DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

19 Jun 2006

MEMORANDUM FOR INTERESTED INDIVIDUALS, ORGANIZATIONS, PUBLIC GROUPS AND GOVERNMENT AGENCIES

FROM: HQ ACC/A7Z
129 Andrews Street, Suite 102
Langley AFB, VA 23665-2969

SUBJECT: Draft Environmental Assessment for Transforming the 49th Fighter Wing's Combat Capability

1. We are pleased to provide you with a copy of the Draft Environmental Assessment for the proposed Transformation of the 49th Fighter Wing's Combat Capability at Holloman Air Force Base, New Mexico. The transformation will replace the retiring F-117A and supporting T-38A aircraft with two new F-22A squadrons. This document is provided in accordance with the National Environmental Policy Act of 1969 (Public Law 91-190, 42 United States Code Sections 4321-4347), and it's implementing regulations (40 CFR Parts 1500-1508). Libraries are requested to file this document for public access and reference. The document is also available on www.A7ZPintegratedplanning.org.

2. Written comments should be sent to the below address or faxed to (757) 896-1525:

Ms. Linda DeVine
c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

3. Submittal of your comments is requested on or before 24 July 2006. Please direct specific questions about this project to the Holloman Public Affairs Office at (505) 752-5406. Thank you for your participation in the Environmental Impact Analysis Process.

MARY ANN H. CHISHOLM
Colonel, USAF
Chief, Programs Division

1 Attachment:
Draft EA

Global Power For America

Environmental Assessment

Transforming the 49th Fighter Wing's Combat Capability

America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

DRAFT

June 2006

Environmental Assessment
Transforming the 49th Fighter Wing's Combat Capability
Holloman AFB, New Mexico

Our goal is to give you a reader-friendly document that provides an in-depth, accurate analysis of potential environmental consequences. The organization of this Draft Environmental Assessment, or Draft EA, is shown below. This EA focuses on the base in Chapter 3.0 and the surrounding airspace in Chapter 4.0. Section 2.8 describes the environmental resources addressed in this EA.

Executive Summary

Chapter 1.0 Purpose and Need to Transform the 49 FW at Holloman AFB
- 1.1 Background
- 1.2 Purpose of Transformation to F-22A Aircraft
- 1.3 Need for Advanced 49 FW Capabilities

Chapter 2.0 Description of Proposed Action and Alternatives
- 2.1 Proposed Action
- 2.2 Alternative A
- 2.3 No Action Alternative
- 2.4 Identification of Alternatives
- 2.5 Environmental Impact Analysis Process
- 2.6 Regulatory Compliance
- 2.7 Environmental Comparison of Alternatives
- 2.8 Environmental Resource Definition, ROI, and Applicable Laws

Chapter 3.0 Holloman AFB Affected Environment and Consequences
- 3.1 Airspace Management and Air Traffic Control
- 3.2 Noise
- 3.3 Safety
- 3.4 Air Quality
- 3.5 Physical Resources
- 3.6 Biological Resources
- 3.7 Cultural Resources
- 3.8 Land Use and Transportation
- 3.9 Socioeconomics
- 3.10 Environmental Justice

Chapter 4.0 Training Airspace Affected Environment and Consequences
- 4.1 Airspace Management
- 4.2 Noise
- 4.3 Safety
- 4.4 Air Quality
- 4.5 Physical Resources
- 4.6 Biological Resources
- 4.7 Cultural Resources
- 4.8 Land Use and Recreation
- 4.9 Socioeconomics
- 4.10 Environmental Justice

Chapter 5.0 Cumulative Effects

Chapter 6.0 References

Chapter 7.0 List of Preparers

Appendices: CD (Hard Copy Available)

How to Use This Document

This Environmental Assessment (EA) is prepared to help the reader understand the environmental consequences of the Proposed Action to transform the 49th Fighter Wing at Holloman AFB. Please review Chapter 1.0 and 2.0 to learn the purpose and details of the proposed transformation of the 49 FW, the retirement of F-117A and T-38A aircraft and the beddown of F-22A aircraft.

Chapter 3.0 explains the environmental consequences of aircraft operations and proposed renovation and construction program at Holloman AFB. The No Action Alternative is also addressed.

Chapter 4.0 explains the environmental consequences of F-22A routinely training within 100 nautical miles of Holloman AFB in New Mexico special use airspace. The No Action Alternative is also addressed.

The box to the left summarizes the EA contents. The cover sheet provides the address where you can send written comments after you review this Draft EA.

Acronyms and Abbreviations can be found on the last page of this document.

Cover Sheet

DRAFT ENVIRONMENTAL ASSESSMENT FOR TRANSFORMING THE 49TH FIGHTER WING'S COMBAT CAPABILITY

a. *Responsible Agency:* United States Air Force (Air Force)

b. *Proposals and Actions:* The Air Force proposes to transform the 49th Fighter Wing (49 FW) at Holloman Air Force Base (AFB) from its F-117A low-observability penetration role to the next generation F-22A with air-to-ground and air superiority capabilities. The Proposed Action is to replace 50 F-117A and associated 14 T-38A aircraft with 36 plus 4 backup F-22A aircraft. This transformation would occur over a period of 5 years and require 26 renovation and construction improvement projects (on approximately 4 acres of previously disturbed land) with a total cost of $37 million. Personnel changes would reduce assigned and other personnel by an estimated 321 positions. The Proposed Action includes enhancements to training airspace within 100 nautical miles (nm) of Holloman AFB. The F-22A would routinely fly at supersonic speeds to attain an advantage in attack and defense. F-22A pilots would employ defensive RR-188 (or equivalent) chaff and MJU-10/B (or equivalent) flares during training. Chaff and flare use is proposed over the White Sands Missile Range (WSMR) and McGregor Range. Defensive flare use is also proposed in the Cowboy Air Traffic Control Assigned Airspace (ATCAA), Beak Military Operations Area (MOA)/ATCAAs, and Talon MOA/ATCAAs. Alternative A would transform the 49 FW by replacing the aircraft, renovating and constructing facilities, and transitioning personnel as described for the Proposed Action. Alternative A does not include the airspace enhancements, although some changes to the use of airspace over WSMR would permit supersonic training and chaff and flare use throughout WSMR restricted airspace. No Action at Holloman means no transformation of the 49 FW from F-117A to next generation F-22A aircraft.

c. *Comments and Inquiries:* Written comments on this document should be directed to Ms. Linda DeVine, Project Manager, c/o SAIC, 22 Enterprise Parkway, Suite 200, Hampton, VA 23666. They may also be faxed to 757-896-1525. Telephone inquiries may be made to Holloman AFB Public Affairs at 505-572-5406.

d. *Designation:* Draft EA

e. *Abstract:* This EA has been prepared in accordance with the National Environmental Policy Act (NEPA). The public and agency scoping process focused the analysis on the following environmental resources: airspace management, noise, safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice. The Proposed Action would result in a decrease in aircraft operations and therefore not effect Holloman AFB airspace management, safety or air quality. Off-base land area subjected to a Day/Night L_{dn} of 65 decibels (dB) or greater subsonic noise would be reduced as would subsonic noise over White Sands National Monument. Renovation and construction in previously disturbed base areas would result in no significant effects to physical and biological resources. Buildings proposed for renovation or demolition are not on the National Register of Historic Places (NRHP). No long term effects to land use or transportation are anticipated. Short-term regional socioeconomic stimulation is anticipated from renovation and construction. Long-term personnel and population reductions are anticipated from the transformation. Off-base housing demand and secondary employment would be reduced. There would be no disproportionate effects upon minorities or low-income populations or children. Alternative A has the same consequences as the Proposed Action at Holloman AFB.

F-22A training in existing airspace would result in minimal changes to subsonic onset rate-adjusted L_{dn} under the Cowboy, Beak, Talon, and northern portion of WSMR airspaces. Subsonic noise increases of 5 to 10 dB over the southern portion of WSMR and McGregor Range would remain below 55 dB (potential impacts not expected). Supersonic training would substantially increase sonic booms from 1 to 2 per month to 20 to 25 per month in the populated areas of the Cowboy ATCAA, including 12 to 18 per month over the Mescalero Reservation, and from 5 per month to 45 per month toward the center of WSMR. The White Sands National Monument Headquarters increases from 5 to approximately 30 per month. Sonic boom overpressure would not pose a health or other risk but could damage windows, rattle shelves, and increase annoyance to residents and long-term visitors from 1 percent to approximately 6 percent highly annoyed toward the center of WSMR and 4 percent under portions of the Cowboy ATCAA. This supersonic activity could result in vibration effects to historic buildings, temporary effects to some wildlife, and annoyance to humans.

Alternative A would have 10 to 20 booms per month on the western edge of Cowboy ATCAA and no change in the majority of the Cowboy ATCAA because supersonic training would be concentrated in WSMR. WSMR sonic booms increase from 5 per month to up to 80 per month toward the center of the airspace. Sonic booms over White Sands National Monument Headquarters would increase from 5 to approximately 40 per month. The percent of highly annoyed individuals is expected to increase from an existing 1 percent to a projected 8 percent.

The No Action Alternative has the potential to reduce the capabilities of the 49 FW, reduce the capabilities for United States required low-observability air-to-ground missions, and increase the future costs of deploying F-22A aircraft.

DRAFT

FINDING OF NO SIGNIFICANT IMPACT

NAME OF PROPOSED ACTION: Transforming the 49th Fighter Wing's Combat Capability, Holloman Air Force Base (AFB), New Mexico.

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES: The United States Air Force (Air Force) proposes to transform the 49 FW from its F-117A low-observability penetration role to the next generation F-22A. The transformation from F-117A to F-22A aircraft would replace existing low-observability fighter assets with the most advanced capabilities and enable the Air Force to achieve rapid worldwide objectives. Holloman AFB is the only U.S. base with F-117A aircraft and provides the infrastructure, including facilities, management experience, and training airspace to support the next generation precision penetration F-22A aircraft. Thirty-six primary and 4 backup F-22A would replace 50 F-117A and associated 14 T-38A trainer aircraft over a period of 3 to 5 years. A total of 26 renovation, construction, or infrastructure improvement projects with a total cost of $37 million would occur on 4 acres of previously disturbed Holloman AFB land. Total personnel assigned to or working at Holloman AFB would be reduced by an estimated 321 positions.

The F-22A would routinely fly at supersonic speeds to attain an advantage in attack and defense for air-to-ground and air-to-air missions. Airspace enhancements within 100 nautical miles (nm) of Holloman AFB would permit the F-22A to realistically train and deploy RR-188 (or equivalent) chaff and MJU-10/B (or equivalent) defensive flares. Proposed airspace enhancements affect Air Traffic Control Assigned Airspace (ATCAAs) above 18,000 feet mean sea level (MSL) (see Figure ES-1). Chaff and flare use is proposed over WSMR and McGregor Ranges. Defensive flare use is also proposed in the Cowboy, Beak, and Talon airspaces.

ALTERNATIVES TO THE PROPOSED ACTION: Alternative A would transform the 49 FW by replacing the F-117A and T-38A aircraft with F-22A aircraft, renovating and constructing facilities, and transitioning personnel as described for the Proposed Action, but would not include the airspace enhancements described in the Proposed Action and would permit supersonic training and chaff and flare use throughout WSMR only. Under the No Action Alternative, transformation of the 49 FW from F-117A to next generation F-22A aircraft would not occur. No Action would continue F-117A and T-38A aircraft at Holloman AFB.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES: The public and agency scoping process focused the analysis on the following environmental resources: airspace management, noise, safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice. Each resource is discussed below for environmental consequences.

Airspace Management and Air Traffic Control. Holloman AFB airspace management would not be impacted by the transformation and daily operations would decrease 11.5 percent compared to existing. Connecting ATCAAs with a floor of 18,000 feet above mean sea level (MSL) and lowering the floor of Cowboy ATCAA from 30,000 feet to 23,000 feet MSL would not affect civil aircraft, including those using Sierra Blanca Airport. Airspace recreational activities in or near the Lincoln National Forest or the Sacramento Mountains, including hang gliding, would not be affected. Use of defensive chaff equivalent to RR-188 training chaff would not interfere with Federal Aviation Administration (FAA) air traffic control radars. Raising the ceiling of Talon ATCAAs would require scheduling and coordination between Air Force and FAA controllers. The Proposed Action in conjunction with existing and proposed Army and other missions at WSMR could restrict some training and missions within the airspace.

Noise. Day/night average sound levels (L_{dn}) would decrease although base housing and other on-base facilities could experience higher noise levels from individual noise events. Construction noise would be minimal and within existing airfield noise contours. Subsonic onset rate adjusted day/night average sound level (L_{dnmr}) would have no discernible difference under the Cowboy, Beak, Talon, and northern portion of WSMR airspaces. Subsonic noise over the southern portion of WSMR and McGregor Range would noticeably increase but remain below 55 L_{dnmr} (no adverse impacts expected). Supersonic training would

increase sonic booms from 1 to 2 to 20 to 25 per month under populated areas of the Cowboy ATCAA, from 5 per month to 45 per month toward the center of WSMR, and to 5 to 8 per month in the northern part of El Paso and Fort Bliss. The average sonic boom overpressure for this type of activity is approximately 1 pound per square foot (psf) and would not pose a health or other risk. Sonic booms could damage glass, plaster, or vibrate shelves and increase annoyance to residents and long-term visitors from 1 percent to approximately 6 percent highly annoyed under WSMR and from 1 to 4 percent under the Cowboy ATCAA. In addition to annoyance, sonic booms have the potential to damage structures. For the magnitude of boom associated with the Proposed Action, the probability of structure damage is extremely small, but is a concern nonetheless. At 1 psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). At 10 psf, the probability of breakage is between one in a hundred and one in a thousand (Haber and Nakaki 1989).

Safety. No substantive changes are expected to flight, ground, or other safety aspects. Bird-aircraft strike hazard (BASH) would be somewhat lessened because the F-22A spends less time where species fly at lower altitudes. Training ordnance use is substantially less for the F-22A than the F-117A. Personnel are trained and facilities are adequate to handle proposed levels of ordnance, chaff, and flares. F-22A improved electronics and maintenance are expected to result in long-term Class A accident rate comparable to that of the similarly sized F-15C aircraft. Enhanced F-22A electronics substantially improve situational awareness of other aircraft in the airspace. Both participating and non-participating aircraft in the MOA and ATCAA are responsible for applying see-and-avoid safety measures. Restrictions on flare use during periods above high fire danger and altitude restrictions of 2,000 feet above ground level (AGL) for flare deployment at any time reduce any potential for fire risk.

Air Quality. Alamogordo area is in air quality attainment for all criteria pollutants. Temporary construction emissions would produce localized short-term elevated air pollutant concentrations. No change is projected to air quality within the Alamogordo area and no conformity determination is required. Change in training aircraft would not affect air quality under the airspace or visibility in any Class 1 area.

Physical Resources. Existing hazardous materials facilities support low-observability coatings of F-117A and F-22A aircraft. No significant on-base effects. Sonic booms and associated vibration would not affect soil, seasonal snow packs, or geologic formations. Chaff fibers thinner than a human hair, three to six 2-inch by 4-inch mylar pieces, and two 1-inch by 1-inch plastic pieces fall with each chaff bundle deployed. Chaff on the ground rapidly breaks down to silica and aluminum particles and becomes indistinguishable from native soils. Inert plastic pieces are not expected to affect soil or water. Each MJU-10/B defensive flare would deposit two 2-inch by 2-inch plastic pieces, one 1-inch by 1-inch by 2-inch Safe & Initiation (S&I) device, and one up to 4-inch by 12-inch aluminum-coated mylar wrapping on the ground. Plastic or mylar pieces that result from chaff or flare deployment would not be in concentrations that could affect soil or water resources.

Biological Resources. Renovation or construction on previously disturbed ground would not be expected to impact sensitive biological species. Birds and mammals associated with the base and its environs are habituated to noise and other activity. F-22A ability to rapidly climb above the normal altitude of migrating waterfowl and other birds should somewhat reduce BASH potential.

Subsonic noise changes are not expected to affect wildlife. The increase in sonic booms may startle some animals. Wildlife under the airspaces have previously experienced thunder and thunder-like sonic booms at different levels and are expected to become habituated to additional thunder-like sounds. An estimated 45 sonic booms per month toward the center of WSMR airspace is not expected to significantly impact wildlife. Even after habituation, a sonic boom, as with thunder, could startle high strung or other animals in a pen or other restricted area. The increase in supersonic flight may affect, but is not likely to adversely affect, Mexican spotted owl, northern aplomado falcon, or bald eagle. Mylar wrappings from chaff and flare use are expected to degrade from exposure to sunlight and inert plastic pieces are not expected to affect biological resources, including native or domestic animals.

Cultural Resources. No building proposed for renovation or demolition is an historic structure. White Sands National Monument, adjacent to Holloman AFB, is expected to have reduced subsonic off-base 65 dB noise contours. Subsonic noise is not expected to significantly affect historic properties. Sonic booms cause vibrations that could affect historic properties under the airspace, including within White Sands National Monument, the Mescalero Apache Reservation, and Holloman AFB. Historic structures in good condition would not be expected to be impacted, but structures or windows in poor condition could be affected by sonic boom vibration. Approximately 12 to 18 sonic booms per month are projected on the Mescalero Apache Reservation and could result in increased annoyance to Native Americans and others.

Land Use. On-base renovation and construction is consistent with the base general plan. Land use near the base are not expected to be impacted by F-22A overflights. Increased sonic booms are expected to occur over workplaces, residential, recreational, hunting, and fishing areas under all airspaces. The largest numbers of residences under the training airspace subject to sonic booms are located under the Cowboy ATCAA and include the city of Alamogordo, the villages of LaLuz, Tularosa, Carriozo, Capitan, Ruidoso, Ruidoso Downs, Cloudcroft, and Mescalero, low-density rural settlements in the Sacramento Mountains, and other communities. The increased frequency of sonic booms would not be expected to affect land use or land use patterns, ownership, or management. Chaff and flare residual pieces would not affect land use, but, if identified by a resident, rancher, or recreationist, the individual could be annoyed.

Socioeconomics. Renovation and construction would create 175 construction jobs. Authorized and other positions at Holloman AFB would reduce by 321 jobs. Anticipated population decline of 674 persons is approximately 2 percent of Alamogordo's population. Off-base housing demand would be reduced by approximately 227 units. Secondary employment is projected to be reduced by approximately 99 positions. Depending upon F-117A retirement, renovation and construction, and introduction of F-22A aircraft, socioeconomic effects in Alamogordo could proportionately result from a decline of base authorized personnel of up to approximately 25 percent before personnel stabilized at approximately 5.3 percent below existing authorizations. Sonic booms under Cowboy ATCAA in residential and tourist areas may annoy residents or long-term visitors but would not be expected to significantly affect general activities under airspace. Specific economic activities associated with horse races at Ruidoso Downs or other recreational activities, including hunting or seeking solitude, could be affected by the number of sonic booms. Lumber, recreational, and gaming industries in the Sacramento Mountains are partially supported by an economically viable Alamogordo and Holloman AFB and could be affected by an economic downturn at those locations.

Environmental Justice. Minority and low income populations in the Alamogordo area are comparable to those of the state of New Mexico. Sonic booms would not be expected to damage health or other environmental resources, although persons living on the Mescalero Apache Reservation and others under the airspace could be annoyed by up to 15 to 25 sonic booms per month. Game species such as elk and mule deer that contribute to the Mescalero economy would be expected to habituate, although an inopportune sonic boom could annoy a hunter. Sonic booms comparable to intense or distant thunder would be distributed throughout the airspace and no disproportionately high or adverse impacts on minority or low income communities would be expected. No disproportionate health or safety risks would be expected to affect children. A reduction in base and Alamogordo economic activity would have an unquantified but expectably adverse effect on the reservation tourism and gaming economy.

ALTERNATIVE A: Alternative A would have essentially the same base effects as the Proposed Action. Alternative A generally reduces sonic booms to areas under the Cowboy ATCAA when compared with the Proposed Action and substantially increases sonic booms to areas under and on the periphery of WSMR. This includes up to 80 sonic booms per month toward the center of WSMR, 30 to 40 per month at the White Sands National Monument Headquarters and at Holloman AFB, and 10 to 15 per month in Alamogordo, Fort Bliss, and the northern portion of El Paso. Chaff and flare use would also be concentrated on WSMR and McGregor Ranges. Alternative A would provide minimum training capabilities for the F-22A aircraft but would not provide multiple realistic training scenarios representative of combat situations.

NO ACTION ALTERNATIVE: No Action would continue F-117A and T-38A aircraft at Holloman AFB. The No Action Alternative has the potential to reduce the capabilities of the 49 FW, reduce the capabilities for U.S. required low-observability air-to-ground missions, and increase the future costs of deploying F-22A aircraft.

CONCLUSION: Based on the EA conducted in accordance with the requirements of the National Environmental Policy Act, the Council on Environmental Quality regulations, and implementing regulations set forth in 32 CFR 989 (Environmental Impact Analysis Process), as amended, it is concluded that implementation of the Proposed Action would not result in significant impacts to the quality of the human or natural environment. For these reasons, a finding of no significant impact (FONSI) is made and preparation of an Environmental Impact Statement (EIS) is not warranted.

_____ _____

NAME Date

Draft

Environmental Assessment Transforming the 49th Fighter Wing's Combat Capability

Public comments on this Draft EA are requested pursuant to the National Environmental Policy Act, 42 USC 4321, *et seq*. All written comments received during the comment period will be made available to the public and considered during Final EA preparation. The provision of private address information with your comment is voluntary and will not be released for any other purpose unless required by law. However, this information is used to compile the project mailing list and failure to provide it will result in your name not being included on the mailing list.

June 2006

Table of Contents

EXECUTIVE SUMMARY ES-1

1.0 PURPOSE AND NEED FOR TRANSFORMATION OF THE 49TH FIGHTER WING 1-1
1.1 Background 1-1
1.1.1 The F-22A Provides Next Generation Capabilities 1-3
1.1.2 Holloman AFB 1-4
1.1.3 Lead Agency 1-4
1.2 Purpose of 49 FW Transformation from F-117A to F-22A Aircraft 1-4
1.3 Need for 49 FW Transformation 1-7

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES 2-1
2.1 Proposed Action 2-1
2.1.1 Proposed Flight Activities 2-2
2.1.2 Proposed Base Facilities 2-2
2.1.3 Proposed Personnel Changes 2-7
2.1.4 Proposed Training Missions 2-7
2.1.5 Proposed Airspace and Use 2-11
2.1.6 Proposed F-22A Training within New Mexico Airspace 2-11
2.1.6.1 Air-to-Ground Training 2-15
2.1.6.2 Air-to-Air Training 2-16
2.1.6.3 Use of Defensive Countermeasures 2-16
2.2 Alternative A 2-17
2.2.1 Alternative A Base Activities 2-17
2.2.2 F-22A Missions within Training Airspace 2-18
2.2.3 Airspace Enhancements 2-18
2.2.4 Training within Alternative A Airspace 2-18
2.3 No Action Alternative 2-19
2.4 Identification of Alternatives 2-19
2.4.1 Identification of Reasonable Alternative 2-19
2.4.2 Alternative Considered But Not Carried Forward 2-20
2.5 Environmental Impact Analysis Process 2-20
2.5.1 Scope of Resource Analysis 2-21
2.5.2 Public and Agency Input 2-21
2.6 Regulatory Compliance 2-22
2.7 Environmental Comparison of Alternatives 2-22
2.8 Environmental Resource Definition, Region of Influence, and Applicable Laws 2-35
2.8.1 Airspace Management and Air Traffic Control 2-35
2.8.2 Noise 2-36
2.8.3 Safety 2-38
2.8.4 Air Quality 2-39
2.8.5 Physical Resources 2-40
2.8.6 Biological Resources 2-41
2.8.7 Cultural Resources 2-43
2.8.8 Land Use and Transportation 2-44
2.8.9 Socioeconomics 2-44
2.8.10 Environmental Justice 2-45

3.0 HOLLOMAN AFB AFFECTED ENVIRONMENT AND CONSEQUENCES 3-1
3.1 Airspace Management and Air Traffic Control 3-1
3.1.1 Existing Conditions 3-1
3.1.2 Environmental Consequences 3-1
3.1.2.1 Proposed Action 3-1

3.1.2.2 Alternative A 3-2
3.1.2.3 No Action 3-2
3.2 Noise 3-2
3.2.1 Existing Conditions 3-2
3.2.2 Environmental Consequences 3-5
3.2.2.1 Proposed Action 3-5
3.2.2.2 Alternative A 3-10
3.2.2.3 No Action 3-10
3.3 Safety 3-10
3.3.1 Existing Conditions 3-11
3.3.1.1 Safety Zones 3-11
3.3.2 Environmental Consequences 3-14
3.3.2.1 Proposed Action 3-14
3.3.2.2 Alternative A 3-14
3.3.2.3 No Action 3-14
3.4 Air Quality 3-15
3.4.1 Existing Conditions 3-15
3.4.2 Environmental Consequences 3-17
3.4.2.1 Proposed Action 3-18
3.4.2.2 Alternative A 3-19
3.4.2.3 No Action 3-19
3.5 Physical Resources 3-19
3.5.1 Existing Conditions 3-19
3.5.2 Environmental Consequences 3-23
3.5.2.1 Proposed Action 3-23
3.5.2.2 Alternative A 3-25
3.5.2.3 No Action 3-25
3.6 Biological Resources 3-25
3.6.1 Existing Conditions 3-26
3.6.1.1 Terrestrial Communities 3-26
3.6.1.2 Wetlands and Freshwater Aquatic Communities 3-27
3.6.1.3 Threatened and Endangered and Special Status Species 3-28
3.6.2 Environmental Consequences 3-28
3.6.2.1 Proposed Action 3-28
3.6.2.2 Alternative A 3-29
3.6.2.3 No Action 3-29
3.7 Cultural Resources 3-29
3.7.1 Existing Conditions 3-29
3.7.2 Environmental Consequences 3-30
3.7.2.1 Proposed Action 3-30
3.7.2.2 Alternative A 3-34
3.7.2.3 No Action 3-34
3.8 Land Use and Transportation 3-34
3.8.1 Existing Conditions 3-34
3.8.2 Environmental Consequences 3-39
3.8.2.1 Proposed Action 3-39
3.8.2.2 Alternative A 3-40
3.8.2.3 No Action 3-40
3.9 Socioeconomics 3-40
3.9.1 Existing Conditions 3-40
3.9.1.1 Demographics 3-40
3.9.1.2 Economic Activity 3-41

3.9.2 Environmental Consequences 3-42
3.9.2.1 Proposed Action 3-42
3.9.2.2 Alternative A 3-44
3.9.2.3 No Action 3-44
3.10 Environmental Justice 3-44
3.10.1 Existing Conditions 3-44
3.10.2 Environmental Consequences 3-45
3.10.2.1 Proposed Action 3-45
3.10.2.2 Alternative A 3-45
3.10.2.3 No Action 3-45

4.0 TRAINING AIRSPACE AFFECTED ENVIRONMENT AND CONSEQUENCES 4-1
4.1 Airspace Management and Control 4-1
4.1.1 Existing Conditions 4-1
4.1.2 Environmental Consequences 4-5
4.1.2.1 Proposed Action 4-5
4.1.2.2 Alternative A 4-6
4.1.2.3 No Action 4-6
4.2 Noise 4-6
4.2.1 Existing Conditions 4-8
4.2.1.1 Subsonic Flight 4-8
4.2.1.2 Supersonic Flight 4-9
4.2.2 Environmental Consequences 4-17
4.2.2.1 Proposed Action 4-17
4.2.2.2 Alternative A 4-18
4.2.2.3 No Action 4-18
4.3 Safety 4-18
4.3.1 Affected Environment 4-18
4.3.1.1 Training Areas/Ranges 4-18
4.3.1.2 Bird/Wildlife Strike Hazard 4-18
4.3.1.3 Mishap Rates for Training Aircraft 4-19
4.3.1.4 Defensive Countermeasures 4-19
4.3.2 Environmental Consequences 4-19
4.3.2.1 Proposed Action 4-19
4.3.2.2 Alternative A 4-20
4.3.2.3 No Action 4-21
4.4 Air Quality 4-21
4.4.1 Existing Conditions 4-21
4.4.2 Environmental Consequences 4-22
4.4.2.1 Proposed Action 4-22
4.4.2.2 Alternative A 4-23
4.4.2.3 No Action 4-23
4.5 Physical Resources 4-23
4.5.1 Existing Conditions 4-23
4.5.2 Environmental Consequences 4-24
4.5.2.1 Proposed Action 4-24
4.5.2.2 Alternative A 4-25
4.5.2.3 No Action 4-25
4.6 Biological Resources 4-25
4.6.1 Existing Conditions 4-25
4.6.1.1 Regional Vegetation 4-25
4.6.1.2 Regional Wildlife 4-28

4.6.1.3 Special-Status Species 4-28
4.6.2 Environmental Consequences....4-31
4.6.2.1 Subsonic Training 4-31
4.6.2.2 Supersonic Training....4-34
4.6.2.3 Chaff and Flares 4-36
4.6.2.4 Alternative A Aircraft Overflight 4-37
4.6.2.5 Alternative A Training Chaff and Flares 4-37
4.6.3 No Action....4-37
4.7 Cultural Resources....4-37
4.7.1 Existing Conditions 4-37
4.7.2 Environmental Consequences....4-39
4.7.3 Alternative A 4-40
4.7.4 No Action....4-41
4.8 Land Use....4-41
4.8.1 Existing Conditions 4-41
4.8.2 Environmental Consequences....4-46
4.8.3 Alternative A 4-47
4.8.4 No Action....4-47
4.9 Socioeconomics....4-47
4.9.1 Existing Conditions 4-47
4.9.2 Environmental Consequences....4-48
4.9.3 Alternative A Consequences 4-50
4.9.4 No Action....4-51
4.10 Environmental Justice....4-51
4.10.1 Existing Conditions 4-51
4.10.2 Environmental Consequences....4-52
4.10.3 Alternative A 4-52
4.10.4 No Action Alternative....4-52

5.0 CUMULATIVE EFFECTS AND OTHER ENVIRONMENTAL CONSIDERATIONS 5-1
5.1 Past, Present, and Reasonably Foreseeable Holloman Air Force Base and Other Military Actions.... 5-1
5.2 Other Federal, State, and Local Actions.... 5-5
5.3 Non-Federal Actions.... 5-6
5.4 Cumulative Effects Analysis.... 5-6
5.5 Other Environmental Considerations 5-9
5.5.1 Relationship Between Short-Term Uses and Long-Term Productivity.... 5-9
5.5.2 Irreversible and Irretrievable Commitment of Resources....5-10

6.0 REFERENCES 6-1

7.0 LIST OF PREPARERS 7-1

APPENDIX A F-22A DEVELOPMENT PROGRAM AND F-117A CHARACTERISTICS
APPENDIX B CHARACTERISTICS OF CHAFF
APPENDIX C CHARACTERISTICS AND ANALYSIS OF FLARES
APPENDIX D PUBLIC AND AGENCY OUTREACH
APPENDIX E AIRCRAFT NOISE ANALYSIS AND AIRSPACE OPERATIONS
APPENDIX F HOLLOMAN AFB AND REGIONAL HISTORICAL CONTEXT
APPENDIX G BIOLOGICAL RESOURCES – SUPPLEMENTAL INFORMATION
APPENDIX H AIRSPACE MANAGEMENT
APPENDIX I AIR QUALITY
APPENDIX J PHYSICAL RESOURCES

Tables

1.1-1 Aircraft Characteristics and Capabilities 1-2
2.1-1 49 FW Transformation Schedule 2-1
2.1-2 Existing and Proposed Aircraft Assigned to Holloman AFB 2-2
2.1-3 Current and Proposed Annual Airfield Operations 2-3
2.1-4 Proposed Action Facility Requirements 2-5
2.1-5 Optional Facility Support Projects 2-6
2.1-6 Government Manpower Authorized Positions 2-7
2.1-7 Projected F-22A Training Activities Similar to F-117A Training 2-9
2.1-8 Projected F-22A Training Activities as an Air Superiority Aircraft 2-10
2.1-9 Comparable F-117A and F-22A Altitude Use 2-11
2.1-10 Baseline and Projected Annual Sortie-Operations in Training Airspace 2-13
2.1-11 Current and Projected Annual Air-to-Ground Munitions 2-15
2.2-1 Alternative A Baseline and Projected Annual Sortie-Operations in Training Airspace 2-18
2.5-1 Community Outreach Scoping Meetings 2-22
2.5-2 Summary of Public Comments and Notes from Scoping/Community Outreach Events 2-23
2.6-1 Reviews and Permits Required to Implement Holloman AFB Transformation of the 49 FW 2-27
2.7-1 Summary of Consequences by Resource at Holloman AFB 2-28
2.7-2 Summary of Consequences by Resource under Training Airspace 2-30
2.8-1 Representative Sound Exposure Levels 2-37
2.8-2 New Mexico and Federal Ambient Air Quality Standards 2-40
3.2-1 Baseline Average Daily Aircraft Operations At Holloman AFB 3-3
3.2-2 Land Area Exposed To Day/Night Average Sound Levels Under Current Conditions 3-3
3.2-3 Percentage of Population Estimated to be Annoyed By Noise Levels 3-5
3.2-4 Average Daily Operations at Holloman AFB Under the Proposed Action 3-6
3.2-5 Land Area Exposed To Day/Night Average Sound Levels under the Proposed Action 3-8
3.2-6 Typical Equipment Sound Levels 3-10
3.3-1 Class A Accident History 3-12
3.4-1 Criteria Pollutant Emissions at Holloman AFB, Baseline 3-17
3.4-2 Air Emissions Inventory Otero County, New Mexico, and AQCR 153, Calendar Year 1999 3-17
3.4-3 Construction Emissions 3-18
3.4-4 Changes in Criteria Pollutant Emissions at Holloman AFB 3-19
3.7-1 Projects of the Proposed Action and Optional Support Projects Listed by Building Number, Including Project Description, Build Date, and NRHP Status 3-31
3.8-1 Land Use Categories at Holloman AFB 3-36
3.8-2 Current Noise Exposure Levels (L_{dn}) on Holloman AFB by Land Use Category 3-37
3.8-3 Projected Noise Levels and Existing Land Ownership 3-39
3.9-1 Population in Otero County and the City of Alamogordo 3-40
3.9-2 Construction-Related Economic Impacts 3-42
3.9-3 Operations-Related Economic Impacts 3-43
3.10-1 2000 Population and Environmental Justice Data 3-44
4.1-1 MOA/ATCAA Identification and Description 4-2
4.1-2 Restricted Airspace Description 4-3
4.1-3 Proposed Airspace Changes 4-5
4.2-1 Relation Between Annoyance, L_{dn} and L_{Cdn} 4-7
4.2-2 Baseline and Projected Subsonic Noise by Airspace Unit 4-8
4.2-3 Representative Maximum Sound Levels for Direct Overflights of Airspace Operations 4-9
4.2-4 Sonic Boom Peak Overpressures (psf) for F-15 and F-22A Aircraft at Mach 1.2 Level Flight 4-9
4.2-5 Baseline and Projected Sonic Booms Per Month 4-16
4.4-1 Aircraft Emissions by AQCR, Baseline 4-22
4.4-2 Aircraft Emissions by AQCR, Proposed Action 4-23

4.6-1 Vegetation/Land Cover Types under All Proposed F-22A Training Airspace in New Mexico 4-26
4.6-2 Mexican Spotted Owl Critical Habitat Associated with the Proposed F-22A Training Airspace 4-30
4.8-1 Special Use Areas Larger than 5,000 Acres under Training Airspace 4-43
4.9-1 Socioeconomic Characteristics of Affected Regions 4-48
4.10-1 Minority and Low-Income Populations by Area (2000) 4-51
5.1-1 Past and Ongoing Military Actions 5-2

Figures

ES-1 Airspace Associated with Holloman AFB ES-2
1.1-1 Holloman AFB 1-5
1.1-2 Training Special Use Airspace 1-6
2.1-1 Proposed Facility Modifications at Holloman AFB 2-4
2.1-2 Percent of Time at Supersonic Speed by Altitude Block 2-8
2.1-3 Types of Training Airspace 2-12
2.1-4 Airspace Associated with Holloman AFB 2-14
2.5-1 EA Process 2-21
3.2-1 Baseline Noise Contours 3-4
3.2-2 Holloman AFB Noise Contours Under the Proposed Action 3-7
3.2-3 Baseline and Proposed 65 dB Contours 3-9
3.3-1 Runway Clear Zones, Accident Potential Zones, and Quantity-Distance Areas on Holloman AFB 3-13
3.4-1 Prevention of Significant Deterioration Class I Areas near Holloman AFB, New Mexico 3-16
3.8-1 Land Use and Major Roads on Holloman AFB 3-35
4.1-1 Airspace Designations 4-4
4.2-1 Baseline Supersonic Maneuver Ellipse and Corridors, L_{Cdn} Values, and Sonic Booms 4-12
4.2-2 Proposed Action Supersonic Maneuver Ellipses and Corridors, L_{Cdn} Values, and Sonic Booms 4-13
4.2-3 Proposed Action Supersonic Maneuver Ellipse, L_{Cdn} Values, and Sonic Booms 4-14
4.2-4 Cumulative Probability Distribution of Peak Sonic Boom Overpressures 4-15
4.6-1 Vegetation and Land Cover in the Project Area 4-27
4.6-2 Mexican Spotted Owl and Bald Eagle Wintering under Training Airspace 4-29
4.8-1 Land Ownership under Training Airspace 4-42
4.8-2 Special Use Areas under Training Airspace 4-44

EXECUTIVE SUMMARY

The overall mission of the Air Force is defense of the United States (U.S.) and fulfillment of the directives of the President and the Secretary of Defense. The transformation of the 49th FW (49 FW) at Holloman Air Force Base (AFB) would position the 49 FW to rapidly respond to these directives with a low-observability precision penetration fighter. The transformation from F-117A to F-22A aircraft would replace existing low-observability fighter assets with the most advanced capabilities and enable the U.S. Air Force (Air Force) to achieve rapid worldwide objectives. Holloman AFB is the only U.S. base with F-117A aircraft and all facilities to handle the F-117A. Holloman AFB provides the infrastructure, including facilities, management experience, and training airspace to support the next generation precision penetration F-22A aircraft.

