to the addition of the paneled aluminum overhang and fluted soffit, stucco, the tile band on the walls, new windows and doors. As such, it is recommended as not eligible to the National Register.
20682	1952	Exchange Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Building 20682 is 50 years old but does not meet NRHP requirements for Criteria A or C. It is a prefabricated metal building and is not architecturally significant. It has been used as a storage facility since its construction in 1952, and is not Cold War significant. As such, it is recommended as not eligible to the National Register.
20389	1952	Signal Field Maintenance Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20389 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It was used first as a communications equipment maintenance shop and then as offices, neither function being Cold War significant. The replacement of windows and doors, and addition of exterior staircases has caused a loss of integrity. As such, it is recommended as not eligible to the National Register.
20410	1952	General Purpose Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is a general supply warehouse and does not meet NRHP Criterion A or C. As such, it is recommended as not eligible.
362	1952	Ground Control Approach	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Although this property is currently referred to as a laser laboratory, from 1968 to 1992, it served as a Nuclear Engineering Testing Laboratory. It had seismic and geology labs. These labs most likely supported the civil engineering survivability tests. As support, they are not of exceptional significance and therefore are recommended as not eligible to the National Register.
926	1952	Exchange Sales Store	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 926 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. As a base exchange since its construction in 1956, the building does not have exceptional significance. As such, it is recommended as not eligible to the National Register.

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48056	1952	Laboratory, Science, Radiation	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 48056 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. During the 1950s and 1960s, it served as a laboratory for the Kirtland Ionization Radiation Complex, where testing was conducted on animals. However, the complex did not have a significant Cold War function. The building is not architecturally significant, and the site has changed dramatically since the era of the Radiation Annex. As such, it is recommended as not eligible to the National Register.
1010	1953	Base Supply and Equipment Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1010 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a base supply warehouse since its construction in 1953. As such, it is recommended as not eligible to the National Register.
28050	1953	General Purpose Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 28050 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It is not architecturally significant, and has served as a storage facility and golf clubhouse since its construction in 1953. As such, it is not Cold War significant and is recommended as not eligible to the National Register.
1017	1953	Electronic Research Laboratory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1017 was originally used for research, but was renovated to serve as offices. Interior has been remodeled and new anodized aluminum windows and doors have been added. The building lacks integrity, is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
1029	1953	Headquarters, Air Base Group	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1029 is not yet 50 years old and is not exceptionally significant. It served as administrative offices and has undergone replacement of the windows. As such, the property is recommended as not eligible to the National Register.
20375	1953	Motor Repair Shops	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20375 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was designed as an automotive repair facility and is used primarily by individuals on base. As such, it is recommended as not eligible to the National Register.
20377	1953	Oil House	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20377 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1953, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
22011	1953	Bachelor Officers Quarters	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G or have architectural integrity from the original design and construction. The building was completely remodeled in the 1980s, when the roof was replaced with hipped metal, the stucco was redone, a new entry was added and anodized aluminum sliders replaced the original windows. As such, it is recommended as not eligible to the National Register.
20602	1953	General Instruction Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20602 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The building served as part of the Defense Atomic Support Agency's Nuclear Weapons School. However the building has suffered an extensive loss of integrity due to a new stucco overlay, the addition of a large band course at the roofline, and the replacement of doors and addition of windows at the entrance. As such, it is recommended as not eligible to the National Register.

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20687	1953	Emergency Training Facility	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20687 is 50 years old, but does not meet NRHP requirements for Criteria A or C. It was built as an emergency nuclear weapons training facility during the early Cold War, but the building has suffered a significant loss of integrity. In 1973, many overhead doors were filled in with CMU and new windows. The doors were also replaced. As such, the building no longer reads as an early Cold War military building, and is recommended as not eligible to the National Register.
20686	1953	Emergency Training Facility	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20686 is 50 years old, but does not meet NRHP requirements for Criterion A or C. It was built as an emergency nuclear weapons training facility during the early Cold War, but the building has suffered a significant loss of integrity. In 1973, many overhead doors were filled in with CMU and new windows. The doors were also replaced. As such, the building no longer reads as an early Cold War military building, and is recommended as not eligible to the National Register.
1020	1953	A/C Laboratory Test	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1020 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has also had a significant loss of architectural integrity, including window replacement and stucco overlay. As such, it is recommended as not eligible to the National Register.
1019	1953	Air Base Group Headquarters	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1019 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. Its architectural integrity has been compromised by the addition of a new roof, anodized aluminum windows and doors, and new stucco walls with reveals. As such, it is recommended as not eligible to the National Register.
1018	1953	Armament Testing Laboratory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Buiilding 1018 was originally used for testing and has been renovated to serve as an avionics shop. New anodized windows and doors have been added, causing a loss of integrity. It is not yet 50 years old, and with its minor functional support role, does not meet NRHP requirements for Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
1028	1954	Flight Simulator Training	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Although Building 1028 was constructed to house a flight simulator, the simulator has been removed and since thenthe building has served primarily as storage. It is not yet 50 years old, does not meet NRHP requirements for Criteria Consideration G, and as such is recommended as not eligible to the National Register.
22012	1954	Bachelor Officers Quarters	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has served as a housing facility since its construction in 1954, and has no Cold War significance. As such, it is recommended as not eligible to the National Register.
22010	1954	Bachelor Officers Quarters	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has served as a housing facility since its construction in 1954. As such, it is recommended as not eligible to the National Register.
980	1954	Fire Station	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 980 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has little architectural integrity from its original design and construction, its original overhead door fenestration has been filled in and new windows added. It was a fire station throughout the Cold War. As such, it is recommended as not eligible to the National Register.

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747	1954	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 747 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as storage for base supplies and various ordnance since its construction. As such, it is recommended as not eligible to the National Register.
20423	1954	Post Engineer Maintenance Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20423 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a vehicle maintenance facility since its construction in 1954, and is not Cold War significant. As such, it is recommended as not eligible to the National Register.
20420	1954	Post Engineer Maintenance Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20420 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It served first as a base engineer maintenance shop, and is now a communications equipment repair shop, and as such is not of exceptional importance. It is recommended as not eligible to the National Register.
916	1954	Academic, Classroom	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 916 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has served as an educational facility since its construction, has no Cold War significance, and has incurred a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
917	1954	Dormitory, Airmen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 917 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. The replacement of the windows and the exterior insulation finishing system have caused a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
1903	1954	Auto Garage	Building	☐	☐	☐	☐	☐	☐	☐	☑	Sandia School	☐	Yes	☑	Building 1903 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has been used as a garage, dining hall and storage facility. It is not exceptionally significant, and as such is recommended as not eligible to the National Register.
638	1954	Fire Station	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not yet 50 years old and does not meet requirements for NRHP Criteria Consideration G. The building does not retain architectural integrity from its original design and construction. As such, it is considered not eligible to the National Register.
592	1954	Dispensary B Military	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 592 is not 50 years old, was used as a dispensary and as health service offices throughout the Cold War, and does not meet NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
703	1954	Test Cell	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Structure 703 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1954. As such, it does not have exceptional Cold War significance and is recommended as not eligible to the National Register.

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627	1954	Base Supply and Equipment Shed	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 627 served as a support warehouse for nuclear weapon parachute retardation device development beginning in the mid 1960s. Because the building's function was solely a supportive one, it is not exceptionally significant. As such, 627 is recommended as not eligible to the National Register.
498	1954	Communications Center	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building functioned primarily as a base telecommunications center. It is not yet 50 years old and as such is recommended as not eligible to the National Register.
593	1954	Dental Clinic	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 593 is not 50 years old, was used throughout the Cold War as a dental clinic, and does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
734	1954	Auto Maintenance Shop	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 734 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as an automotive maintenance shop, and a storage facility for a variety of KAFB tenants. As such, it is not exceptionally significant and is recommended as not eligible to the National Register.
471	1954	Exchange Service Station	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not yet 50 years old, has had a significant loss of architectural integrity including new stucco, windows and entrances, and does not meet requirements for Criteria Consideration G. As such it is recommended as not eligible to the National Register.
704	1954	Test Cell	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 704 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a shed for test cells for aircraft engine testing since its construction in 1954. The test cells are mobile vehicles and the shed serves as weather protection. As such, it is not exceptionally significant and is recommended as not eligible to the National Register.
742	1954	Storage Magazine, Segregated	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 741 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as small weapons storage since its construction. As such, it is recommended as not eligible to the National Register.
743	1954	Storage, Base Rocket Assembly	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 743 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction. As such, it is recommended as not eligible to the National Register.
744	1954	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 744 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as storage since its construction. As such, it is recommended as not eligible to the National Register.

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745	1954	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 745 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as storage for base supplies and various ordnance since its construction. As such, it is recommended as not eligible to the National Register.
746	1954	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 746 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as storage for base supplies and various ordnance since its construction. As such, it is recommended as not eligible to the National Register.
730	1954	Auto Maintenance Administration	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 730 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as an automotive maintenance shop, a storage facility for a variety of KAFB tenants, and for fire detection and suppression testing. As such, it is not exceptionally significant and is recommended as not eligible to the National Register.
20683	1955	General Purpose Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20683 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a warehouse in 1955, and has served in a storage capacity since. As such, it has no Cold War significance and is recommended as not eligible to the National Register.
915	1955	Dormitory, Airmen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 915 is not 50 years old or exceptionally significant. It has served as a dormitory since its construction. The building has also been stuccoed and the windows replaced. As such, it is recommended as not eligible to the National Register.
922	1955	Dormitory, Airmen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not yet 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has served as a dormitory since its construction in 1955, and has no Cold War significance. As such, it is recommended as not eligible to the National Register.
923	1955		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 923 is not 50 years old and does not meet NRHP Criteria Consideration G. It has lost the architectural integrity of its original design and construction. It was remodeled with all doors and windows replaced in 1968. In 1980, the windows on the east elevation were replaced with a door, and in 1995, the east, west and south porches, railing and steps were removed. A ramp was added and the sidewalks were realigned. As such, it is recommended as not eligible to the National Register.
924	1955	Dormitory, Airmen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not yet 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has been a dormitory since its construction in 1955, and has no Cold War significance. As such, it is recommended as not eligible to the National Register.
20130	1955	Administrative Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20130 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. The building has also suffered a significant loss of architectural integrity, including its original windows, siding and roofline. The entry portico and landscaped wing walls are also a new addition to the building. As such, it is recommended as not eligible to the National Register.