Proposed Action

The Air Force proposes to transform the 49 FW from its F-117A low-observability penetration role to the next generation F-22A with multiple capabilities that exceed those of the F-117A. The proposal is to replace 50 F-117A and associated 14 T-38A trainer aircraft with two squadrons of F-22A aircraft. Each F-22A squadron consists of 18 primary assigned aircraft (PAI) and two backup aircraft inventory (BAI). With the retirement of the F-117A and supporting T-38A aircraft, Holloman AFB has the capabilities and facilities to support the operational F-22A aircraft in meeting national defense objectives. This transformation would occur over a period of approximately 3 to 5 years and require a total of 26 renovation, construction, or infrastructure improvement projects with a total cost of $37 million. New additions and buildings on 4 acres of previously disturbed land add approximately 37,600 square feet of constructed space at Holloman AFB. Assigned personnel changes and associated revisions in maintenance would reduce total personnel assigned to or working at Holloman AFB by an estimated 321 positions.

F-22A training would include air-to-ground training similar to that performed by the F-117A plus air-to-air training associated with an air superiority fighter. Operational requirements and performance characteristics of the F-22A dictate that routine training would occur within 100 nautical miles (nm) of Holloman AFB. This training would occur in restricted airspace, Military Operations Areas (MOAs) and Air Traffic Control Assigned Airspaces (ATCAAs). The F-22A would routinely fly at supersonic speeds to attain an advantage in attack and defense. The F-22A would train to use its speed, low observability, and/or defense countermeasures to penetrate enemy defenses and evade simulated adversary weapons targeted at the aircraft.

The Proposed Action includes enhancements to the airspace within 100 nm of Holloman AFB that would improve the training airspace for F-22A missions. The Proposed Action airspace enhancements are presented on Figure ES-1. For the purpose of this EA, White Sands Missile Range (WSMR) is defined as the restricted airspace R-5107 (series) and R-5111 A&B. Defensive chaff and flares are used to break radar contact or decoy a heat-seeking missile away from a targeted aircraft. F-22A pilots need to train as they will fight and deploy defensive RR-188 (or equivalent) chaff and MJU-10/B (or equivalent) flares during training. Chaff and flare use is proposed over WSMR and McGregor Ranges. Defensive flare use is also proposed in the Cowboy ATCAA, Beak MOA/ATCAAs, and Talon MOA/ATCAAs. These airspace enhancements and ability to use defensive countermeasures would diversify F-22A training for realistic combat conditions.

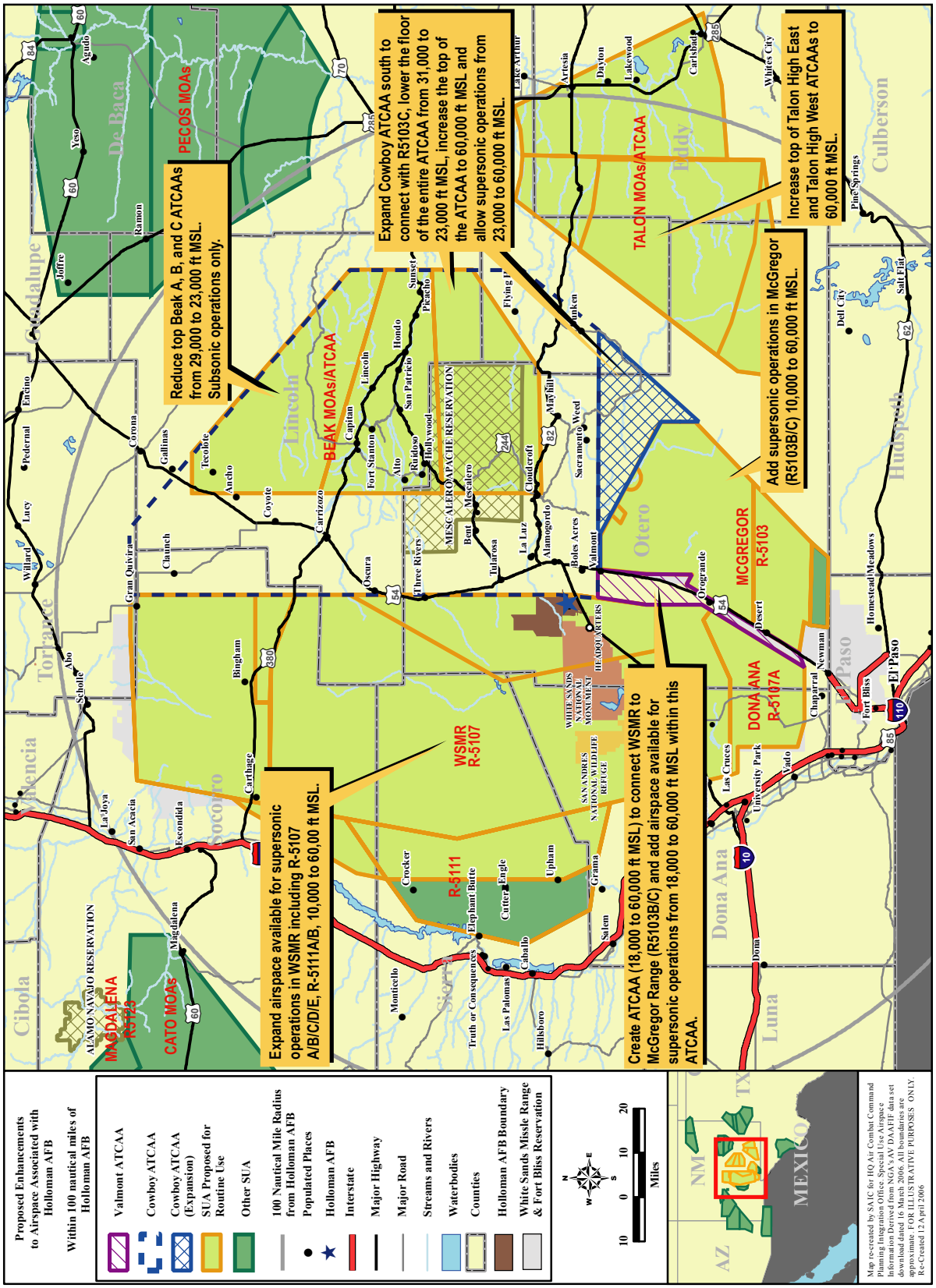


Figure ES-1. Airspace Associated with Holloman AFB

Alternative A

Alternative A would transform the 49 FW by replacing the F-117A and T-38A aircraft with F-22A aircraft, renovating and constructing facilities, and transitioning personnel as described for the Proposed Action. Alternative A does not include the airspace enhancements described in the Proposed Action. Alternative A includes some changes to permit supersonic training and chaff and flare use throughout WSMR.

Alternative A would provide minimum training capabilities for the F-22A aircraft but would not provide multiple realistic training scenarios representative of combat situations.

No Action Alternative

No Action at Holloman means no transformation of the 49 FW from F-117A to next generation F-22A aircraft. Analysis of the No Action Alternative provides a benchmark and permits decisionmakers to compare the magnitude of environmental effects of the Proposed Action or Alternative A with the No Action Alternative. No Action would not include airspace changes and would continue F-117A and T-38A aircraft at Holloman AFB until they are retired. The No Action Alternative has the potential to reduce the capabilities of the 49 FW, reduce the capabilities for U.S. required low-observability air-to-ground missions, and increase the future costs of deploying F-22A aircraft.

Environmental Consequences

The public and agency scoping process focused the analysis on the following environmental resources: airspace management, noise, safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice. Each resource is discussed below for environmental consequences to base and airspace for the Proposed Action, Alternative A, and the No Action Alternative.

Airspace Management and Air Traffic Control

Base. *Proposed Action* - Holloman AFB airspace management would not be impacted by the transition to F-22A sorties. Daily operations would decrease by approximately 11.5 percent compared to existing conditions. The F-22A's greater power permits more rapid acceleration away from the base environs and reduces the time in the vicinity of the airfield.

Alternative A - Same as Proposed Action.

No Action Alternative – No change in use of Holloman AFB facilities by F-117A and T-38A aircraft.

Airspace. *Proposed Action* - Connecting ATCAAs with a floor of 18,000 feet above mean sea level (MSL) would permit civil aircraft to fly below military training aircraft. Lowering the floor of Cowboy ATCAA from 30,000 feet to 23,000 feet MSL would not affect civil aircraft, including those using Sierra Blanca Airport which is within the existing Beak MOA. Airspace recreational activities in or near the Lincoln National Forest or the Sacramento Mountains, including hang gliding, would not be affected. Combat coded chaff used for defensive

Questions at scoping meetings included whether potential commercial service at the Sierra Blanca Airport could be affected by enhancements to the Beak or Cowboy ATCAAs. The Beak and Cowboy ATCAA altitude changes should have no effect on commercial or general aviation.

countermeasures could have a significant effect on FAA radars, so this analysis assumes RR-188 training chaff or its equivalent is modified for use during F-22A training. Raising the ceiling of Talon ATCAAs would require scheduling and coordination between Air Force and Federal Aviation Administration (FAA) controllers. The Proposed Action in conjunction with existing and proposed Army and other missions at WSMR could result in restrictions in some training and missions within the airspace.

Alternative A - Concentration of nearly all F-22A training over WSMR could substantially affect airspace management and scheduling among competing users of WSMR.

No Action Alternative - No change from existing conditions.

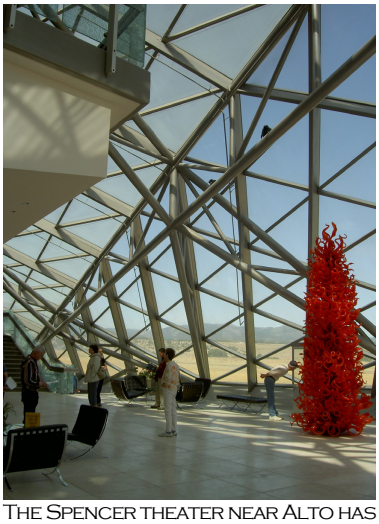
Noise

Base. *Proposed Action* - F-22A engines are more powerful and louder than F-117A or T-38A engines. Fewer F-22A operations during environmental night would reduce the night noise penalty in environmental noise analysis. The F-22A's ability to rapidly climb from the base decreases noise levels on-base and lowers noise levels off-base near the airfield when compared to existing levels from individual events. Base housing and other on-base facilities could experience higher noise levels from individual noise events. Construction noise would be minimal and within existing airfield noise contours.

Alternative A - Same as Proposed Action.

No Action Alternative - No change in aircraft and no construction associated with 49 FW transformation.

Airspace. *Proposed Action* - Subsonic onset rate adjusted day-night average sound level (L_{dnmr}) to have little or no discernible difference under the Cowboy, Beak, Talon, and northern portion of WSMR airspaces. Subsonic noise over the southern portion of WSMR would noticeably increase from below 25.8 to 47.9 L_{dnmr} and under McGregor Range from below 25 to 43.6 L_{dnmr}. Subsonic noise level of L_{dn} 55 dB have been identified by the United States Environmental Protection Agency (USEPA) as a threshold below which adverse impacts are not expected to occur. Supersonic training would increase sonic booms from 1 to 2 per month to 15 to 30 per month under the Cowboy ATCAA and from 5 per month to 45 per month toward the center of WSMR decreasing to 5 to 8 per month in the northern part of El Paso and Fort Bliss. The average sonic boom overpressure for this type of activity is approximately 1 pound per square foot (psf) and would not pose a health or other risk. Sonic booms could damage glass, plaster, or other parts of structures and increase annoyance to residents and long-term visitors from 1 percent highly annoyed to approximately 6 percent highly annoyed under WSMR and 1 to 4 percent under the Cowboy ATCAA. In addition to annoyance, sonic booms have the potential to damage structures. For the magnitude of boom associated with the Proposed Action, the probability of structural damage is extremely small, but is a concern nonetheless. At 1 psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to



THE SPENCER THEATER NEAR ALTO HAS 1-INCH THICK GLASS THAT IS DESIGNED TO WITHSTAND OVERPRESSURES SUBSTANTIALLY GREATER THAN THOSE CREATED BY SONIC BOOMS.

one in a million (Hershey and Higgins 1976). At 10 psf, the probability of breakage is between one in a hundred and one in a thousand (Haber and Nakaki 1989).

Alternative A - Subsonic L_{dnmr} would have little or no discernible difference under the Cowboy, Beak, and Talon airspaces. Subsonic L_{dnmr} would noticeably increase under all of WSMR from the existing below 35 to 50 dB to a projected 50 to 55 dB. Subsonic noise conditions below 55 dB are identified by USEPA as a level below which potential impacts are not expected to occur. Increased sonic booms from an existing 8 to a projected 80 per month toward the center of WSMR could increase the percent of highly annoyed individuals from an existing 1 percent to a projected 12 percent. This level of booms could impact residents, workers, recreationists, or other activities under WSMR. The vibration from a regular, large number of sonic booms could affect adobe structures at the White Sands National Monument headquarters. Most of the Cowboy ATCAA would continue to have an estimated 1 to 2 sonic booms per month except the western edge of the Cowboy ATCAA, which could have 5 to 10 sonic booms per month. Northern El Paso and Fort Bliss could experience 10 to 15 booms per month.

No Action Alternative -No change from existing 1 to 2 booms per month under Cowboy ATCAA and existing 8 to 10 per month on WSMR.

Safety

Base. *Proposed Action* - No change is projected in off-base safety conditions or personnel safety. Bird-aircraft strike hazard (BASH) would be somewhat lessened because the F-22A attains altitude more rapidly and spends less time where species fly at lower altitudes. Training ordnance use is substantially less for the F-22A than for the F-117A. The F-22A would use defensive chaff and flares. Although F-4's and F-15's previously assigned to the 49 FW used chaff and flares, they have not been used by the wing-assigned aircraft during the last 14 years. Other Holloman-based aircraft have used, and continue to use, both chaff and flares. Personnel are trained and facilities are adequate to handle proposed levels of ordnance, chaff, and flares. The Class A accident potential risk has not been calculated for the F-22A. F-22A improved electronics and maintenance expected to result in long-term Class A accident rate comparable to that of the similarly sized F-15C aircraft.

Alternative A - Same as Proposed Action.

No Action Alternative - Continuation of current BASH, ordnance, and other safety conditions.

Airspace. *Proposed Action* - No substantive change in or impacts are expected for flight, ground, or other safety aspects. The F-22A would not use Military Training Routes (MTRs) for low level navigation training. Enhanced F-22A electronics substantially improve situational awareness of other aircraft in the airspace. Both participating and non-participating aircraft in a MOA or ATCAA are responsible for applying see-and-avoid safety measures. Deployment of RR-188 or equivalent chaff over WSMR would not be expected to interfere with FAA radar. Restrictions on flare use during periods above high fire danger and altitude restrictions of 2,000 feet above ground level (AGL) for flare deployment at any time reduce any potential for fire risk. Residual materials from chaff or flare deployment include up to 2-inch by 2-inch plastic or nylon pieces and up to 4-inch by 13-inch aluminum-coated mylar wrappings. These pieces would not affect safety or biological resources, but, if found and identified by a resident, rancher, or recreationist, the individual could be annoyed.

Alternative A - Same as Proposed Action, except chaff and flare use restricted to R-5107 over WSMR.

No Action Alternative - No change from existing training by F-117A and T-38A aircraft. No change in use of chaff and flares in training airspace.

Air Quality

Base. *Proposed Action* – The Alamogordo area is in air quality attainment for all criteria pollutants. Temporary construction emissions would produce localized short-term elevated air pollutant concentrations. Local air quality or visibility would not be significantly affected. No change is projected to air quality within the Alamogordo area and no conformity determination is required.

Alternative A - Same as Proposed Action.

No Action Alternative - No renovation or new construction and no change from current emissions.

Airspace. *Proposed Action* - Areas under the training airspace are in air quality attainment. Change in training aircraft would not affect air quality under airspace. Any emissions would be dispersed and not measurably affect air quality or visibility in any Class 1 area.

Alternative A - Same as Proposed Action.

No Action Alternative - No change in training aircraft. No effects on air quality.

Physical Resources

Base. *Proposed Action* - On-base renovation and construction would occur on four previously disturbed acres. National Pollutant Discharge Elimination System (NPDES) storm water permits and the site specific Storm Water Pollution Prevention Plan (SWPPP) would be updated with best management practices (BMPs). Erosion or off-site sedimentation would be negligible. Existing hazardous materials facilities support low-observability coatings of F-117A and F-22A aircraft. No significant effects would occur to earth or water resources, hazardous materials, hazardous wastes, or the Environmental Restoration Program (ERP).

One commentor at scoping expressed concern with chaff and flare materials being deposited in New Mexico water bodies. Chaff quickly degrades to become indistinguishable from ambient soils and inert plastic end caps and slider assemblies would not be concentrated in any area where they could affect water resources.

Alternative A - Same as Proposed Action.

No Action Alternative - No ground-disturbing activities. Hazardous wastes would be generated at current levels.

Airspace. *Proposed Action* – No construction would occur under the airspace outside the base. An increase in sonic booms and associated vibration would not be expected to affect soil, seasonal snow packs, or geologic formations. Chaff fibers thinner than a human hair, three to six 2-inch by 4-inch mylar pieces, and two 1-inch by 1-inch plastic pieces fall to the ground with each chaff bundle deployed. Chaff on the ground rapidly breaks down to silica and aluminum particles and becomes indistinguishable from native soils. Inert plastic pieces are not expected to affect soils or water. Each MJU-10/B defensive flare would result in two 2-inch by 2-inch plastic pieces, one 1-inch by 1-inch by 2-inch Safe & Initiation

(S&I) device, and one up to 4-inch by 12-inch aluminum-coated mylar wrapping falling to the ground. Flare use is restricted to a minimum altitude of 2,000 feet AGL and flares would not be deployed in the airspace during periods of very high or extreme fire danger, thus reducing any risk of fire. Plastic or mylar pieces that result from chaff or flare deployment would not be in concentrations that could affect soil or water resources.

Alternative A - Same as Proposed Action, except that chaff and flares would only be deployed in WSMR and supersonic training would be primarily concentrated in WSMR.

No Action Alternative - No change from existing conditions. F-117A and T-38A do not use chaff or flares.

Biological Resources

Base. *Proposed Action* - Renovation or construction would occur on previously disturbed ground and would not be expected to impact sensitive biological species. The F-22A's ability to rapidly climb above the normal altitude of migrating waterfowl and other birds should somewhat reduce BASH potential. Noise contours on-base would be comparable to existing conditions, and birds and mammals associated with the base and its environs are habituated and are not expected to be adversely affected.

Alternative A - Same as Proposed Action.

No Action Alternative - No change from existing conditions.

Airspace. *Proposed Action* - Subsonic noise would be somewhat greater than existing conditions under the southern portion of WSMR airspace and on McGregor Range. This subsonic noise change is not expected to affect wildlife. The increase in sonic booms may startle some animals. Studies have demonstrated that, even within species, individuals can vary widely in reactions. Wildlife under the airspaces have previously experienced sonic booms at different levels and are expected to become habituated to additional thunder-like sounds. An estimated 45 sonic booms per month under the airspace is not expected to significantly impact wildlife after habituation occurs. Even after habituation, a sonic boom, as with thunder, could startle high strung or other animals in a pen or other restricted area. The increase in supersonic flight may affect, but is not likely to adversely affect, Mexican spotted owl, northern aplomado falcon, or bald eagle. Chaff and flare use would not be expected to adversely affect biological resources. Plastic or nylon pieces are inert and aluminum-coated mylar wrappings are expected to degrade from exposure to sunlight and have not been found to cause a threat to native or domestic animals.

Native species that coexist with human activity on and near Holloman AFB include the Cactus wren on White Sands National Monument.

Elk and other game animals are not expected to be affected by approximately 20 sonic booms per month over the Sacramento Mountains.

Alternative A - Subsonic noise effect would be similar to those described for Proposed Action. Sonic boom effects are not expected under most of the Cowboy ATCAA. Sonic booms of up to 80 per month toward the center of WSMR could increase domestic animal and wildlife reactions among unusually sensitive or non-habituated animals.

No Action Alternative - No change from existing conditions, with an estimated 1 to 2 sonic booms per month under the Cowboy ATCAA and some use of chaff and flares over ranges.

Cultural Resources

Base. *Proposed Action* – None of the buildings proposed for renovation or demolition is an historic structure. White Sands National Monument, located adjacent to Holloman AFB, is expected to have lower subsonic noise due to F-22A reduced off-base 65 dB noise contours. Subsonic noise is not expected to significantly affect historic properties.

Alternative A - Same as Proposed Action.

No Action Alternative - Continued existing noise contours that extend into the White Sands National Monument.

White Sands National Monument Headquarters Complex is located southwest of Holloman AFB and is under an airspace avoidance area. Subsonic noise levels at the monument headquarters are expected to decline and sonic booms increase with the proposed 49 FW transformation.

Airspace. *Proposed Action* - Increase in sonic booms could cause vibrations that could affect historic properties under the airspace, including within White Sands National Monument. and Holloman AFB. Vibration studies have found potential detrimental effect upon adobe structures near highways. Historic structures in good condition would not be expected to be impacted, but structures or windows in poor condition could be affected by sonic boom vibration. Approximately 12 to 18 sonic booms per month are projected on the Mescalero Apache Reservation and could result in increased annoyance to Native Americans and others. Mescalero representatives, in meetings with Air Force representatives, expressed concern about sonic booms that would likely be noticed by residents or long-term visitors to the reservation or reservation facilities. The reservation economy is based upon gaming, tourism, and natural resources. The Mescalero also expressed concern that these economic activities could also be affected by an economic downturn at Alamogordo or at Holloman AFB.

The Mescalero Apache Reservation Church is a stone structure undergoing renovation. Structures in good condition are not expected to be significantly impacted by 12 to 18 sonic booms per month that could vary in intensity from a sharp thunder clap to distant thunder.

Alternative A - Effects generally similar to those described for the Proposed Action except there would be no increased supersonic activity over the Mescalero Apache Reservation. The potential for up to 40 sonic booms per month over portions of the White Sands National Monument headquarters and other historic properties could result in vibration effects upon these historic resources. Structures in disrepair or with fragile windows could be adversely affected by the increased sonic booms.

No Action Alternative - No change from existing conditions.

Land Use

Base. *Proposed Action* – On-base renovation and construction is consistent with the base general plan. Day/night average sound levels over base housing and other portions of the base are projected to decrease. Off-base areas affected by L_{dn} 65 dB would be reduced. Potential increased traffic congestion during construction would drop below current conditions after 49 FW transformation. Land uses near the base, consisting of ranching with light industry or commercial between Holloman AFB and Alamogordo, are not expected to be impacted by F-22A overflights.

Alternative A - Same as Proposed Action.

No Action Alternative - No change to noise environment on-base and environs. No construction or personnel changes. No changes in traffic.

Airspace. *Proposed Action* - Increased sonic booms are expected to occur over workplaces, residential, recreational, hunting, and fishing areas under all airspaces. Sonic booms would be noticed by individuals who live or spend extensive time under the airspaces. The largest numbers of residences are located under the Cowboy ATCAA, including the city of Alamogordo, the villages of LaLuz, Tularosa, Carriozo, Capitan, Ruidoso, Ruidoso Downs, Cloudcroft, and Mescalero, low-density rural settlements in the Sacramento Mountains, and other communities. Communities under the Cowboy ATCAA would experience increases from 1 to 2 to 5 to 30 booms per month. The frequency of sonic booms would not be expected to affect land use or land use patterns, ownership, or management. Overpressure from sonic booms should not be greater than high wind pressure on facilities such as ski lift gondolas, gaming locations, or the Spencer Theater. Sonic booms over WSMR that could be generated at lower altitudes have a greater potential for higher overpressures. Some sonic booms could have sufficient pressure to damage windows in poor condition or to vibrate loose materials off of shelves.

Alternative A - Little or no change is expected in sonic booms under the majority of the Cowboy ATCAA when compared with existing conditions. Alamogordo would experience 5 to 10 and northern El Paso 10 to 15 sonic booms per month. There may be potential effects on users of land or workers on land under WSMR from up to 80 sonic booms per month. Management practices at the National Monument may be affected by changes in the noise environment. In case of damage, the Air Force has established procedures for handling damage claims, which begin by contacting the Holloman AFB Public Affairs Office.

No Action Alternative - No change from existing conditions with a continued presence of military aircraft training during day and night within the airspace.

Socioeconomics

Base. *Proposed Action* – The 26 projects and $37 million in construction costs would generate 175 construction jobs and $9.4 million in direct earnings. Socioeconomic total consequences of renovation and construction are estimated to be $54.1 million in total output and 330 total jobs. The Alamogordo existing work force should be adequate to supply needed personnel. Transformation of the 49 FW would reduce authorized and other positions at Holloman AFB by 321 jobs. This assigned personnel reduction of 5.3 percent, with dependents, would produce an anticipated population decline of 674 persons, or approximately 2 percent of Alamogordo's population. Off-base housing demand would be reduced by approximately 227 off-base units

in the Alamogordo area. Secondary employment is projected to be reduced by approximately 99 positions. Depending upon schedule of withdrawal of F-117A and T-38A, renovation and construction, and introduction of F-22A aircraft, socioeconomic effects upon Alamogordo could proportionately result from a decline of base authorized personnel of up to approximately 25 percent before the authorized personnel stabilized at approximately 5.3 percent below existing authorizations when the 49 FW transformation is complete.

Alternative A - Same as Proposed Action.

No Action Alternative – Base personnel will remain at levels necessary to support Holloman AFB's mission.

Airspace. *Proposed Action* - Projected increase in sonic booms under Cowboy ATCAA residential and tourist areas may annoy residents or long-term visitors to the area. An estimated up to 20 to 25 sonic booms per month would not be expected to significantly affect general activities under the Cowboy ATCAA. Specific economic activities associated with horse races at Ruidoso Downs or other recreational activities, including hunting or seeking solitude, could be affected by the number of sonic booms.

Lumber, recreational, and gaming industries in the Sacramento Mountains are partially supported by an economically viable Alamogordo and Holloman AFB and could be affected by an economic downturn at those locations. Chaff and flare residual materials would not be expected to affect social or economic activities but could result in annoyance if found in a remote or unexpected location.

THE MESCALERO APACHE RESERVATION ECONOMY IS PRIMARILY BASED ON RECREATION AND TIMBER PRODUCTS.

Alternative A - Little or no change in sonic booms is projected under the Cowboy ATCAA except along the western edge where sonic booms could increase to 10 per month. Visitors and employees at White Sands National Monument (35 to 40 booms per month), residents and employees at Holloman AFB (30 to 40 booms per month), workers at WSMR (up to 80 booms per month), and residents of northern El Paso and Fort Bliss (10 to 15 booms per month) would likely be affected by the sonic booms. Overall socioeconomic activities would not be expected to change, although individuals sensitive to sonic booms could elect to avoid activities in areas of concentrated sonic booms.

No Action Alternative - No change from existing conditions as long as F-117A and T-38A aircraft remain at Holloman AFB.

Environmental Justice

Base. *Proposed Action* - Minority and low income populations in the Alamogordo area are comparable to those of the state of New Mexico. There would be no disproportionate impact upon minority or low-income populations or upon children.

Alternative A - Same as Proposed Action.

No Action Alternative - No change from existing conditions.

Airspace. *Proposed Action* – The Mescalero Apache Reservation represents a high concentration of minorities under the training airspace. Persons living on the reservation and others under the Cowboy ATCAA could be annoyed by 5 to 30 sonic booms per month. Sonic booms would not be expected to damage health or other environmental resources and would almost all occur during daylight or prior to 10:00 p.m. at night. Both native and domestic species on the reservation and in the Sacramento Mountains are habituated to thunder and in the past have experienced sonic booms. Game species such as elk and mule deer that contribute to the Mescalero economy would be expected to habituate, although an inopportune sonic boom could annoy a hunter. Sonic booms comparable to intense or distant thunder would be distributed throughout the airspace over all communities and no disproportionately high or adverse impacts on minority or low income communities would be expected. No disproportionate health or safety risks would be expected to affect children. A reduction in base and Alamogordo economic activity would have an unquantified but expectably adverse effect on the reservation tourism and gaming economy.

Alternative A - Supersonic activity would be concentrated in WSMR and sonic booms would be experienced primarily on WSMR and in nearby areas. There would be no substantive change in sonic booms under most of the Cowboy ATCAA compared with existing conditions and no change in sonic booms over the Mescalero Apache Reservation. An increase in sonic booms from 1 to 2 per month to 5 to 15 per month on the western edge of Cowboy ATCAA or northern El Paso and Fort Bliss is not expected to disproportionately affect minority or low income communities or children. An estimated 35 to 40 sonic booms per month over White Sands National Monument and 30 to 40 over Holloman AFB would not be expected to disproportionately affect minority, low-income populations, or children.

No Action Alternative - No change from existing conditions.

THIS PAGE INTENTIONALLY LEFT BLANK.

1.0 PURPOSE AND NEED FOR TRANSFORMATION OF THE 49TH FIGHTER WING

In July 1992, all of the United States Air Force (Air Force) F-117A assets were assigned to the 49th Fighter Wing (49 FW) at Holloman Air Force Base (AFB). For the past 14 years, the 49 FW has provided a single-seat, stealth attack aircraft to meet national defense objectives worldwide. The proposed transformation of the 49 FW to next generation stealth aircraft, the F-22A, would extend and expand the mission of the 49 FW and maintain the combat capability of Holloman AFB. The 49 FW would be positioned to meet current and future Air Force requirements with the latest stealth aircraft.

The F-22A's next generation design incorporates multiple features that would increase the effectiveness of the 49 FW and permit the 49 FW to continue its mission as a potent strike force well into the 21st century. The 49 FW transformation involves retirement of the F-117A and supporting T-38A aircraft and the beddown of 36 F-22A Primary Aircraft Inventory (PAI) and 4 Backup Aircraft Inventory (BAI). The transformation would include modifying existing and constructing new facilities; changing personnel; and routinely conducting flight training operations in airspace within 100 miles nautical miles (nm) of Holloman AFB.

HOLLOMAN AFB IS THE LOCATION FOR ALL F-117A STEALTH ASSETS.

This Draft Environmental Assessment (EA) analyzes the potential environmental consequences associated with the 49 FW transformation from F-117A to F-22A aircraft according to the requirements of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality (CEQ) Regulation of 1978, and 32 Code of Federal Regulations (CFR) Part 989, titled the Environmental Impact Analysis Process (EIAP). 32 CFR Part 989 addresses the implementation of NEPA and directs Air Force officials to consider the environmental consequences of any proposal as part of the decision-making process.

1.1 BACKGROUND

In June 1977, the Air Force set up a Special Project Office to identify opportunities for applying low-observable technology. From those early years, an Advanced Technology Aircraft Program was developed to construct a single-seat, stealth attack aircraft. The F-117A was the result of these studies and combined very low observable features with the payload and range requirements to meet national objectives. In 1992, all F-117A capabilities were relocated to Holloman AFB from the Tonopah Test Range. The 49 FW F-117A met or exceeded its stealth strike mission. However, the F-117A is a subsonic aircraft with a night air-to-ground mission.

THE PROPOSED ACTION IS TO TRANSFORM THE 49 FW BY REPLACING F-117A WITH THE F-22A PICTURED ABOVE.

The Air Force needs to transform its stealth experience and management capabilities to the next generation F-22A aircraft to retain mission readiness. This transformation will provide the 49 FW a low-observable, precision penetrating weapon system to meet existing and future warfighting requirements.

The F-22A Raptor is the Air Force's precision penetrating stealth weapon system designed to ensure that America's armed forces retain air-to-air and air-to-ground dominance. This means complete control of the airspace over an area of conflict, thereby allowing freedom to attack and freedom from attack at all times and places for the full spectrum of military operations. Air dominance provides the ability to defend American and allied forces from enemy attack and to attack air and ground adversary forces without hindrance from enemy aircraft.

> THE AIR FORCE PROPOSES TO TRANSFORM THE 49 FW SO THAT IT WOULD BE EQUIPPED, TRAINED, AND READY TO FULFILL ITS COMBAT MISSIONS AS DIRECTED BY THE PRESIDENT AND SECRETARY OF DEFENSE.

During the initial phases of deployment into an area of conflict, the first aircraft to arrive are the most vulnerable because they face the entire warfighting capability of an adversary. The F-22A's state-of-the-art stealth technology, high speed, advanced electronics, and skilled pilots will ensure air dominance from the outset of such situations into the foreseeable future. With the F-22A, the 49 FW would possess the stealth, speed, and maneuverability to overcome adversary improvements in air defenses and ensure air dominance over any battlefield.

> THE F-117A WOULD BE RETIRED AND REPLACED BY THE F-22A.

Three types of aircraft would be involved in the transformation of the 49 FW, the F-117A, the F-22A, and the T-38A. There are no two-seat F-117As, so basic training and check flights for F-117A pilots are provided by Holloman-based T-38A chase planes. To accomplish these training and check flights, an F-117A instructor pilot flies a T-38A on the wing of the training F-117A and provides inputs as needed to the training pilot. The T-38As do not participate in combat. The T-38As supporting the F-117A mission would also be retired.

Table 1.1-1 presents the aircraft characteristics and capabilities of the three aircraft.