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591	1955	Medical Food Inspection	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 591 is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was used to test food, which was not an exceptionally significant role during the Cold War and as such is recommended as not eligible to the National Register.
499	1955	Headquarters Group Air Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 499 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has served in an administrative capacity since its construction in 1955, and had extensive renovation (new windows, stucco, two-story vestibule) circa the late 1980s so it no longer reflects the character of a Cold War AFWL building. As such, it is recommended as not eligible to the National Register.
748	1955	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 748 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as storage for base supplies and various ordnance since its construction. As such it is recommended as not eligible to the National Register.
497	1955	Headquarters Major Command	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 497 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. Though it has served as headquarters space for the Air Force Space Technology Center, among others, the building lost architectural integrity in remodelings in 1971, when the flat roof and parapets were replaced with a gabled standing seam metal roof, and 1982, when the double hung wood windows and steel doors were replaced with anodized aluminum and some infilled. The architectural changes are signficant and have altered the character to the extent that it no longer reads as a Cold War headquarters (it reads more as a Post Modern office building) and as such, is recommended as not eligible to the National Register.
1021	1955	Water Fire Pumping Station	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1021 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has been a utility facility since 1955. As such, it is recommended as not eligible to the National Register.
20219	1956	Main Library	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20219 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built in 1956 and functioned as a library for 20 years, and was then used for administrative purposes. It is not exceptionally significant, and as such is recommended as not eligible to the National Register.
485	1956	Theatre, Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 485 is not yet 50 years old and is not exceptionally significant. It was originally constructed as a theater and is currently used to process personnel. As such it is recommended as not eligible to the National Register.
952	1956	Service Club	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 952 originally served as an officer's club, then a library and in 1976 as classrooms for flight training. As a classroom building the structure is not exceptionally significant to the Cold War, therefore does not meet Criteria Consideration G and as such is recommended as not eligible to the NRHP.
20229	1956	Indoor Swimming Pool	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20229 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. As a swimming pool, it is not Cold War significant. As such, it is recommended as not eligible to the National Register.

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48068	1956	Sheep Shelter	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 48068 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built as a sheep shelter in 1956 and has served as an animal shelter since. As such, it is recommended as not eligible to the National Register.
48064	1956	Sheep Shelter	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 48064 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a shelter for animals since its construction in 1956. As such, it is recommended as not eligible to the National Register.
20224	1956	Base Exchange	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20224 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as an exchange since at least 1978, and likely since 1956. As such, it is not exceptional, and is recommended as not eligible to the National Register.
22005	1956	Outdoor Swimming Pool	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 22005 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a swimming pool since 1956 and is not Cold War significant. As such, it is recommended as not eligible to the National Register.
376	1956	Workshop Recreation	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 376 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a recreation workshop, after which it was used as a fire hose house and then air freight terminal through 1989. It is not exceptionally significant, and as such is recommended as not eligible to the National Register.
1038	1956	Fire Station	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1038 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a fire station since its construction in 1956, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
434	1957	Administrative, Office	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 434 was constructed during WWII, but has undergone a significant loss of architectural integrity through the addition of a new standing seam metal roof, stucco and anodized aluminum windows, and loss of windows. It served as offices during the Cold War and does not meet the NRHP requirements for Criteria Consideration G. As such, this property is recommended as not eligible to the National Register.
741	1957	Base Storage, Segregated Magazine	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 741 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as small weapons storage since its construction. As such, it is recommended as not eligible to the National Register.
420	1957	Warehouse, Supply and Equipment Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 420 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has served as storage space since its construction in 1957. As such, it is recommended as not eligible to the National Register.

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20140	1957	Base Hospital	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20140 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It served as a hospital from its construction in 1957 through 1989, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
20206	1957	Exchange Cafe	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20206 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It served as a cafeteria from its construction in 1957 into the 1990s. As such, it is recommended as not eligible to the National Register.
20107	1957	Post Chapel	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20107 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has been a chapel since its construction in 1957, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
336	1957	Aircraft Engine Inspection and Repair	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 336 is not yet 50 years old and does not meet the NRHP requirements for Criteria Consideration G. It has been used as an engine repair shop since its construction, is not exceptionally significant and as such is recommended as not eligible to the National Register.
1042	1957	Base Rocket Assembly Storage	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1042 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served basically as a storage facility since its construction, and is not exceptionally significant. It has also had a significant loss of architectural integrity through the addition of a new roof, new doors and stucco. As such, it is recommended as not eligible to the National Register.
590	1957	Garage, Ambulance	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 590 is not 50 years old, was used as storage throughout the Cold War, and does not meet NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
424	1958	Administrative Office	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 424 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has been used for administrative offices since its construction in 1958. As such, it is not exceptional and is recommended as not eligible to the National Register.
426	1958	Dining Hall, Airmen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 426 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a dining hall in 1958 and in 1966 was converted to offices, which have been used by various entities since then. As such, it is not exceptional and is recommended as not eligible to the National Register.
425	1958	Dormitory, Airmen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 425 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has served as a dormitory since its construction in 1958. As such, it is recommended as not eligible to the National Register.

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423	1958	Dormitory, Airmen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 423 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It was a dormitory for approximately 13 years, and subsequently as administrative offices for AFWL. As such, it is recommended as not eligible to the National Register.
1045	1958	Supply and Issue Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1045 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It served as a storage facility from its construction in 1958 until 1970, when it became a base engineer maintenance shop until 1987. It is not exceptionally significant, and as such is recommended as not eligible to the National Register.
708	1959	Base Small Arms Ammunition Storage	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 708 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1959. As such, it is not exceptional and is recommended as not eligible to the National Register.
1047	1959	Readiness, Crew	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1047 served as a crew readiness facility, but has undergone significant architectural changes including a new gabled standing seam metal roof; new windows and doors; and an addition to the west. As such, it does not meet NRHP requirements for Criteria Consideration G, and is recommended as not eligible to the National Register.
1050	1959	Petroleum Operations Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1050 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a utility facility and then general support facility since its construction in 1959. It has also undergone alteration, causing a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
1012	1959	Base Paint and Dope Storage	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1012 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has been a storage facility since its construction in 1959, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
509	1960	Radio Facility, Amateur	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 509 is not 50 years old, served as an amateur radio facility throughout the Cold War, and does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
750	1960	Special Police Sentry House	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 750 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built as a sentry house before becoming administrative offices. As such, it is recommended as not eligible to the National Register.
751	1960	Storage, Base Rocket Assembly	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 751 is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was used for munitions assembly and did not have a significant Cold War function. As such, it is recommended as not eligible to the National Register.

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473	1960	Exchange Service Outlet	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 473 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has served as an exchange building since its construction in 1960. As such, it is recommended as not eligible to the National Register.
467	1960	Youth Center	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 467 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It functioned as a youth center from its construction in 1960 until the mid 1970s, when it was used as a support facility by the 1550th Aircrew Training and Test Wing Pararescue School, and in the 1980s as a support facility for materials research testing by the Air Force Weapons Laboratory. It is not exceptionally significant, and as such is recommended as not eligible to the National Register.
753	1960	Storage, Ammunition Air Defense	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 753 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction. As such, it is recommended as not eligible to the National Register.
754	1960	Storage, Ammunition Air Defense	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 754 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction. As such, it is recommended as not eligible to the National Register.
752	1960	Storage, Ammunition Air Defense	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 752 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction. As such, it is recommended as not eligible to the National Register.
589	1960	Chapel, Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 589 is not 50 years old, served as a chapel throughout the Cold War, and does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
755	1960	Storage, Ammunition Air Defense	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 755 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction. As such, it is recommended as not eligible to the National Register.
57002	1961	Soil Engineering Science Laboratory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 57002 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was used as a machine shop during the shock tube testing era, and is therefore not significant. As such it is recommended as not eligible for the National Register.
276	1961	Civil Engineer Equipment Storage	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 276 is not yet 50 years old and has been used for storage since its construction. The facility did not have an important Cold War function and does not meet NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.

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1025	1961	Base Disposal and Salvage Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1025 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a warehouse since its construction in 1961. As such, it is recommended as not eligible to the National Register.
419	1961	Technical Library	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 419 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has served as a technical library throughout its history. As such, it has operated as a support facility and does not have Cold War significance. It is recommended as not eligible for the National Register.
1053	1961	Woodworking Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1053 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It served first as a woodworking shop from its construction in 1961, and then as a telecommunications facility in the 1970s and 1980s. It is not exceptionally significant, and as such is recommended as not eligible to the National Register.
1051	1961	Aircraft Engine Inspection and Repair Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1051 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has served as a warehouse and a facility for aircraft maintenance. As such, it is not exceptionally significant and is recommended as not eligible to the National Register.
415	1962	Science Laboratory, Physics	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 415 is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was used as a physics lab and is not exceptionally significant. In addition, the CMU wall has been stuccoed and the windows replaced with anodized aluminum sliders. As such, this property is recommended as not eligible to the National Register.
416	1962	Laboratory, Science, Physics	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 416 served as a high and low bay laser laboratory. Since its construction the laboratory bays have been diivided into offices. They no longer are readable as high and low bay laboratories, a significant loss of integrity. As such the facility should be considered not eligible for the National Register of Historic Places.
414	1962	Physics Science Laboratory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 414 was constructed to support the work of the Air Force Weapons Laboratory (AFWL). Since its construction, it has had a layer of horizontally scored stucco added; windows and doors replaced; new entrance vestibule and portico added to the north. This property lacks the integrity to convey its AFWL role, and as such is recommended as not eligible to the National Register.
411	1962	Refuse Incinerator	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 411 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It served as a waste disposal facility for more than 20 years before becoming storage space for research equipment in 1983. It served in this capacity for the remainder of the Cold War era, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
1052	1962	Base Supply and Equipment Shed	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1052 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1962. As such, it is recommended as not eligible to the National Register.

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417	1962	Science Laboratory, Physics	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	This building was constructed as a corridor. It is not yet 50 years old and does not have exceptional significance. It does not meet NRHP requirements for Criteria Consideration G, and as such is recommended as not eligible to the National Register.
378	1963	Paint Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 378 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a paint shop in 1963 and functioned as such for almost 20 years, after which it was used for storage. It is not exceptionally significant, and as such is recommended as not eligible to the National Register.
57005	1963	Bottled Gas Storage	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 57005 is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as storage since its construction. As such, it is recommended as not eligible to the National Register.
377	1963	Shop, Refueling Vehicle	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 377 is not 50 years years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a garage since its construction in 1963, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
381	1963	Auto Maintenance Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 381 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as an auto maintenance facility, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
1008	1963	Storage, Inert Spares	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1008 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1963, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
20694	1963	Flammable Material Storehouse	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20694 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a paint storage facility since its construction in 1963. As such, it is recommended as not eligible to the National Register.
22007	1964	Swimming Pool	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 22007 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was a swimming pool from 1964 to 1990, when it was demolished to make space for a volleyball court. As such, it is recommended as not eligible to the National Register.
953	1964	Bowling Center	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 953 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It served as a bowling center and then roller rink throughout the Cold War. As such, it is recommended as not eligible to the National Register.

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613	1964	Weapons Support Training	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
According to Real Property files, building 613 was associated with AFSWCenter missile work at KAFB. Most AFSWCenter missile development took place at White Sands, and the KAFB "old timers" have stated that there was no missile work at KAFB. The conclusion is that work in this location was minor and as such, 613 is recommended as not eligible for the NRHP.															
331	1964	Base Oil and Gas Storage	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
Building 331 is not yet 50 years old, and has served as a storage facility since its construction in 1964. The building did not have an important Cold War function and does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.															
20216	1965	Post Office Main	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
Building 20216 is not yet 50 years old, and does not meet requirements for NRHP Criteria Consideration G. As a post office, it does not have Cold War or exceptional significance. As such, it is recommended as not eligible to the National Register.															
382	1965	Auto Maintenance Administration	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
Building 382 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as an administrative facility since its construction in 1965. As such, it is not exceptionally significant, and is recommended as not eligible to the National Register.															
1911	1965	Officers Quarters	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
Building 1911 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as housing since 1965, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.															
1056	1965	Base Supply and Equipment Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
Building 1056 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has been a supplies warehouse since its construction, and is not exceptionally significant. It has also undergone alteration, causing a significant loss of integrity. As such, it is recommended as not eligible to the National Register.															
1055	1965		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
Building 1055 is not 50 years old, has suffered loss of architectural integrity, and does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.															
1054	1965	Lounge, Dayroom	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
Building 1054 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a recreation or education facility since its construction, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.															
608	1966	Equipment Testing Laboratory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑
During the Cold War, Building 608 served as a storage facility for AFWL test equipment and instrumentation vans when not being used in the field. This building is not yet 50 years old, and the use is not exceptional. As such, it is recommended as not eligible for the NRHP.															

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20604	1966	General Instruction Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20604 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The building served as part of the Defense Atomic Support Agency's Nuclear Weapons School. However it has suffered an extensive loss of integrity due to the replacement of doors, and addition of a new stucco overlay in geometric panels with a large band at the roofline, and Post Modern entrance portico. The building now reads as a Post Modern structure, and as such is recommended as not eligible to the National Register.
1022	1966	Base Ammunition Storage	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Building 1022 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1966. As such, it is recommended as not eligible to the National Register.
418	1966	Laboratory, Physics, Science	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 418 is not yet 50 years old and does not meet the NRHP requirements for Criteria Consideration G. It was a physics lab and is not exceptionally significant. As such, this property is recommended as not eligible to the National Register.
1058	1966	Auto Maintenance Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not yet 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has served as a vehicle maintenance shop since its construction, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
48065	1967	Laboratory, Radiation, Science	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 48065 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. t served as the Cobalt 60 radiation source for the Kirtland Ionization Radiation Complex, where testing was conducted on animals during the late 1960s. However, the complex did not have a significant Cold War function. The building is not architecturally significant, and the site has changed dramatically since the era of the Radiation Annex. As such, it is recommended as not eligible to the National Register.
48062	1967	Farm Facility	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 48062 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built in 1967 as a storage facility and has served in a support capacity since that date. As such, it is recommended as not eligible to the National Register.
48063	1967	Farm Facility	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 48062 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built in 1967 as a storage facility and has served in a support capacity since that date. As such, it is recommended as not eligible to the National Register.
908	1968	Dynamics Environment Science Laboratory	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 908 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It is a prefabricated storage facility for building 909. As such, it is recommended as not eligible to the National Register.
57006	1968	Base Paint and Sealer Storage	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 57006 is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as storage since its construction. As such, it is recommended as not eligible to the National Register.

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585	1968	Recreation Gymnasium	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	This building is not 50 years old and does not meet the requirements for NRHP Criteria Consideration G. It has been a gymnasium since its construction. As such, it is recommended as not eligible to the National Register.
201	1968	NCO Open Mess	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not yet 50 years old and because it was used as a mess hall throughout the Cold War, it does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible for the National Register.
20320	1968	Bank	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20320 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It served as a bank from its construction in 1968 until 1998, and therefore has no Cold War significance. As such, it is recommended as not eligible to the National Register.
510	1968	Traffic Check House	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 510 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
886	1968	Traffic Check House	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 886 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has no Cold War significance, as it has served as a Traffic Check House since its construction in 1968. It has also undergone significant alterations from its original character. As such, it is recommended as not eligible to the National Register.
48058	1968	Farm Facility	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 48058 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built in 1968 as a shelter for animals and has served in that capacity since that date. As such, it is recommended as not eligible to the National Register.
412	1968	Nuclear Engineering Test Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 412 served as a data processing center. It does not meet the NRHP requirements for Criteria Consideration G, and as such is recommended as not eligible to the National Register.
325	1968	Equipment Research Laboratory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 325 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a calibration facility for laboratory equipment and as such does not have exceptional significance. It is recommended as not eligible to the NRHP.
255	1969	Petroleum Operations Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 255 is not yet 50 years old, and not exceptionally significant. As such, it is recommended as not eligible for the National Register.
1009	1969	Avionics Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1009 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as an aircraft maintenance shop since its construction in 1969, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.

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57008	1969	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 57008 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It served as a storage facility for conventional explosives for shock tube testing. As such, it does not have exceptional significance and is recommended as not eligible to the National Register.
57010	1969	Civil Engineering Science Laboratory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 57010 served as storage for shock tube tests; it is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
749	1970	Paint Storage	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 749 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has functioned as storage for paint and other materials. As such, it is recommended as not eligible to the National Register.
907	1970	Base Supply and Equipment Warehouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 907 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has served as a storage facility since its construction in 1970. As such, it is recommended as not eligible to the National Register.
621	1970	Equipment Research Laboratory	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 621 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1970. As such, it is recommended as not eligible to the National Register.
944	1970	Open Mess, Consolidated	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 944 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. Having served as a dining hall since its construction, it does not have exceptional significance. As such, it is recommended as not eligible to the National Register.
20757	1970	Other (Concrete Slab)	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Structure 20757 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The original concrete slab for assembling equipment prior to EMP testing is now covered with a prefabricated fluted aluminum building. As such, it has been significantly altered and is recommended as not eligible to the National Register or contributing to the EMP Simulation Historic District.
66009	1970	Laser Science Laboratory	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 66009 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as storage since its construction in 1970. As such, it is recommended as not eligible to the National Register.
48059	1970	Unknown	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 48059 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built in 1970 and served as a support structure for the Riding Club. As such, it is recommended as not eligible to the National Register.

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330	1970	Shop, Aircraft Maintenance Engine Inspectio	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 330 is not 50 years old, was used for engine maintenance, and as such does not have exceptional Cold War significance. The facility does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
66007	1970	Laser Science Laboratory	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 66007 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a support facility since its construction in 1970. As such, it is recommended as not eligible to the National Register.
66005	1970	Electric Power Station Building	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 66005 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a support facility since its construction in 1970. As such, it is recommended as not eligible to the National Register.
66008	1971	Base Supply and Equipment Shed	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 66008 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a machine shop since its construction in 1971. As such, it is recommended as not eligible to the National Register.
66006	1971	Security Police Sentry House	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 66006 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It had a minor support role for the Starfire Optical Range and its integrity has been altered by the replacement of doors and windows. As such, it is recommended as not eligible to the National Register.
945	1971	Post Office, Center	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 945 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It served as a post office from its construction in 1971 to 1982, when it was taken over by explosive ordnance disposal. After 1987, it began functioning as a training building for pararescue activity. As such, it is recommended as ineligible to the National Register.
57007	1972	Vehicle Maintenance Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 57007 is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a shop to maintain vehicles since its construction. As such, it is recommended as not eligible to the National Register.
954	1972	Arts and Crafts Center	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 954 is not 50 years old, and served as an Arts and Crafts Center from 1972 to 1987. It is not associated with the Cold War, and doesn't meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
1031	1973	Aircraft Maintenance Engine Inspection and	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1031 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as an engine inspection shop since its construction in 1973. As such, it is recommended as not eligible to the National Register.