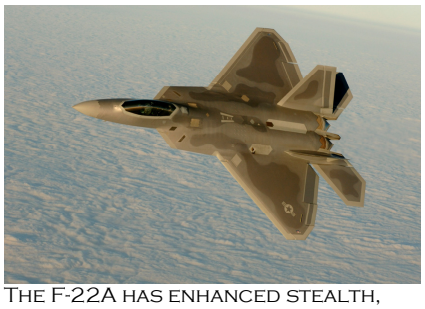
TABLE 1.1-1. AIRCRAFT CHARACTERISTICS AND CAPABILITIES

	Stealth	*Air-to-Ground*	*Air-to-Air*	*Engines*	*Speed*	*Flight Ceiling*	*Normal Altitude*	*Defensive Countermeasures*
F-117A	1970s stealth	Yes	No	2 at 10,600 pound thrust	Mach .9	45,000 feet	20,000 to 30,000 feet	None
T-38A[1]	No stealth	No	No	2 at 3,800 pound thrust	Mach 1.08	45,000 feet	20,000 to 30,000 feet	None
F-22A	1990s stealth	Yes	Yes	2 at 35,000 pound thrust	Above Mach 1.5 plus supercruise	60,000 feet	30,000 to 50,000 feet	Chaff and Flares

Notes: 1. As flown at 49 FW.

1.1.1 The F-22A Provides Next Generation Capabilities

The F-22A Raptor is a single-seat, all-weather, multipurpose fighter capable of both air-to-ground and air-to-air missions. F-22A characteristics make the aircraft able to launch sophisticated air-to-ground weapons at higher speeds and from greater distances than possible for the F-117A. The F-22A can deploy defensive flares and chaff to avoid enemy threats. The F-117A can not utilize chaff or flares for defensive countermeasures.



The F-22A has enhanced stealth, speed, maneuverability, electronics, and maintainability.

The first F-22A aircraft flew in 1997 as compared with the first F-117A flight in 1981. The F-22A offers a unique combination of capabilities that go beyond those of the F-117A and make the F-22A less detectable, faster, more maneuverable, and more reliable than the F-117A. These capabilities enable the F-22A to reach the conflict faster, reduce danger to pilots, and provide more diversified air power available to the combat commander. The enhanced capabilities include the following:

> Several designations have been used for the F-22A throughout the development of the aircraft. During initial experimental testing it was the XF-22. Then, the F-22 designation emphasized the air-superiority function. For a period, the designation F/A-22 was used to highlight the aircraft's attack capability. The F-22A is basically the same aircraft under all these designations.

- **Low Observability**: State-of-the-art design and radar-absorbent composite materials make the F-22A very difficult to detect by radar.
- **Supersonic Speed**: The F-22A can sustain supersonic speeds without the use of afterburners. This supercruise capability permits the F-22A to operate longer at higher speeds and with less vulnerability.
- **Increased Maneuverability**: The F-22A design, coupled with the ability to direct engine thrust, permits the pilot to turn more rapidly, maintain better control, and evade missile threats better than other fighter aircraft.
- **Advanced Electronics**: Highly sophisticated avionics systems are integrated throughout the F-22A to provide the pilot information from many sources and produce a clear, understandable picture of the combat situation.
- **Maintainability, Sustainability, Reliability, and Responsiveness**: Reliability and mission-readiness of the F-22A is enhanced with computerized self-tests of all systems and other maintenance features. The F-22A requires fewer personnel and less equipment for maintenance and deployment compared to the F-117A.

Additional F-22A details are contained in the F-22A fact sheet in Appendix D. F-22A capabilities would transform the 49 FW for future mission readiness and make efficient use of 49 FW infrastructure at Holloman AFB.

1.1.2 Holloman AFB

Holloman AFB, located near Alamogordo, New Mexico, is part of Air Combat Command (ACC). Holloman AFB is home of the 49 FW, German Air Force training, and various test programs, including the world's longest rail test track. Currently, the F-117A, T-38A, QF-4, and Tornado aircraft operate from Holloman. Holloman covers 59,639 acres of land at an average altitude of 4,093 feet (Figure 1.1-1). Facilities and infrastructure for stealth fighter aircraft were developed at Holloman AFB during the 1990s. Under the proposed transformation, relatively little new construction would be needed since the new F-22A squadrons could use many existing F-117A facilities

Holloman AFB bases F-117A, T-38A, QF-4, and Tornado aircraft.

Training airspace used by Holloman AFB aircraft includes restricted airspace associated with White Sands Missile Range (WSMR), Centennial Range, McGregor Range, large overland Military Operations Areas (MOAs), and Air Traffic Control Assigned Airspace (ATCAA). These airspaces currently provide training for the F-117A, Tornados, F-22A weapons tests, and other testing and training missions (Figure 1.1-2). Existing training ranges provide for local air-to-ground training for F-117A aircraft. The F-22A would routinely use the existing training airspace within 100 nm of Holloman AFB and Air Force operated ranges currently used by Holloman AFB-based aircraft. Chapter 2.0 of this EA describes the F-22A missions and training.

1.1.3 Lead Agency

The Air Force is the proponent for this proposal and is the agency responsible for the preparation of the EA. Appendix D includes correspondence between agencies regarding potential cooperating agency status.

The Department of the Army has responsibility for McGregor Range and WSMR. These installations are within the region of influence (ROI) for this EA. The Army possesses special expertise in evaluating potential effects to resources within these installations. However, the Department of the Army is not a cooperating agency.

Congress has charged the FAA with administering all navigable airspace in the public interest as necessary to ensure the safety of aircraft and the efficient use of such airspace. FAA participated in scoping for this EA. Since no FAA rulemaking action is required for airspace enhancements proposed for the 49 FW transformation, FAA declined to participate as a formal cooperating agency.

1.2 Purpose of 49 FW Transformation from F-117A to F-22A Aircraft

The overall mission of the Air Force is defense of the United States (U.S.) and fulfillment of the directives of the President and Secretary of Defense. The purpose of the 49 FW transformation is to be positioned to respond to these directives. To meet these requirements, the Air Force must develop and operate combat and support aircraft and train personnel. With the F-117A, the 49 FW currently provides a low observable precision penetrating weapons system. The transformation to the F-22A retains the 49 FW capabilities and provides the 49 FW and the Air Force with an improved capability to meet its future mission responsibilities.

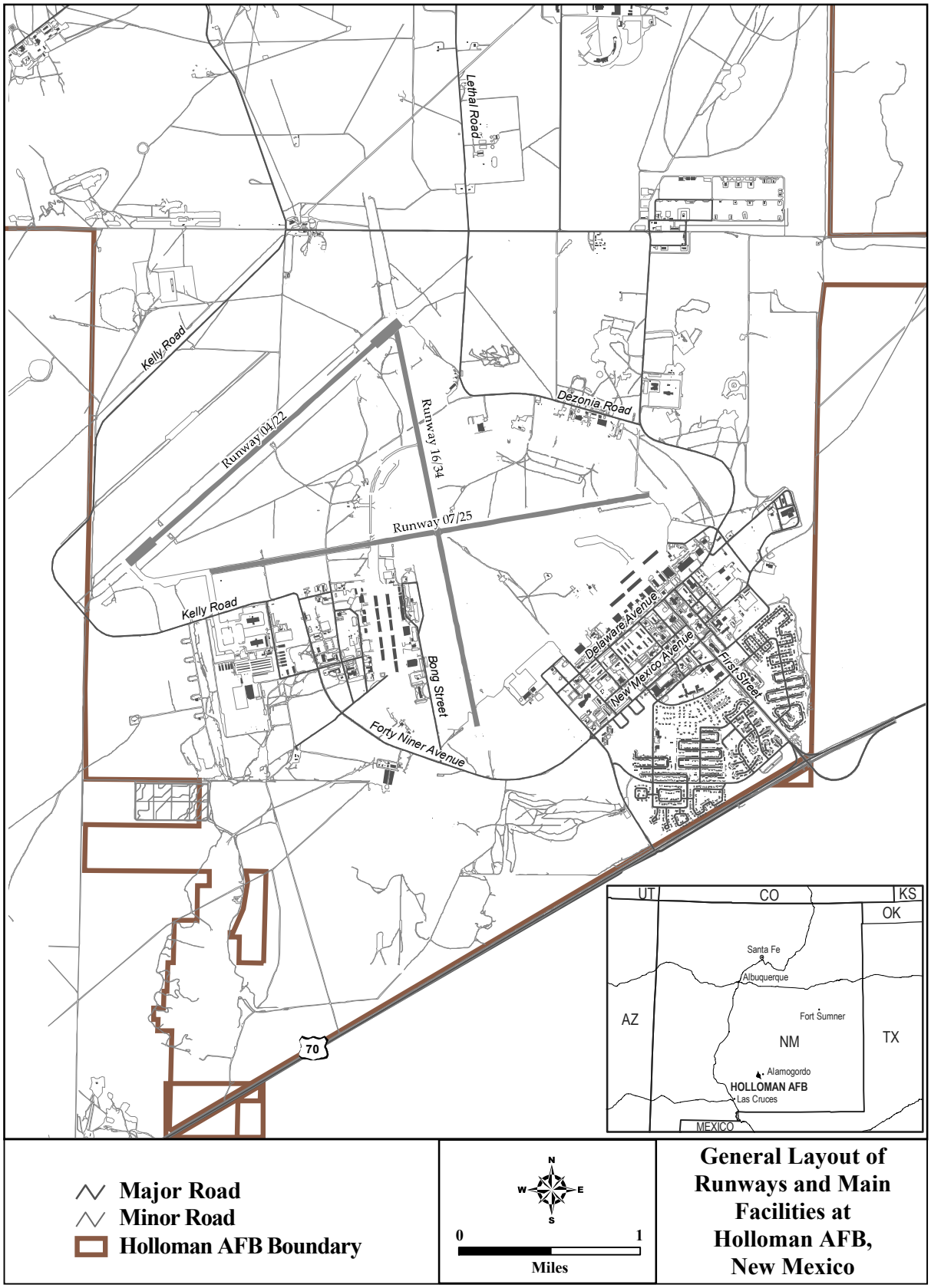


Figure 1.1-1. Holloman AFB

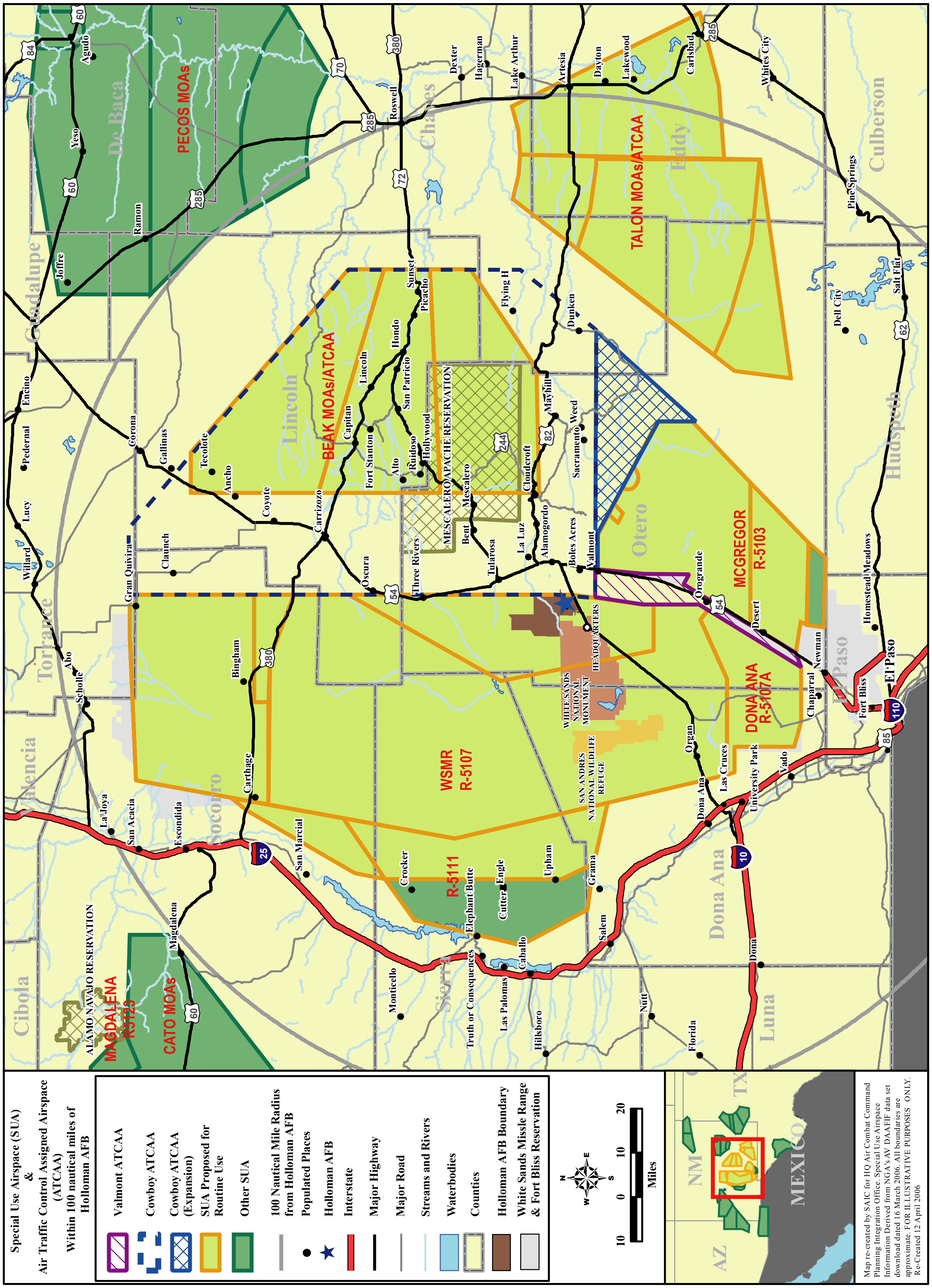


Figure 1.1-2. Training Special Use Airspace

The infrastructure of Holloman AFB for the F-117A provides needed facilities for stealth aircraft. Transformation to the F-22A permits maximum use of this infrastructure while expanding the precision strike capabilities of the 49 FW.

1.3 Need for 49 FW Transformation

The 49 FW faces two challenges in continuing to accomplish its mission with the F-117A aircraft. First, other nations continuously improve their sophisticated air defenses which are built around surface-to-air and air-to-air missiles that can target aircraft more accurately and at greater distances than in the past. Second, other air forces have added newer, faster, more maneuverable aircraft, such as the MiG-29, Su-35, Rafale, Gripen, and Eurofighter. The single purpose F-117A cannot perform multiple air-to-ground and air-to-air roles and cannot achieve the maneuverability and speed necessary to ensure future 49 FW combat success. The F-22A has the stealth, speed, and maneuverability to overcome these challenges and ensure air dominance over any battlefield.

The Air Force must provide the capabilities to achieve precision penetration early in a conflict. The 49 FW has been assigned that stealth penetration mission. The 49 FW must transform from the slower, older technology F-117A aircraft to the next generation F-22A aircraft to ensure mission capability and effectiveness.

The 49 FW and the proposed two F-22A operational squadrons need to be combat-ready and able to perform anywhere in the world at any time. In order to accomplish this mission, the 49 FW must provide infrastructure and facilities to support two operational squadrons of F-22A aircraft and have access to training airspace. The need for a transformation of the 49 FW to F-22A aircraft at Holloman AFB is the logical outgrowth of the 49 FW history and its 14 year long stealth mission.

The ultimate goal of the 49 FW transformation is to provide Holloman AFB with a next generation aircraft, as well as with tactics and operational guidance to meet national mission requirements. The proposed transformation of the 49 FW through replacement of F-117A aircraft with F-22A aircraft, as analyzed in this EA, represents a continuation of the 49 FW mission to provide a low-observable, precision penetrating weapons system for the Air Force.

THIS PAGE INTENTIONALLY LEFT BLANK.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter presents the Proposed Action and alternatives at the base and in the airspace associated with the 49 FW transformation. Proposed project elements affecting the base are presented in Sections 2.1.1 through 2.1.3 and elements affecting training airspace are presented in Sections 2.1.4 through 2.1.6. Alternative A is presented in Section 2.2 and the No Action Alternative is described in Section 2.3 in conformance with the CEQ regulations (40 CFR 1502.14(d)) in Section 2.2.4.

2.1 Proposed Action

The Proposed Action is to transform the combat capability of the 49 FW and maximize the use of available infrastructure at Holloman AFB by replacing the retiring F-117A aircraft and T-38A aircraft supporting the F-117A mission with two F-22A squadrons. This transition would extend and enhance the low-observable, precision weapons system capability of the 49 FW while using existing related low-observability facilities at Holloman AFB.

The Proposed Action is to transform the 49 FW from F-117A to F-22A aircraft at Holloman AFB.

Transformation of the 49 FW at Holloman AFB is proposed to take place over a period of approximately five years and would involve renovation of existing and construction of new facilities to support the aircraft and personnel needed to operate and maintain the F-22A aircraft. The 49 FW transformation schedule is presented on Table 2.1-1.

Table 2.1-1. 49 FW Transformation Schedule

Aircraft	*FY06*	*FY07*	*FY08*	*FY09*	*FY10*	*FY11*	*Total*
F-117A	50[1]	-10	-40	0	0	0	0
T-38A	17[2]	-4	-10	3	3	3	3
F-22A	0	0	0	14	20	6	36 (4)

Notes: 1. Includes two F-117A aircraft at Edwards AFB.
2. Includes three 46th Test Group T-38A aircraft.
FY = Fiscal Year

Each of the two F-22A squadrons would be composed of 18 PAI F-22As plus 2 BAI F-22As. As such, the F-22A Operational Wing would include 36 PAI and 4 BAI aircraft. PAI consists of the aircraft authorized and assigned to perform the squadron's missions in training, deployment, and combat. BAI includes those aircraft additional to the PAI that are used as substitutes for PAI aircraft. Table 2.1-2 presents the types and number of aircraft currently assigned and proposed for Holloman AFB. This table permits a comparison of current 49 FW aircraft assignments and proposed aircraft after transformation.

Table 2.1-2. Existing and Proposed Aircraft Assigned to Holloman AFB

Aircraft Type	Number Assigned-PAI	
	Current	*Proposed*
F-117A	50	0
T-38A	17	3
F-22A	0	36+4
GAF Tornado	42	42
QF-4	23	23

Note: GAF = German Air Force

2.1.1 Proposed Flight Activities

The transformation of the 49 FW would involve several activities at Holloman AFB. The F-117A and the F-22A have different performance characteristics. This section describes existing and proposed flight activities on and near the base. F-22A aircraft would use the base runways and fly in the base environs similar to the way the F-117A aircraft do today. This includes take-off and landings, practice approaches, training, and deployments.

The Air Force anticipates that the two Holloman F-22A squadrons would fly approximately 8,640 sorties per year at Holloman AFB. The engine capabilities of the F-22A permit it to take off without afterburners over 90 percent of the time. Based on projected requirements and deployment patterns under the Aerospace Expeditionary Forces program, Holloman F-22A operational aircraft would fly an estimated 2,800 sorties at overseas airfields during deployments or at other locations for exercises in preparation for deployments (see Appendix A).

A SORTIE IS THE FLIGHT OF A SINGLE AIRCRAFT FROM TAKEOFF TO LANDING.

Table 2.1-3 presents the existing and proposed annual airfield operations by Holloman AFB-based aircraft. Holloman AFB F-22As would fly approximately 30 percent of sorties after dark (i.e., about one hour after sunset) with an estimated 3.75 percent landing after 10:00 p.m. This is substantially fewer than the number of night sorties performed by the F-117A (see Table 2.1-3).

2.1.2 Proposed Base Facilities

The transformation of the 49 FW retires the two combat coded squadrons of F-117A aircraft and the associated T-38A chase planes used in training (see Section 1.1). The departure of these aircraft from Holloman AFB permits the reuse of many base facilities and would provide space for the F-22A aircraft. The F-22A is a low-observability weapon system superior to the F-117A. As such, the F-22A would require only a few additional facilities to ensure the combat readiness and capability of the system at Holloman. These new facilities would provide for and protect the F-22A characteristics noted in Section 1.1.2, including higher performance engine, advanced electronics, and maintenance procedures.

Table 2.1-3. Current and Proposed Annual Airfield Operations

Aircraft	Arrivals		Departures		Closed Patterns		Total		All
	Day	*Night*	*Day*	*Night*	*Day*	*Night*	*Day*	*Night*	
Current Operations									
F-117A	4,441	2,745	4,441	2,745	15,100	9,334	23,982	14,824	**38,806**
T-38A	1,288	0	1,288	0	5,080	0	7,656	0	**7,656**
Tornado	6,537	239	6,537	239	30,262	638	43,336	1,116	**44,452**
QF-4	400	0	400	0	800	0	1,600	0	**1,600**
F-22A	0	0	0	0	0	0	0	0	**0**
Other	2,076	389	2,076	389	0	0	4,152	778	**4,930**
Total	**14,742**	**3,373**	**14,742**	**3,373**	**51,242**	**9,972**	**80,726**	**16,718**	**97,444**
Proposed Operations									
F-117A	0	0	0	0	0	0	0	0	**0**
T-38A	261	0	261	0	1,044	0	1,566	0	**1,566**
Tornado	6,537	239	6,537	239	30,262	638	43,336	1,116	**44,452**
QF-4	400	0	400	0	800	0	1,600	0	**1,600**
F-22A	8,316	324	8,640	0	16,632	0	33,588	324	**33,912**
Other	2,076	389	2,076	389	0	0	4,152	778	**4,930**
Total	**17,590**	**952**	**17,914**	**628**	**48,738**	**638**	**84,242**	**2,218**	**86,460**

Notes: An airfield operation represents the single movement or individual portion of a flight in the base airfield airspace environment, such as one landing, one takeoff, or one transit of the airport traffic area.
A sortie consists of a single military aircraft from takeoff through landing. A single sortie generates at least two airfield operations (takeoff and landing).
Each multiple pattern at the airport consists of two operations: a touch down immediately followed by a take off. These are additional to the initial takeoff and final landing of each sortie at the airfield.
Day sortie – 0700-2200L
Night sortie = 2200-0700L

The Proposed Action would use existing F-117A facilities as much as possible to house both squadrons of F-22A aircraft in the western portion of the base (Figure 2.1-1). This development would include a total of 26 renovation, construction, or infrastructure improvement projects with a total cost of $37 million implemented over the period from 2006 to 2009 (Table 2.1-4). Table 2.1-4 lists the proposed 11 operations and maintenance (O&M) projects with an estimated cost of $7.9 million and the 8 military construction (MILCON) projects with an estimated cost of $29.1 million. Construction associated with the transformation would include two new structures within the Munitions Storage Area and one new building in the west area for the Aerospace Ground Equipment (AGE) functions. New buildings and additions would add approximately 37,600 square feet of space to Holloman AFB.

The projects listed in 2.1-5 are optional projects that will be scheduled by the base should funds become available.

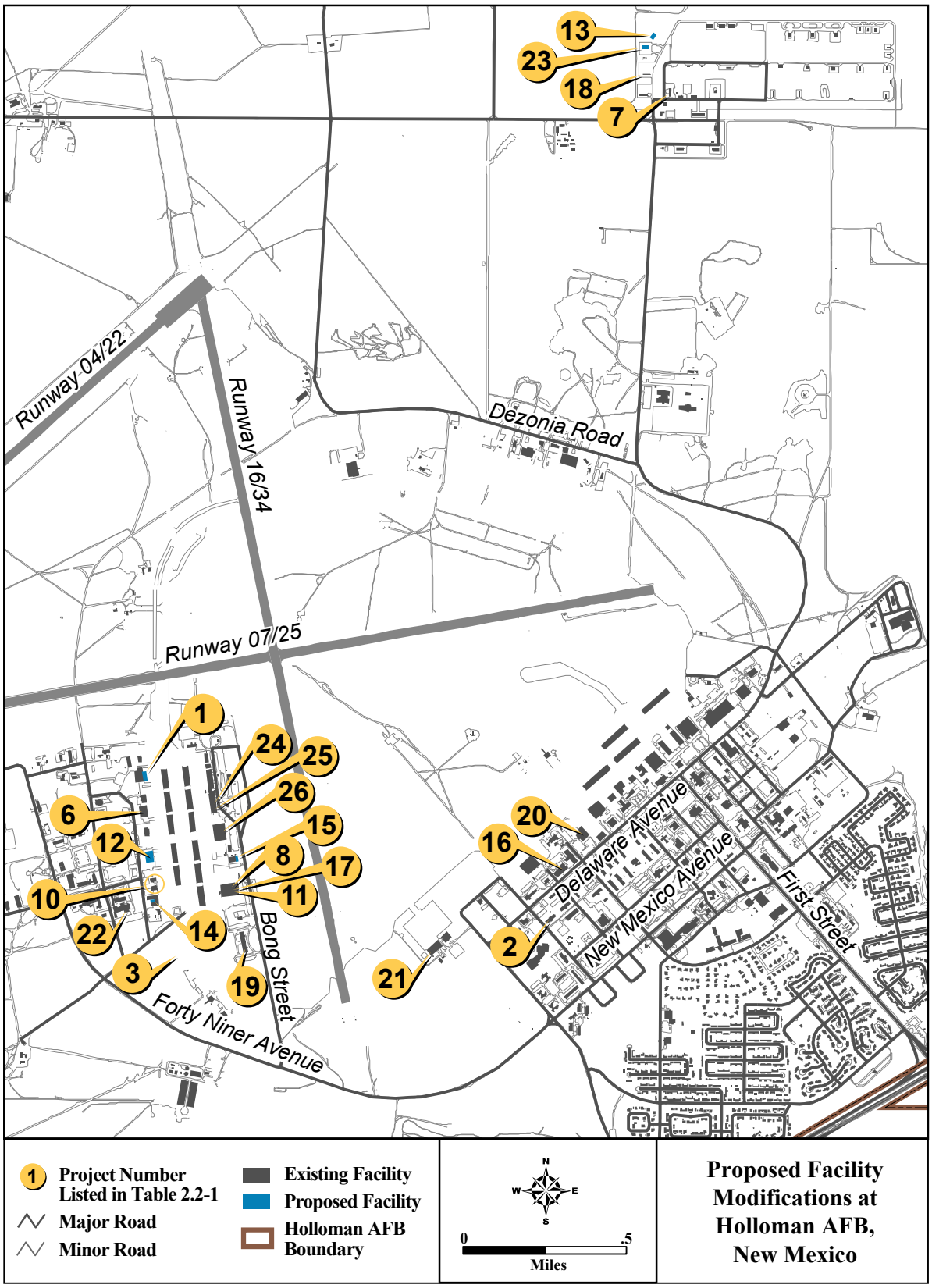


Figure 2.1-1. Proposed Facility Modifications at Holloman AFB

Table 2.1-4. Proposed Action Facility Requirements

Project Number	*Project Name*	*Fiscal Year*	*Building Square Feet*[1]	*Project Details*
O&M Projects				
1	Addition to Aircraft Parts Store, Bldg 824	06	3,000	
2	Repair Field Training Detachment, Bldg 513	06	4,000	
3	Repair Trim Pad-North of Hush House	06		Replace anchor and concrete surface
4[1]	Repair West Ramp Drainage	06		Repair pavement around box drains
5[1]	Repair Taxi Lanes & Apron	06		Pavement Repair
6	Convert Field Training Detachment, Bldg 823	06	4,000	
7	Addition to Trailer Maintenance, Bldg 1226	06	1 bay	
8	Wash Rack Infrastructure, Bldg 898	06		
9[1]	Repair Secure Areas in Bldg 310 and 311	06		
10	Convert Bldg 816 and 817 for Wing Tank Storage	06	10,000	
11	Repair offices for Interim Aircraft Maintenance Unit (AMU) and Information Management System (IMIS), Bldg 898	06	10,000	
MILCON Projects				
12	Construct Aerospace Ground Equipment (AGE) Maintenance and Storage Facility	08	11,050	
13	Construct Precision Guided Missile Storage Facility	08	6,000	
14	Addition and Alterations (ADAL) Jet Engine Inspection and Maintenance, Bldg 800	09	7,500	5,000 sq ft new addition
15	ADAL AMU, Bldg 894	09	4,000	3,500 sq ft new addition
16	ADAL Simulator Facility, Bldg 315	09	11,000	7,000 sq ft new addition
17	Convert Low Observable/Corrosion Resistant Facility, Bldg 898	09		Insert 2 paint booths and wash rack
18	ADAL Conventional Munitions Shop, Bldg 1239	09	3,000	
19	ADAL Squadron Operations, Bldg 892	09	10,000	8,000 sq ft new addition

Note: 1. Not depicted on Figure 2.1-1.
ADAL=Addition and/or Alteration

Table 2.1-5. Optional Facility Support Projects

Project Number	*Project Name*
Optional Projects	
20	Initial or Temporary Squadron Operations Standup, Bldg. 302
21	F-22A Engine Shop, Bldg. 578
22	Temporary Standup for First Squad Ops, 53 TEG Area and IMIS Location, Bldg. 811
23	Construct New Conventional Munitions Shop
24	Armament
25	WLT
26	Phase MX
27	Pave Munitions Ground Equipment Park (Replaces areas used for new PGM and new conventional munitions shops)

Most construction would occur in 2007 and 2008, although some projects would continue through 2009. In total, the renovation, construction, and infrastructure improvements for the Proposed Action would affect about 4 acres of previously disturbed ground. Affected acres represent the area covered by the construction footprints of the proposed facilities plus the surrounding lands where construction-related clearing and grading would occur. Infrastructure upgrades, such as connecting new facilities to water and power systems, would also count as affected area on the base.

Renovation Activities. Prior to facility renovation, Holloman AFB would contract to have any asbestos-containing materials (ACMs) properly disposed of in accordance with federal and state regulations. Site preparation would include establishing a buffer zone around the involved facilities. The proposed renovation would include dismantling and removal of all excess facility equipment and machinery, in accordance with applicable regulatory requirements to ensure proper handling and disposition of the waste. Utilities would be capped or disconnected as necessary. Materials from all facilities proposed for renovation would be recycled to the greatest extent practicable.

The contractor would dispose of the materials removed in an approved landfill in accordance with state and local regulations and utilize an established haul route for equipment delivery and debris removal. The renovation would involve minimal ground disturbance and any areas that may be disturbed would be restored to prevent any long-term soil erosion. Frequent spraying of water on exposed soil during ground disturbance activities, proper soil stockpiling methods, and prompt replacement of ground cover or pavement are standard construction procedures that could be used to minimize the amount of dust generated.

Construction Activities. With the start of building construction, each building site would be graded and sediment and erosion controls appropriate to the site would be installed. These standard construction practices include the installation of a silt fence, storm drain inlet protection, temporary sediment traps, and diversion dikes within project limits prior to

commencement of any on-site work. All development activities would be performed in accordance with current security and force protection requirements.

Prior to construction at any site, a construction laydown area and haul route would be established. Appropriate erosion and siltation controls would be implemented and maintained in effective operating condition prior to, and throughout all construction activities.

Similarly, fugitive dust would be controlled by the use of standard construction practices. In all cases where construction disturbs the existing vegetation or other ground surface, the contractor would revegetate or restore the area as directed by the base.

2.1.3 Proposed Personnel Changes

Retirement of the F-117A and T-38A squadrons and beddown of the two F-22A squadrons would affect military and civilian personnel at the base. Table 2.1-6 details manpower requirements to operate and maintain the aircraft and to provide necessary support services. Fewer personnel, particularly for maintenance, would be needed for the F-22A squadrons than for the F-117A squadrons. For Holloman AFB, the F-22A personnel positions would be drawn from the equivalent positions associated with existing manpower authorizations to the extent practicable.

Table 2.1-6. Government Manpower Authorized Positions

	Government Manpower Authorized Positions			
	Officer	*Enlisted*	*Civilian*	*Total*
F-117A/T-38A	132	1282	40	1454
F-22A	112	1035	33	1180
	-20	-247	-7	-274

In addition to the government positions presented in Table 2.1-6, 35 contractor positions would no longer be needed to support the F-117A and associated T-38A aircraft. An additional 12 government authorized positions associated with the 417th Weapons Group could be affected by personnel changes including 10 government and 2 contractor personnel. In all, 321 positions may be affected including 286 government and 37 contractor positions. This represents a 5.3 percent reduction to the 6,111 personnel at Holloman AFB.

2.1.4 Proposed Training Missions

The F-22A training missions would include both air-to-ground training similar to that performed by the F-117A and air-to-air training associated with an air superiority aircraft. Air Force operated ranges provide air-to-ground capabilities for routine F-22A training within 100 nm of Holloman AFB. Munitions deployment training can also be simulated in training airspace.

The F-22A would conduct numerous related training activities to fulfill its mission requirements. Table 2.1-7 describes the projected F-22A air-to-ground missions and training. F-22A air-to-ground mission and training would be similar to those performed by the F-117A operational aircraft in terms of duration. Table 2.1-8 presents the training activities projected for F-22A air superiority missions. The F-22A would fly one and one-half to two hour long missions, including takeoff, transit to and from the training airspace, training activities, and landing. Depending upon the distance and type of training activity, the F-22A could spend between 30 to 60 minutes in a training airspace. On occasion during an exercise, the F-22A may spend up to 90 minutes in one or a set of airspace units. The F-22A would fly substantially less time after 10:00 p.m. and before 7:00 a.m. than the F-117As currently using the airspace.

The F-22A would spend 75 percent of its time operating above 30,000 feet, but could operate as low as 500 feet above ground level (AGL) and as high as Flight Level (FL) 600 (nominally 60,000 feet above mean sea level [MSL]). F-22As would use the authorized limits of each airspace unit. The F-22A would rarely (5 percent or less) fly below 5,000 feet AGL and primarily flies above 30,000 feet MSL (see Table 2.1-9.) Actual flight altitudes within an airspace would depend upon the lower and upper limits of specific airspace units.

The F-117A is a subsonic aircraft (see Table 1.1-1) that has relied on stealth alone to accomplish its mission. The F-22A has greater performance capabilities and pilots must train to use those capabilities at higher altitudes. The F-22A would employ supercruise to train to the full capabilities of the aircraft. The F-22A would fly approximately 25 percent of the time spent in restricted airspace and ATCAAs at supersonic speed.

Transformation of the 49 FW from the primary night air-to-ground mission of the subsonic F-117A to the multi-mission supersonic F-22A will substantially increase the capabilities of the 49 FW. The F-22A has supersonic performance without the use of afterburners. This means that F-22A pilots could attain supersonic speeds in the course of normal maneuvering without employing a separate procedure (i.e., lighting the afterburner). As such, pilots would be able to use the F-22A's supersonic capability more consistently with less concern for fuel use. Figure 2.1-2 presents the percent of time the F-22A would train at supersonic airspeed, by altitude block, within authorized ATCAAs and Restricted Airspace. In terms of its mission, more frequent use of supersonic speeds would provide an advantage when engaging enemy aircraft or when training for munitions deployment. Supersonic speeds enable the F-22A to "close on" (fly toward) and set up to fire a missile more rapidly than an aircraft with less supersonic capability. After "taking the shot," the F-22A could use its speed, stealth, and/or defensive countermeasures to evade simulated or real adversary missiles and aircraft.