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20684	1973	Base Engineer Administration	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20684 is not yet 50 years old, and does not meet requirements for NRHP Criteria Consideration G. As an administrative building for the base engineer, it does not exhibit exceptional significance. As such, it is recommended as not eligible for the National Register.
406	1973	Laser Science Laboratory	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 406 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It is a prefabricated support facility for the building 400 complex. As such, it is recommended as not eligible to the National Register.
57009	1973		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 57009 served as storage for shock tube tests; it is not yet 50 years old and does not meet NRHP requirements for Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
48066	1973	Riding Stables	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 48066 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was constructed in 1973 as a stable. As such, it is recommended as not eligible to the National Register.
48067	1973	Riding Stables	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 48067 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was constructed in 1973 as a stable. As such, it is recommended as not eligible to the National Register.
1059	1974	Security Police Operations	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1059 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has served as a police headquarters since its construction in 1974, and is not exceptionally significant. It has also undergone alteration, causing a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
756	1975	Unknown	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 756 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has been a maintenance support building to the munitions storage facilities since its erection in 1970. As such, it is recommended as not eligible to the National Register.
421	1975	Laboratory, Laser, Science	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 421 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It is a prefabricated support facility for the building 400 complex, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
407	1975	Laboratory, Laser, Science	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 907 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It is a prefabricated support facility for the building 400 complex. As such, it is recommended as not eligible to the National Register.

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66011	1975	Propulsion Research Laboratory, Fuel and L	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 66011 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built as part of the early Sandia Optical Range, the USAF's first high energy laser facility. However, the building served in a functional support capacity as a location for storing and maintaining rocket fuel propellant. As such, it is not exceptionally signfiicant and is recommended as not eligible to the National Register.
906	1975		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 906 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It is a prefabricated storage facility for building 909. As such, it is recommended as not eligible to the National Register.
20793	1975	Water Fire Pumping Station	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	No	☑	Building 20793 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. Though the Real Property record has not been updated, the current building replaced the original building on this site sometime after 2001. As such, this property is recommended as not eligible to the National Register.
1060	1976	Avionics Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1060 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as an aircraft maintenance shop for avionics systems since its construction, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
758	1976	Water Fire Pumping Station	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 758 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a water pump house since its construction in 1976. As such, it is recommended as not eligible to the National Register.
767	1976	Storage, Liquid Oxygen	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 767 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility and equipment repair shop since its construction in 1976. As such, it is recommended as not eligible to the National Register.
1061	1976	Aircraft Maintenance Engine Inspection and	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1061 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as an engine maintenance facility since its construction, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
22014	1976	Swimmers Bath House	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 22014 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has served as a bath house since its construction in 1976. As such, it is recommended as not eligible to the National Register.
90002	1977	Fire Station	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 90002 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a fire station since its construction in 1977. As such, it is recommended as not eligible to the National Register.

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2457	1977	Storage Magazine, Aboveground Type A, B	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Structure 2457 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1977. As such, it is not exceptionally Cold War significant and is recommended as not eligible to the National Register.
410	1977	Research Data Services Center	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 410 is not 50 years old and does not meet NRHP requirements of exceptional significance for Criteria Consideration G. It served as a data processing installation from 1977 to the present, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
20170	1978		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20170 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a base exchange since its construction in 1978. As such, it is recommended as not eligible to the National Register.
28054	1978	Golf Course Clubhouse	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 28054 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It was built in 1978 as a golf clubhouse, and is not Cold War significant. As such, it is recommended as not eligible to the National Register.
57011	1979	Laboratory, Civil Engineering Science	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 57011 is not yet 50 years old and does not meet the NRHP requirements for Criteria Consideration G. It has functioned as administrative offices since its construction in 1979. As such, it is not exceptional, and is recommended as not eligible to the National Register.
2705	1980		Object	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Monument 2705 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The aircraft has been painted, and is not flight worthy, resulting in a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
2704	1980		Object	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Monument 2704 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The aircraft has been painted, and is not flight worthy, resulting in a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
2703	1980		Object	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Monument 2703 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The aircraft has been painted, and is not flight worthy, resulting in a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
2702	1980		Object	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Monument 2702 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The aircraft has been painted, and is not flight worthy, resulting in a significant loss of integrity. As such, it is recommended as not eligible to the National Register.

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2701	1980		Object	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Monument 2701 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The aircraft has been painted, and is not flight worthy, resulting in a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
66029	1981	Headquarters Specified	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 66029 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as administrative offices since its construction in 1981, post the era of the Airborne Laser Laboratory, a significant Cold War defense research project that took place at the Starfire Optical Range. As such, it is recommended as not eligible to the National Register.
28061	1981	Base Engineer Pavement and Grounds Facil	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 28061 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a groundskeeping facility for the golf course since its construction in 1981. As such, it is recommended as not eligible to the National Register.
770	1982	Storage, Research Equipment	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 770 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1982. As such, it is recommended as not eligible to the National Register.
2706	1983		Object	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Monument 2706 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. The aircraft has been painted, and is not flight worthy, resulting in a significant loss of integrity. As such, it is recommended as not eligible to the National Register.
48057	1983	Riding Stables	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 48057 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built in 1983 as a support building for the KAFB Riding Club. As such, it is recommended as not eligible to the National Register.
1063	1983	Fuel Cell/ Corrosion Control Facility	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1063 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a fuel cell maintenance facility since its construction, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
20698	1983		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20698 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. Its function as a vehicle wash rack is not Cold War significant. As such, it is recommended as not eligible to the National Register.
1037	1983		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1037 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as an aircraft fueling facility since its construction in 1983, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.

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20160	1983		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20160 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has been a child care center since its construction in 1983. As such, it is recommended as not eligible to the National Register.
887	1983		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 887 has been an administrative/support facility since its construction in 1983. It is less than 50 years old, and does not meet NRHP requirements for Criteria Consideration G. As such it is recommended as not eligible to the National Register.
891	1983		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 891 has been an administrative/support facility since its construction in 1983. It is not yet 50 years old and does not meet the NRHP requirements for Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
20450	1983	Communications Facility	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20450 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a support building for a communications facility since its construction in 1983, and is not exceptionally significant. It has also suffered a loss of architectural integrity due to the addition of the paneled aluminum overhang and fluted soffit, stucco, the tile band on the walls, new windows and doors. As such, it is recommended as not eligible to the National Register.
1046	1983	Weapons and Release Systems Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1046 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a weapons systems maintenance shop since its construction in 1983. As such, it is recommended as not eligible to the National Register.
1064	1983		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1064 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a base engineer maintenance shop since its construction in 1983, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
435	1984	Headquarters Specified	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 435 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It is a temporary facility that was added to provide extra office space, and does not have exceptional Cold War significance. As such, it is recommended as not eligible to the National Register.
433	1984	Headquarters Specified	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 435 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It is a temporary facility that was added to provide extra office space, and does not have exceptional Cold War significance. As such, it is recommended as not eligible to the National Register.
48069	1984	Riding Stable	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 48069 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a stable since its construction in 1984. As such, it is recommended as not eligible to the National Register.

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402	1985	Unknown	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 402 is not yet 50 years old and does not meet NRHP Criteria Consideration G. It has been a data processing installation, an administrative function, almost since its construction. As such, it is recommended as not eligible to the National Register.
20376	1985		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20376 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has functioned as a storage facility since its construction in 1985. As such, it is recommended as not eligible to the National Register.
20366	1985		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20366 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a guard shack since its construction in 1985. As such, it is recommended as not eligible to the National Register.
20369	1985		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☑	Building 20369 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a security facility since its construction in 1985, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
20365	1986	Vehicle Service Rack	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Structure 20365 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built in 1986 as a carwash facility. As such, it is recommended as not eligible to the National Register.
20664	1987		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20664 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a storage facility in 1987, and as such is not Cold War significant. It is recommended as not eligible to the National Register.
20300	1987	Hardin Field	Site	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	The parade ground is not yet 50 years old and is not exceptionally significant under the Cold War context. As such it does not meet the requirements for Criteria Consideration G and is recommended as not eligible to the National Register.
999	1987		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 999 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It served as a warehouse between its construction in 1987 and the end of the Cold War in 1989. As such, it is recommended as not eligible to the National Register.
20665	1987		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20665 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a storage facility in 1987, and as such is not Cold War significant. It is recommended as not eligible to the National Register.

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763	1987		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	No Response Yet	☐	Structure 763 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1987. As such, it is not exceptionally significant, and is recommended as not eligible to the National Register.
902	1987	Laboratory, Radiation, Science	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 902 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It is a prefabricated building that was built to study infrared radiation effects. It is not exceptionally significant, and as such, is recommended as not eligible to the National Register.
20666	1987		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20666 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a storage facility in 1987, and as such is not Cold War significant. It is recommended as not eligible to the National Register.
20657	1988		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20657 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a storage facility in 1988, and as such is not Cold War significant. It is recommended as not eligible to the National Register.
20245	1988		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20245 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
20706	1988		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20706 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a maintenance facility since its construction in 1988. As such, it is recommended as not eligible to the National Register.
20655	1988		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20655 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage shed since its construction in 1988. As such, it is recommended as not eligible to the National Register.
1926	1988	Security Police Entry Control Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1926 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has no Cold War significance, as it has served as a guard house since its construction in 1968. It has also undergone significant alterations from its original character. As such, it is recommended as not eligible to the National Register.
66017	1988		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 66017 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as administrative offices since its construction in 1988, post the era of the Airborne Laser Laboratory, a significant Cold War defense research project that took place at the Starfire Optical Range. As such, it is recommended as not eligible to the National Register.

KAFB No	Constructed	Historic Name	NRHP Category / Criteria / Consideration / Type										Overall Integ. Intact	SHPO Concurrence.	Form Complete	Status Explanation
			Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name				
20180	1988		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20180 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a commissary since its construction in 1988. As such, it is recommended as not eligible to the National Register.
66014	1988		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 66014 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as administrative offices since its construction in 1988, post the era of the Airborne Laser Laboratory, a significant Cold War defense research project that took place at the Starfire Optical Range. As such, it is recommended as not eligible to the National Register.
20667	1988		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20667 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built as a storage facility in 1988, and as such is not Cold War significant. It is recommended as not eligible to the National Register.
639	1989	Not applicable	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 639 is an open air storage facility. It is not yet 50 years old and does not meet NRHP criteria for exceptional significance. As such, it is not eligible for the National Register.
1200	1989		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1200 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It has been a hospital since its construction in 1989. As such, it is recommended as not eligible to the National Register.
1024	1989		Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1024 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a hazardous storage facility since its construction in 1989. As such, it is recommended as not eligible to the National Register.
20129	1989		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20129 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
20399	1989	Warehouse Supply and Equipment Base	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20399 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It was built in 1989 and has been used as a storage facility since. As such, it is recommended as not eligible to the National Register.
20416	1989	Storage, Research Equipment	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20416 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as a storage facility since its construction in 1989, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
29054	1989	Testing, Ammunition, Explosives and Toxics	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20954 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built in 1989 and has served as an ammunition and explosives testing facility. As such, it is not exceptionally significant and is recommended as not eligible to the National Register.

KAFB No	Const ructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
640	1989	Not applicable	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 640 is an open air storage facility. It is not yet 50 years old and does not meet NRHP criteria for exceptional significance. As such, it is not eligible for the National Register.
20400	1989	Vehicle Operations Administration	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20400 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was constructed in 1989, and has served as an administrative office since. As such, it is recommended as not eligible to the National Register.
20168	1989		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20168 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as an animal clinic since its construction in 1989. As such, it is recommended as not eligible to the National Register.
1048	1989		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1048 is not 50 years old, and does not meet NRHP requirements for Criteria Consideration G. It has served as an administrative building for a hazardous waste storage facility since its construction in 1989. As such, it is recommended as not eligible to the National Register.
1049	1989		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1049 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It has served as a warehouse storage facility since its construction in 1989, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
20707	1989	Security Police Entry Control Building	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20707 is not 50 years old and does not meet NRHP requirements for Criteria Consideration G. It was built in 1989 as a guard house, and is not exceptionally significant. As such, it is recommended as not eligible to the National Register.
22016	1990	Headquarters, Group	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It was built in 1990 as an administration and greeting building for the Officers Club area. As such, it is recommended as not eligible to the National Register.
641	1990	Not applicable	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 641 is a solid waste storage facility. It is not yet 50 years old and does not meet NRHP criteria for exceptional significance. As such, it is not eligible for the National Register.
619	1990	Headquarters, Specified	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building was built in 1990, and as such is not eligible for the National Register.
1205	1991		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1205 is not 50 years old, has served as a dental clinic since its construction, and does not meet NRHP requirements for Criteria Consideration G. As such, it is recommended as not eligible to the National Register.

KAFB No	Const ructed	Historic Name	Cat.	A	B	C	D	G	Ind. Elig.	Cont. to District	Non-Cont. to District	District Name	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
1079	1993		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 1079 is not 50 years old and does not meet requirements for NRHP Criteria Consideration G. It has served as a medical facility since its construction in 1993. As such, it is recommended as not eligible to the National Register.
20724	1995		Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20724 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
949	1996	Not applicable	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 949 is not 50 years old, was constructed after the Cold War, and does not meet NRHP Criteria Consideration G. As such, it is recommended as not eligible to the National Register.
20147	1999	Exchange Branch	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 20147 is not 50 years old, and does not meet requirements for NRHP Criteria Consideration G. It was built in 1999. As such, it is recommended as not eligible to the National Register.
29053	c. 1944	Carpenter Shop	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	Building 29053 is more than 50 years old, but does not meet NRHP requirements for Criteria A or C. It was built as part of the New Mexico Proving Ground for constructing aircraft replicas for proximity fuze testing. However the building has suffered a significant loss of integrity. All of the original windows have been filled in, the building has been stuccoed, and the original west elevation covered porch replaced. A water tower attached to the south elevation of 29053 has been demolished. This building no longer has a feeling or association with the NMPG, and as such is recommended as not eligible to the National Register.
48061	c. 1960s	Support Structure	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	The KAFB Real Property date of construction for this building is listed as 1983, however it appears to date from the 1960s. It was likely a support facility for the Kirtland Ionization Radiation Annex, where animal testing was conducted during the 1960s. However, the complex did not have a significant Cold War function. As such, this building does not meet NRHP requirements for Criteria Consideration G, and is recommended as not eligible to the National Register.
29024	post 194	Storage Igloo	Structure	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	It is not known the exact date that structure 29024 was built, though it was after 1946 and it was a replacement for the original igloo. As it was built after 1946, it was not constructed for the New Mexico Proving Ground, WWII proving grounds for the testing of the proximity fuze, and falls out the range of the period of significance for the area. As such, it does not meet NRHP requirements for Criterion A, and is recommended as not eligible to the National Register.
399	Unknow	Unknown	Building	☐	☐	☐	☐	☐	☐	☐	☐		☐	Yes	☑	The Real Property database notes the construction of building 399 as 1988, but records go back to 1981 when it was known as building R-23. In 1984, it was numbered 399. Building seems to have served as supplemental office space, and as such does not have exceptional significance and is recommended as not eligible to the National Register.

APPENDIX D:

PROPERTIES EXEMPT FROM SURVEY

PA Exempt Properties Report

Historic Theme: BLANK

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Overall Integ. Intact	SHPO Concurrence.	Form Complete
Status Explanation							
2624	1942		Taxiway	Non-structural	☐	No Response Yet	☑
1097	1942		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
2607	1942		Apron	Non-structural	☐	No Response Yet	☑
2618	1942		Taxiway	Non-structural	☐	No Response Yet	☑
2619	1942		Taxiway	Non-structural	☐	No Response Yet	☑
2487	1942		Storm Drainage Disposal	Minimal surface manifestation	☐	No Response Yet	☑
2620	1942		Taxiway	Non-structural	☐	No Response Yet	☑
2480	1942		Fire Hydrant	Minimal surface manifestation	☐	No Response Yet	☑
2475	1942		Water Distribution Mains	Minimal surface manifestation	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
2621	1942		Taxiway	Non-structural	☐	No Response Yet	☑	
2622	1942		Taxiway	Non-structural	☐	No Response Yet	☑	
2610	1942		Apron	Non-structural	☐	No Response Yet	☑	
2470	1942		Sanitary Sewage Main	Minimal surface manifestation	☐	No Response Yet	☑	
2604	1942		Apron	Non-structural	☐	No Response Yet	☑	
2625	1942		Taxiway	Non-structural	☐	No Response Yet	☑	
2460	1942		Gas Mains	Minimal surface manifestation	☐	No Response Yet	☑	
2666	1942		Road	Non-structural	☐	No Response Yet	☑	
2443	1942		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑	
2442	1942		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑	
2441	1942		Distribution Line, Primary, Underground	Minimal surface manifestation	☐	No Response Yet	☑	

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2440	1942		Distribution Line, Primary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑
2421	1942		Storage, Diesel Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2402	1942		Pipeline, Liquid Fuels	Minimal surface manifestation	☐	No Response Yet	☑
2623	1942		Taxiway	Non-structural	☐	No Response Yet	☑
2652	1944		Storage, Civil Engineering**	Non-structural	☐	No Response Yet	☑
2675	1944		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑
2680	1944		Sidewalk	Non-structural	☐	No Response Yet	☑
2606	1944		Apron	Non-structural	☐	No Response Yet	☑
2445	1944		Electric Substation	Transformer station	☐	No Response Yet	☑
2472	1944		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
2473	1944		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑

KAFB No Status Explanation	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
2455	1945		Steam Heating Mains	Minimal surface manifestation	☐	No Response Yet	☑
2608	1945		Apron	Non-structural	☐	No Response Yet	☑
2667	1945		Road	Non-structural	☐	No Response Yet	☑
1608	1946		Railroad Trackage	Minimal surface manifestation	☐	No Response Yet	☐
20070	1947		Fence, Security	Non-structural	☐	No Response Yet	☑
26017	1947		Electric Power Station Building	Transformer station	☐	No Response Yet	☑
20071	1947		Fence, Boundary	Non-structural	☐	No Response Yet	☑
21871	1947		Water Tank	Does not meet Criteria Consideration G	☐	Yes	☑
20012	1947		Distribution Line, Primary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑
20002	1947		Distribution Line, Secondary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑
20080	1947		Water Distribution Mains	Minimal surface manifestation	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur- ence.	Form Com- plete	Status Explanation
2580	1948		Fence, Boundary	Non-structural	☐	No Response Yet	☑	
20014	1949		Gas Mains	Minimal surface manifestation	☐	No Response Yet	☑	
20013	1949		Steam Heating Mains	Minimal surface manifestation	☐	No Response Yet	☑	
20023	1949		Sidewalk	Non-structural	☐	No Response Yet	☑	
20015	1949		Sanitary Sewage Main	Minimal surface manifestation	☐	No Response Yet	☑	
20018	1949		Road	Non-structural	☐	No Response Yet	☑	
20020	1949		Road	Non-structural	☐	No Response Yet	☑	
20024	1949		Storage, Open, Base Supply	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
20025	1949		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑	
20374	1949		Water Well	Wells and bore holes	☐	No Response Yet	☑	
20428	1949		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑	