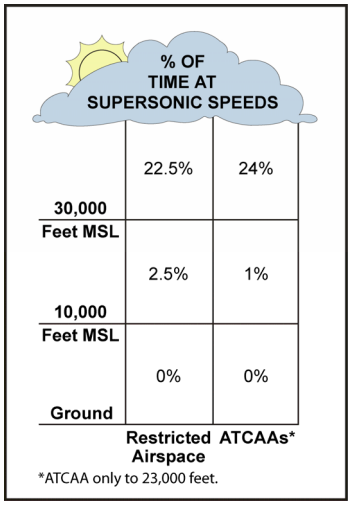


Figure 2.1-2. Percent of Time at Supersonic Speed by Altitude Block

Table 2.1-7. Projected F-22A Training Activities Similar to F-117A Training

Activity	*Description*[1, 2]	*Altitude (feet)*	*Time in Airspace*
Basic Surface Attack	Air-to-ground simulated delivery of munitions or delivery of inert ordnance, such as training ordnance, on a military training range.	Surface to 18,000 MSL	0.5 to 1.0 hour
Tactical Weapons Delivery	More challenging multiple attack headings and profiles; pilot is exposed to varying visual cues, shadow patterns, and the overall configuration and appearance of the target. Supersonic speeds that can include target acquisition are added to the challenge of weapon release accuracy.	Surface to 60,000 MSL	0.5 to 1.0 hour
Surface Attack Tactics	Practiced in a block of airspace such as a MOA or Restricted Area that provides room for supersonic speeds. Defensive countermeasures may be deployed. Precise timing during the ingress to the target is practiced, as is target acquisition. Training ordnance is only used on approved ranges. Training includes egress from the target area and reforming into a tactical formation.	Surface to 60,000 MSL	0.5 to 1.0 hour
Long Range Stand Off Weapons (LRSOW) Delivery	Practiced in a MOA or ATCAA that provides for maneuvering room and supersonic speeds. Precise timing for speed, altitude, and launch parameters is practiced at high altitudes without release. Use of inert munitions in low altitude drops to evaluate timing and aircraft performance.	Surface to 50,000 MSL	0.5 to 1.0 hour
Suppression of Enemy Air Defenses	Highly specialized mission requiring specific ordnance and avionics and can include supersonic speeds and defensive countermeasures. The objective of this mission is to neutralize or destroy ground-based anti-aircraft systems	Surface to 60,000 MSL	0.5 to 1.0 hour
Large Force Employment/ Mission Employment	Multi-aircraft and multi-adversary composite strike force exercise (day or night), air refueling, strike-force rendezvous, conducting air-to-ground strikes, strike force defense and escort, air intercepts, electronic countermeasures, electronic counter-counter measures, combat air patrol, defense against composite force, bomber intercepts, destroy/disrupt/avoid adversary fighters, defensive countermeasure (chaff/flare) use.	Surface to 60,000 MSL	0.5 to 1.0 hour

Notes: 1. Ordinance (inert and live) can only be released on an air-to-ground range.
2. Simulated deliveries can be conducted in MOAs, ATCAAs, and Restricted Airspace.
MSL = mean sea level; MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace

Table 2.1-8. Projected F-22A Training Activities as an Air Superiority Aircraft

Activity	*Description*[1.]	*Altitude (feet)*	*Time in Airspace*
Aircraft Handling Characteristics	Training for proficiency in use and exploitation of the aircraft's flight capabilities (consistent with operational and safety constraints) including, but not limited to high/maximum angle of attack maneuvering, energy management, minimum time turns, maximum/optimum acceleration and deceleration techniques, and confidence maneuvers.	5,000 AGL to 60,000 MSL	0.5 to 1.0 hour
Basic Fighter Maneuvers	Training designed to apply aircraft (1 versus 1) handling skills to gain proficiency in recognizing and solving range, closure, aspect, angle, and turning room problems in relation to another aircraft to either attain a position from which weapons may be launched, or defeat weapons employed by an adversary.	5,000 AGL to 30,000 MSL	0.5 to 1.0 hour
Air Combat Maneuvers	Training designed to achieve proficiency in formation (2 versus 1 or 2 versus 1+1) maneuvering and the coordinated application of basic fighter maneuvers to achieve a simulated kill or effectively defend against one or more aircraft from a pre-planned starting position. Use of defensive countermeasures (chaff, flares). Air combat maneuvers may be accomplished from a visual formation or short-range to beyond visual range.	5,000 AGL to 60,000 MSL	0.5 to 1.0 hour
Tactical Intercepts	Training (1 versus 1 up to 4 versus multiple adversaries) designed to achieve proficiency in formation tactics, radar employment, identification, weapons employment, defensive response, electronic countermeasures, and electronic counter countermeasures.	500 AGL to 60,000 MSL	0.5 to 1.0 hour
Night Operations	Aircraft intercepts (1 versus 1 up to 4 versus multiple adversaries) flown one-half hour after sunset, including tactical intercepts, weapons employment, offensive and defensive maneuvering, chaff/flare, and electronic countermeasures.	2,000 AGL to 60,000 MSL	0.75 to 1.5 hour
(Dissimilar) Air Combat Tactics	Multi-aircraft and multi-adversary (2 versus multiple to larger force exercises) conducting offensive and defensive operations, combat air patrol, defense of airspace sector from composite force attack, intercept and simulate and destroy bomber aircraft, destroy/avoid adversary ground and air threats with simulated munitions and defensive countermeasures, strike-force rendezvous and protection.	500 AGL to 60,000 MSL	0.5 to 1.0 hour
Air Combat Maneuvering (Aerial Gunnery)	Includes tow target training with guns.		

Note: 1. All activities can be conducted in MOAs, ATCAAs, and Restricted Airspace.
AGL = above ground level; MSL = mean sea level

Table 2.1-9. Comparable F-117A and F-22A Altitude Use

Altitude (feet)	*Percent of Flight Hours: F-117A*	*Percent of Flight Hours: F-22A*
Above 30,000 MSL[1]	8%	75%
10,000-30,000 MSL	67%	10%
5,000-10,000 AGL	14%	10%
2,000-5,000 AGL	8%	3.75%
1,000-2,000 AGL	2.75%	1%
500-1000 AGL	0.25%	0.25%

Note: 1. Operations by F-22As would emphasize use of higher altitudes more often than F-117As.
MSL = mean sea level
AGL = above ground level

2.1.5 Proposed Airspace and Use

There are three types of training airspace used by Holloman AFB F-117As and T-38A aircraft for training. Figure 2.1-3 displays these types of airspace. Airspace managed by Holloman AFB associated includes MOAs, ATCAAs, and Military Training Routes (MTRs). Restricted airspace supporting F-117A training is managed by the Army at WSMR and Fort Bliss (McGregor Range).

F-22A operational aircraft would routinely fly training flights in one or more of the Holloman AFB airspace units. Activities in the training airspace are termed *sortie-operations*. A *sortie-operation* is defined as the use of one airspace unit by one aircraft. Each time a single aircraft flies in a different airspace unit, one sortie-operation is counted for that unit. Thus, a single aircraft can generate several sortie-operations in the course of a mission.

Holloman AFB aircraft use MOAs, ATCAAs, low-level training routes, and restricted areas for training on a continuing basis. The Proposed Action includes enhancements to the airspace to provide for the expanded F-22A flight capabilities and does not use low-level training routes. These proposed enhancements are summarized on Figure 2.1-4.

2.1.6 Proposed F-22A Training within New Mexico Airspace

F-22A training is needed to maintain operational capabilities. The F-22A is the latest generation aircraft with both an air-to-ground and an air-to-air role. In comparison, the F-117 mission is strictly air-to-ground. The F-22A needs both air-to-air and air-to-ground training airspace and range facilities for pilots to achieve and maintain combat skills. Pilots would routinely train in New Mexico airspace within 100 nm of Holloman AFB.

Table 2.1-10 presents the current and projected sortie-operations in MOA, ATCAA, and restricted airspace used and proposed by Holloman-based aircraft. The F-117As and T-38As use the MOAs for 10 percent of all their training sortie-operations. The F-22A would conduct a greater proportion of its training at higher altitudes, at higher speeds, and during daylight hours than the F-117A.

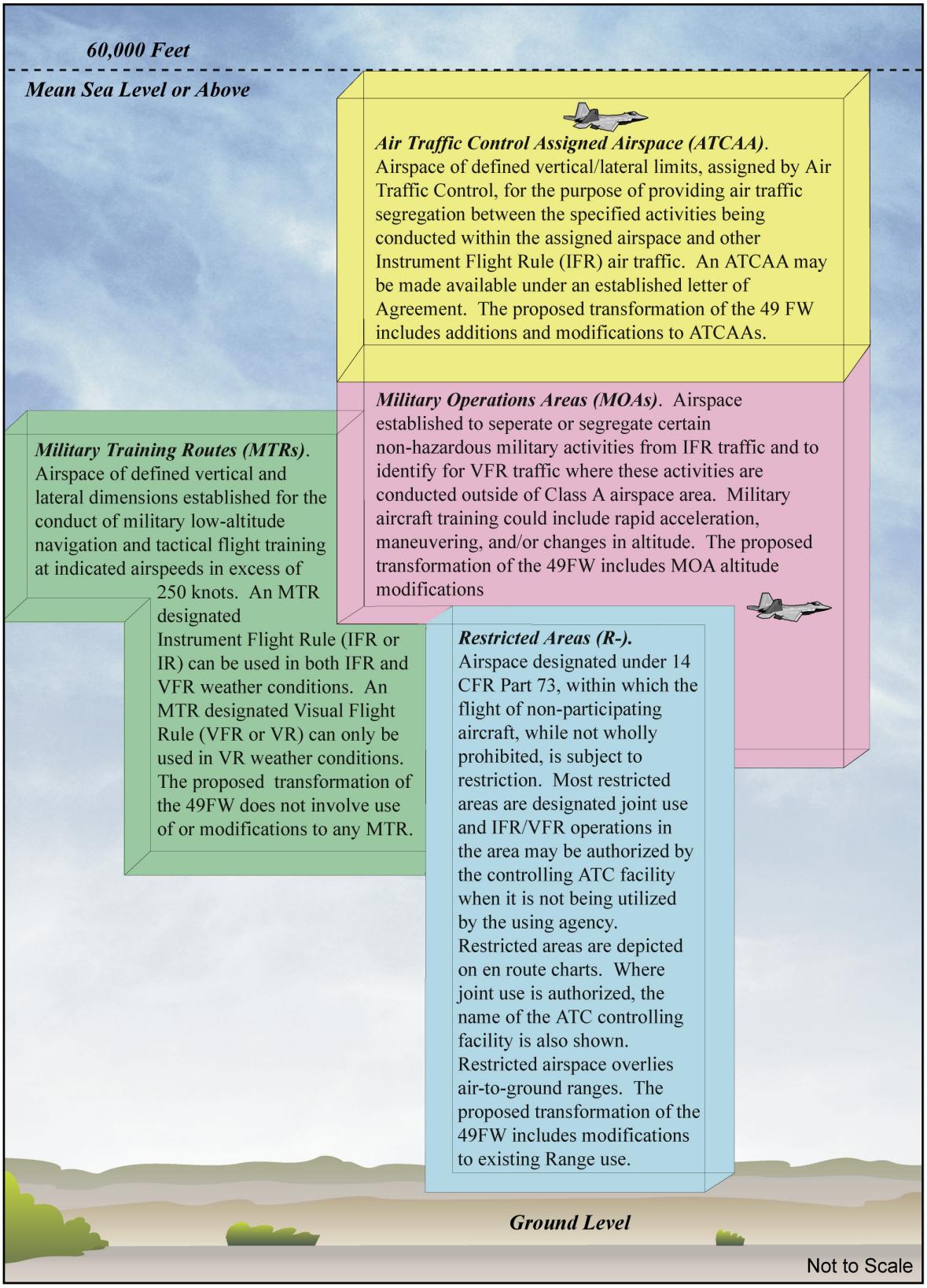


Figure 2.1-3. Types of Training Airspace

Table 2.1-10. Baseline and Projected Annual Sortie-Operations in Training Airspace

Airspace Unit	Floor (feet)	Ceiling (feet)	Baseline Use				Projected Use		
			F-117A	T-38A	Other	Total	Other	F-22A	Total
Beak MOA/ATCAA[1] A/B/C	12,500 AGL	FL290	339	591	548	1,478	671	4,315	4,986
Cowboy ATCAA[2, 3]	FL 310	FL 500		182	84	266	84	4,315	4,399
Talon[4]	12,500 MSL	FL 180	78	303	600	981	659	891	1,550
R-5107 Red Rio	Surface	Unlimited	2,893	10	980	3,883	1,127	200	1,327
R-5107 Oscura	Surface	Unlimited	2,288	6	1,391	3,685	1,392	200	1,592
R-5107 Lava E/W	Surface	Unlimited	4,848	34	640	5,522	646	6,904	7,550
R-5107 Mesa L/H	Surface	Unlimited	4,848	50	571	5,469	581	6,904	7,485
R-5107 Yonder	Surface	Unlimited	0	63	14	77	25	6,904	6,929
R-5103 McGregor[5]	Surface	Unlimited	0	97	0	97	17	863	880
R-5103 Centennial Range	Surface	Unlimited	3,209	4	712	3,925	713	200	913

Notes:
1. Proposed Action Beak ATCAA ceiling FL230.
2. Includes expanded Cowboy airspace.
3. Proposed Action Cowboy ATCAA floor FL230 and ceiling FL600.
4. The F-22A is not proposed to use Talon Low.
5. Includes new ATCAA between McGregor and WSMR.

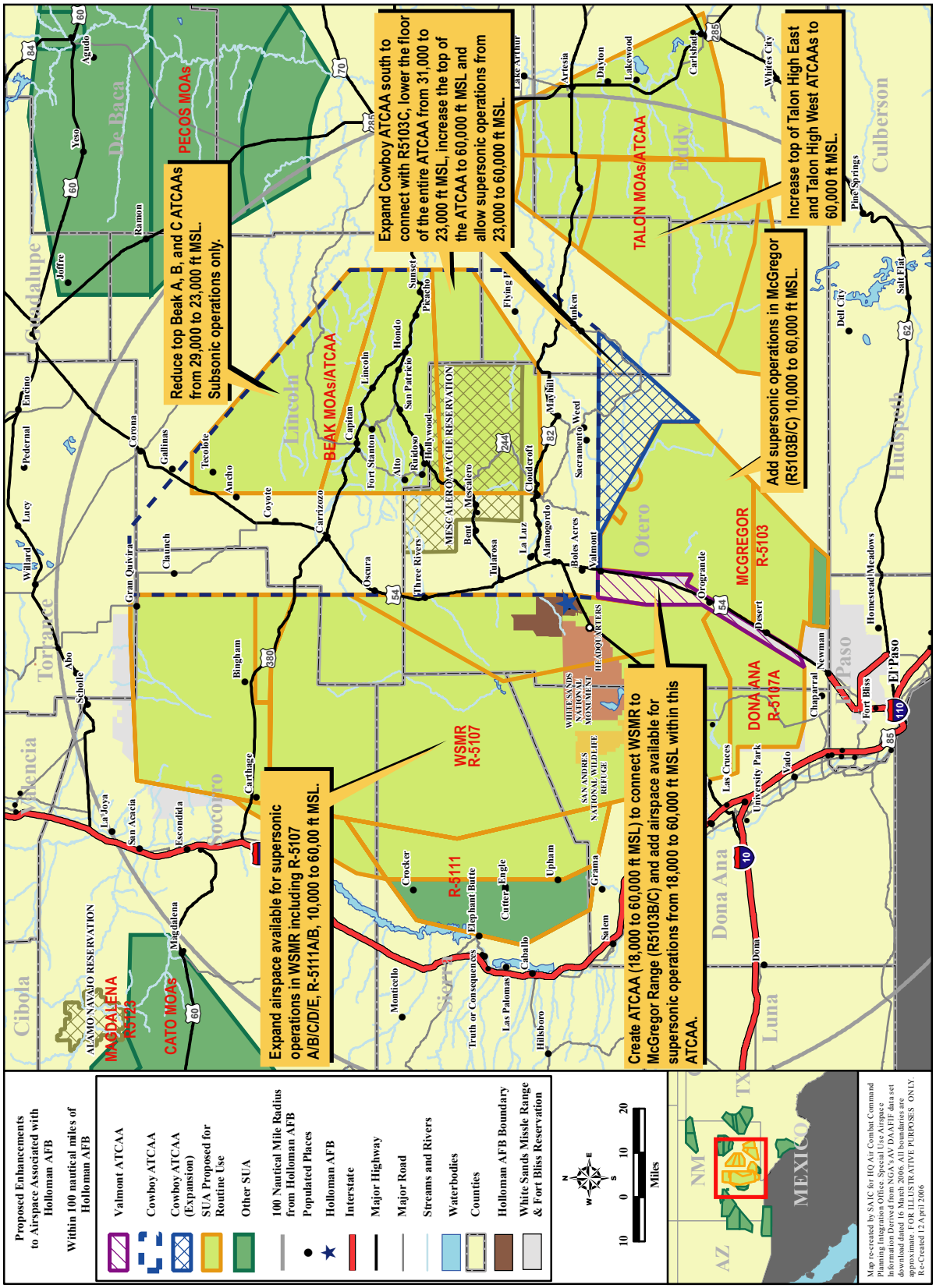


Figure 2.1-4. Airspace Associated with Holloman AFB

2.1.6.1 Air-to-Ground Training

Like the F-117A, the F-22A has an air-to-ground mission. For the purpose of this EA, F-22A pilots are projected to spend 60 percent of their training in air-to-air missions and 40 percent of their training in air-to-ground training. The Holloman AFB F-22A Operational Wing air-to-ground training would represent an important part of the F-22A training program. Projected air-to-ground training activities for the 49 FW F-22A aircraft are presented in Table 2.1-7.

Most air-to-ground training would be simulated, where nothing is released from the aircraft. The F-22As use avionics to simulate ordnance delivery on a target. This type of training could be conducted in any of the airspace units and would not require use of an air-to-ground range. A typical F-22A training mission would prepare for combat where Long Range Stand Off Weapons (LRSOW) would be deployed. The high cost of actual air-to-ground LRSOW will limit pilots from launching them in training no more than once or twice per year. Most of the LRSOW training will be conducted by a supersonic aircraft penetrating an airspace at high altitude, acquiring a target electronically or via satellite, opening bombay doors and becoming unstealthy to simulate launch, closing the doors and flying supersonic to another location to simulate another launch.

Air-to-ground training also includes ordnance delivery training. Air Force managed ranges are currently used for F-117A training. The F-117A has laser targeting capabilities for laser guided bombs. The F-22A munitions are not laser guided from the aircraft and rely on satellite and other electronic means for targeting. All ordnance delivery training would adhere to the requirements and restrictions of the existing ranges. Table 2.1-11 presents the current F-117A air-to-ground munitions used in training and the projected F-22A training munitions. Although several different types of smaller munitions are being studied for the F-22A, the primary air-to-ground ordnance carried by the F-22A will be the Guided Bomb Unit (GBU)-32 and a Small Diameter Bomb (SDB). The GBU-32 is a 1,000 pound variant of the Joint Direct Attack Munition (JDAM). JDAMs are guided to the target by an attached global positioning system (GPS) receiver. Training with these weapons could include accelerating to optimum weapons release speed, altitude, and delivery profile prior to opening the weapons bay. No JDAMs or SDBs would be released in MOAs or ATCAAs. F-22A training that included release of any munitions would occur on approved ranges at speeds and altitudes to keep munition debris within the range safety footprint.

Table 2.1-11. Current and Projected Annual Air-to-Ground Munitions

Training Munition Size	*F-117A*	*F-22A*
25 pound	3,994	0
250 pound	444	200
500 pound	164	0
1,000 pound	36	100
2,000 pound	155	0

In combat, some weapons could be released by an F-22A at supersonic speeds at altitudes up to 50,000 feet MSL. Actual ordnance delivery training using JDAMs or SDBs at approved delivery profiles would routinely occur during the times when F-22A squadrons would be at locations

approved for their use or during special training cycles. Current locations where release of these munitions is authorized may include the Nellis Range Complex in Nevada, the Utah Test and Training Range, and the approved ranges associated with Eglin AFB. An estimated 222 annual missions (approximately 3 percent of total F-22A missions) would be flown by the F-22As at exercises and training away from Holloman AFB. A portion of these missions would involve ordnance delivery training. The negligible level of use of these remote ranges and the current level of use by others suggest that projected F-22A use does not warrant additional detailed environmental analysis for these ranges.

2.1.6.2 Air-to-Air Training

The F-22A is a multi-role weapon system, with an air superiority mission. The F-117A does not have a defined air superiority mission. The F-22A uses AIM-120 Advanced Medium-Range and AIM-9 Sidewinder short range air-to-air missiles. It also has a 20 millimeter gun for close-in air-to-air engagements. Training for the use of these weapons is predominantly simulated. Simulating air-to-air attacks uses all the performance, radar, and targeting systems available on the F-22A. F-22A live-fire training would occur during specialized training or exercises at ranges authorized for these activities. The F-22A gun is not designed for air-to-ground use.

Most air-to-air training missions described in Table 2.1-7 would occur at higher altitudes and speeds and would not involve the release of weapons. Pilots of the 49 FW would conduct live aerial gunnery training employing 20 millimeter training munitions from the F-22A at towed targets. Yonder Range on WSMR is approved for aerial gunnery training and has supported such training in the past for F-15 and F-4 aircraft. The annual training requirement for the two F-22A squadrons is estimated at 34,000 rounds of M-56 20 millimeter training munitions.

2.1.6.3 Use of Defensive Countermeasures

Chaff and flares are the principal defensive countermeasures dispensed by military aircraft to avoid detection or attack by enemy air defense systems. Although the F-22A's stealth features reduce its detectability, pilots must train to employ defensive countermeasures. F-22As currently use RR-190A/AL chaff and MJU-10/B flares. A bundle of chaff consists of approximately 5.0 to 5.6 million fibers, each thinner than a human hair, that are cut to reflect radar signals and, when dispensed from aircraft, form an electronic "cloud" that breaks the radar signal and temporarily hides the maneuvering aircraft from radar detection. The RR-190A/AL chaff is combat coded that reflects air traffic control radars and therefore cannot be used for routine training. RR-188 chaff is non-combat training chaff that does not reflect all air traffic control radars. RR-188 chaff will need to be adapted for F-22A use in training. RR-188 chaff is currently authorized for use by test aircraft over WSMR. All analysis in this Draft EA addresses RR-188 chaff modified to eject from F-22A aircraft, because RR-190A/AL chaff is not permitted for training use. Each modified RR-188 chaff cartridge is assumed to release three 2-inch by 4-inch mylar strips and two 1-inch by 1-inch plastic or nylon pieces that fall to the ground.

Flares ejected from aircraft provide high-temperature heat sources that mislead heat-sensitive or heat-seeking targeting systems. Flares burn for 3 to 4 seconds at a temperature in excess of 2,000 degrees Fahrenheit (°F) to simulate a jet exhaust. During each flare burn, the flare burns for 3 to 4 seconds and descends approximately 400 feet. The burning magnesium flare pellet is completely consumed and three approximately 2-inch by 2-inch plastic or nylon pieces, and up to one 4-inch by 11-inch aluminum coated mylar wrapping material, and one or two 2-inch by

2-inch felt spacers fall to the ground. Holloman AFB restricts flare use during very high or extreme fire danger.

Defensive chaff and flares are used to keep aircraft from being successfully targeted by weapons such as surface-to-air missiles, anti-aircraft artillery, or other aircraft. The Proposed Action is for Holloman-based F-22A aircraft to train with defensive chaff and flares in the WSMR and McGregor airspaces and with defensive flares in the Cowboy, Doña Ana, Beak, and Talon airspaces. Appendix B describes F-22A chaff and projected chaff and Appendix C describes F-22A flares used in defensive training.

Effective use of chaff and flares in combat requires frequent training by aircrews to master the timing of deployment and the capabilities of the defensive countermeasure, and by ground crews to ensure safe and efficient handling of chaff and flares. Defensive countermeasures deployment in Holloman AFB authorized airspace is governed by a series of regulations based on safety, environmental considerations, and defensive countermeasures limitations. These regulations establish procedures governing the use of chaff and flares over ranges, other government-owned and controlled lands, and nongovernment-owned or controlled areas.

The proposed transformation of the 49 FW includes the F-22A use of 20,900 bundles (about 5,200 pounds) of chaff per year over WSMR and the McGregor Range. The amount of chaff used over the ranges would be proportional to the number of sortie-operations conducted by the F-22As over the ranges.

The F-22A would release up to 11,200 flares per year in all airspaces. The number of flares used in each airspace would be proportional to the number of sortie-operations conducted by the F-22As in that airspace. Based on the emphasis on flight at higher altitudes for the F-22A, approximately 75 percent of F-22A flare release throughout the airspace would occur above 30,000 feet MSL and there would be no flare release below 2,000 feet AGL.

2.2 Alternative A

Alternative A consists of an action decision to transform the 49 FW by retiring the stealth F-117A and supporting T-38A aircraft and establishing two squadrons of stealth F-22A aircraft at Holloman AFB. Alternative A utilizes WSMR for F-22A supersonic training and does not provide enhanced airspace as described in the Proposed Action. Under Alternative A, WSMR airspace would permit supersonic activities and chaff and flare use for training throughout WSMR airspace.

2.2.1 Alternative A Base Activities

Under Alternative A, the 49 FW transformation at Holloman AFB would affect the following aspects of the base and airspace:

- The F-22A flight activities, base operations, and sorties from the base would be the same for Alternative A as described for the Proposed Action.
- Planning, design, renovation, and construction of facilities at Holloman AFB to meet mission and maintenance requirements would be the same for Alternative A as described under the Proposed Action.
- The numbers and responsibilities of base personnel associated with the transformation from the F-117A and T-38A to F-22A aircraft would be the same for Alternative A as described under the Proposed Action.

2.2.2 F-22A Missions within Training Airspace

Alternative A airspace used, types of missions, number of missions, altitudes used for training, time spent in supersonic training, and defensive countermeasure use would be the same as that described for the Proposed Action.

2.2.3 Airspace Enhancements

Alternative A has no changes to the Cowboy ATCAA, Beak MOAs, or McGregor Range, and there would be no new bridging ATCAAs as described under the Proposed Action. Alternative A airspace modifications would expand supersonic training to 10,000 feet MSL and permit chaff and defensive flare use in training throughout WSMR. Alternative A would provide minimal training capabilities for F-22A missions at Holloman AFB.

2.2.4 Training within Alternative A Airspace

Table 2.2-1 presents current and projected airspace use under Alternative A. The F-22A would conduct nearly all supersonic training within WSMR. Alternative A permits the F-22A to meet minimum training capabilities with small adjustments to WSMR airspace. Alternative A does not provide diversity of training over varied terrain, nor does it permit multiple exercises using different airspaces.

Table 2.2-1. Alternative A Baseline and Projected Annual Sortie-Operations in Training Airspace

Airspace Unit	*Floor (feet)*	*Ceiling (feet)*	Baseline Use				Projected Use		
			F-117A	*T-38A*	*Other*	*Total*	*Other*	*F-22A*	*Total*
Beak MOA/ATCAA[1] A/B/C	12,500 AGL	FL180	339	591	548	1,478	671	315	986
Cowboy ATCAA[2, 3]	FL 310	FL 500		182	84	266	84	315	399
Talon[4]	12,500 MSL	FL 180	78	303	600	981	659	891	1,550
R-5107 Red Rio	Surface	Unlimited	2,893	10	980	3,883	1,127	200	1,327
R-5107 Oscura	Surface	Unlimited	2,288	6	1,391	3,685	1,392	200	1,592
R-5107 Lava E/W	Surface	Unlimited	4,848	34	640	5,522	646	10,904	11,550
R-5107 Mesa L/H	Surface	Unlimited	4,848	50	571	5,469	581	10,904	11,485
R-5107 Yonder	Surface	Unlimited	0	63	14	77	25	10,904	10,929
R-5103 McGregor[5]	Surface	Unlimited	0	97	0	97	17	4,863	4,880
R-5103 Centennial Range	Surface	Unlimited	3,209	4	712	3,925	713	200	913

Notes: 1. Proposed Action Beak ATCAA ceiling FL230.
2. Includes expanded Cowboy airspace.
3. Proposed Action Cowboy ATCAA floor FL230 and ceiling FL600.
4. The F-22A is not proposed to use Talon Low.
5. Includes new ATCAA between McGregor and WSMR.

2.3 No Action Alternative

No Action for this Draft EA means no transformation of the 49 FW to next generation F-22A aircraft. Analysis of the No Action Alternative provides a benchmark and enables decisionmakers to compare the magnitude of the environmental effects of the Proposed Action with the No Action Alternative. Section 1502.14(d) of NEPA requires analysis of the No Action Alternative.

For this EA, No Action is the baseline condition which currently has three squadrons of F-117A and associated T-38A aircraft based at Holloman AFB. The No Action Alternative would not transform the 49 FW by replacing F-117A aircraft and supporting T-38A and F-22A aircraft at Holloman AFB at this time. Supersonic activity would continue to be permitted above 10,000 feet MSL in approved WSMR airspace. Supersonic activity in the Cowboy ATCAA would continue at authorized levels. Munitions would continue to be deployed on approved ranges, and defensive countermeasures would be used as authorized. No action would result in the status quo or existing condition as addressed in this EA.

2.4 Identification of Alternatives

2.4.1 Identification of reasonable Alternative

The following criteria were used to determine if there were reasonable alternatives that would transform the 49 FW combat capability to fulfill the Air Force's Transformation Flight Plan. The Transformation Flight Plan includes transforming the F-117A assets into a more lethal, more agile, streamlined force with an increased emphasis on the war fighter. The transformation aircraft must accomplish the following:

1. Must be a more capable Air Force asset with an airframe that will permit the 49 FW to continue its combat mission of providing low-observable, precision penetrating weapons capability.
2. The transformation must meet the Air Force goal of recapitalizing, modernizing, and rebalancing the Air Force "total force" into a smaller, more lethal and agile force.
3. To recapitalize on the existing infrastructure, the airframe must minimize changes to the available infrastructure at Holloman AFB and the existing airspace.

Operational pilots must continually train to maintain skills essential for combat. Existing New Mexico airspace would meet the training needs of F-22A pilots based at Holloman AFB.

The Air Force has two airframe assets that could provide low-observable, precision penetrating weapons system capability, the B-2 and the F-22A.

The B-2 provides the penetrating flexibility and effectiveness inherent in manned bombers. Its low-observable, or "stealth," characteristics give it the unique ability to penetrate an enemy's most sophisticated defenses and threaten its most valued, and heavily defended, targets. The B-2 capability to penetrate air defenses and threaten effective retaliation provides a strong, effective deterrent and combat force well into the 21st century.

The Air Force inventory includes 21 (1 test) B-2 aircraft based at Whiteman AFB, Missouri, the only operational base for the B-2. The B-2 bomber is a substantially larger aircraft than a fighter and the only infrastructure available to support the B-2 and its mission has been established at Whiteman AFB. The B-2 would meet two of the three selection criteria identified above. However, there are no additional B-2 aircraft funded and there are no B-2 aircraft available to provide a low-observable, precision penetrating weapons capability to accomplish the purpose and need to transform the 49 FW.

The F-22A is funded to have additional aircraft constructed and meets the three selection criteria identified above. The F-22A is a more capable Air Force asset that would permit the 49 FW to continue its combat mission of providing low-observable, precision penetrating weapons capability with a low-observable precision penetrating weapons capability. The F-22A airframe is the only modernization aircraft available that meets the transition purpose and need as described in Chapter 1.0. Holloman AFB has extensive existing infrastructure particularly suitable to supporting a low observable weapon system, such as the F-22A. Transitioning from the F-117A to the F-22A airframe minimizes changes to the available, necessary infrastructure.

The B-2 aircraft would retain the 49 FWs stealth capabilities. However, no additional B-2 aircraft have been funded, and there are not a sufficient number of B-2 aircraft in the inventory to replace the F-117A and meet the Air Force's goal of transforming to a more lethal, more agile, force. Therefore, this is not a reasonable alternative and is not carried forward for detailed analysis.

2.4.2 Alternative Considered But Not Carried Forward

The Quadrennial Defense Review (QDR) of military capabilities and projected requirements has scheduled the retirement of the F-117A and supporting T-38A squadrons from Holloman AFB. If no F-22A aircraft replaced the F-117A aircraft to transform the 49 FW and maintain the 49 FW mission at Holloman AFB, the purpose and need described in Chapter 1.0 would not be met. The QDR action alone does not transform the 49 FW mission to provide precision penetration low observability aircraft capabilities that make maximum use of Holloman AFB facilities. The QDR action alone does not meet the purpose and need to transform the 49 FW and is not carried forward as a viable alternative in this Environmental Assessment.

2.5 Environmental Impact Analysis Process

This EA for the transformation of the 49 FW at Holloman AFB has been prepared in accordance with NEPA (42 United States Code [USC] 4321-4347), CEQ Regulations (40 CFR § 1500-1508), and 32 CFR 989, *et seq.*, *Environmental Impact Analysis Process* (Air Force Instruction [AFI] 32-7061). NEPA is the basic national requirement for identifying environmental consequences of federal decisions. NEPA ensures that environmental information is available to the public, agencies, and the decision-maker before decisions are made and before actions are taken.

Compliance with NEPA guidance for preparation of an EA involves several steps depicted in Figure 2.5-1.

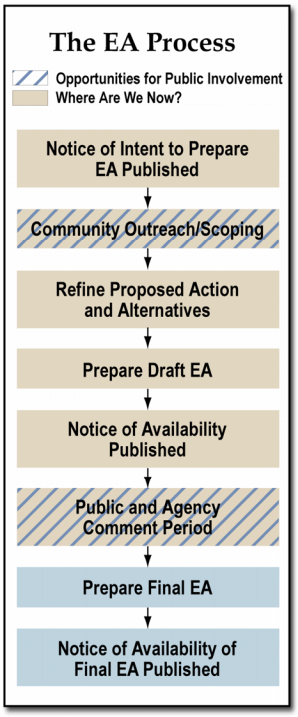


Figure 2.5-1. EA Process

The environmental analysis process includes public and agency review of information pertinent to the Proposed Action and alternatives, and provides a full and fair discussion of potential consequences to the natural and human environment. Community outreach/scoping meetings were conducted at cities beneath or near the airspace from 17 through 20 April 2006 to involve the public and agencies, to identify possible consequences of an action, and to focus analysis on resources potentially affected by the Proposed Action, alternatives, or the No Action Alternative. Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) letters were sent and responses received through 5 May 2006.

The inside of this Draft EA's front cover explains how this EA is organized and how to use this document. In addition to the main text described inside the front cover, the following appendices are included on a CD attached to the inside back cover: Appendix A, F-22A Development Program; Appendix B, Characteristics of Chaff; Appendix C, Characteristics of Flares; Appendix D, Public and Agency Outreach including FAA, Otero County, and City of Alamogordo and other letters; Appendix E, Noise; Appendix F, Holloman AFB and Regional Historical Context; Appendix G Biological Resources – Supplemental Information; Appendix H Airspace Management; Appendix I Air Quality; and Appendix J Physical Resources.

2.5.1 Scope of Resource Analysis

The Proposed Action and alternatives have the potential to affect certain resources. These potentially affected resources have been identified through public scoping meetings, communications with state and federal agencies and Native American governments, and review of past environmental documentation. Specific resources with the potential for environmental consequences include airspace management and air traffic control, subsonic and supersonic noise, safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice.

2.5.2 Public and Agency Input

The Air Force initiated early public and agency involvement in the environmental analysis of the proposed transformation of the 49 FW. The Air Force published a Notice of Intent in the *Federal Register*, published newspaper advertisements, provided flyers for posting, sent out press releases, and distributed IICEP letters. These announcements solicited public and agency input on the proposal and invited the public and agencies to attend community outreach scoping meetings in Ruidoso, Truth or Consequences, and Alamogordo, New Mexico, April 17, 18, and 19, 2006, respectively. Table 2.5-1 presents details on the community outreach events.