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20425	1949		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20426	1949		Storage, Solvents	Above-ground fuel tank	☐	No Response Yet	☑
20427	1949		Vehicle Fueling Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20064	1949		Storm Drainage Disposal	Minimal surface manifestation	☐	No Response Yet	☑
20050	1949		Railroad Trackage	Minimal surface manifestation	☐	No Response Yet	☐
2611	1949		Overrun, Paved	Non-structural	☐	No Response Yet	☑
21998	1949		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑
26026	1950		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20550	1950		Water Well	Wells and bore holes	☐	No Response Yet	☑
20372	1950		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
26025	1950		Water Well	Wells and bore holes	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
23902	1950		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
23901	1950		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
23900	1950		Water Well	Wells and bore holes	☐	No Response Yet	☑
20230	1950		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20551	1950		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20370	1950		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20373	1950		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
20334	1951		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
2417	1951		Light, Taxiway	Non-structural	☐	No Response Yet	☑
2416	1951		Light, Obstruction	Non-structural	☐	No Response Yet	☑
21001	1951		Recreation Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
1096	1951		Lighting, Taxiway	Non-structural	☐	No Response Yet	☑
20138	1951		Tennis Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑
281	1951		Base Engineer Pavements and Grounds Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20335	1951		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
888	1952		Water Supply Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20214	1952		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
2450	1952		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
20386	1952		Recreation Building, Miscellaneous	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2465	1952		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
2603	1952		Apron	Non-structural	☐	No Response Yet	☑
20231	1952		Tennis Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
22009	1952		Tennis Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20043	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
20037	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
20038	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
20237	1953		Athletic Field, Football/Soccer	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2655	1953		Curbs & Gutters	Non-structural	☐	No Response Yet	☑
889	1953		Water Supply Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
403	1953		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20042	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2444	1953		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
20041	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20039	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
20040	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
20044	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2405	1953		Fuel Stand, Liquid, Unloading	Above-ground fuel tank	☐	No Response Yet	☑
2403	1953		Fuel Stand, Liquid Truck Fill	Above-ground fuel tank	☐	No Response Yet	☑
2404	1953		Fuel Stand, Liquid Truck Fill	Above-ground fuel tank	☐	No Response Yet	☑
2401	1953		Fuel Stand, Liquid Truck Fill	Above-ground fuel tank	☐	No Response Yet	☑
20036	1953		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2400	1953		Hydrant Fueling System	Minimal surface manifestation	☐	No Response Yet	☑
22999	1953		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1032	1953		Operations Building, Petroleum	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2628	1953		Apron	Non-structural	☐	No Response Yet	☑
1033	1953		Pump Station, Liquid Fuel	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2636	1953		Pad, Aircraft Washrack	Non-structural	☐	No Response Yet	☑
2420	1953		Storage, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2422	1953		Storage, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
26039	1954		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
997	1954		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑
1036	1954		Operations Building, Petroleum	Does not meet Criteria Consideration G	☐	No Response Yet	☑
998	1954		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑
1011	1954		Storage, Liquid Oxygen	Above-ground fuel tank	☐	No Response Yet	☑
2552	1955		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2553	1955		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2483	1955		Fire Protection Water Storage	Minimal surface manifestation	☐	No Response Yet	☑
20662	1955		Electric Power Station Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20798	1955		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
22006	1955		Swimming Pool Water Treatment	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20227	1956		Recreation Building, Miscellaneous	Does not meet Criteria Consideration G	☐	No Response Yet	☑
904	1956		Heating Fuel Oil Storage	Above-ground fuel tank	☐	Yes	☑
20345	1957		Compressed Air Plant Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2696	1957	Loading and Unloading Area	Load and Unloading Platform	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2695	1957	Loading and Unloading Area	Load and Unloading Platform	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2609	1957		Apron	Non-structural	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
470	1957		Vehicle Fueling Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2664	1957		Road	Non-structural	☐	No Response Yet	☑
2647	1957		Storage, Open, Base Supply	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2582	1958		Fence, Security	Non-structural	☐	No Response Yet	☑
2548	1958		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2581	1958		Fence, Interior	Non-structural	☐	No Response Yet	☑
20034	1958		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑
2446	1958		Traffic Lights	Non-structural	☐	No Response Yet	☑
2482	1958		Fire Protection Water Main	Minimal surface manifestation	☐	No Response Yet	☑
2495	1958		Utility Line Ducts	Minimal surface manifestation	☐	No Response Yet	☑
20032	1958		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
2481	1958		Water Supply Main Non-Potable	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
2643	1959		Shoulder, Paved	Non-structural	☐	No Response Yet	☑	
2642	1959		Shoulder, Paved	Non-structural	☐	No Response Yet	☑	
2659	1960		Driveway	Non-structural	☐	No Response Yet	☑	
48002	1960		Water Distribution Mains	Minimal surface manifestation	☐	No Response Yet	☑	
48001	1960		Distribution Line, Primary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑	
2439	1960		Distribution Line, Secondary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑	
2676	1960		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑	
2547	1960		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
2590	1960		Load and Unloading Platform	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
2510	1960		Range, Small Arms, System	Does not meet Criteria Consideration G	☐	No Response Yet	☑	

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
48003	1960		Sanitary Sewage Main	Minimal surface manifestation	☐	No Response Yet	☑	
57026	1961		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑	
57030	1961		Sanitary Sewage Main	Minimal surface manifestation	☐	No Response Yet	☑	
57029	1961		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑	
20379	1961		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
57028	1961		Distribution Line, Primary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑	
57022	1961		Road	Non-structural	☐	No Response Yet	☑	
2419	1961		Storage, Special Liquids	Above-ground fuel tank	☐	No Response Yet	☑	
57025	1961		Road	Non-structural	☐	No Response Yet	☑	
2637	1961		Pad, Equipment	Non-structural	☐	No Response Yet	☑	
486	1961		Pad, Aircraft Washrack	Non-structural	☐	No Response Yet	☑	

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20010	1961		Telephone Pole Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2658	1961		Driveway	Non-structural	☐	No Response Yet	☑
57027	1961		Water Distribution Mains	Minimal surface manifestation	☐	No Response Yet	☑
2556	1961		Tennis Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1039	1961		Storage, Liquid Oxygen	Above-ground fuel tank	☐	No Response Yet	☑
2677	1961		Vehicle Parking, Operations	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2506	1961		Deflector, Blast	Non-structural	☐	No Response Yet	☑
2505	1961		Blast Deflector	Non-structural	☐	No Response Yet	☑
48004	1961		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
2462	1962		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
1016	1962		Shop, Aircraft Support Equipment/Storage Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2678	1962		Vehicle Parking, Refueling	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2591	1962		Weighing Scale	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2679	1962		Storage Yard, Aircraft Support Equipment	Non-structural	☐	No Response Yet	☑
23800	1962		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
48006	1962		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
48005	1962		Fence, Interior	Non-structural	☐	No Response Yet	☑
2557	1962		Athletic Field, Standard	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2507	1963		Deflector, Blast	Non-structural	☐	No Response Yet	☑
1023	1963		Weighing Scale	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2447	1963		Electric Switching Station	Transformer station	☐	No Response Yet	☑
2508	1963		Deflector, Blast	Non-structural	☐	No Response Yet	☑

KAFB No Status Explanation	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
525	1963		Sanitary Latrine	Minimal surface manifestation	☐	No Response Yet	☑
48009	1963		Distribution Line, Secondary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑
48008	1963		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
2429	1964		Storage, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
2427	1964		Storage, Diesel Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2516	1964		Support, Aircraft Arresting System	Non-structural	☐	No Response Yet	☑
2515	1964		Support, Aircraft Arresting System	Non-structural	☐	No Response Yet	☑
2428	1964		Storage, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
22008	1964		Swimming Pool Water Treatment	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20718	1964		Recreation Building, Miscellaneous	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1026	1964		Storage, Base Hazardous	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No Status Explanation	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
1041	1964		Pump Station, Liquid Fuel	Does not meet Criteria Consideration G	☐	No Response Yet	☑
57032	1964		Sidewalk	Non-structural	☐	No Response Yet	☑
1027	1964		Shed, Base Supply and Equipment	Does not meet Criteria Consideration G	☐	No Response Yet	☑
57033	1964		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
57034	1964		Gas Mains	Minimal surface manifestation	☐	No Response Yet	☑
20016	1964		Traffic Lights	Non-structural	☐	No Response Yet	☑
57035	1964		Fence, Security	Non-structural	☐	No Response Yet	☑
2617	1964		Shoulder, Paved	Non-structural	☐	No Response Yet	☑
48010	1965		Sidewalk	Non-structural	☐	No Response Yet	☑
2411	1965		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
57036	1965		Fence, Interior	Non-structural	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2629	1965		Taxiway	Non-structural	☐	No Response Yet	☑
2558	1965		Recreation Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2410	1965		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2494	1965		Compressed Air Distribution	Minimal surface manifestation	☐	No Response Yet	☑
2509	1965		Vehicle Fueling Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2571	1965		Private Vehicle Parking Compound	Non-structural	☐	No Response Yet	☑
2644	1965		Shoulder, Paved	Non-structural	☐	No Response Yet	☑
2530	1965		Vehicle Service Rack	Does not meet Criteria Consideration G	☐	No Response Yet	☑
29076	1965		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1057	1965		Storage, Liquid Oxygen	Above-ground fuel tank	☐	No Response Yet	☑
48012	1966		Road	Non-structural	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
48011	1966		Road	Non-structural	☐	No Response Yet	☑
20067	1966		Fire Alarm System, Manual, Exterior	Minimal surface manifestation	☐	No Response Yet	☑
2521	1966		Vehicle Service Rack	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20597	1966		Sewage Treatment and Disposal	Minimal surface manifestation	☐	No Response Yet	☑
2673	1967		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑
2648	1967		Storage, Open, Base Supply	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2564	1967		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1003	1968		Storage, Base Hazardous	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2407	1968		Remote Con Cir	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20422	1968		Base Engineer Pavements and Grounds Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2593	1968		Support Structure	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2412	1969		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2413	1969		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2645	1969		Shoulder, Paved	Non-structural	☐	No Response Yet	☑
28049	1970		Golf Course, Eighteen Hole	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20553	1970		Water Supply Non-Potable Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2565	1970		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2545	1970		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
66035	1970		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
66030	1970		Distribution Line, Primary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑
2474	1970		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
2649	1970		Storage, Open, Base Supply	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
23299	1970		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20758	1970		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
20756	1970		Vehicle/Equipment Parking Research and Developme	Non-structural	☐	No Response Yet	☑
21999	1970		Recreation Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1912	1970		Swimming Pool Water Treatment	Does not meet Criteria Consideration G	☐	No Response Yet	☑
26038	1970		Electric Power Station Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
66020	1970		Fence, Interior	Non-structural	☐	No Response Yet	☑
20081	1970		Water Supply Main Non-Potable	Does not meet Criteria Consideration G	☐	No Response Yet	☑
25999	1970		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
66050	1970		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑
66004	1970		Electric Power Station Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Overall Integ. Intact	SHPO Concurrence.	Form Complete
Status Explanation							
28053	1970		Water Supply Non-Potable Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
66025	1970		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
1014	1970		Water Supply Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2575	1970		Swimming Pool, Officer	Does not meet Criteria Consideration G	☐	No Response Yet	☑
332	1970		Storage, Liquid Oxygen	Above-ground fuel tank	☐	No Response Yet	☑
20011	1971		Remote Con Cir	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20131	1971		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20301	1971		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20207	1971		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20601	1971		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20759	1971		Storage, Research Equipment	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Overall Integ. Intact	SHPO Concurrence.	Form Complete
Status Explanation							
20759a	1971		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
66032	1971		Distribution Line, Primary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
2671	1971		Private Vehicle Parking Compound	Non-structural	☐	No Response Yet	☑
66031	1971		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
2536	1971		Base Flag Pole	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2567	1971		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2670	1971		Vehicle Parking, Operations	Does not meet Criteria Consideration G	☐	No Response Yet	☑
28031	1972		Water Pump Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
28033	1972		Electric Substation	Transformer station	☐	No Response Yet	☑
2549	1972		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2546	1972		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2551	1972		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
28030	1972		Water Supply Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2568	1972		Athletic Field, Standard	Does not meet Criteria Consideration G	☐	No Response Yet	☑
66012	1972		Utility Line Ducts	Minimal surface manifestation	☐	No Response Yet	☑
602	1972		Firing-In	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20760	1972		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
66057	1973		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
22013	1973		Electric Substation	Transformer station	☐	No Response Yet	☑
66013	1973		Electric Power Station Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
66027	1973		Sanitary Sewage Main	Minimal surface manifestation	☐	No Response Yet	☑
20017	1973		Telephone Duct Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
1065	1973		Storage, Base Hazardous	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
66026	1973		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑	
20701	1974		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑	
66028	1974		Storm Drainage Disposal	Minimal surface manifestation	☐	No Response Yet	☑	
20699	1974		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑	
2638	1974		Telephone Duct Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
2466	1974		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑	
2632	1974		Shoulder, Paved	Non-structural	☐	No Response Yet	☑	
2631	1974		Taxiway	Non-structural	☐	No Response Yet	☑	
66021	1974		Fence, Security	Non-structural	☐	No Response Yet	☑	
48054	1974		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑	

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
501	1974		Billboard	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2630	1974		Taxiway	Non-structural	☐	No Response Yet	☑
20009	1974		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
66055	1974		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑
20008	1974		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
66060	1974		Road	Non-structural	☐	No Response Yet	☑
21006	1974		Billboard	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2633	1974		Shoulder, Paved	Non-structural	☐	No Response Yet	☑
66033	1974		Distribution Line, Secondary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
769	1974		Electric Substation	Transformer station	☐	No Response Yet	☑
66036	1974		Electric Substation	Transformer station	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20421	1975		Support Structure, Ant.	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2511	1975		Range, Small Arms, System	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2408	1975		Storage, Special Liquids	Above-ground fuel tank	☐	No Response Yet	☑
2406	1975		Storage, Special Liquids	Above-ground fuel tank	☐	No Response Yet	☑
57024	1975		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
66056	1975		Sidewalk	Non-structural	☐	No Response Yet	☑
20145	1975		Electric Power Station Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20371	1975		Water Supply Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20060	1975		Taxiway	Non-structural	☐	No Response Yet	☑
20001	1975		Distribution Line, Primary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
2409	1975		Storage, Special Liquids	Above-ground fuel tank	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur- ence.	Form Com- plete
Status Explanation							
20208	1975		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
20761	1975		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
20209	1975		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
27500	1975		Solid Waste Disposal Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2537	1975		Monuments/Memorial	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20799	1975		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
20795	1975		Storm Drainage Pumping Station	Minimal surface manifestation	☐	No Response Yet	☑
20791	1975		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑
20003	1975		Distribution Line, Secondary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
20090	1975		Fire Hydrant	Minimal surface manifestation	☐	No Response Yet	☑
20021	1975		Retaining Wall	Non-structural	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concurrence.	Form Complete
Status Explanation							
20019	1975		Road	Non-structural	☐	No Response Yet	☑
28070	1975		Water Supply Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2513	1976		Fireman Training Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2612	1976		Apron	Non-structural	☐	No Response Yet	☑
20314	1976		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
2698	1976		Vehicle/Equipment Parking Research and Developme	Non-structural	☐	No Response Yet	☑
2572	1976		Support Structure	Does not meet Criteria Consideration G	☐	No Response Yet	☑
66067	1976		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
20315	1976		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
759	1976		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
66066	1976		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
66068	1976		Support Structure	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20031	1976		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑
66065	1976		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
2700	1976		Fire Alarm System, Manual, Exterior	Minimal surface manifestation	☐	No Response Yet	☑
66064	1976		Sewage Treatment and Disposal	Minimal surface manifestation	☐	No Response Yet	☑
66063	1976		Gas Mains	Minimal surface manifestation	☐	No Response Yet	☑
66062	1976		Utility Line Ducts	Minimal surface manifestation	☐	No Response Yet	☑
20215	1976		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
2699	1976		Retaining Wall	Non-structural	☐	No Response Yet	☑
66070	1976		Telephone Duct Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
768	1976		Storage, Liquid Oxygen	Above-ground fuel tank	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
766	1976		Storage, Liquid Oxygen	Above-ground fuel tank	☐	No Response Yet	☑
20312	1976		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20311	1976		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
2697	1976		Vehicle/Equipment Parking Research and Developme	Non-structural	☐	No Response Yet	☑
20313	1976		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
66069	1976		Storage Special Fuels	Above-ground fuel tank	☐	No Response Yet	☑
20419	1976		Fireman Training Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1004	1977		Telecommunications Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
90001	1977		Pad, Helicopter	Non-structural	☐	No Response Yet	☑
90003	1977		Light, Runway	Non-structural	☐	No Response Yet	☑
90004	1977		Driveway	Non-structural	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
90005	1977		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
90009	1977		Distribution Line, Secondary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
90008	1977		Distribution Line, Primary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑
28032	1977		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
90006	1977		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
2503	1977		Support, Aircraft Arresting System	Non-structural	☐	No Response Yet	☑
20318	1977		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
90000	1977		Shoulder, Paved	Non-structural	☐	No Response Yet	☑
90007	1977		Sanitary Sewage Main	Minimal surface manifestation	☐	No Response Yet	☑
20004	1977		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
20109	1978		Electric Substation	Transformer station	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
57031	1978		Electric Substation	Transformer station	☐	No Response Yet	☑
25951	1978		Electric Substation	Transformer station	☐	No Response Yet	☑
57017	1978		Telephone Duct Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
90010	1978		Short Field Takeoff and Landing	Non-structural	☐	No Response Yet	☑
2448	1978		Electric Substation	Transformer station	☐	No Response Yet	☑
28056	1978		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑
20303	1978		Electric Substation	Transformer station	☐	No Response Yet	☑
20173	1978		Electric Substation	Transformer station	☐	No Response Yet	☑
20238	1978		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20027	1978		Curbs & Gutters	Non-structural	☐	No Response Yet	☑
2449	1978		Electric Substation	Transformer station	☐	No Response Yet	☑

KAFB No Status Explanation	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
20565	1978		Storage, Special Liquids	Above-ground fuel tank	☐	No Response Yet	☑
20171	1978		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑
20172	1978		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑
2583	1979		Recreation Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2459	1979		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20418	1979		Fireman Training Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20062	1979		Pad, Calibration	Non-structural	☐	No Response Yet	☑
57023	1979		Distribution Line, Primary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
2452	1979		Storage, Solvents	Above-ground fuel tank	☐	No Response Yet	☑
20309	1980		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
2587	1980		Recreation Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20304	1980		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
20305	1980		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
25870	1980		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2519	1980		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
2533	1980		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2538	1980		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2539	1980		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2585	1980		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2518	1980		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
24250	1980		Family Camping Area	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2584	1980		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2588	1980		Recreation Court	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20999	1980		Utility Vault	Minimal surface manifestation	☐	No Response Yet	☑
2600	1980		Taxiway	Non-structural	☐	No Response Yet	☑
2601	1980		Taxiway	Non-structural	☐	No Response Yet	☑
2602	1980		Apron	Non-structural	☐	No Response Yet	☑
2586	1980		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2566	1981		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2650	1981		Storage, Open, Air Freight/Traffic Management Surfa	Does not meet Criteria Consideration G	☐	No Response Yet	☑
48100	1981	Training Aid	Training Aids	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20702	1981		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
20907	1981		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20905	1981		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑
20904	1981		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑
2569	1981		Athletic Field, Baseball	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20703	1981		Storage Tank, Miscellaneous	Above-ground fuel tank	☐	No Response Yet	☑
20661	1981		Compressed Air Plant Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20902	1981		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑
20354	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1007	1982		Electric Power Station Building	Does not meet Criteria Consideration G	☐	Yes	☑
27925	1982		Training Aids	Does not meet Criteria Consideration G	☐	No Response Yet	☑
27926	1982		Training Aids	Does not meet Criteria Consideration G	☐	No Response Yet	☑
27928	1982		Training Aids	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20307	1982		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
27933	1982		Radioactive Waste Burial Site	Minimal surface manifestation	☐	No Response Yet	☑
27935	1982		Radioactive Waste EU/Site	Minimal surface manifestation	☐	Yes	☑
27934	1982		Radioactive Waste EU/Site	Minimal surface manifestation	☐	Yes	☑
2594	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
27929	1982		Training Aids	Does not meet Criteria Consideration G	☐	No Response Yet	☑
27930	1982		Training Aids	Does not meet Criteria Consideration G	☐	No Response Yet	☑
27932	1982		Training Aids	Does not meet Criteria Consideration G	☐	No Response Yet	☑
27927	1982		Training Aids	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20232	1982		Recreation Pavilion, Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2514	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2454	1982		Cathodic Protection System	Minimal surface manifestation	☐	No Response Yet	☑
20297	1982		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20298	1982		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
2535	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20108	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20223	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20217	1982		Electric Power Station Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2595	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20197	1982		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
2589	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2592	1982		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete	Status Explanation
20054	1982		Cathodic Protection System	Minimal surface manifestation	☐	No Response Yet	☑	
2451	1982		Storage, Operating, AvGas	Above-ground fuel tank	☐	No Response Yet	☑	
2478	1983		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑	
20159	1983		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
20233	1983		Recreation Pavilion, Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑	
20033	1983		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑	
20316	1983		Storage, Operating, Diesel	Above-ground fuel tank	☐	Yes	☑	
2458	1983		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑	
2461	1983		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑	
2471	1983		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑	
2477	1983		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑	