Table 2.5-1. Community Outreach Scoping Meetings

Meeting Date & Time	*Meeting Location*
Monday, April 17, 2006 5:30 p.m. – 7:30 p.m.	Best Western Pine Springs Inn 1420 E. Hwy 70 Ruidoso Downs
Tuesday, April 18, 2006 5:30 p.m. – 7:30 p.m.	Youth and Family Community Center 300 Daniels Street Truth or Consequences
Wednesday, April 19, 2006 5:30 p.m. – 7:30 p.m.	Sgt. Willie Estrada Memorial Civic Center 800 E. First Street Alamogordo

In addition to the scoping meetings identified in Table 2.5-1, the Air Force conducted separate meetings with the Mescalero Apache Tribal Council on March 23, 2006, and with the Mescalero Apache Elders and others on April 17, 2006, at the Tribal Administration Building in Mescalero.

Table 2.5-2 presents issues identified by the public and government entities during this process and Appendix D provides correspondence received.

2.6 Regulatory Compliance

This EA has been prepared to satisfy the requirements of NEPA (Public Law [P.L.] 91-190, 42 USC 4321 *et seq*.) as amended in 1975 by P.L. 94-52 and P.L. 94-83. In addition to complying with NEPA (see Section 2.4), Table 2.6-1 presents other reviews and permits required if the 49 FW transformation were selected.

2.7 Environmental Comparison of Alternatives

The public and agency scoping process focused the analysis on the following environmental resources: airspace management, noise, safety, air quality, physical resources, biological resources, cultural resources, land use, socioeconomics, and environmental justice. Table 2.7-1 presents the summary of environmental consequences from the proposed 49 FW transformation at Holloman AFB. Table 2.7-2 presents the summary of environmental consequences under the airspace used for training after the proposed 49 FW transformation.

Table 2.5-2. Summary of Public Comments and Notes from Scoping/Community Outreach Events (Page 1 of 4)

	EA Section Addressing Issue
MESCALERO, NEW MEXICO	
Aircraft	
Inquiry into the colors of different aircraft. Why is the F-22A a different color than the F-117A?	*Not included in environmental analysis*
Economic	
What will be the economic impact of this proposal on tourism and the local economy, particularly the ski area?	3.9, 4.9
Safety	
Concerns about ejection of projectiles, chaff, or flares.	4.5
Noise	
Concerns that noise pollution could effect the local economic activities	4.2
Concerns about noise impacts from sonic booms	4.2
RUIDOSO, NEW MEXICO	
Aircraft	
How long does it take for aircraft to fly 100 miles?	*Not included in environmental analysis*
What is the cost of the F-22A aircraft?	
Why isn't the F-22A black?	
How do the GAF aircraft train?	
What type of aircraft does the German Air Force (GAF) have and how many?	Table 2.1-2
Airspace	
Would the proposal hurt commercial air service that is planned out of Sierra Blanca?	4.1
Would there be conflicts with commercial or private aircraft?	4.1
Inquiry as to why the Air Force is pushing forward with NMTRI. Inquiry that if the Capitan ATCAA bridge still exists, would the F-22As use it?	*Not included in environmental analysis*
Concern about restricted airspace over WSMR.	4.1
Concern about approaches into Sierra Blanca Airport	4.1
Base Facility	
Will there be any construction at Holloman AFB?	2.1.2
Biological	
Concerns regarding animal ingestion of chaff	4.6
Air Quality	
Concern regarding the inhalation of chaff and flares and potential harm to lungs from the particulates?	4.5
Is chaff in any way like asbestos?	4.5

Table 2.5-2. Summary of Public Comments and Notes from Scoping/Community Outreach Events (Page 2 of 4)

	EA Section Addressing Issue
Physical Resources	
Dropping chaff and flares is a concern with respect to impacts upon wildlife, water, forests, the ecosystem, and the physical environment.	4.5
Concerns regarding drought, fire, and release of flares from aircraft.	4.5
Concern regarding inadvertent actuation of flares or flare redundancy.	4.5
Concern regarding dud flares igniting on the ground.	4.5
What sort of shape will chaff have once it makes it to the ground?	4.5
If the flares are expended at night, will they be visible?	4.5
Economic	
What will the proposal mean to current personnel numbers at Holloman?	4.9
Would the proposal hurt commercial air service that is planned out of Sierra Blanca?	4.9
Would Holloman have any continued mission to sustain personnel currently employed there?	4.9
Noise	
Expect to hear F-22 sonic booms.	4.2
Will sonic booms affect the Spencer Theater?	4.2
Can training be limited to WSMR?	2.2
Can sonic booms be minimized over populated areas?	2.2
Can you control the time of day for sonic booms?	3.2.2
Land Use/Recreation	
What will be the overpressure from sonic booms?	4.2
Will there be effects of sonic booms on gondolas or other recreation?	4.2, 4.8
What will be the effects of sonic booms or other materials on the economy, ski area gondolas or other recreation facilities, gaming, horses?	4.2, 4.6, 4.8, 4.9
Military Activity	
Appreciation expressed for the Air Force's duty and service.	*Comment noted*
TRUTH OR CONSEQUENCES, NEW MEXICO	
Airspace	
Will there be any impact upon general aviation?	4.1
Physical resources	
Concern regarding things falling on community from chaff and flares.	4.5
Are there any hazardous chemicals that could enter the environment, particularly bodies of water from chaff or flares?	4.5
Is there any potential for radioactive contamination?	4.5
Noise	
Persons living in Monticello hear sonic booms, particularly in summer.	4.2
Military Activity	
Use "battle ground" rather than "theatre" and use terminology that accurately portrays the war fighting purpose of the aircraft.	*Comment noted*

Table 2.5-2. Scoping/Community Outreach Events (Page 3 of 4)

	EA Section Addressing Issue
ALAMOGORDO, NEW MEXICO	
Proposed Action and Alternatives	
If the F-117A goes away, and the F-22A does not come to Holloman, could other missions be brought into Holloman AFB?	Currently, no other missions proposed
If you had to pick a weakness of the project, what would it be?	Not included in EA
Aircraft	
What is the actual timeframe for the retirement of the F-117A and the beddown of the F-22A squadron?	Table 2.1-1
Will the T-38s stay as long as the F-117s?	Chapter 2.0, Table 2.1-1
Are there other proposals to bring other aircraft into Holloman?	None at this time
Is there any truth in Holloman regarding any UAVs being beddown?	No UAV proposal at this time
Airspace	
How much of a decrease in flight activity or sorties given that there will be fewer airplanes?	3.2.1, 4.2.2
The two airspace areas that are being stitched together – will the approval of that go through this environmental analysis process or another FAA process?	1.4
Base Facility	
Will the proposal impact some of the facilities on base?	3.8
Physical Resources	
Concerns regarding an increase in water usage from the proposal.	4.5
Recreation	
Will this impact the hang-gliding hobbyists?	4.8
Economic	
What is the actual timeframe for the retirement of the 117A?	2.1
When you bring in the new plane, what total number of people may be coming for the training – will there be an influx?	2.1
Will the economic effects of this proposal and the potential decrease in Air Force personnel be analyzed?	4.9
Holloman AFB is the heart of the community, and without a flying mission, the economic impacts would be severe.	4.9
How will the economy of ranchers and the ranching industry be impacted by sonic booms?	4.9

Table 2.5-2. Scoping/Community Outreach Events (Page 4 of 4)

	EA Section Addressing Issue
Noise	
How much will ranchers and the ranching industry be impacted by sonic booms?	4.2
What area or areas will be impacted by sonic booms?	4.2
Biological	
Did sonic booms from F-15s affect cattle or deer breeding? Would sonic booms from the F-22A affect cattle or deer?	4.2, 4.6
EIAP Process	
Is the EA for Elmendorf going in parallel with this one?	Elmendorf EA is completed
When would the final decision be made?	2.5
Is part of the analysis going to include not retiring the F-117A and not bringing the F-22s at Holloman?	2.4
If in the future, if Holloman AFB wanted to do F-22A additional pilot training, would they have to do additional environmental analysis?	Yes
Miscellaneous	
Would the budget for the U.S. have anything to do with whether or not the F-22As come to Holloman AFB?	Yes, a budget proposal has precipitated Holloman AFB looking for a new mission.
Cumulative Impacts	
How could increased airspace affect activities like Roving Sands or other training opportunities?	5.0
Could the F-22A beddown be the start of other missions at Holloman?	5.0

Table 2.6-1. Reviews and Permits Required to Implement Holloman AFB Transformation of the 49 FW

Review/Permit	*Responsible Agency(ies)*	*Action Requiring Analysis, Permit Review, and/or Permit*
Federal		
NEPA	Air Force	Transformation of the 49 FW
Air Conformity Analysis/ Review Under the Clean Air Act Amendments	Air Force/ New Mexico Environment Department	Federal action (i.e., change in aircraft) potentially changing of air emissions in an area designated as nonattainment for one or more criteria pollutants designated under the Clean Air Act
Section 7 of the Federal ESA	U.S. Fish and Wildlife Service (USFWS)/ Air Force	Construction and operational changes associated with transformation of the 49 FW
State		
Permit to Construct and Operate New Stationary Source	New Mexico of Environment Department /Air Force	Required for new paint facility
Review of Current Title V, Clean Air Act Permit	Air Force/ New Mexico Environment Department	Required to assess changes in maintenance materials and processes
National Pollution Discharge Elimination System Permit	Air Force /New Mexico Environment Department	Land alternation of more than 1 acre.
NHPA Section 106	Consultation with State Historic Preservation Office (SHPO) and Notification to Advisory Council on Historic Preservation (ACHP)	Potential overflight consequences to historic properties

Table 2.7-1. Summary of Consequences by Resource at Holloman AFB (Page 1 of 2)

Resource, EA Section	*Proposed Action*	*Alternative A*	*No Action Alternative*
Airspace Management, EA Section 3.1	Daily operations decrease by approximately 11.5 percent compared to existing conditions.	Same as Proposed Action.	Continued use of Holloman AFB by F-117A and T-38A aircraft.
Noise, EA Section 3.2	F-22A's ability to rapidly climb from base results in greater noise on-base and lowered noise levels off-base. Noise contours would reduce the off-base area subject to 65 dB or greater. Subsonic noise over White Sands National Monument reduced.	Same as Proposed Action.	No change in aircraft and no construction. Noise conditions at White Sands National Monument HQ remain at baseline conditions.
Safety, EA Section 3.3	Bird-aircraft strike hazard somewhat lessened. Munitions less and chaff and flares more for F-22A compared to F-117A. Personnel and facilities able to handle munitions, chaff, and flares. Class A accident potential risk expected to be comparable to similarly sized F-15C aircraft as F-22A system matures.	Same as Proposed Action.	Continuation of current BASH, ordnance, and other safety conditions.
Air Quality, EA Section 3.4	Alamogordo area is in air quality attainment for all criteria pollutants. Local air quality or visibility not significantly affected. No significant change projected to air quality within Alamogordo area. No conformity determination required.	Same as Proposed Action.	No renovation or new construction and no change from current emissions.
Physical Resources, EA Section 3.5	Renovation and construction in previously disturbed areas. Existing hazardous materials facilities support low observability aircraft coatings. No significant effects on earth or water resources, hazardous materials, hazardous wastes, or Environmental Restoration Program.	Same as Proposed Action.	No ground-disturbing activities. Hazardous wastes would be generated at current levels.
Biological Resources, EA Section 3.6	No sensitive biological species affected. F-22A ability to rapidly climb above normal altitude of migrating waterfowl and other birds should minimally reduce BASH potential. Birds and mammals associated with the base and its environs not expected to be adversely affected.	Same as Proposed Action.	No change from existing conditions.

Table 2.7-1. Summary of Consequences by Resource at Holloman AFB (Page 2 of 2)

Resource, EA Section	*Proposed Action*	*Alternative A*	*No Action Alternative*
Cultural Resources, EA Section 3.7	Buildings proposed for renovation or demolition not registered historic structures. White Sands National Monument HQ expected to have lower subsonic noise.	Same as Proposed Action.	Existing noise contours extend into White Sands National Monument.
Land Use, EA Section 3.8	Renovation and construction consistent with base general plan. Off-base area affected by 65 dB noise contour reduced. Light industry or commercial land use not expected to be impacted by F-22A flights. Potential increased traffic congestion during construction reduced to below existing after transformation.	Same as Proposed Action.	No change to noise environment on-base and environs. No construction or personnel changes. No changes in traffic.
Socioeconomics, EA Section 3.9	Total regional socioeconomic stimulation from $37 million renovation and construction estimated at $54.1 million in total output and 330 total jobs. Base authorized and other positions reduced by 321 jobs, or 5.3 percent of Holloman AFB positions. Anticipated population decline of 674 persons is approximately 2 percent of Alamogordo population. Housing demands reduced by approximately 227 off-base units. Secondary employment reduced by approximately 99 positions. F-117A and T-38A aircraft represent approximately 25 percent of base authorized personnel.	Same as Proposed Action.	No change in base personnel before retirement of F-117A and associated T-38A aircraft.
Environmental Justice, EA Section 3.10	Minority and low income populations in the Alamogordo area comparable to those of the state of New Mexico. No disproportionate impact upon minority or low income populations or upon children.	Same as Proposed Action.	No change from existing conditions.

Table 2.7-2. Summary of Consequences by Resource under Training Airspace (Page 1 of 5)

Resource, EA Section	*Proposed Action*	*Alternative A*	*No Action Alternative*
Airspace Management, EA Section 4.1	Civil aircraft can fly below connecting 18,000 feet MSL floor ATCAAs. Lowering the floor of Cowboy ATCAA from 29,000 feet to 23,000 feet MSL not expected to affect Sierra Blanca Airport or civil aircraft. Recreational activities, including ski gondolas, or hang gliding, not affected. Use of defensive chaff equivalent to RR-188 training chaff not expected to affect air traffic control radars.	Concentration of nearly all F-22A training over WSMR could affect airspace management among competing users of restricted airspace.	No change from existing conditions.
Noise, EA Section 4.2	Subsonic day-night average sound levels (L_{dnmr}) not discernibly changed under the Cowboy, Beak, Talon, and northern portion of WSMR airspaces. Subsonic noise increases of 5 to 10 dB over the southern portion of WSMR and McGregor Range would remain below 55 dB (potential impacts not expected). Supersonic training would increase sonic booms from 1 to 2 per month to 30 per month toward the center of the Cowboy ATCAA and from 5 per month to 45 per month toward the center of WSMR. Sonic boom overpressure would not pose a health or other risk but could damage windows, rattle shelves, and increase annoyance to residents and long-term visitors of from 1 percent highly annoyed to approximately 6 percent highly annoyed under WSMR and approximately 4 percent highly annoyed under the Cowboy ATCAA.	Subsonic L_{dnmr} levels essentially the same as existing under Cowboy, Beak, and Talon airspaces. WSMR subsonic increases from existing between 35 to 50 dB to 50 to 55 dB. Sonic booms on WSMR increase from 5 per month to up to 80 per month. Percent of highly annoyed individuals increases from an existing 1 to 2 percent to a projected 12 percent of the population. Booms could impact residents, workers, visitors, or others under WSMR. Alamogordo and northern portion of El Paso to have 10 to 15 sonic booms per month.	No change from existing 1 to 2 booms per month under Cowboy ATCAA and existing 5 per month on WSMR.

Table 2.7-2. Summary of Consequences by Resource under Training Airspace (Page 2 of 5)

Resource, EA Section	*Proposed Action*	*Alternative A*	*No Action Alternative*
Safety, EA Section 4.3	No substantive change in or impacts to flight, ground, or other safety aspects. Enhanced F-22A electronics substantially improve situational awareness of other aircraft in airspaces. F-22A improved electronics and maintenance expected to result in long-term Class A accident rate comparable to that of similarly sized F-15C aircraft. Deployment of RR-188 or equivalent chaff not expected to interfere with FAA radar. Restrictions on flare use during periods of very high or extreme fire danger and 2,000 feet AGL minimum altitude deployment minimize fire risk.	Same as Proposed Action, except chaff and flare use all in WSMR.	No change from existing training by F-117A and T-38A aircraft. No change in use of chaff and flares in training airspace.
Air Quality, EA Section 4.4	Change in training aircraft mix would not affect air quality. Areas under training airspace within air quality attainment. Any emissions would be dispersed and not measurably affect air quality or visibility in any Class 1 area.	Same as Proposed Action.	No change in training aircraft. No effects on air quality.
Physical Resources, EA Section 4.5	Increase in sonic booms and associated vibration would not impact soil, geologic, or snow pack formation. Each chaff deposits three 2-inch by 4-inch mylar pieces, and two 1-inch by 1-inch plastic pieces. Each flare deposits two 2-inch by 2-inch plastic pieces, one S&I device, and up to a 4-inch by 12-inch aluminum-coated mylar wrapping. Plastic or mylar pieces not in concentrations that could affect soil or water resources. Flare minimum altitude (above 2,000 feet AGL) and not being deployed during periods of very high or extreme fire danger minimize fire risk.	Same as Proposed Action, except chaff and flares only deployed in WSMR.	No change from existing conditions. F-117A and T-38A do not use chaff or flares.

Table 2.7-2. Summary of Consequences by Resource under Training Airspace (Page 3 of 5)

Resource, EA Section	*Proposed Action*	*Alternative A*	*No Action Alternative*
Biological Resources, EA Section 4.6	Subsonic noise greater than existing conditions under southern portion of WSMR and the McGregor Range. Subsonic change not expected to affect wildlife. Like thunder, the increase in sonic booms could startle some animals; individuals will vary in their reaction. Wildlife previously exposed to sonic booms or thunder are expected to habituate to additional exposure. Sonic booms, like thunder, could startle sensitive animals in a pen or restricted area. Twenty to 40 sonic booms per month could affect, but would not likely adversely affect protected species. Chaff and flare residual materials are not a threat to native or domestic animals. The Proposed Action may affect but is not likely to adversely affect the Mexican Spotted Owl, bald eagle, or the northern aplomado falcon.	Subsonic noise effect similar to those described for Proposed Action. Sonic boom effect to be up to 80 per month toward the center of WSMR.	No change from existing conditions.
Cultural Resources EA Section 4.7	Sonic boom vibrations could affect historic properties under WSMR, particularly within White Sands National Monument Headquarters, and under Cowboy ATCAA, particularly on the Mescalero Apache Reservation. Structures in disrepair or with fragile windows could be damaged by sonic booms. Mescalero representatives expressed concern about increased sonic booms. Reservation economy based upon gaming, tourism, and natural resources could be affected by economic downturn at Alamogordo.	No noise change from baseline over Mescalero Apache Reservation. Potential 40 sonic booms per month over White Sands National Monument HQ and other historic properties under WSMR could impact these resources. Sonic boom overpressures could damage structures in disrepair or with fragile windows.	No change from existing conditions as long as F-117A and T-38A aircraft remain at Holloman AFB.

Table 2.7-2. Summary of Consequences by Resource under Training Airspace (Page 4 of 5)

Resource, EA Section	*Proposed Action*	*Alternative A*	*No Action Alternative*
Land Use, EA Section 4.8	Increased sonic booms over workplace, residential, recreational, hunting, and fishing areas under the airspace. Largest number of residences affected are located under Cowboy ATCAA (approximately 25 booms per month). WSMR would have approximately 45 booms per month. Sonic booms not expected to affect land use or land use patterns, ownership, or management. Highly annoyed percent of population increases from 1 percent to 6 percent. Overpressure from sonic booms should not be greater than normal wind pressure on facilities such as ski lift gondolas, gaming locations, or the Spencer Theater. A small percentage of sonic booms could have sufficient pressure to damage windows in poor condition or to vibrate loose materials off of shelves. WSMR sonic booms generated at lower altitudes have greater potential for higher overpressures.	Little or no change in baseline conditions under Cowboy ATCAA. In WSMR, potential effects of up to 80 sonic booms per month on residents, users of land, or workers. Affected population highly annoyed projected to increase from 1 percent to as much as 12 percent. Damage claims begin by contacting the Holloman AFB Public Affairs Office.	No change from existing conditions. Continued presence of military aircraft training during day and night within airspace.
Socioeconomics, EA Section 4.9	No discernible change in subsonic noise under most airspace. Approximately 30 sonic booms per month under Cowboy ATCAA may annoy residents or long-term visitors to the area. General activities under the airspace or the local economy not significantly affected. Specific activities associated with horse races at Ruidoso Downs or other recreational activities could be affected by increases in sonic booms. Residual materials from chaff or flare deployment include up to 2 inch by 2 inch plastic or nylon pieces and up to 4 inch by 13 inch aluminum-coated mylar wrapping. These pieces would not affect safety, but, if found and identified by a resident, rancher, or recreationalist, the individual could be annoyed. Recreational and gaming activities partially supported by an economically viable Alamogordo and Holloman AFB.	Little or no change from existing noise under the Cowboy ATCAA except along western edge where sonic booms could increase to 10 per month. Visitors and residents at White Sands National Monument Headquarters could experience 35 to 40 sonic booms per month. Overall socioeconomic activities not expected to substantially change. Sensitive individuals could avoid areas of sonic boom concentration.	No change from existing conditions.

Table 2.7-2. Summary of Consequences by Resource under Training Airspace (Page 5 of 5)

Resource, EA Section	*Proposed Action*	*Alternative A*	*No Action Alternative*
Environmental Justice, EA Section 4.10	Some Mescalero Apache Reservation residents or visitors could be annoyed by approximately 18 sonic booms per month. Game species, such as elk, mule deer, and domestic species, that contribute to the Mescalero economy expected to habituate. Sonic booms comparable to thunder will be distributed throughout the airspace, so no disproportionately high or adverse impacts on minority or low income communities expected. Sonic booms not expected to damage health or other environmental resources. No disproportionate health or safety risks to children. A reduction in base and Alamogordo activity would have anticipated and unquantified effects on the reservation economy.	No change from baseline noise under all but western edge of Cowboy ATCAA. No effects on Mescalero Apache Reservation. Supersonic activity concentrated in WSMR and sonic booms experienced primarily on WSMR. Northern El Paso, Alamogordo, or the other areas on periphery of WSMR subject to approximately 5 to 15 booms per month would not be expected to have minority or low income communities or children disproportionately affected.	No change from existing conditions.

2.8 Environmental Resource Definition, Region of Influence, and Applicable Laws

This section provides a definition of resource attributes and any applicable regulations for each resource. The expected geographic scope of potential impacts is also identified as the ROI. The ROI is defined as the outermost boundary of potential environmental consequences. For most resources in this chapter, the ROI is defined as the boundaries of Holloman AFB. However, for some resources, the ROI extends over a larger jurisdiction unique to the resource.

2.8.1 Airspace Management and Air Traffic Control

Resource Definition

Airspace management and air traffic control is defined as the direction, control, and handling of flight operations in the "navigable airspace" that overlies the geopolitical borders of the U.S. and its territories. "Navigable airspace" is airspace above the minimum altitudes of flight prescribed by regulations under USC Title 49, Subtitle VII, Part A, and includes airspace needed to ensure safety in the takeoff and landing of aircraft, as defined in FAA Order 7400.2E (49 USC). This navigable airspace is a limited natural resource that Congress has charged the FAA to administer in the public interest as necessary to ensure the safety of aircraft and its efficient use (FAA Order 7400.2E 2000).

The FAA has designated four types of airspace above the U.S. They are Controlled Airspace, Special Use Airspace (SUA), Other Airspace, and Uncontrolled airspace. Controlled airspace is designated to support Holloman AFB aviation operations and associated airspace. These airspaces are shown graphically in Appendix H.

This resource will be discussed in more detail in Section 3.1 and 4.1.

Region of Influence (ROI)

The affected environment or ROI for aircraft operations at Holloman AFB includes the base and the airspace surrounding the airfield. The ROI for training includes the military training airspace within 100 nm of Holloman AFB proposed for routine use by F-22A aircraft.

Regulatory Setting

FAA-H-8083-25, Pilot's Handbook of Aeronautical Knowledge. U.S. Department of Transportation, FAA 2001. FAA Order 7400.2E, Procedures for Handling Airspace Matters. June 4.

The Air Force manages airspace in accordance with processes and procedures detailed in AFI 13-201, *Air Force Airspace Management*. AFI 13-201 implements Air Force Planning Document 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*, and Department of Defense (DoD) Directive 5030.19, *DoD Responsibilities on Federal Aviation and National Airspace System Matters*. It addresses the development and processing of SUA, and covers aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support Air Force flight operations.

Air Force management of training ranges involves the development and implementation of those processes and procedures required by AFI 13-212, Volumes 1, 2, and 3, to ensure that Air Force ranges are planned, operated, and managed in a safe manner, that all required equipment

and facilities are available to support range use, and that proper security for range assets is present. The overall purpose of range management is to balance the military's need to accomplish realistic testing and training with the need to minimize potential impacts of such activities on the environment and surrounding communities.

2.8.2 Noise

Resource Definition

Subsonic

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive. It may be stationary or transient. Stationary sources are normally related to specific land uses, e.g., housing tracts or industrial plants. Transient noise sources move through the environment, either along relatively established paths (e.g., highways, railroads, and aircraft flight tracks around airports), or randomly. There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal).

The physical characteristics of noise, or sound, include its intensity, frequency, and duration. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the ear drum. This may be likened to the ripples in water that would be produced when a stone is dropped into it. As the acoustic energy increases, the intensity or amplitude of these pressure waves increase, and the ear senses louder noise. The unit used to measure the intensity of sound is the dB. Sound intensity varies widely (from a soft whisper to a jet engine) and is measured on a logarithmic scale to accommodate this wide range. The logarithm, and its use, is nothing more than a mathematical tool that simplifies dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is -6 (minus 6). Obviously, as more zeros are added before or after the decimal point, converting these numbers to their logarithms greatly simplifies calculations that use these numbers.

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound measurement is further refined through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz. However, all sounds throughout this range are not heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted", and are shown in terms of A-weighted decibels (dBA).

Subsonic noise is quantified by A-weighted noise levels, using the maximum noise level (L_{max}), sound exposure level (SEL) and the L_{dnmr}. L_{dnmr} is similar to the L_{dn} used for airfield noise analysis in Section 3.2, but includes a penalty of up to 11 dB to account for the high onset rate of noise from high speed low altitude flight.

Sonic boom exposure is quantified by C-weighted levels, using the C-weighted day-night average sound level (L_{Cdn}). This is similar to L_{dn}, but C-weighting (rather than A-weighting) is used to account for the low frequency energy content of sonic booms. L_{dn}, L_{dnmr} and L_{Cdn} are all expressed in units of dB. If it is not clear from context whether A or C weighting is used, dB is sometimes written dBA or dBC. Within this study, subsonic levels are always A-weighted and sonic booms are always C-weighted.

Supersonic

Table 2.8-1 shows SEL values corresponding to the aircraft and power settings reflected in Table E-1.

Table 2.8-1. Representative Sound Exposure Levels

Aircraft/Power Setting	SEL Values (in dBA) at Varying Distances (in Feet)				
	500	***1,000***	***2,000***	***5,000***	***10,000***
Takeoff/Departure Operations					
F-117A/96% RPM	120.9	115.0	108.1	96.6	85.1
QF-4/100% RPM	124.3	118.4	118.1	101.5	91.6
T-38A/100% RPM	114.0	108.2	101.5	90.7	80.7
F-22A/100% ETR	126.9	121.4	115.4	106.2	97.9
Landing/Arrival Operations					
F-117A/87% RPM	112.4	106.9	100.7	90.1	79.5
QF-4/87% RPM	111.3	105.9	99.9	90.3	81.5
T-38A/91% RPM	96.0	90.7	84.7	75.0	66.0
F-22A/43% ETR	114.9	109.3	103.1	93.5	84.5

RPM = Revolutions per Minute (For the specific engine considered).
ETR = Engine Temperature Ratio
Sources: NMAP Version 7, 2006 and OMEGA108R

Because the SEL and the maximum sound level are both used to describe single events, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

SEL can be computed for C-weighted levels (appropriate for impulsive sounds), and the results denoted CSEL or L_{CE}. SEL for A-weighted sound is sometimes denoted ASEL. Within this study, SEL is used for A-weighted sounds and CSEL for C-weighted.

This resource will be discussed in more detail in Section 3.2 and 4.2.

ROI

The ROI for the noise assessments includes the area around Holloman AFB that is exposed to elevated noise levels caused by aviation-related noise and other human activities in the region, as well as the areas encompassed by, and underlying the military training airspace which supports routine training activities conducted by the F-22A.

2.8.3 Safety

Resource Definition

Issues of safety involve explosives, ground and flight safety associated with operations conducted at Holloman AFB, New Mexico. Explosives safety involves the management and use of ordnance or munitions associated with airfield operations and training activities. Ground safety considers issues associated with operations and maintenance activities that support base operations and activities, including fire safety. Fire safety specifically focuses on potential fire risks associated with both aircraft operations and normal ground-related fire safety issues. Flight safety involves the potential for aircraft accidents. One public concern with regard to flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of weather-related accidents, mechanical failure, pilot error, mid-air collisions, collisions with manmade structures or terrain, or bird-aircraft collisions. Flight risks apply to all aircraft; they are not limited to the military.

This resource will be discussed in more detail in Section 3.3 and 4.3.

ROI

The affected environment or ROI for aircraft operations at Holloman AFB includes the base and the airspace surrounding the airfield, including the Cowboy ATCAA, Beak MOA and ATCAA, Talon MOA and ATCAA, WSMR, McGregor Range, and Dona Ana Range.

Regulatory Setting

Defense Department Explosives Safety Board 6055.9-Standard and Air Force Manual 91-201 Explosives Safety Standards represent DoD and the Air Force guidelines for complying with explosives safety. These regulations, as well as AFI 91-204, identify explosives safety mishaps involved in both explosive and chemical agents. Explosives include ammunition, propellants (solid and liquid), pyrotechnics, warheads, explosive devices, and chemical agent substances and associated components that present real or potential hazards to life, property, or the environment.

Siting requirements for munitions and ammunition storage and handling facilities are based on safety and security criteria. Defined distances are maintained between munitions storage areas and a variety of other types of facilities. These distances, called quantity-distance (QD) arcs, are determined by the type and quantity of explosive material to be stored. Each explosive material storage or handling facility has QD arcs extending outward from its sides and corners for a prescribed distance. QD areas on Holloman AFB in the combined project area are shown on Figure 3.3-1 of this Draft EA. Within these QD arcs, development is either restricted or prohibited altogether in order to ensure safety of personnel and minimize potential for damage to other facilities in the event of an accident. In addition, explosives storage and handling facilities must be located in areas where security of the munitions can be maintained at all times. Identifying the QD arcs ensures that construction does not occur within these areas.

With respect to flight safety, the Air Force defines four major categories of aircraft mishaps: Classes A, B, C, and E, which includes High Accident Potential (HAP). Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $1 million, or destruction of

an aircraft. Class B mishaps result in total costs of more than $200,000, but less than $1 million, result in permanent partial disability or inpatient hospitalization of three or more personnel. Class C mishaps involve reportable damage of more than $20,000, but less than $200,000; an injury resulting in any loss of time from work beyond the day or shift on which it occurred, or occupational illness that causes loss of time from work at any time; or an occupational injury or illness resulting in permanent change of job. HAP events are any hazardous occurrence that has a high potential for becoming a mishap. Class C mishaps and HAP, the most common types of accidents, represent relatively unimportant incidents because they generally involve minor damage and injuries, and rarely affect property or the public. This Environmental Assessment (EA) will focus on Class A mishaps because of their potentially catastrophic results.

2.8.4 Air Quality

Resource Definition

Air quality in a given location is determined by the type and concentration of pollutants in the atmosphere. The significance of a pollutant concentration in a region or geographical area is determined by comparing it to federal and/or state ambient air quality standards. The main pollutants of concern considered in the air quality analysis include volatile organic compounds (VOCs), ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter less than 10 microns in diameter (PM_{10}). Although VOCs or NO_x (other than nitrogen dioxide) have no established ambient standards, they are important as precursors to O_3 formation.

This resource will be discussed in more detail in Section 3.4 and 4.4.

ROI

The ROI for the proposed action includes the following four air quality control regions (AQCRs):

- AQCR 153, which includes Doña Ana, Lincoln, Otero, and Sierra Counties in New Mexico and Brewster, Culberson, Hudspeth, Jeff Davis, and Presidio Counties in Texas.
- AQCR 154, which includes Guadelupe and Torrance Counties in New Mexico.
- AQCR 155, which includes Chaves, Curry, De Baca, Eddy, Quay, and Roosevelt Counties in New Mexico.
- AQCR 156, which includes Catron and Socorro Counties, New Mexico.

Regulatory Setting

A summary of the federal and New Mexico ambient air quality standards that apply to the proposed project area is presented in Table 2.8-2.

Table 2.8-2. New Mexico and Federal Ambient Air Quality Standards

Air Pollutant	*Averaging Time*	*New Mexico Standards*	Federal Standards	
			Primary	*Secondary*
Carbon Monoxide (CO)	8-hour 1-hour	8.7 ppm 13.1 ppm	9 ppm 35 ppm	– –
Nitrogen Dioxide (NO_2)	AAM 24-hour	0.05 ppm 0.10 ppm	0.053 ppm –	0.053 ppm –
Sulfur Dioxide (SO_2)	AAM 24-hour 3-hour	0.02 ppm 0.10 ppm –	0.030 ppm 0.140 ppm –	– – 0.50 ppm
Particulate Matter (PM_{10})	AAM 24-hour	– –	50 μg/m^3 150 μg/m^3	50 μg/m^3 150 μg/m^3
Particulate Matter ($PM_{2.5}$)[a]	AAM 24-hour	– –	15 μg/m^3 65 μg/m^3	15 μg/m^3 65 μg/m^3
Total Suspended Particulates (TSP)	AGM 24-hour	60 μg/m^3 150 μg/m^3	– –	– –
Hydrogen sulfide (H_2S)	1-hour[c]	0.010 ppm	–	–
Total Reduced Sulfur[b]	½-hour[c]	0.003 ppm	–	–
Ozone (O_3)	1-hour 8-hour	– –	0.12 ppm 0.08 ppm	0.12 ppm 0.08 ppm
Lead (Pb)	3-month	–	1.5 μg/m^3	1.5 μg/m^3

Notes: a. The $PM_{2.5}$ standard (particulate matter with a 2.5 μm diameter or smaller) were promulgated in January 2005. The standard will be implemented over the next few years.

b. Total reduced sulfur does not include H_2S.

c. Entire state except for the Pecos-Permian Air Basin, which includes De Baca, Chaves, Curry, Quay, and Roosevelt Counties.

AAM = Annual Arithmetic Mean; AGM = Annual Geometric Mean; μg/m^3 = micrograms per cubic meter; ppm = parts per million

Sources: 40 CFR 50; NMAC 2006

2.8.5 Physical Resources

Resource Definition

Physical resources are defined as the earth and water resources beneath the project airspace proposed for use for air-to-air and air-to-ground training by the F-22A. Approximately 10.4 million acres of land lay beneath the project airspace, representing a diverse range of geologic and hydrologic features. The ROI of the proposed airspace can be divided into three Land Resource Areas, as defined by the Natural Resources Conservation Service (NRCS): Southern Desertic Basin, Plains and Mountains; Pecos-Canadian Plains and Valleys; and Arizona and New Mexico Mountains (NRCS 1998).

This resource will be discussed in more detail in Section 3.5 and 4.5.

ROI

The affected environment or ROI for physical resources includes Holloman AFB and the lands under the airspace, including the Cowboy ATCAA, Beak MOAs and ATCAA, Talon MOAs and ATCAA, White Sands Missile Range, McGregor Range, and Dona Ana Range.

Regulatory Setting

Hazardous materials are identified and regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Occupational Safety and Health Administration (OSHA); and the Emergency Planning and Community Right-to-Know Act. Hazardous materials have been defined in AFI 32-7086, *Hazardous Materials Management*, to include any substance with special characteristics that could harm people, plants, or animals. Hazardous waste is defined in the Resource Conservation and Recovery Act (RCRA) as any solid, liquid, contained gaseous or semisolid waste, or any combination of wastes that could or do pose a substantial hazard to human health or the environment. Waste may be classified as hazardous because of its toxicity, reactivity, ignitibility, or corrosivity. In addition, certain types of waste are "listed" or identified as hazardous in 40 CFR 263.

2.8.6 Biological Resources

Resource Definition

Biological resources consist of native or naturalized plants and animals, along with their habitats, including wetlands. Although the existence and preservation of biological resources are both intrinsically valuable, these resources also provide essential aesthetic, recreational, and socioeconomic benefits to society. The analysis focuses on plant and animal species and vegetation types that are important to the functioning of local ecosystems, are of special societal importance, or are protected under federal or state law or statute.

As treated in Section 4.6, (lands under training airspace), biological resources include vegetation and habitat, wetlands, fish and wildlife, and special-status species. Section 3.6.1 explains these resources in more detail. In addition, because of concerns expressed during scoping, domestic animals are included in the discussion of environmental consequences to biological resources. The ROI encompasses all lands under the proposed F-22A training airspace in southern New Mexico.

This resource will be discussed in more detail in Section 3.6 and 4.6.

ROI

The ROI for this resource is Holloman AFB as well as the lands under the training airspace. The ROI also spans several landownership classifications; Bureau of Land Management (BLM), U.S. Forest Service, DoD, National Park Service, U.S. Fish and Wildlife Service (USFWS), and tribal, state, local government, and private lands all occur under the proposed F-22A training airspace.

Regulatory Setting

Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 USC §§ 1531–1544, as amended) established measures for the protection of plant and animal species that are federally listed as threatened and endangered, and for the conservation of habitats that are critical to the continued existence of those species. Federal agencies must evaluate the effects of their proposed actions through a

set of defined procedures, which can include the preparation of a Biological Assessment and can require formal consultation with the USFWS under Section 7 of the Act.

Implementation of an alternative will involve coordination with several organizations and agencies. Compliance with the ESA requires communication with the USFWS in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this consultation is to request a determination of whether any of these species occur in the region of influence. If any of these species are present, a determination of the potentially adverse effects on the species is made. Should no species protected by the ESA be affected by the Proposed Action, no additional action is required. Letters were sent to the appropriate USFWS offices as well as state agencies, informing them of the Proposed Action and alternatives and requesting data regarding applicable protected species. Appendix A includes copies of relevant coordination letters sent by the Air Force.

Clean Water Act

The Clean Water Act (CWA) of 1977 (33 USC § 1251 *et seq*.) and the USEPA Storm Water General Permit regulate pollutant discharges that could affect aquatic life forms or human health and safety. Section 404 of the CWA and EO 11990, *Protection of Wetlands*, regulate development activities in or near streams or wetlands. Section 404 regulates development in streams and wetlands and requires a permit from the United States Army Corps of Engineers (USACE) for dredging and filling in wetlands. Executive Order (EO) 11988, *Floodplain Management*, requires federal agencies to take action to reduce the risk of flood damage; minimize the impacts of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains. Federal agencies are directed to consider the proximity of their actions to or within floodplains. There are no wetlands in any of the proposed construction areas at Holloman Air Force Base.

Migratory Bird Treaty Act (16 U.S.C. 703 et seq.) and EO 13186

The Migratory Bird Treaty Act (MBTA) governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. The take of all migratory birds is governed by the MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent overuse. The MBTA also prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase or barter, any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit (50 CFR 21.11).

EO 13186 (effective January 10, 2001), outlines the responsibilities of federal agencies to protect migratory birds, in accordance with the MBTA, the Bald and Golden Eagle Protection Acts, the Fish and Wildlife Coordination Act, ESA, and NEPA. This order specifies the following:

- The USFWS as the lead for coordinating and implementing EO 13186;
- Requires federal agencies to incorporate migratory bird protection measures into their activities; and
- Requires federal agencies to obtain permits from USFWS before any "take" occurs, even when the agency intent is not to kill or injure migratory birds.

Sikes Act (16 USC 670)

The Sikes Act requires military services to establish Integrated Natural Resources Management Plans (INRMPs) to conserve natural resources for their military installations. The INRMPs include threatened and endangered species, other fish and wildlife resources, wetlands, migratory bird habitat and forest lands. INRMPs are developed in cooperation with the USFWS and State Fish and Wildlife agencies.

2.8.7 Cultural Resources

Resource Definition

Cultural resources are defined as any prehistoric or historic district, site, building, structure, or object considered to be important to a culture, subculture, or community for scientific, traditional, religious or any other reason. Cultural resources are usually divided into three major categories: prehistoric and historic archaeological resources, architectural resources, and traditional cultural resources.

Significant cultural resources are those that are eligible or potentially eligible to the National Register of Historic Places (NRHP). The criteria for significance are contained in 36 CFR 60.4, regulations associated with the National Historic Preservation Act (NHPA).

Archaeological, architectural, and traditional cultural resources determined to be significant under cultural resource legislation are subject to protection or consideration by a federal agency.

Native Americans may define traditional sites important to their culture as significant in addition to sites that are on the National Register.

This resource will be discussed in more detail in Section 3.7 and 4.7.

ROI

The ROI for cultural resources is the area within which the Proposed Action has the potential to affect existing cultural resources. For the Proposed Action, the ROI is defined as the footprint of proposed construction projects on Holloman AFB, the lands beneath the 65 dB and louder noise contours surrounding the Holloman AFB runways, and the training airspace proposed for use by the Holloman-based F-22A aircraft.

Regulatory Setting

A number of federal regulations and guidelines have been established for the management of cultural resources. The standards set forth in Section 106 of the NHPA, as amended, are used to determine effects to most cultural resources in the affected environment. Section 106 requires federal agencies to take into account the effects of their undertakings on historic properties. Historic properties are cultural resources that are listed in, or eligible for listing in, the NRHP. Eligibility evaluation is the process by which resources are assessed relative to NRHP significance criteria for scientific or historic research, for the general public, and for traditional cultural groups. Under federal law, including NEPA, impacts to cultural resources may be considered adverse if the resources have been determined eligible for listing in the NRHP or have been identified as important to Native Americans as outlined in the American Indian Religious Freedom Act (AIRFA), EO 13007 Indian Sacred Sites, and the Native American Graves Protection and Repatriation Act. DoD American Indian and Alaska Native Policy (1999) provides guidance for interacting and working with federally-recognized American Indian

governments. DoD policy requires that installations provide timely notice to, and consult with, tribal governments prior to taking any actions that may have the potential to significantly affect protected tribal resources, tribal rights, or American Indian lands.

2.8.8 Land Use and Transportation

Resource Definition

The land use attributes of Holloman AFB and environs addressed in this section include land use patterns, land ownership, and applicable land use management plans. Land use patterns characterize the types of uses resulting from human activities such as residential, commercial, industrial, recreational, and other developed areas. The major land ownership categories associated with Holloman AFB include federal, state, and private lands. Management plans, policies, and guidelines regulate the type and extent of land use allowable in specific areas and establish appropriate goals for future use. Transportation attributes include the local highway and road network.

This resource will be discussed in more detail in Section 3.8 and 4.8.

ROI

The ROI for land use is the area within which the Proposed Action has the potential to affect land uses. Therefore, the ROI is defined as the land at Holloman AFB, the lands beneath the 65 dB and louder noise contours surrounding the base, and the lands under the training airspace proposed for use by the Holloman-based F-22A aircraft.

The transportation ROI includes the road network on Holloman AFB and in the immediate vicinity.

2.8.9 Socioeconomics

Resource Definition

Socioeconomic resources for this analysis are characterized in terms of demographics and economic activity. Data for the socioeconomic analysis in this EA were obtained from a variety of sources, including the Air Force, the U.S. Bureau of the Census, the U.S. Bureau of Economic Analysis, the University of New Mexico Bureau of Business and Economic Research, and the New Mexico Department of Labor.

This resource will be discussed in more detail in Section 3.9 and 4.9.

ROI

Holloman AFB is situated in south-central New Mexico, 6 miles west of the city of Alamogordo. Nearly all active-duty military personnel and the large majority of base-related civilian personnel reside on base, in Alamogordo, or other communities in Otero County. Thus, the ROI for socioeconomics is defined as Otero County, with additional attention focused on the City of Alamogordo.

Socioeconomic resources were also evaluated for geographic areas under or proximate to the training airspace. Affected lands occur in the following New Mexico counties:

- Cowboy ATCAA: Chaves, Lincoln, and Otero Counties
- McGregor Range: Otero County

- Doña Ana Range: Doña Ana County
- Talon MOA: Chaves, Eddy, Otero Counties
- WSMR (Remaining Airspace): Doña Ana, Lincoln, Otero, Sierra, and Socorro Counties

2.8.10 Environmental Justice

Resource Definition

The purpose of environmental justice studies is to determine whether or not actions of federal agencies disproportionately impact the human health and environmental conditions in potentially disadvantaged communities. EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, directs federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

For purposes of this analysis, minority, low-income and youth populations are defined as follows:

- *Minority Population*: Persons of Hispanic origin of any race, Blacks, American Indians, Eskimos, Aleuts, Asians, or Pacific Islanders.
- *Low-Income Population*: Persons living below the poverty level, based on an average poverty threshold for a family of four in 2000 of $17,603 in annual income.
- *Youth Population*: Children under the age of 18 years.

Estimates of these three population categories were developed based on data from the U.S. Bureau of the Census. The census does not report minority population, per se, but reports population by race and by ethnic origin. Low-income and youth population figures also were drawn from the Census 2000 reports.

This resource will be discussed in more detail in Section 3.10 and 4.10.

ROI

Environmental justice resources evaluated include areas around Holloman AFB as well as geographic areas under or proximate to the training airspace. Affected counties include:

- Cowboy ATCAA: Chaves, Lincoln, and Otero Counties
- McGregor Range: Otero County
- Doña Ana Range: Doña Ana County
- Talon MOA: Chaves, Eddy, Otero Counties
- WSMR (Remaining Airspace): Doña Ana, Lincoln, Otero, Sierra, and Socorro Counties

Regulatory Setting

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to address environmental and human health conditions in minority and low-income communities. The general purposes of this EO are as follows:

- To focus attention of federal agencies on the human health and environmental conditions in minority communities and low-income communities with the goal of achieving environmental justice.

- To foster non-discrimination in federal programs that substantially affect human health or the environment.
- To give minority communities and low-income communities greater opportunities for public participation in, and access to, public information on matters relating to human health and the environment.

The approach applied in this section is in accordance with the Interim Guide for Environmental Justice with the Environmental Impact Analysis Process (Air Force 1998a).

3.0 HOLLOMAN AFB AFFECTED ENVIRONMENT AND CONSEQUENCES

This chapter contains both the affected environment and environmental consequences analysis for the Proposed Action and Alternative A at Holloman AFB. NEPA requires that the analysis address those areas and the components of the environment with the potential to be affected; locations and resources with no potential to be affected need not be analyzed.

The *Existing Condition* of each relevant environmental resource is described to give the public, agencies, and decision-makers a meaningful point from which they can compare potential future environmental effects. The *Environmental Consequences* section for each resource considers the direct and indirect effects of renovation, construction, and airfield operations related to the Proposed Action and Alternative A from Chapter 2.0. Environmental Consequences also includes the analysis of the No Action Alternative. Cumulative effects are discussed in Chapter 5.0.

3.1 Airspace Management and Air Traffic Control

The definitions of airspace management and air traffic control are included in Section 2.8.1 and Appendix H.

3.1.1 Existing Conditions

Holloman AFB manages airspace in accordance with processes and procedures detailed in AFI 13-201, *Air Force Airspace Management*. AFI 13-201 implements Air Force Planning Document 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*, and DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation and National Airspace System Matters*. This AFI addresses the aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support Air Force flight operations.

Under current conditions, Holloman AFB supports approximately 97,400 aircraft-operations on the airfield annually (ACC 2006).

Albuquerque Center is the FAA's Air Route Traffic Control Center (ARTCC) responsible for the airspace in the vicinity of Holloman AFB. Responsibility for the management of air traffic at Holloman AFB has been delegated to Holloman Approach Control (Holloman AFB 2003a).

Class D Controlled Airspace has been established around Holloman AFB to manage flight operations at the airfield. Holloman's Class D airspace extends from the surface up to and including 6,600 feet MSL, within a 4.8 statute mile radius of Holloman. However, it excludes airspace within a 2 statute mile radius of the Alamogordo-White Sands Regional Airport (Holloman AFB 2003a). Alamogordo-White Sands Regional is located approximately 5 nm east of Holloman AFB. This airspace is depicted in Figure 1.1-2.

3.1.2 Environmental Consequences

3.1.2.1 Proposed Action

The Proposed Action has no changes to the Controlled Airspace around Holloman AFB, or to the procedures established to manage and control air traffic in the area. Due to the proposed retirement of F-117As, the reassignment of the T-38A aircraft supporting the F-117As, and the introduction of F-22A aircraft, overall operations at Holloman would decrease. Current annual

operations would be projected to decrease from approximately 97,400 to approximately 87,000. This estimated 11.5 percent reduction to current aircraft operations would be expected to have a slightly positive impact on the regional Air Traffic Control (ATC) system.

3.1.2.2 Alternative A

Alternative A only involves military training airspace. It would have no effect on the airspace directly supporting operations at Holloman AFB.

3.1.2.3 No Action

No Action would continue to have the F117A and T-38A aircraft using the surrounding airspace for the foreseeable future. Existing conditions would continue.

3.2 Noise

The definition of noise and the ROI are included in Section 2.8.2 and detailed technical data is expanded upon in Appendix E.

3.2.1 Existing Conditions

Aircraft Activity

The following terms are defined to provide a better understanding of how data are developed for input to the various noise models used to calculate noise.

Around an airfield, ***aircraft operations*** are categorized as takeoffs, landings, or closed patterns (which could include activities referred to as touch-and-gos or low approaches). Each takeoff or landing constitutes one operation. For the purpose of noise modeling, a ***closed pattern*** occurs when the pilot of the aircraft approaches the runway as though planning to land, but then applies power to the aircraft and continues to take off. The pilot then flies a circular or rectangular track around the airfield, and again approaches for landing. In some cases the pilot may actually land on the runway before applying power, or in other cases the pilot simply approaches very close to the ground. In either event, since a closed pattern operation essentially consists of a landing and a takeoff, it is considered two operations.

Holloman AFB is located approximately 6 miles west of downtown Alamogordo, New Mexico. Holloman AFB currently supports approximately 97,400 aircraft operations per year. Considering all types of flight activities, a scenario representing an "average busy day's" operations was developed. The operations considered include arrivals (landings), departures (takeoffs), and closed patterns. Noise calculations consider the frequency of flight operations, runway utilization, and the flight tracks and flight profiles flown by each aircraft. The numbers and types of representative operations considered are shown in Table 3.2-1.

Table 3.2-1. Baseline Average Daily Aircraft Operations At Holloman AFB[1]

Aircraft	Arrivals		Departures		Closed Patterns [2]	
	Day	*Night*	*Day*	*Night*	*Day*	*Night*
Based Military	66	10	72	4	211	0.5
Transient Military	2	0	2	0	0	0
Civil	6	0	6	0	0	0
Total	**74**	**10**	**80**	**4**	**211**	**0.5**

Notes 1. Baseline daily operations are derived from the reassignment of German F-4 aircraft.
2. Since closed patterns consist of a landing and a takeoff (two aviation operations), the 211 closed patterns shown equate to 422 aviation operations.

Source: ACC 2006

These levels and types of activity are then combined with information on climatology, maintenance activities, and aircraft flight parameters, and processed through the Air Force's noise computer models to calculate Day/Night Average Sound Level (L_{dn}). Once noise levels are calculated, they are plotted on a background map in 5-dB increments from 65 dBA to 80 dBA, as applicable. Noise contours associated with current activities at Holloman AFB are shown in Figure 3.2-1. The land area (in acres) encompassed by each contour under current conditions is shown in Table 3.2-2.

Table 3.2-2. Land Area Exposed To Day/Night Average Sound Levels Under Current Conditions

Sound Level (In L_{dn})	Acres of Land		
	On Base	*Off Base*	*Total*
65 – 70	7,716	16,940	24,656
70 – 75	4,940	7,516	12,456
75 – 80	3,404	3,456	6,860
80 – 85	1,962	1,734	3,696
>85	2,728	411	3,139
Total	20,750	30,057	50,807

Source: ACC 2004

Other Ground-Based Activity

Some additional noise results from day-to-day activities associated with operations, maintenance, and the industrial functions at Holloman AFB and around the installation. These noise sources include the operation of ground-support equipment, and other transportation noise from vehicular traffic. This noise is generally localized in industrial areas on or near the airfield, or on established lines of communication supporting traffic to-and-from the base. Noise resulting from aircraft operations remains the dominant noise source in the airfield region.

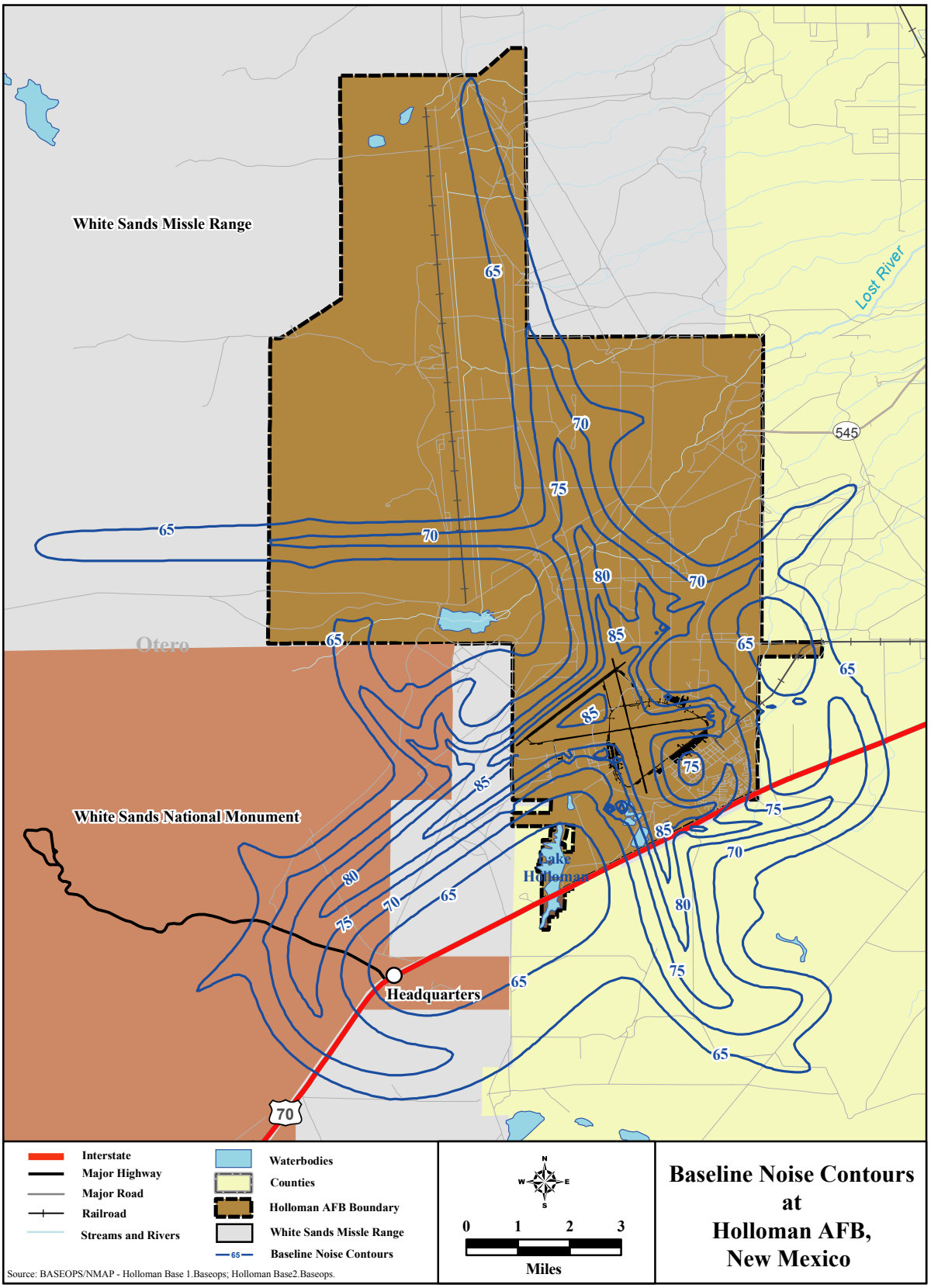


Figure 3.2-1. Baseline Noise Contours

3.2.2 Environmental Consequences

Noise associated with aircraft operations at Holloman AFB, other transportation-related noise, and construction activities associated with the Proposed Action are considered and compared with current conditions to assess consequences.

Based on numerous sociological surveys and recommendations from Federal Interagency Committee on Aviation Noise, the most common benchmark referred to is an L_{dn} of 65 dBA. This threshold is often used to determine residential land use compatibility around airports, highways, or other transportation corridors. Additionally, an L_{dn} of 55 dBA was identified by the USEPA as a level ". . . requisite to protect the public health and welfare with an adequate margin of safety" (USEPA 1974).

Effects on activities and human annoyance are the most common concerns associated with exposure to elevated noise levels. Table 3.2-3 shows the percentage of the population expected to be highly annoyed at a range of noise levels.

Table 3.2-3. Percentage of Population Estimated to be Annoyed By Noise Levels

Noise Exposure (L_{dn} in dBA)	*Percent Highly Annoyed*
40-45	Less than 1
45-50	1 - 2
50-55	2 - 3
55-60	3 - 6
60-65	6 - 12
65 – 70	12 – 22
70 – 75	22 – 36
75 – 80	36 – 54
80 – 85	54 – 70
Greater than 85	Greater than 70

Source: Finegold *et al.* 1994

When subjected to an L_{dn} of 65 dBA, approximately 12 percent of persons so exposed will be "highly annoyed" by the noise. At levels below 55 dBA, the percentage of annoyance is correspondingly lower (less than three percent). The percentage of people annoyed by noise never drops to zero (some people are always annoyed), but at levels below 55 dBA it is reduced enough to be essentially negligible.

3.2.2.1 Proposed Action

Noise modeling for this proposed action is based on aircraft configuration data gathered from pilots currently flying the F-22A mission at Langley AFB, Virginia, together with operational data provided by 49 FW operations staff. The following operations procedures were included.

- Current noise abatement procedures that minimize operations between 10 p.m. and 7 a.m. ("noise night") will continue. During the summer months, while no departures

would occur after 10 p.m., approximately 4 percent of arrivals at Holloman AFB would occur after 10 p.m.

- F-22A afterburner departures would occur 3 percent of the time. While these departures create more noise than departures under military power, the increased climb rate provided by the additional thrust does not add to overall noise exposure away from the immediate vicinity of the airfield.
- Flight track and profile modifications to reflect Holloman AFB local operating procedures were used in the noise modeling.

With the retirement of the F-117As, reassignment of all but three of the T-38As, and beddown of F-22As, overall aviation activity at Holloman AFB would be reduced. Total daily operations would be reduced from approximately 589 to 387, a 34 percent reduction. Estimated daily operations at Holloman AFB under the Proposed Action are detailed in Table 3.2-4.

Table 3.2-4. Average Daily Operations at Holloman AFB Under the Proposed Action[1]

	Arrivals		Departures		Closed Patterns[2]	
Aircraft	*Day*	*Night*	*Day*	*Night*	*Day*	*Night*
Based Military	59	1	60	0.1	125	0.5
Transient Military	2	0	2	0	0	0
Civil	6	0	6	0	0	0
Total	**66**	**1**	**66.9**	**0.1**	**125**	**0.5**

Notes: 1. Daily operations are based on averages of annual operations; therefore, numbers do not round.
2. Since closed patterns consist of a landing and a takeoff (two aviation operations),the 126 closed patterns shown equate to 252 aviation operations.

Source: ACC 2006

Aircraft noise levels at Holloman AFB resulting from this conversion are depicted in Figure 3.2-2. Table 3.2-5 compares baseline and Proposed Action conditions for land areas on- and off-base exposed to elevated noise levels. Data for total land areas are included.

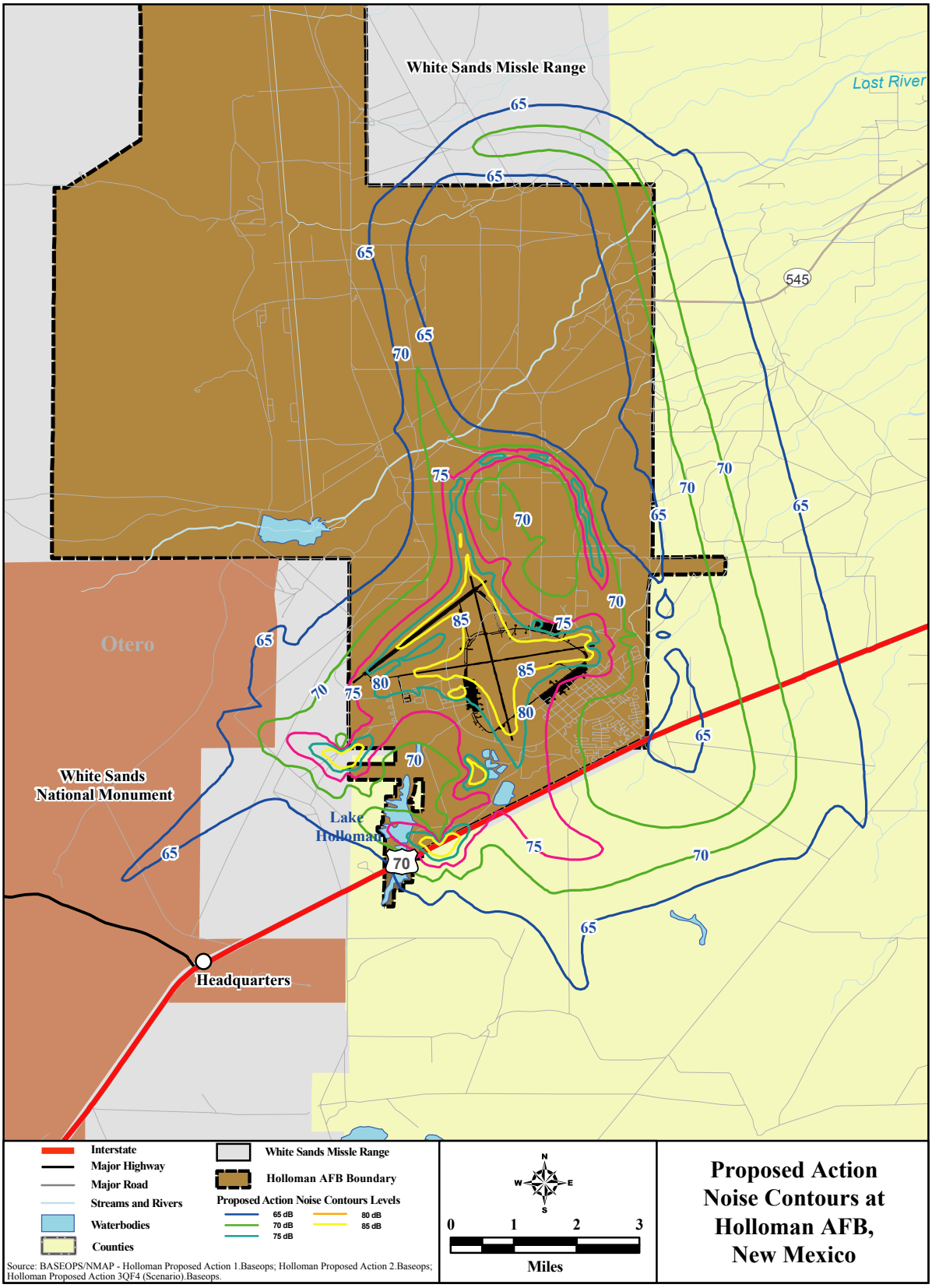


Figure 3.2-2. Holloman AFB Noise Contours Under the Proposed Action

Table 3.2-5. Land Area Exposed To Day/Night Average Sound Levels under the Proposed Action

Sound Level (In L_{dn})	Acres of Land		*Net Change*	*Percent Change*
	Baseline	*Proposed Action*		
On-Base				
65 – 70	7,716	5,250	- 2,466	- 32.0
70 – 75	4,940	4,072	- 868	- 17.6
75 – 80	3,404	2,676	- 728	- 21.4
80 – 85	1,962	1,535	- 427	- 21.8
> 85	2,728	1,294	- 1,434	- 52.6
Total > 65	**20,750**	**14,827**	**- 5,923**	**- 28.5**
Off-Base				
65 – 70	16,940	15,781	- 1,159	- 6.8
70 – 75	7,516	6,260	- 1,256	- 16.7
75 – 80	3,456	710	- 2,746	- 79.5
80 – 85	1,734	103	- 1,631	- 94.1
> 85	411	116	- 295	- 71.8
Total > 65	**30,057**	**22,970**	**- 7,087**	**- 23.6**
Total Land Area				
65 – 70	24,656	21,031	- 3,625	- 14.7
70 – 75	12,456	10,332	- 2,124	- 17.1
75 – 80	6,860	3,386	- 3,474	- 50.6
80 – 85	3,696	1,638	- 2,058	- 55.7
> 85	3,139	1,410	- 1,729	- 55.1
Total > 65	**50,807**	**37,797**	**- 13,010**	**- 25.6**

Source: ACC 2004, Wasmer and Maunsell 2005

Overall noise exposure around Holloman AFB decreases, with the greatest decreases in the high ranges. Figure 3.2-3 depicts the change in the 65 dB contour.

During the public outreach process, concern was expressed about potential noise impacts on the White Sands National Monument Headquarters. To address this concern, a specific point noise assessment was accomplished for the Headquarters of the White Sands National Monument. Under current conditions at this location, noise levels are L_{dn} 59.9. Under the Proposed Action, noise levels associated with base operations are reduced to L_{dn} 52.9 – a 7 dB decrease.

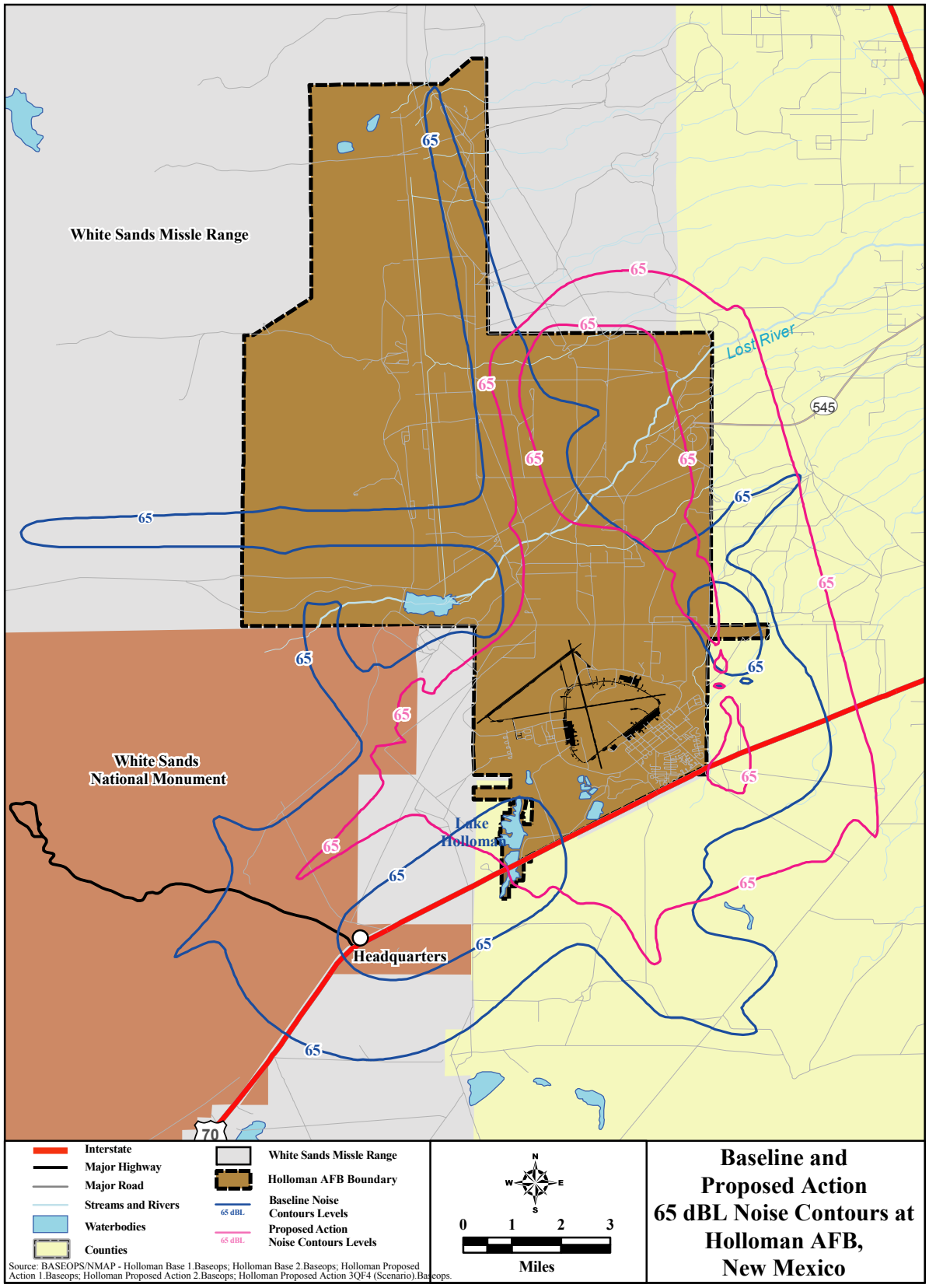


Figure 3.2-3. Baseline and Proposed 65 dB Contours

Construction would most likely occur over an extended time-frame, and, at any one time, a small number of projects would be expected to be ongoing simultaneously. Noise associated with active construction sites would be expected to be intermittent and of relatively limited duration. A hypothetical scenario was developed to assess potential noise associated with construction activities on a construction site. Primary noise sources during such activity would be expected to be heavy vehicles and earth moving equipment. Table 3.2-6 shows sound levels associated with typical heavy construction equipment under varying modes of operation.

Table 3.2-6. Typical Equipment Sound Levels

	Sound Level (in dBA) Under Indicated Operational Mode[1]		
Equipment	*Idle Power*	*Full Power*	*Moving Under Load*
Forklift	63	69	91
Backhoe	62	71	77
Dozer	63	74	81
Front-End Loader	60	62	68
Dump Truck	70	71	74

Note: 1. Measured at 125 feet.
Source: Air Force 1998b.

For the assessment of construction noise, a hypothetical "construction area" was designated that approximated the estimated area that would be involved in supporting a large project on Holloman AFB. Potential construction noise was modeled and calculated to be below L_{dn} 63.

Construction areas are situated within areas already exposed to elevated noise from airfield operations. All projects are located in, or immediately proximate to air-side locations directly supporting aircraft operations (runways, taxi-ways, parking ramps, etc.) These areas are well within the L_{dn} 65 contour created by aircraft noise. Construction noise emanating off-site would probably be noticeable in the immediate site vicinity, but would not be expected to create adverse impacts, or alter noise contours associated with aircraft operations. Furthermore, construction-related noise is intermittent and transitory, ceasing at the completion of construction. The long-term acoustic environment on Holloman AFB would not be expected to be influenced by construction activities.

3.2.2.2 Alternative A

Base activity for Alternative A is the same as that for the Proposed Action and consequences are the same.

3.2.2.3 No Action

No Action would continue to have the F-117A and T-38A aircraft operating from Holloman AFB for the foreseeable future. Existing conditions would continue, and would not result in any changes to the current noise environment in the vicinity of Holloman AFB.