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2485	1983		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20750	1983		Electric Power Station Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2534	1983		Base Flag Pole	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2544	1983		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2560	1983		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2613	1983		Pad, Arming and Disarming	Minimal surface manifestation	☐	No Response Yet	☑
20559	1983		Sanitary Sewage Pump Station	Minimal surface manifestation	☐	No Response Yet	☑
2476	1983		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
27501	1983		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
29100	1983		Support Structure, Ant.	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20447	1983		Support Structure, Ant.	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
637	1983		Support Structure, Ant.	Does not meet Criteria Consideration G	☐	No Response Yet	☑
57021	1984		Fire Hydrant	Minimal surface manifestation	☐	No Response Yet	☑
20903	1984		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑
20901	1984		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑
66038	1984		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
2469	1984		Industrial Waste Main	Minimal surface manifestation	☐	No Response Yet	☑
66039	1984		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
757	1984		Load and Unloading Platform	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20906	1984		Water Supply Storage, Non-Potable	Above-ground fuel tank	☐	No Response Yet	☑
2541	1984		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
48007	1984		Fire Hydrant	Minimal surface manifestation	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20306	1984		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20106	1985		Billboard	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2453	1985		Electric Substation	Transformer station	☐	No Response Yet	☑
2438	1985		Distribution Line, Secondary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
2615	1985		Wind Direction Indicator	Does not meet Criteria Consideration G	☐	No Response Yet	☑
588	1985		Billboard	Does not meet Criteria Consideration G	☐	No Response Yet	☑
28051	1985		Sanitary Latrine	Minimal surface manifestation	☐	No Response Yet	☑
2501	1985		Deflector, Blast	Non-structural	☐	No Response Yet	☑
24251	1985		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
479	1985		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
335	1985		Billboard	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
1066	1985		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20343	1985		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1067	1986		Athletic Field, Softball	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20235	1986		Swimming Pool Water Treatment	Does not meet Criteria Consideration G	☐	No Response Yet	☑
27498	1986		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20558	1986		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20557	1986		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
20022	1986		Private Vehicle Parking Compound	Non-structural	☐	No Response Yet	☑
28062	1986		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
20556	1986		Storage, Operating, Jet Fuel	Above-ground fuel tank	☐	No Response Yet	☑
57019	1986		Distribution Line, Secondary, Overhead	Minimal surface manifestation	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
1073	1986		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
1072	1986		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
257	1986		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
1070	1986		Operations Building, Petroleum	Does not meet Criteria Consideration G	☐	No Response Yet	☑
57018	1986		Distribution Line, Secondary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
66034	1986		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20337	1986		Load and Unloading Platform	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20333	1986		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
66046	1986		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
66049	1986		Sanitary Latrine	Minimal surface manifestation	☐	No Response Yet	☑
66051	1986		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
710	1986		Flagpole	Does not meet Criteria Consideration G	☐	Yes	☑
90012	1986		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
905	1986		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
995	1986		Storage, Base Hazardous	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1071	1986		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
20800	1986		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
20801	1986		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
22015	1986		Athletic Field, Football/Soccer	Does not meet Criteria Consideration G	☐	No Response Yet	☑
2517	1986		Support, Aircraft Arresting System	Non-structural	☐	No Response Yet	☑
20302	1987		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20663	1987		Recreation Pavilion, Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No Status Explanation	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
2484	1987		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20310	1987		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
2468	1987		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
1035	1987		Electric Power Station Building	Does not meet Criteria Consideration G	☐	No Response Yet	☑
48053	1987	Storage, Open, Research and Development	Storage, Open, Research and Development	Minimal surface manifestation	☐	No Response Yet	☑
20317	1987		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
2540	1987		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20035	1987		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑
1006	1987		Compressed Air Plant Building	Does not meet Criteria Consideration G	☐	Yes	☑
20705	1987		Storage, Open, Base Civil Engineer	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20182	1988		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20359	1988		Vehicle Fueling Station	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20607	1988		Monument/Memorial	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20396	1988		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20028	1988		Vehicle Parking, Operations	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20709	1988		Storage, Water Tank	Above-ground fuel tank	☐	No Response Yet	☑
20710	1988		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
20712	1988		Storage, Heating Fuel Oil	Above-ground fuel tank	☐	No Response Yet	☑
28063	1988		Storage, Operating, Diesel	Above-ground fuel tank	☐	No Response Yet	☑
20026	1988		Private Vehicle Parking Compound	Non-structural	☐	No Response Yet	☑
28064	1988		Storage, Operating, Motor Gas	Above-ground fuel tank	☐	No Response Yet	☑
20355	1988		Recreation Pavilion, Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
20166	1989		Curbs & Gutters	Non-structural	☐	No Response Yet	☑
1264	1989		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑
1262	1989		Road	Non-structural	☐	No Response Yet	☑
1260	1989		Curbs & Gutters	Non-structural	☐	No Response Yet	☑
59004	1989		Pad, Equipment	Non-structural	☐	No Response Yet	☑
59005	1989		Support Structure, Ant.	Does not meet Criteria Consideration G	☐	No Response Yet	☑
23265	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
21997	1989		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
59006	1989		Fence, Security	Non-structural	☐	No Response Yet	☑
24099	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
23049	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Constructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
861	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
22200	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1290	1989		Water Distribution Mains	Minimal surface manifestation	☐	No Response Yet	☑
23030	1989		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1266	1989		Storm Drainage Disposal	Minimal surface manifestation	☐	No Response Yet	☑
20165	1989		Vehicle Parking, Non-Organizational	Non-structural	☐	No Response Yet	☑
59000	1989		Road	Non-structural	☐	No Response Yet	☑
25899	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
20247	1989		Utility Line Ducts	Minimal surface manifestation	☐	No Response Yet	☑
29057	1989		Sewage Septic Tank	Minimal surface manifestation	☐	No Response Yet	☑
203	1989		Utility Line Ducts	Minimal surface manifestation	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
23145	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
25007	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1286	1989		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
587	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1267	1989		Gas Mains	Minimal surface manifestation	☐	No Response Yet	☑
59001	1989		Distribution Line, Secondary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
59002	1989		Lighting, Exterior Area	Non-structural	☐	No Response Yet	☑
1282	1989		Distribution Line, Primary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
1268	1989		Fence, Security	Non-structural	☐	No Response Yet	☑
1270	1989		Sidewalk	Non-structural	☐	No Response Yet	☑
584	1989		Bus Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
1272	1989		Water Supply Main Non-Potable	Does not meet Criteria Consideration G	☐	No Response Yet	☑
59003	1989		Telephone Pole Facility	Does not meet Criteria Consideration G	☐	No Response Yet	☑
1284	1989		Distribution Line, Secondary, Underground	Minimal surface manifestation	☐	No Response Yet	☑
1288	1989		Sanitary Sewage Main	Minimal surface manifestation	☐	No Response Yet	☑
1292	1989		Steam Heating Mains	Minimal surface manifestation	☐	No Response Yet	☑
1294	1989		Distributuion Line, Cold Water Exterior	Minimal surface manifestation	☐	No Response Yet	☑
1296	1989		Fire Hydrant	Minimal surface manifestation	☐	No Response Yet	☑
28052	1998		Water Well	Wells and bore holes	☐	No Response Yet	☑
940	2000		Base Flag Pole	Does not meet Criteria Consideration G	☐	No Response Yet	☑

Historic Theme: None

20142			AMB Shelter	Does not meet Criteria Consideration G	☐	No Response Yet	☑

KAFB No	Const ructed	Historic Name	Real Estate Name	PA Exemption	Over-all Integ. Intact	SHPO Concur-ence.	Form Com-plete
Status Explanation							
2605	1944		Pad, Dangerous Cargo	Minimal surface manifestation	☐	No Response Yet	☑
249	1970		Storage, Liquid Oxygen	Above-ground fuel tank	☐	No Response Yet	☑
.							
409	1972		Laboratory, Laser, Science	Does not meet Criteria Consideration G	☐	No Response Yet	☑
256	1977		Utility Vault	Minimal surface manifestation	☐	No Response Yet	☑
254	1978		Recreation Facility, Miscellaneous Outdoor	Does not meet Criteria Consideration G	☐	No Response Yet	☑