3.3 Safety

The definition of Safety and the ROI are included in Section 2.8.3.

3.3.1 Existing Conditions

Explosive Safety

Holloman AFB controls, maintains, and stores all ordnance and munitions required for mission performance in accordance with Air Force and Department of Defense Explosives Safety Board safety procedures. All munitions maintenance is carried out by trained, qualified personnel using Air Force-approved technical data for the specific type of ordnance. Ample storage facilities exist, and all facilities are fully certified for the ordnance they store. Some storage magazines near the Munitions Storage Area fence line have been limited to storing less than their designed Net Explosive Weights due to safety concerns. These restrictions have not impacted operations at Holloman since sufficient storage is available in other magazines within the Munitions Storage Area. The Air Force imposes procedures for arming and de-arming munitions and ordnance. All such activities occur on defined arm/de-arm pads. An arm/de-arm pad is located at the end of each runway and at the specified distance for safety away from incompatible land uses. Air Force and Department of Defense Explosives Safety Board procedures require safeguards on weapons systems and ordnance that ensure against inadvertent releases.

Both live and inert munitions are stored and handled at Holloman AFB. Inert training ordnance accounts for the vast majority of training materials. Trained, qualified personnel using Air Force approved technical data carry out all munitions maintenance and aircraft loading. All storage facilities are approved for the specific ordnance involved.

Ground Safety

Ground safety includes many categories (AFI 91-204) consisting of ground and industrial operations, operational and occupational safety hazards (OSHA), motor vehicles use, off-duty military and maritime activities, and fire. Ground mishaps can occur on ground or water, on or off an installation, and may involve Air Force personnel, contractors, and property losses. They can occur in a work environment from the use of equipment or materials including administrative, supply, custodial, and maintenance for Air Force functions. Holloman AFB fire and emergency services meet all established Air Force staffing and equipment standards.

3.3.1.1 Safety Zones

Areas around airfields are exposed to the potential for aircraft accidents despite well-maintained aircraft with highly trained aircrews. The DoD developed the Air Installation Compatible Use Zone (AICUZ) program to aid in the development of planning mechanisms that protect the safety and health of personnel on and adjacent to military airfields and preserve operational capabilities. The AICUZ program consists of three distinct parts: Accident Potential Zones (APZs); hazards to Air Navigation (Height and Obstruction Criteria established by the FAA); and Noise Zones.

APZs are identified where most accidents have occurred in the past at military airfields. This approach does not produce accident probability statistics since the question of probability involves too many variables for an accurate prediction model to be developed. Rather, the analysis of military aircraft accident history focuses on determining where, within the airfield environments, an accident is likely to occur and how large an impact area is likely to result from any single accident. To this end, an expanded Clear Zone (CZ) and two APZs have been designated at each end of military runways as follows (Figure 3.3-1).

- ***Clear Zones.*** The CZs at Holloman, required under current criteria, are shown in Figure 3.3-1. The CZ is a rectangular area 3,000 feet wide by 3,000 feet long (Class B runway) and occurs at each end of the runway. The potential for aircraft accidents is so high here that land use restrictions prohibit any reasonable economic use of the land within the CZ area.
- ***APZ I.*** APZ I consists of an area 3,000 feet wide by 5,000 feet long adjacent to each CZ. The potential for aircraft accidents is less critical within APZ I than within the CZ but it is still substantial. Guidance on land use within the APZ I permits reasonable economic uses (e.g., construction of roads, automobile parking areas, utilities or outdoor recreation areas). However, transmission lines or any other above ground level construction that obstructs airspace are not permitted.
- ***APZ II.*** APZ II consists of an area 3,000 feet wide by 7,000 feet long, adjacent to APZ 1. APZ II possesses a lower potential for aircraft accidents, but the risk of accidents is still present. People-intensive buildings should not be permitted within the APZ II.

Aircraft Mishaps

Based on historical data on mishaps at all installations, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. Mishap rates do not consider combat losses. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft.

The F-22 has not yet accumulated enough flying hours to calculate a Class A mishap rate. Table 3.3-1 reflects the cumulative annual Class A mishap rates of the F-15C, F-117A, and T-38A for the periods for which accident records have been established. The F-15C is included because it was previously based at Holloman AFB and represents an aircraft comparable in use and size to the F-22A. The F-22A has had three Class A mishaps to date, primarily during test or weapons evaluation activities. As the F-22A aircraft, the pilots who fly it, and the technicians who maintain it, gain more experience, mishap rates are reduced and a relatively constant level is maintained. The F-22A Class A mishap rate is expected to approach that of the F-15C over time.

Table 3.3-1. Class A Accident History

Aircraft	*Reporting Period*	*Accident Rate per 100,000 hours*	*Lifetime Hours Flown*
F-117	FY91-FY05	3.61	194,173
T-38	CY60-FY05	1.47	13,193,523
F-15C	FY72-FY05	2.46	4,998,100

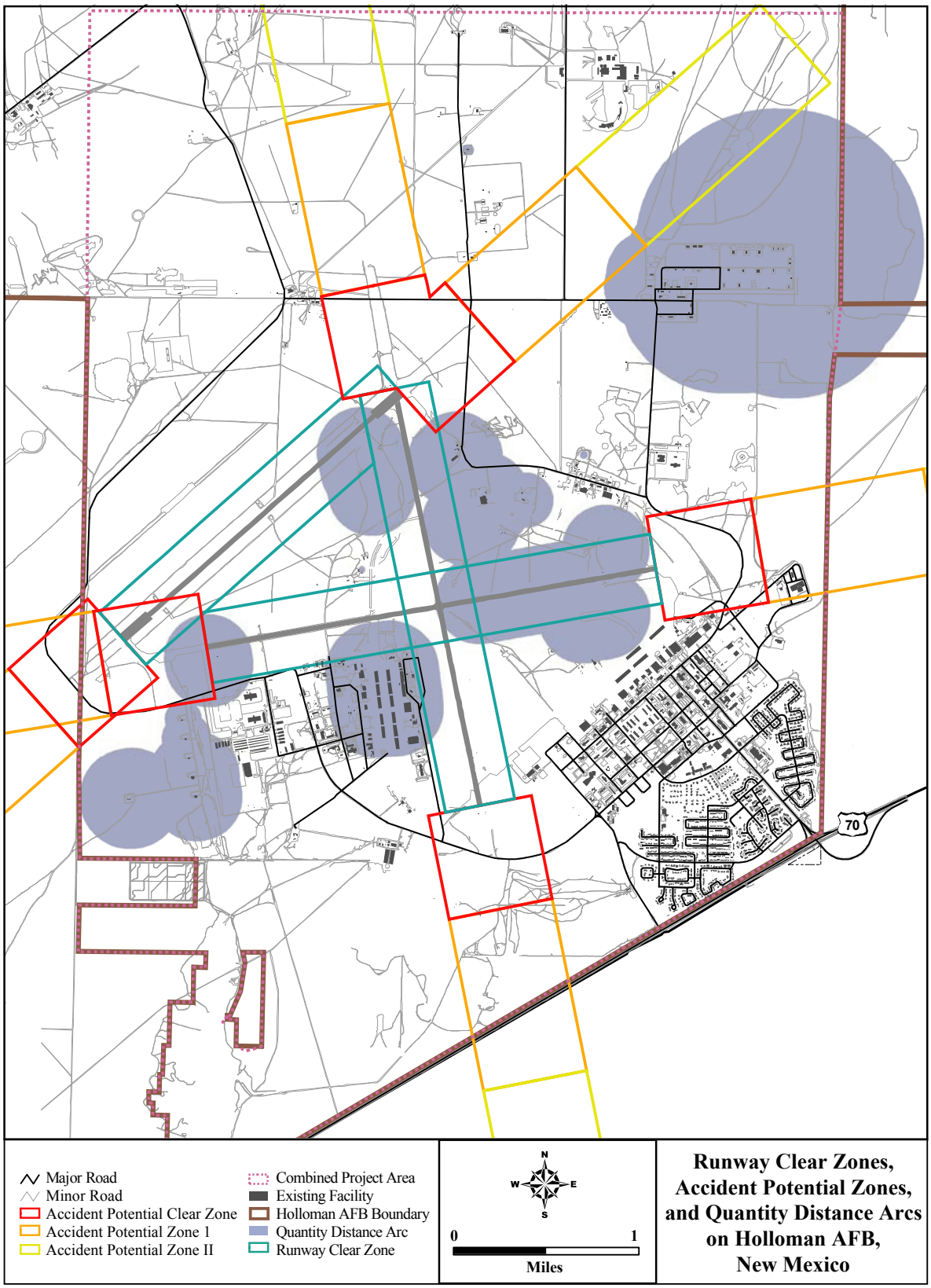


Figure 3.3-1. Runway Clear Zones, Accident Potential Zones, and Quantity-Distance Areas on Holloman AFB

Bird/Wildlife Strike Hazard Holloman AFB and Vicinity

Bird-aircraft strikes constitute a safety concern for the Air Force because they can result in damage to aircraft or injury to aircrews or local human populations if an aircraft crashes. Aircraft may encounter birds at altitudes up to 30,000 feet MSL or higher. However, most birds fly close to the ground. More than 97 percent of reported bird strikes occur below 3,000 feet AGL. Approximately 30 percent of bird strikes happen in the airport environment, and almost 55 percent occur during low-altitude flight training (Air Force Safety Center 2002). A minimal BASH exists at Holloman AFB and its vicinity due to low populations of resident and migratory species and their distribution patterns.

Migratory waterfowl (e.g., ducks, geese, and swans) are the most hazardous birds to low-flying aircraft because of their size and their propensity for migrating in large flocks at a variety of elevations and times of day. Waterfowl vary considerably in size, from 1 to 2 pounds for ducks, 5 to 8 pounds for geese, and up to 20 pounds for most swans. There are two normal migratory seasons, fall and spring. Waterfowl are usually only a hazard during migratory seasons. These birds typically migrate at night and generally fly between 1,000 to 2,500 feet AGL during migration. Holloman AFB is located within a minor migration corridor in the Central Flyway. The most common species of migratory birds are Mallard, Northern Pintail, Blue-winged Teal, Northern Shoveler, and Wilson's Phalorope. In the proximity of the migratory flyway and the Lake Holloman Wildlife Refuge Area, a complex of small lakes, constructed wetlands, and playas southwest of Runway 34 contribute to potential bird strikes. The complex which primarily serves as storage for treated effluent from the base's wastewater treatment plant, provides some of the only permanent water in the vicinity of the Base and attracts primarily waterfowl and shorebirds. The local waters sustain low-breeding populations, but support substantial migratory populations of waterfowl and shorebirds. Local flying procedures avoid direct overflight of these areas.

3.3.2 Environmental Consequences

3.3.2.1 Proposed Action

The 49 FW transformation would replace existing F-117A and T-38 aircraft that have been in the Air Force inventory for decades with the new F-22A aircraft. The F-22A would be expected to have a Class A mishap rate similar to the F-117A by the time the transformation is completed and is expected to approach the F-15C Class A mishap rate over time. Holloman AFB aircraft ground safety conditions would not change as a result of the F-22A beddown.

Other Holloman activities, including the construction of new buildings and facilities under Alternative A would not take place in CZs or APZs. The construction would be consistent with the Base General Plan and construction safety procedures would be part of any construction contract. The change in personnel is not expected to have an effect on safety.

3.3.2.2 Alternative A

Alternative A construction and flight safety consequences would be the same as described for the Proposed Action.

3.3.2.3 No Action

Under the No Action Alternative, existing conditions would continue.

3.4 Air Quality

The definition of air quality and the ROI are included in Section 2.8.4 and Appendix I.

3.4.1 Existing Conditions

Attainment Status. The USEPA designates all areas of the U.S. as having air quality better than or equal to (attainment) or worse than (nonattainment) the National Ambient Air Quality Standards (NAAQS). The criteria for nonattainment designation varies by pollutant: (1) an area is in nonattainment for O_3 if its NAAQS has been exceeded more than three discontinuous times in 3 years and (2) an area is generally in nonattainment for any other pollutant if its NAAQS has been exceeded more than once per year. Former nonattainment areas that have attained the NAAQS are designated as maintenance areas.

A review of the federally published attainment status for Otero County, New Mexico, in 40 CFR 81.322 indicated that this region is designated as attainment (i.e., meeting national standards) for all criteria pollutants, including CO, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), PM_{10}, particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), O_3, and lead (Pb).

Class I Areas. Mandatory Prevention of Significant Deterioration (PSD) Class I areas established under the Clean Air Act (CAA) Amendments of 1977 for New Mexico are listed under 40 CFR 81.421. The nearest PSD Class I area is the White Mountain Wilderness Area, located approximately 43 miles northeast of Holloman AFB. Other Class I areas within 186 miles (300 kilometers) of Holloman AFB include Bosque del Apache National Wilderness Refuge, Guadalupe Mountains National Park, Carlsbad Caverns National Park, and the Salt Creek and Gila wilderness areas (Figure 3.4-1).

Current Emissions at Holloman AFB. Baseline emissions from Holloman AFB include conventional stationary sources associated with aircraft and facility maintenance, and mobile sources such as personal vehicles and facility-based utility and construction vehicles, as well as aircraft ground and flying operations within the Holloman AFB airfield. Table 3.4-1 presents the baseline emissions at Holloman AFB for employee commuting and on-base vehicles, stationary sources, and aircraft landing/take-off and touch and go operations (Holloman AFB 2004a). In the following tables and for tables in Section 3.4.2, VOCs are precursors to the formation of O_3 in the atmosphere; NO_x include NO_2 and other related compounds; sulfur oxides (SO_x) include SO_2 and other related compounds; and particulate matter is equivalent to total suspended particulates and includes PM_{10} as a component.

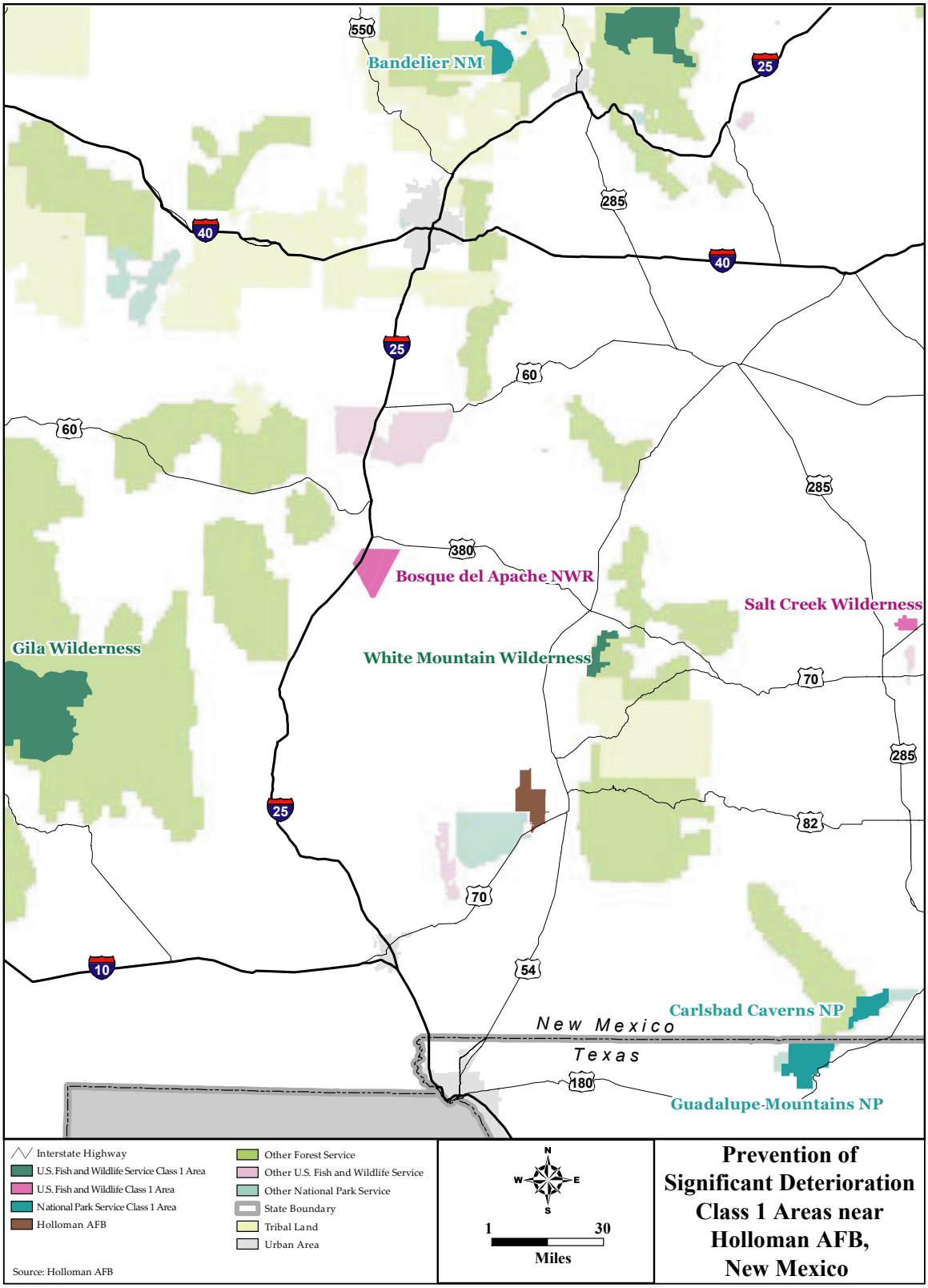


Figure 3.4-1. Prevention of Significant Deterioration Class I Areas near Holloman AFB, New Mexico

Table 3.4-1. Criteria Pollutant Emissions at Holloman AFB, Baseline

	Annual Emissions (tons/year)				
Source	*CO*	*VOC*	*NOx*	*SOx*	*PM*
Commuting	444.9	60.9	36.1	0.1	1.6
On-Base Vehicles	187.1	22.8	220.2	0.1	21.2
Stationary Sources	19.9	92.8	19.5	1.5	11.3
Aircraft (Airfield only)	496.8	147.6	424.5	12.9	78.1
Total Emissions at Holloman	**1,148.9**	**324.4**	**700.4**	**14.6**	**112.2**

CO = carbon monoxide; NO_x = nitrogen oxides which include nitrogen dioxide (NO_2) and other nitrogen-related compounds; PM = particulate matter which is equivalent to Total Suspended Particles (TSP) and includes particulate matter (PM_{10}) as a component; SO_x = sulfur oxides which include sulfur dioxide (SO_2) and other sulfur-related compounds; VOCs = volatile organic compounds, which are precursors to the formation of ozone (O_3) in the atmosphere
Source: Holloman 2004a

Regional Air Emissions. Table 3.4-2 lists county-wide emissions for Otero County and for AQCR 153 (which includes Otero County), as compiled by USEPA in its National Emissions Inventory. This table uses the inventory data for 1999, since the recently compiled 2002 National Emissions Inventory is still in the process of being released by the USEPA and not fully available at this time (USEPA 2006). The 1999 National Emissions Inventory contains estimates of annual emissions for stationary and mobile sources of air pollutants in each county on an annual basis.

Table 3.4-2. Air Emissions Inventory Otero County, New Mexico, and AQCR 153, Calendar Year 1999

	Pollutants (in Tons per Year)				
	CO	*SO_2*	*NO_x*	*PM_{10}*	*VOC*
Otero County, New Mexico					
Stationary Sources	15,799.8	326.8	1,430.4	30,481.3	2,501.8
Mobile Sources	14,842.7	63.3	1,657.2	51.4	1,183.2
Air Quality Control Region 153					
Stationary Sources	72,659.9	1,905.0	14,530.2	128,481.3	12,979.2
Mobile Sources	135,738.0	585.7	16,377.5	479.3	10,447.3

CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter; SO_2 = sulfur dioxide; VOC = volatile organic compounds
Source: USEPA 2006

3.4.2 Environmental Consequences

The approach to the air quality analysis was to estimate any increase in emission levels due to the proposed transformation of the 49 FW. Air emissions resulting from the proposed action were evaluated in accordance with federal, state, and local air pollution standards and regulations. Air quality impacts from a proposed activity or action would be significant if they:

- increase ambient air pollution concentrations above any NAAQS;
- contribute to an existing violation of any NAAQS;
- interfere with or delay timely attainment of NAAQS; or
- impair visibility within any federally mandated federal Class I area.

3.4.2.1 Proposed Action

According to USEPA's General Conformity Rule in 40 CFR Part 51, Subpart W, any proposed federal action that has the potential to cause violations in a NAAQS nonattainment or maintenance area must undergo a conformity analysis. A conformity determination is not required since the ROI is in attainment for all criteria pollutants.

PSD regulations protect the air quality in regions that already meet the NAAQS. According to the New Mexico Air Quality Bureau, the Proposed Action, including impacts to visibility, would not be covered under state or federal PSD regulations because it includes primarily fugitive dust and mobile source emissions (Wunker 2001). The nearest PSD Class I area is approximately 43 miles from the region potentially affected by the Proposed Action. Therefore, the Proposed Action would be unlikely to have any impact on any PSD Class I area.

Estimated construction emissions that would occur from construction, demolition, grading, and paving activities under the Proposed Action are presented in Table 3.4-3. The emissions shown would occur over the duration of the construction period.

Table 3.4-3. Construction Emissions

	Emissions (In Tons)					
Source	*CO*	*VOC*	*NO_x*	*SO_x*	*PM_{10}*	*$PM_{2.5}$*
Construction & Demolition	2.3	0.7	10.5	< 0.1	0.7	0.7
Grading	0.3	0.1	0.2	< 0.1	< 0.1	< 0.1
New Pavement	0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Total	2.6	0.8	10.8	< 0.1	0.8	0.8

CO = carbon monoxide; VOC = volatile organic compound; NO_x = nitrogen oxides; SO_x = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; < = less than

Operational emissions were calculated for an estimated 13 additional fleet vehicles, for airfield operations, and for the estimated decrease in personnel. These emissions are presented in Table 3.4-4. There would be a projected net decrease in operational emissions associated with the transformation of the 49 FW.

Table 3.4-4. Changes in Criteria Pollutant Emissions at Holloman AFB

Source	Change in Annual Emissions (tons/year)				
	CO	*VOC*	*NO_x*	*SO_x*	*PM*
Commuting	-74.2	-11.1	-7.3	< 0.1	-0.3
On-Base Vehicles	1.8	0.2	2.2	< 0.1	0.2
Stationary Sources	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aircraft (Landing and takeoff sorties)	-36.4	-89.2	71.6	6.4	7.9
Aircraft (Multiple Patterns)	-584.3	-368.4	29.6	3.9	-11.6
Change in Emissions at Holloman AFB	**-693.1**	**-468.5**	**96.1**	**10.3**	**-3.8**

< = less than; CO = carbon monoxide; NO_X = nitrogen oxides include NO_2 and other nitrogen-related compounds; PM = particulate matter, is equivalent to TSP and includes PM_{10} as a component; SO_X = sulfur oxides include SO_2 and other sulfur-related compounds; VOCs = volatile organic compounds are precursors to the formation of O_3 in the atmosphere; Airfield emissions include sorties (take-off and landing) and multiple pattern operations

3.4.2.2 Alternative A

Alternative A would only affect training airspace use and would not affect Holloman AFB.

3.4.2.3 No Action

Under the No Action Alternative, no construction emissions would occur and operational emissions would be identical to current baseline.

3.5 Physical Resources

The definition of Physical Resources and the ROI are included in Section 2.8.5 and Appendix J

3.5.1 Existing Conditions

Earth and Water Resources. Holloman AFB is located in the Tularosa Basin within Major Land Resource Area 42 (the Southern Desertic Basins, Plains, and Mountains) and Subresource Area SD-2. These groupings are based on a national system that delineates generalized regions sharing recognizable associations of soils, vegetation, hydrology, and other similar land features (Soil Conservation Service [SCS] 1980).

Typical of areas with low precipitation, basin soils have little horizon development, high pH, and are susceptible to wind and water erosion. The soil temperature regime is thermic, having a mean annual temperature between 59°F and 72°F; the soil moisture regime is aridic (dry) (SCS 1980).

Holloman AFB relies on off-base sources of groundwater and surface water to provide potable water to base personnel. Groundwater is obtained from five wellfields: the Boles, Escondido, San Andreas, Frenchy, and Douglas wellfields. A total of 15 groundwater wells draw water from the Bolson Aquifer located in the Tularosa Basin and are the primary source of potable water year-round (Holloman AFB 2003a). There are two ground level storage tanks with a total storage capacity of 0.9 million gallons associated with the well fields. These two tanks feed the Boles Field Pumping Station.

Storm water, typically generated in the arid climate of New Mexico during the months of June through October, is conveyed through drainage channels, underground piping (storm sewer), and, in a few areas, by sheet flow on Holloman AFB.

There are approximately 780 acres of delineated wetlands on Holloman AFB. While there are no perennial streams on Holloman AFB, there are Waters of the U.S. that receive storm water discharges from the base including Lake Holloman, Dillard Draw, Ritas Draw, and Lost River (Holloman AFB 2001). Ritas Draw flows into Lost River, which sinks into the sand dunes of White Sands National Monument. Flows that reach Dillard Draw and Lake Holloman either infiltrate the soil or evaporate.

Hazardous Materials. The majority of hazardous materials used by Air Force and contractor personnel at Holloman AFB are controlled by the hazardous materials pharmacy established at the base in 1993 (Holloman AFB 2004b). This pharmacy tracks products used at Holloman AFB and ensures that they are utilized prior to the expiration of their shelf life. This system also operates a Just-In-Time ordering system to greatly reduce the amount of hazardous materials stored onsite. Most hazardous materials used by Air Force and contractor personnel at Holloman AFB are controlled through the Air Force Pollution Prevention Program Plan and Holloman's Hazardous Waste Management Plan. This process provides centralized management of the procurement, handling, storage, and issuing of hazardous materials and turn-in, recovery, reuse, or recycling of hazardous materials. Development of these plans includes review and approval by Air Force personnel to ensure that users are aware of exposure and safety risks. Base management plans further serve to ensure compliance with applicable federal, state, and local regulations.

Aircraft flight operations and maintenance, as well as installation maintenance, require the storage and use of many types of hazardous materials, such as flammable and combustible liquids. These materials include acids, corrosives, caustics, glycols, compressed gases, aerosols, batteries, hydraulic fluids, solvents, paints, pesticides, herbicides, lubricants, fire retardants, photographic chemicals, alcohols, and sealants.

Hazardous Waste. Holloman AFB is a large-quantity hazardous waste generator, generating more than 2,200 pounds of nonacute hazardous waste per month. Hazardous wastes are generated from a variety of functions on base, including aircraft and vehicle operations and maintenance; medical and dental facilities; cleaning and degreasing operations; and various maintenance and paint operations. These wastes include solvents, paints and paint-related material, absorbent material, rags and debris, blast material and expired shelf-life material. Holloman AFB recycles all lubricating fluids, batteries, oil filters, and shop rags. Hazardous wastes generated are managed in accordance with the Holloman AFB Hazardous Waste Management Plan.

Initial accumulation point (IAP) managers are responsible for properly segregating, storing, characterizing, labeling, marking, packaging, and transferring all hazardous wastes for disposal from the IAP to the established 90-day storage area according to federal, state, local, and Air Force regulations. The Hazardous Waste Program Manager is responsible for characterizing and profiling each waste stream. There are approximately 39 hazardous waste IAPs located at Holloman AFB. Approximately 70,820 pounds of hazardous wastes were disposed of in Fiscal Year (FY) 2005. About 35 percent were associated with operation and maintenance of the F-117A.

Holloman AFB has one less-than-90-day site (Building 149), which allows the base to store hazardous waste for up to 90 days before transfer to the Defense Reutilization Market Office. The 90-day site is currently operated by a contractor, with the base retaining quality control of the site. Hazardous wastes generated on base and not stored in an IAP must be characterized, profiled, and moved to the 90-day site the same day it is rendered as waste. Wastes generated on base are managed under regulations set forth in Holloman AFB's RCRA Part B permit. Holloman AFB also holds a RCRA permit for handling the disposal and treatment of waste munitions.

Asbestos. ACMs are those materials that contain greater than 1 percent asbestos. Friable, finely divided, and powdered wastes containing greater than 1 percent asbestos are subject to regulation. A friable waste is one that can be reduced to a powder or dust under hand pressure when dry. Nonfriable ACMs, such as floor tiles, are considered to be nonhazardous, except during removal and/or renovation, and are not subject to regulation.

An asbestos management plan provides guidance for the identification of ACMs and the management of asbestos wastes. An asbestos facility register is maintained by 49th Civil Engineering. The design of building alteration projects and requests for self-help projects are reviewed to determine if ACMs are present in the proposed work area. ACM wastes are removed by contractor and disposed of in accordance with state and federal regulations.

Lead-based Paint. Lead-based paint (LBP) is defined as surface paint that contains lead in excess of 1 milligram per square centimeter as measured by X-ray fluorescence spectrum analyzer, or 0.5 percent lead by weight. Several structures associated with the transition to the F-22A weapon system have the potential to have LBP on building surfaces. Demolition and renovation of facilities with LBP require special procedures and disposal. In 1993, OSHA, under 29 CFR 1926, restricted the permissible exposure limit for general industrial workers to 50 micrograms per cubic centimeter of air, which would include workers in the construction field.

Environmental Restoration Program. The DoD developed the Environmental Restoration Program (ERP) to identify, investigate, and remediate potentially hazardous material disposal sites that existed on DoD property prior to 1984. Seventy -one ERP sites, eight areas of concern (AOCs) and 106 solid waste management units (SWMUs) have been identified at Holloman AFB (refer to Figure 3.5-1). Of the 71 sites, 36 have been closed with no further response action planned; nine are site closed with remedial action-operations; 15 are closed with long-term monitoring or require no further action; three are in the preliminary assessment/site investigation stage; and one is in the remedial design stage. The Holloman AFB Environmental Restoration Program Management Action Plan (Air Force 2005a) identifies the current status of the sites, including SWMUs and AOCs, and presents a comprehensive strategy for implementing actions necessary to protect human health and the environment. This strategy integrates activities under the ERP and the associated environmental compliance programs that support full restoration of the base.

ACC policy requires that any proposed project on or near a Holloman AFB ERP site be coordinated through the Holloman ERP Manager and obtain construction waivers from ACC. Construction and demolition would take place at or near ERP sites OT-44, SS-56 and DP-63. Descriptions of these sites found in *The Holloman Air Force Base Environmental Restoration Program Site Status Summaries* (Air Force 2005b) provide the following status.

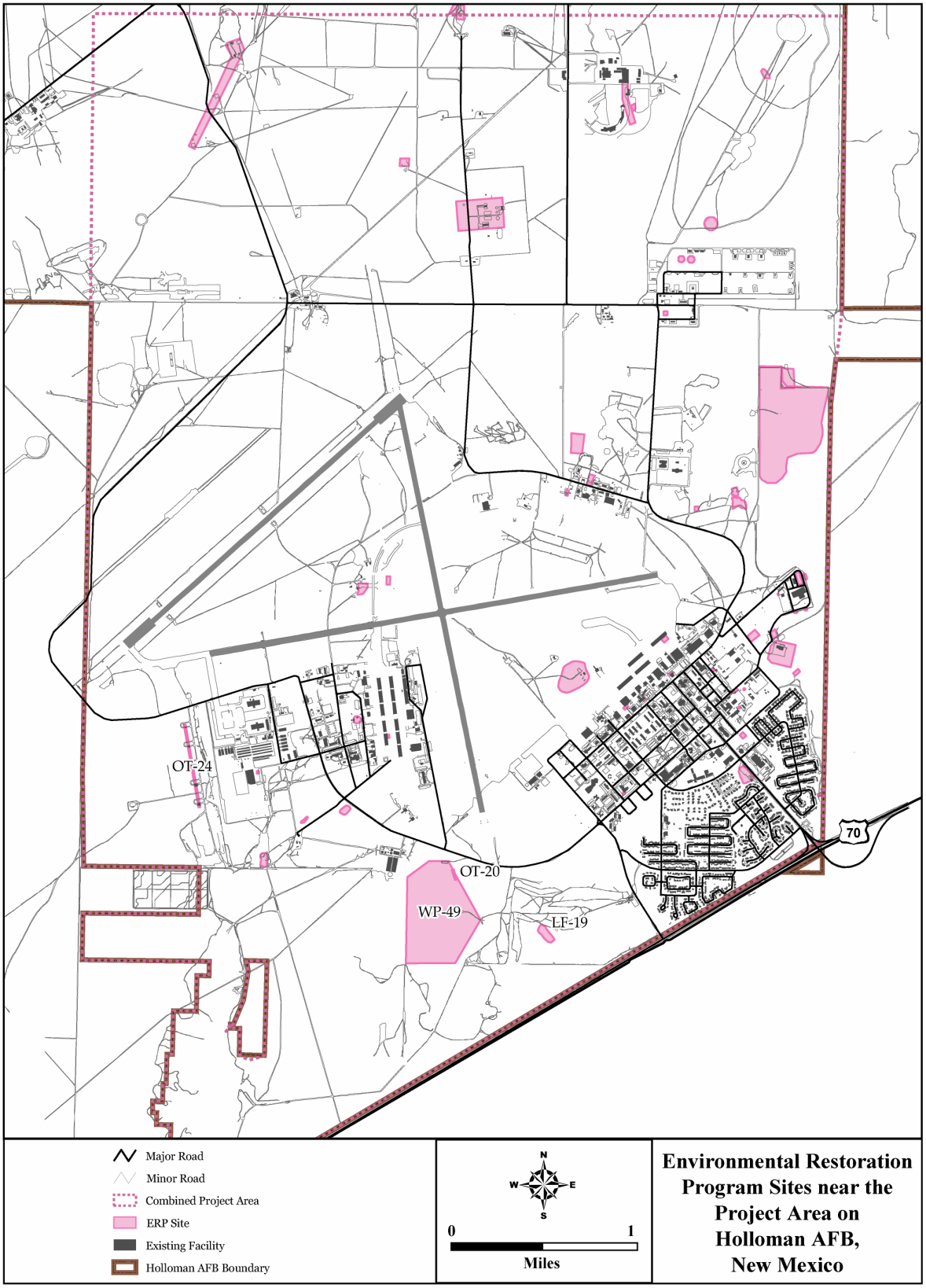


Figure 3.5-1. Environmental Restoration Program Sites Near the Project Area on Holloman AFB

- ERP Site OT-44 is designated as the area between Building 301-an aircraft maintenance hangar, Building 315 a fuel barn, and Building 302 a training facility. The entire area is covered with asphalt and/or concrete. Liquid hydrocarbons were found on the water table during an exploratory excavation for a sewer line. The hydrocarbons are believed to be from one of two sources: oil from aircraft fuel spills on the concrete area west of Building 301, or leakage from an underground heating oil tank which is no longer in service and was located south of Building 301. Long term monitoring is continuing of the site while a closure strategy is determined.
- ERP Site SS-56 is located southwest of the main runways and covers over 20 acres. Fuel contamination of the soils and water beneath the ramp is suspected due to past fuel spills on the ramp. The site is a concrete pad used for parking and maintenance of F-117A aircraft. Long term monitoring is continuing of the site while a closure strategy is determined.
- ERP Site DP-63 Munitions Disposal Pit is located to the northeast of the runway area, inside the Munitions Yard. Originally, the AOC was located immediately north of the munitions yard, but expansion of the yard in the 1950s and 1960s has enveloped the AOC within the compound. Munitions were placed into a pit with fuel and wood and then ignited to render the ordnance inert. Over time, fuel may have seeped into the soils directly below the treatment area. Currently remedial actions are continuing through 2007. Following completion of the remedial action closure will be requested from the state.

3.5.2 Environmental Consequences

3.5.2.1 Proposed Action

The F-22A is the first major Air Force weapon system to incorporate hazardous materials, pollution prevention and environment, safety, and health considerations from design throughout the weapon system lifecycle.

Earth and Water Resources. The Proposed Action would disturb approximately 4 acres in an area that was previously disturbed during various phases of base construction. The ground surface would be cleared of existing vegetation, graded and prepared for the installation of subsurface utilities and building foundations. All facilities would be designed and constructed to meet seismic design standards for the base. Since more than 1 acre would be disturbed by construction, a construction National Pollutant Discharge Elimination System (NPDES) storm water permit would be required. Under the permit, the contractor must develop a site-specific Storm Water Pollution Prevention Plan (SWPPP) that describes best management practices (BMPs) to be implemented to eliminate or reduce sediment and non-storm water discharges. With proper design and implementation of the SWPPP, impacts from erosion and off-site sedimentation would be negligible.

Construction would generate minimal storm water runoff. With the limited acreage involved in the construction, impacts to water resources are not expected.

Once facility construction is completed and operations commence, the base's SWPPP also specifies procedures for spill prevention and response, routine inspection of discharges at sites, and proper training of employees. With implementation of BMPs, impacts to surface water quality at Holloman AFB would not be considered significant.

Hazardous Materials. Existing procedures for the centralized management of the procurement, handling, storage, and issuing of hazardous materials through the Hazardous Materials Pharmacy (HAZMART) are adequate to handle the changes anticipated with the transformation of the 49 FW. Construction of the F-22A facilities may require the use of hazardous materials by contractor personnel. Project contractors would comply with federal, state, and local environmental laws and would employ affirmative procurement practices when economically and technically feasible.

All hazardous materials and construction debris generated by the proposed project would be handled, stored, and disposed of in accordance with federal, state, and local regulations and laws. Permits for handling and disposal of hazardous material would be coordinated by the contractor with the base hazardous waste program manager. The use of hazardous materials would not cause adverse impacts.

In the event of fuel spillage during renovation or construction, the contractor would be responsible for its containment, clean up, and related disposal costs. The contractor would have sufficient spill supplies readily available on the pumping vehicle and/or at the site to contain any spillage. In the event of a contractor related release, the contractor would immediately notify the 49th Civil Engineering Squadron and take appropriate actions to correct its cause and prevent future occurrences.

Hazardous Waste. Holloman AFB would continue to generate hazardous wastes during various operations and maintenance activities. Hazardous waste disposal procedures, including off base disposal procedures, are adequate to handle changes in quantity and would remain the same. The base's plans and regulations would be updated to reflect any changes of hazardous waste generators and waste accumulation point monitors. The number of hazardous waste accumulation sites would be modified to handle the change in waste generation and there would be no adverse impacts. In the event that any hazardous wastes are generated as a result of F-22A maintenance activities that present any unique hazards over those generated by the F-117A and T-38 aircraft, Holloman AFB would implement appropriate hazardous waste control procedures to minimize potential risks to personnel and the environment.

The stealth coatings of the F-22A require low observability composite repair facilities. These facilities provide engineering and environmental controls whereby any hazardous materials associated with the composite materials used by the F-22A can be isolated from the air and water environments for safe disposition. Many of the low observability components of the F-22A are similar to or the same as those for the F-117A. Transition to the F-22A should have no new environmental effects on physical resources at Holloman AFB.

Asbestos. Structures slated for demolition or renovation associated with the transition to the F-22A weapon system have the potential for having ACM. Materials containing ACM include floor tile, adhesive, window caulk, and roofing material. AFI 32-1052, *Facilities Asbestos Management*, requires that when safety and budgetary considerations permit, complete removal of asbestos-containing material would be included in military construction program facility projects. Asbestos surveys (taking samples and obtaining analysis by a state-certified laboratory) would be performed prior to demolition to locate all ACM. Where asbestos is found, the demolition contractor would perform any and all asbestos work in accordance with applicable laws. Contractor personnel would be appropriately trained and certified, as necessary. Also, the contractor would submit an Asbestos Work/Disposal Plan for the demolition. Transport and disposal documentation records, including signed manifests, would

also be required. With these management requirements in effect, there would be no anticipated adverse impacts resulting from asbestos contamination from demolition of buildings. ACM would not be employed for any new constructed units; therefore, there would be an overall beneficial result upon the removal of potential exposure to ACM.

Lead-Based Paint. Materials that maybe potentially disturbed as part of the transition to the F-22A weapon system containing LBP include interior baseboards, windowsills, metal doorframes, window frames, exterior wood trims, and soffits. LBP-containing materials do not have to be treated as hazardous waste as long as these materials are not removed from a structure prior to demolition. Prior to any renovation and demolition activities, the Environmental Flight would review all construction project programming documents, designs, and contracts. Projects requiring alteration or demolition of an existing housing structure would require LBP surveys. Project designs would stipulate the appropriate abatement and disposal requirements for LBP. With these management requirements met, there would be no anticipated adverse impacts as a result of implementation of the Proposed Action from LBP. LBP would not be employed for any new constructed units; therefore, there would be an overall beneficial impact to base personnel upon the removal of potential exposure to LBP.

Environmental Restoration Program. Construction supporting the F-22A aircraft would occur near the ERP Sites OT-44, SS-56, and DP-63. The 49th Civil Engineering Squadron, Environmental Restoration Branch (49 CES/CEVR), would request an ACC waiver for construction near these ERP sites and provide notification to New Mexico Environment Department and USEPA Region VI. The Air Force will ensure that construction activities are coordinated with ongoing remediation or investigation activities at any CERCLA site. Any soil suspected of contamination, as discovered during the construction process, would be tested and disposed of in accordance with appropriate New Mexico Environment Department regulations. The environmental consequences for this resource are not anticipated to be significant.

3.5.2.2 Alternative A

Construction of the F-22A facilities to support Alternative A are the same as those described in the Proposed Action.

3.5.2.3 No Action

No Action would mean no F-22A beddown at Holloman AFB. No additional construction supporting the F-22A program would occur and no ground disturbing activities would take place. Aircraft maintenance activities, generating hazardous waste, would continue to support the existing aircraft squadrons and the other aircraft stationed at Holloman AFB.

3.6 Biological Resources

The Holloman INRMP addresses the conservation of natural resources on Holloman AFB as well as the Air Force ranges on WSMR. The definition of biological resources and the ROI are included in Section 2.8.6. Other information relative to biological resources may also be found in Appendix G.

3.6.1 Existing Conditions

3.6.1.1 Terrestrial Communities

Plants

Holloman AFB is located in Bailey's (1995) Chihuahuan Desert Province, which is dominated by thorny shrubs. Overall, creosote bush (*Larrea tridentata*) is the most widespread and abundant plant in the province, especially on gravel fans. On deep soils, however, honey mesquite (*Prosopis glandulosa*) becomes the dominant plant, and cacti are also abundant, particularly prickly pears (*Opuntia* spp.). Other plants that are common to abundant in the Chihuahuan Desert Province include yuccas (*Yucca* spp.), lechuguilla (*Agave lechuguilla*), and ocotillo (*Fouquieria splendens*) (Bailey 1995). Soils along rivers support some trees including cottonwoods (*Populus* spp.).

On Holloman AFB, much of the original vegetation has been replaced by ornamental plants and shade trees, such as desert willow (*Chilopsis linearis*), ocotillo, yuccas, pines (*Pinus* spp.), and mulberry (*Morus* sp.). The installation has a golf course, and lawns flank some of the residential buildings. Away from buildings and roads, the vegetation tends to be dominated by four-wing saltbush (*Atriplex canescens*) and patches of sacaton (*Sporobolus* spp.), with some areas of saltgrass (*Distichlis* spp.). Cryptogamic crusts are present. On disturbed soils, the vegetation may consist largely of silverleaf nightshade (*Solanum elaeagnifolium*), Russian thistle (*Salsola iberica*), or African rue (*Peganum harmala*). African rue in particular is invasive and local management efforts are aimed at preventing its spread. Some areas have alkaline soils that support little or no vegetation.

Wildlife

The fauna of the Chihuahuan Desert Province includes pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) as the most widely distributed large game animals (Bailey 1995). African Oryx or gemsbok (*Oryx gazella*), a large African antelope introduced as a game animal to New Mexico, is found in southern New Mexico and is abundant on Holloman AFB, where a population reduction hunt was conducted in early 2006. Population reduction hunts are conducted on Holloman AFB periodically, as needed. On adjacent WSMR, the population supports approximately 10 "trophy hunts" annually, managed through once-in-a-lifetime hunting permits issued through a special draw. The trophy hunts may be supplemented with periodic population-reduction hunts scheduled as needed using hunters who have applied for placement on a standby list. The WSMR Integrated Natural Resources Management Plan (New Mexico Heritage Program and WSMR Environmental Directorate 2002) gives the 1998 population of oryx on WSMR as 2,530 animals. Lagomorphs are represented by the blacktail jackrabbit (*Lepus californicus*) and the desert cottontail (*Sylvilagus audubonii*); kangaroo rats (*Dipodomys* spp.) and woodrats (*Neotoma* spp.) are some of the numerous rodents competing with domestic and wild herbivores for forage. The coyote (*Canis latrans*) and the bobcat (*Lynx rufus*) are two of the mammalian predators present in the province (Bailey 1995).

The black-throated sparrow (*Amphispiza bilineata*) is one of the most abundant birds of the Chihuahuan Desert Province. The greater roadrunner (*Geococcyx californianus*), curve-billed thrasher (*Toxostoma curvirostre*), and Chihuahuan raven (*Corvus cryptoleucus*) are also common, as are the scaled quail (*Callipepla squamata*) and Gambel's quail (*Callipepla gambellii*). Some of the raptors that occur in the province are the golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), and ferruginous hawk (*B. regalis*). The

Chihuahuan Desert Province harbors a large number of reptile species including the common chuckwalla (*Sauromalus ater*), Texas horned lizard (*Phrynosoma cornutum*), desert spiny lizard (*Sceloporus magister*), and various rattlesnakes (Bailey 1995).

On Holloman AFB, great-tailed grackles (*Quiscalus mexicanus*) are typically common near buildings, while desert cottontails and Gambel's quail frequent the golf course. Some common terrestrial birds of the general area include the western kingbird (*Tyrannus verticalis*), Cassin's kingbird (*T. vociferans*), and Say's phoebe (*Sayornis saya*). Swainson's hawks (*Buteo swainsoni*), red-tailed hawks, and Chihuahuan ravens nest locally. Juvenile northern harriers (*Circus cyaneus*) have been observed on the military installation, although there is no nesting record for this species at Holloman AFB. Holloman AFB is located within a minor migration corridor in the Central Flyway (Air Force 2006). The most common species of migratory birds are Mallard, Northern Pintail, Blue-winged Teal, Northern Shoveler, and Wilson's Phalarope. In the proximity of the migratory flyway and the Lake Holloman Wildlife Refuge Area is a complex of small lakes, constructed wetlands, and playas southwest of Runway 34, that contribute to potential bird strikes. The complex, which primarily serves as storage for treated effluent from the base's wastewater treatment plant, provides some of the only permanent water in the vicinity of the Base and attracts primarily waterfowl and shorebirds. The local waters support low populations of breeding species, but support substantial migratory populations of waterfowl and shorebirds. Local flying procedures avoid direct over flight of these areas.

Characteristic reptiles include checkered whiptails (*Cnemidophorus tesselatus*), bullsnakes (*Pituophis melanoleucus*), and prairie (or western) rattlesnake (*Crotalis viridis*) and western diamondback rattlesnake (*Crotalis atrox*). The Texas horned lizard occurs only occasionally in the area.

Although currently not an important cause of bird mortality, collisions between birds and airplanes do occur at Holloman AFB. At Holloman AFB, a total of 16 bird aircraft strikes were documented in 2005 and 3 in 2006 (January through March). BASH has been discussed in the Flight Safety section.

3.6.1.2 Wetlands and Freshwater Aquatic Communities

Section 404 of the CWA established a program to regulate the discharge of dredged and fill material into Waters of the U.S., including wetlands. Activities in Waters of the U.S. that are regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. The federal regulations implementing Section 404 of the CWA define wetlands as quoted in the physical resource section. EO 11990, *Protection of Wetlands*, requires federal agencies, including the Air Force, to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

There are approximately 780 acres of wetland on Holloman AFB, primarily to the north and west of the golf course. Some of these wetlands consist of ponds and sections of open ditches with cattail (*Typha* sp.) and bulrush (*Scirpus* sp.). Along some ditches, the vegetation is dominated by saltcedar (*Tamarix ramossissima*), while others are lined with some vegetation that includes saltbush, silverleaf nightshade, Russian thistle, globe mallow (*Sphaeralcea* spp.), buffalo gourd (*Cucurbita foetidissima*), desert willow, creosote bush, and common reed (*Phragmites australis*).

American coots (*Fulica americana*) and ruddy ducks (*Oxyura jamaicensis*) may be observed in a small pond adjacent to the golf course; teals (*Anas* spp.) have been documented nesting along a ditch with bulrush and cattail vegetation. Aquatic birds observed during the winter in wetlands include the northern shoveler (*Anas clypeata*) and the American avocet (*Recurvirostra americana*). These species are observed in areas of Holloman AFB with permanent surface water. Fish species in golf course ponds include introduced carp and mosquitofish. There are no fish species in the project construction area.

3.6.1.3 Threatened and Endangered and Special Status Species

For purposes of this assessment, sensitive biological resources are defined as those plant and animal species listed as threatened or endangered by the USFWS and species that are listed for conservation-related reasons by the State of New Mexico or other relevant entities. Three categories of protection status are included in this section: (1) federally listed threatened and endangered species; (2) state listed species; and (3) other sensitive species. Definitions of these categories are included in Appendix G. Appendix G lists threatened, endangered, and sensitive plant and animal species on or in close proximity to Holloman AFB and gives their status. None of these species are expected on or near project construction sites.

3.6.2 Environmental Consequences

Four areas of consideration are used to identify the potential environmental consequences to wildlife and habitat. These areas are (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource; (2) the proportion of the resource that would be affected relative to its occurrence in the region; (3) the sensitivity of the resource to proposed activities; and (4) the duration of any ecological ramifications. Impacts to resources would be considered significant if special-status species or habitats are adversely affected over relatively large areas or disturbances cause significant reductions in population size or distribution of a special-status species (40 CFR 1508.2).

Specific concerns for biological resources within the base environs ROI are habitat loss due to construction of new facilities, noise associated with construction, and noise associated with the operation and maintenance of the F-22As at Holloman AFB.

3.6.2.1 Proposed Action

Under the Proposed Action, only 4 acres would be affected by renovation, construction, and infrastructure improvements on the base. Planned construction is confined to developed areas of Holloman AFB. Most of the proposed construction and demolition would be modification of existing buildings in developed portions of the facility and would not affect biological resources. Two structures would be placed on existing graded pads within the fenced Munitions Storage Area. The pads and surroundings are sparsely vegetated by low grasses and weeds including African rue, an invasive perennial herb. This disturbed habitat is regularly mowed for security and fire prevention purposes and offers little in the way of habitat for native wildlife. No wetlands would be disturbed or lost. Erosion, siltation, and fugitive dust control measures would be included as part of the project and revegetation of temporarily disturbed areas would be conducted as directed by the base.

Since the construction areas are limited in size and located in previously disturbed areas, no significant impacts to threatened, endangered, or sensitive species or habitats would result from construction of project facilities.

Replacement of the F-117A and T-38 aircraft with the F-22A squadrons would decrease noise contours at Holloman AFB and vicinity (see Section 3.2.3, Noise). This would not adversely affect wildlife currently present on base because they already exist in a qualitatively similar noise environment involving regular takeoffs, landings, and overflight by military jet aircraft and would be expected to habituate to the changes associated with transformation to the F-22A aircraft.

3.6.2.2 Alternative A

There are no differences on-base between the Proposed Action and Alternative A.

3.6.2.3 No Action

Under the No Action Alternative, two squadrons of F-22A would not beddown at Holloman AFB. Construction of new support facilities would not occur. Biological resources would not be expected to change from baseline conditions.

3.7 Cultural Resources

The definition of cultural resources and the ROI are included in Section 2.8.7 and historical background and is included in Appendix F.

3.7.1 Existing Conditions

Identified Cultural Resources

Approximately 57,600 acres of Holloman AFB has been surveyed for cultural resources. This represents about 96 percent of the base's 59,639 acres. Most of the survey is a result of projects between 1993 and 1997 (Holloman AFB 2005a). The unsurveyed acres are entirely within the disturbed and built environment of Holloman AFB. Through these surveys, 363 archaeological resources and almost 1,500 facilities (potential architectural resources) have been identified on base and base-administered lands. Of the 363 recorded sites, 250 are located on the main base with the remainder located on the Boles Wells Water System Annex .

Archaeological Resources

Of the 250 archaeological resources located on the main area of Holloman AFB, 135 are associated with the activities of indigenous populations, distributed between four recognized time periods spanning almost 12,000 years. There are an additional 23 historic properties attributable to the historic period that are primarily associated with ranching, 49 cultural resources related to the military presence in the Tularosa Basin, and 41 cultural resources that have both an indigenous and a historic component. Two of the cultural resources are isolated thermal features with no associated artifacts, and, without testing, defy categorization (Holloman AFB 2005a).

Thirty-five of the archaeological resources have been evaluated as eligible for the NRHP, 142 are potentially eligible, and 73 are considered not eligible (Holloman AFB 2005a).

Historic Architectural Resources

Currently there are 1,474 architectural resources on Holloman AFB (Holloman AFB 2005a). Of these, 60 are recognized as being associated with World War II (pre-1946), 1,392 are related to the Cold War Period (1946 to 1989), and 22 are pre-military Historic Era architectural resources. Of these, 29 are considered eligible for inclusion in the NRHP, 18 are potentially eligible, 50 are considered ineligible, and 1,377 remain unevaluated (Holloman AFB 2005a).

In the ROI surrounding Holloman AFB, the most notable historic cultural resource is the White Sands National Monument Visitor Center. This complex of seven buildings was constructed between 1936 and 1940, is officially listed as the White Sands National Monument Historic District.

Traditional Resources

Native American groups with historic ties to the area, such as the Mescalero Apache, have not identified any traditional cultural properties on Holloman AFB (Holloman AFB 2005a). Holloman AFB continues to consult with the Mescalero Apache.

3.7.2 Environmental Consequences

A number of federal regulations and guidelines have been established for the management of cultural resources. Section 106 of the NHPA, as amended, requires federal agencies to take into account the effects of their undertakings on historic properties. Historic properties are cultural resources that are listed in, or eligible for listing in, the NRHP. Eligibility evaluation is the process by which resources are assessed relative to NRHP significance criteria for scientific or historic research, for the general public, and for traditional cultural groups.

Analysis of potential effects or impacts to cultural resources considers direct impacts that may occur by physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance; introducing visual or audible elements that are out of character with the property or alter its setting; or neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the types and locations of proposed activity and determining the exact location and nature of cultural resources that could be affected. Indirect impacts generally result from increased use of an area.

For all projects of the Proposed Action, compliance with Section 106 of the NHPA, including State Historic Preservation Office (SHPO) consultation, would take place prior to the project implementation, including determining NRHP eligibility of facilities that are currently unevaluated that could be affected by the undertaking. Several projects include ground-disturbing activities in previously disturbed areas. However, there is still a possibility of encountering previously unrecorded and unknown archaeological resources. If suspected artifacts of any type (wood, stone, bone, metal, etc.) or other unidentifiable materials are inadvertently uncovered during ground disturbing projects, the soil disturbance activities in that area must cease until environmental staff can determine whether or not the materials warrant further actions under the Native American Graves Protection and Repatriation Act, Archeological Resources Protection Act, NHPA, or the Holloman AFB Integrated Cultural Resource Management Plan (ICRMP).

3.7.2.1 Proposed Action

Within the environs of Holloman AFB, the Proposed Action involves renovation or construction projects clustered in three locations: the main base cantonment area, the F-117A operations area, and the munitions storage area (see Table 3.7-1).

Table 3.7-1. Projects of the Proposed Action and Optional Support Projects Listed by Building Number, Including Project Description, Build Date, and NRHP Status (Page 1 of 2)

Building #	*Project Activity*	*Current Use*	*Project Description – Use Under Transformation*	*Build Date and Area*	*NRHP[1]*	*Proposed Action (PA)*	*Option under PA*
302	Conversion	Weapons Flight School and F-117A FTU	Initial or temporary Squadron Operations standup	1943 Main Base	Not eligible		X
310	Repair	Supply and Equip Warehouse	Repair secure area	1956 Cantonment	Unevaluated	X	
311	Repair	Traffic Management Facility	Repair secure area	1968 Cantonment	Unevaluated	X	
315	Repair	ADAL simulator facility	Requires addition of 2 high bays	1968 Cantonment	Unevaluated	X	
513	Repair	FTD facility	Requires space be converted to high bays	1976 Cantonment	Unevaluated	X	
578	Reuse	Engine shop	F-22A engine shop	Main Base	Unevaluated		X
800	Addition and alteration	engine shop	Additional space to accommodate needs of new mission	1957 F117A Ops	**Needs to be evaluated[1]**	X	
811	Reuse	53 TEG area	Temporary stand-up for first Squad Ops	F117A Ops	Unevaluated		X
816	Conversion	SHP ACFT GEN PURP	Installation of fuel tank racks (Fig 7)	1955 F117A Ops	**Needs to be evaluated[1]**	**X**	
817	Conversion	SQ OPS	Installation of fuel tank racks (Fig 7)	1955 F117A Ops	**Needs to be evaluated[1]**	**X**	
823	Conversion	Avionics Shop	Convert Field Training Development	1953 F117A Ops	**Not eligible[1]**	**X**	**X**
824	Addition	Parts store	Additional space to accommodate needs of new mission	1953 F117A Ops	**Not eligible[1]**	**X**	
868	Conversion	Maintenance Dock	Armament and WTL functions will be housed in hangar bays	1986 F117A Ops	Unevaluated	X	

Table 3.7-1. Projects of the Proposed Action and Optional Support Projects Listed by Building Number, Including Project Description, Build Date, and NRHP Status (Page 2 of 2)

Building #	*Project Activity*	*Current Use*	*Project Description – Use Under Transformation*	*Build Date and Area*	*NRHP[1]*	*Proposed Action (PA)*	*Option under PA*
892	Addition	Squad Ops	Additional space to accommodate needs of new mission	1982 F117A Ops	Unevaluated	X	
894	Addition	ADAL/AMU	Additional space to accommodate needs of new mission	1996 F117A Ops	Not eligible	X	
898	Addition, repair, and conversion	Aerospace Ground Equipment (AGE)	Interim AMU, permanent IMIS, addition of Wash Rack, installation of paint booths (conversion low observable/corrosion resistance facility)	1969 F117A Ops	Unevaluated	X	
1226	Addition	Conventional munitions shop	addition to Trailer Maintenance	1985 Munitions	Unevaluated	X	
1239	Addition	Conventional munitions shop	2 bay addition	1971 Munitions	Unevaluated	X	

Note: 1. Evaluation or need of evaluation is specifically identified in the ICRMP (Holloman AFB 2005a).

These projects involve repairs, additions, alterations, and conversions to 15 existing facilities, the construction of three new structures, and the repair of three existing pavement areas. The facilities involved in the Proposed Action include facilities that are not eligible for the NRHP, and structures that have not been evaluated for NRHP eligibility.

Of the 15 existing facilities to be altered by the Proposed Action, two are ineligible for NRHP listing (Buildings 823 and 824) (Holloman AFB 2005a). The other thirteen facilities are either recent construction (Building 894: 1996) or were constructed during the Cold War Era (1946-1991) and are not yet evaluated. Prior to project implementation, all of these facilities would be evaluated for NRHP eligibility. Should any of the structures be determined to be eligible for the NRHP, impacts to architectural resources could occur under the Proposed Action.

Three facilities could be included in the Proposed Action for temporary squadron stand-up while other facilities are being built or converted. Building 302, built in 1943, is not eligible for the NRHP (Holloman AFB 2005a). Buildings 578 and 811 are unevaluated. If use of these facilities is included in the Proposed Action and would involve exterior changes, they would need to be evaluated for NRHP eligibility.

An additional and unspecified project of the Proposed Action includes possible alterations to a series of Hangarettes (Buildings 21808 through 21819). The Hangarettes were all constructed after 1990, and as such do not merit consideration for NRHP inclusion.

The six projects of the Proposed Action that do not involve existing facilities include the construction of three new facilities and the repair of three sections of pavements (see Table 3.7-1). Archaeological surveys have documented 177 archaeological resources evaluated as eligible or potentially eligible for inclusion in the NRHP: none are within the ROI of any of the Proposed Action projects. However, it is possible that project related ground disturbing activities could encounter previously unknown and unevaluated cultural resources. If such resources were encountered, they would need to be evaluated for NRHP eligibility and mitigations could be needed to avoid impacts to archaeological resources under the Proposed Action.

Continued noise from overflights should have no adverse effect on archaeological or historic structures on Holloman AFB. Outside the base boundaries and within the base environs ROI, the adobe visitor's center at White Sands National Monument is a structure that could potentially be damaged by noise and vibrations. This structure, built between 1936 and 1940, is constructed in a traditional southwest Pueblo style using adobe bricks and a flat, horizontal roof supported by "large, exposed log beams, or vigas" (King *et al.* 1988). A study of the visitor center (King *et al.* 1988) identified "low-flying helicopters and low-flying, high-speed jet aircraft" as well as "road construction or heavy earth-tamping" as potential sources of damage from vibration. Current conditions regarding vibrations from the adjacent highway could experience indiscernible short-term change from increased traffic related to construction activities on the base. Following completion of construction, conditions should revert to the baseline, since there will be little change in the number of personnel working and living at Holloman AFB. Projected noise contours in the vicinity of the visitor center will be reduced from existing conditions, with overflights producing noise at levels less than 65 dB. However, more frequent sonic booms could adversely affect this structure as described in Section 4.7.

In the event of inadvertent discoveries of cultural resources during any project-related activities, including ground disturbance, construction or demolition, all activities at that location would be halted until the find is evaluated by a qualified professional archaeologist in compliance with the Holloman ICRMP and Federal regulations.

Impacts to traditional resources on or near the base are not expected under the Proposed Action. The Air Force has met with the nearby Mescalero Apache to identify any potential concerns associated with the proposed action.

3.7.2.2 Alternative A

On Holloman AFB, Alternative A would include all actions discussed under the Proposed Action. Impacts to cultural resources, particularly the White Sands Visitor Center would be the same as described under the Proposed Action. Unevaluated facilities would need to be evaluated for NRHP eligibility. In all cases, resources would continue to be managed in compliance with federal law and Air Force regulation.

3.7.2.3 No Action

Under the No Action Alternative, the F-22A would not be beddown at Holloman AFB. Construction associated with the beddown would not occur and impacts to cultural resources would not be expected under this alternative. In all cases, resources would continue to be managed in compliance with federal law and Air Force regulation.

3.8 Land Use and Transportation

The definition of land use and transportation and the ROI are included in Section 2.8.8.

3.8.1 Existing Conditions

Holloman AFB is located approximately 6 miles west of downtown Alamogordo, New Mexico, although one narrow extension of the Alamogordo City Limit reaches along U.S. Highway 70 to 3 miles east of the base. To the south and northeast of Holloman AFB, land is owned and administered by the BLM. White Sands National Monument is located to the southwest. WSMR surrounds the monument and borders Holloman AFB to the north, west, and south. A combination of federal, state, and private lands are located to the east, southeast, and southwest of the base.

Holloman AFB Land Use. Figure 3.8-1 depicts existing land uses for Holloman AFB. Holloman AFB is comprised of two parcels of land that together cover 59,639 acres. This includes the Boles Wells Water System Annex, a parcel of about 7,450 acres east of U.S. 54. The base is predominately undeveloped open space used for a variety of mission-related activities. The heaviest concentration of facilities is in the south end of the base and flanks the southern side of the airfield. Other facilities are in the north area and the west areas of the base. The north and west areas have airfield pavement and involve a mixture of industrial, aviation-related, administrative, and community uses. The main area, or cantonment, includes a mixture of uses similar to those of a small town or city with housing, outdoor recreation, offices, and medical land uses. Within a mile north of the cantonment area is a scatter of mission, industrial, mission support, recreational and historic facilities. Further north there are very few facilities, as the vast majority of the northern 40,000 acres of Holloman is undeveloped open space. Some open space serves as a buffer required for safety clearances, security areas, utility easements, and environmentally sensitive areas.

The Holloman General Plan guides overall organization and development of the base to support the mission on the installation. The General Plan defines 12 land use categories to achieve the most effective use of land and facilities. Table 3.8-1 lists and describes these categories. For the most part, existing land uses on the base, have been developed within planning and safety criteria to be compatible with each other. These uses include safety and security restricted zones, contamination avoidance sites, and natural features such as floodplains, wetlands, and sensitive habitats.

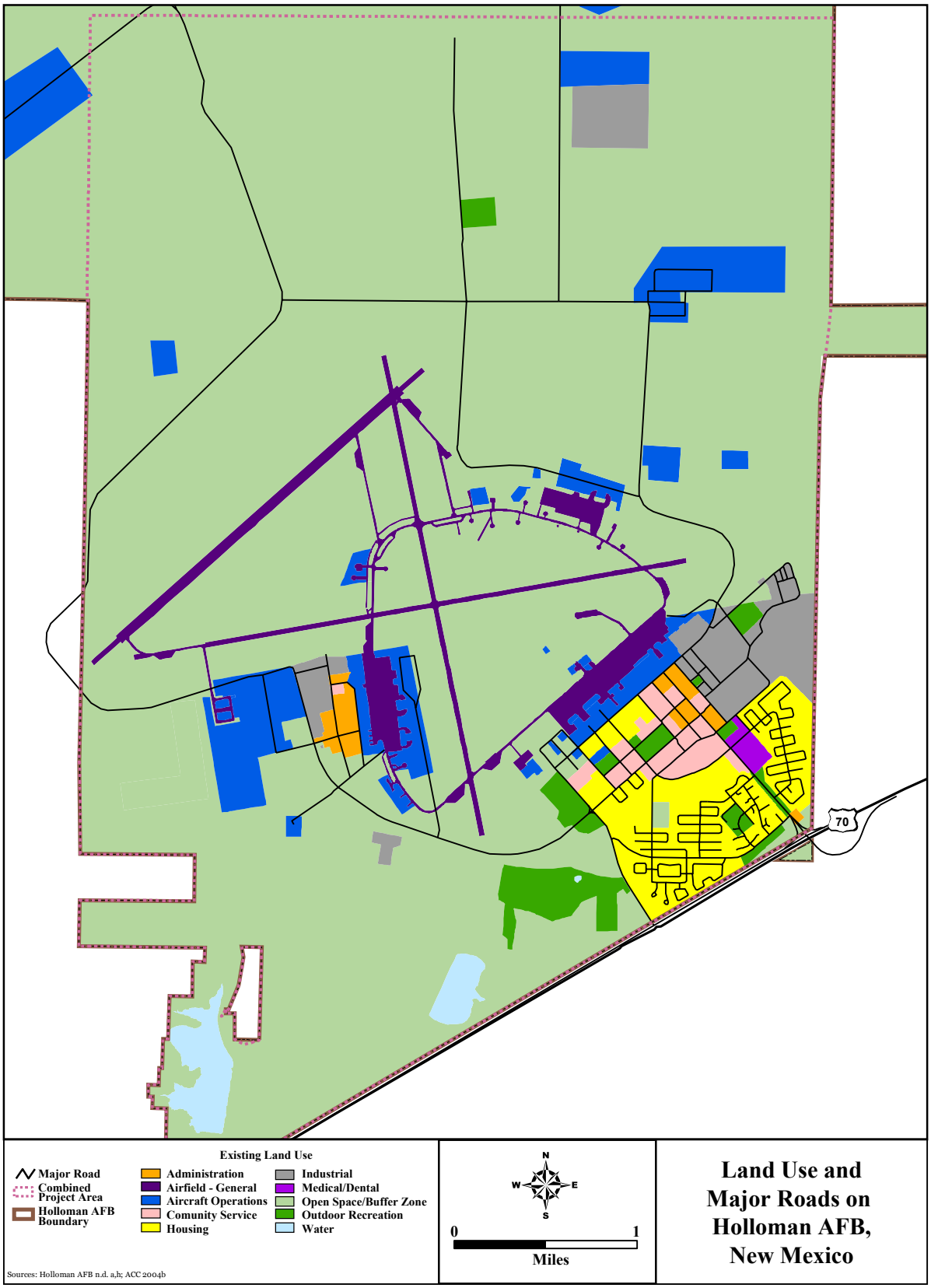


Figure 3.8-1. Land Use and Major Roads on Holloman AFB

Table 3.8-1. Land Use Categories at Holloman AFB

Land Use Category	*Example*
Airfield	Runway, overruns, taxiways, aprons
Aircraft Operations and Maintenance	Hangars, maintenance shops, aircrew facilities
Industrial	Supply, civil engineering facilities, vehicle maintenance facilities
Administrative	Headquarters facilities, base support, security
Community Commercial	Base exchange, commissary, credit union, dining halls
Community Services	Schools, post office, library, chapel
Medical	Health care center, dental clinic, veterinarian facility
Accompanied Housing	Family housing, temporary housing, trailer courts
Unaccompanied Housing	Dormitories, visiting officers quarters, visiting airman quarters
Outdoor Recreation	Golf course, swimming pool, playing fields
Open Space	Conservation areas, safety clearance zones
Water	Storm drainage collection ponds

Source: 49 FW 2004b

The base uses the AICUZ program to provide land use compatibility guidelines for areas exposed to increased safety risks and noise in the vicinity of the airfield. The noise compatibility guidelines recommended in the AICUZ program are similar to those used by U.S. Department of Housing and Urban Development and the FAA (see Appendix E). The intent of the program is to provide information to surrounding jurisdictions to guide planning and regulation of land use. Table 3.8-2 provides existing noise exposure by land use category on Holloman AFB. Almost 87 percent of this land is open space.

Holloman uses noise exposure information for planning and improving land use noise compatibility over time. This information is used by base planners and designers for incorporating noise level reduction construction in new facilities and renovation projects. When noise levels exceed an L_{dn} of 65 dB, residential land uses are normally considered incompatible. Noise exposures (depicted with contours), from operations occurring today at Holloman AFB are shown in Figure 3.2-1. Proposed noise contours with the transformation of the 49 FW are presented in Figure 3.2-2. These two contour figures provide the baseline and the measure of projected change under the Proposed Action to base the F-22A at Holloman AFB.

Table 3.8-2. Current Noise Exposure Levels (L_{DN}) on Holloman AFB by Land Use Category

Land Use[1]	Current Average Noise Level (L_{dn})					
	65-70 dB	*70-75 dB*	*75-80 dB*	*80-85 dB*	*>85 dB*	*Total*
Airfield	–	79	16	82	295	456
Aircraft Operations and Maintenance	382	193	178	116	93	963
Industrial	1	204	114	33	32	383
Administration	–	20	26	25	8	79
Community/Commercial	–	108	16	–	3	127
Community Services	–	–	–	–	–	–
Medical	–	24	–	–	–	24
Accompanied Housing	–	401	42	4	–	446
Unaccompanied Housing	–	37	11	–	–	48
Outdoor Recreation	–	54	51	73	52	229
Open Space	7,333	3,899	2,857	1,613	2,246	17,948
Water	–	–	29	18	–	47
Total	**7,716**	**4,940**	**3,404**	**1,962**	**2,728**	**20,750**

Note: 1. Areas depicted in acres.
Source: Holloman AFB 2004a

Lands Adjacent to Holloman AFB. To the south and northeast of Holloman AFB, land is owned and administered by the BLM and primarily leased for grazing. White Sands National Monument encompasses an area of about 145,000 acres to the southwest (also refer to Section 4.8). The monument is administered by the National Park Service and used for recreation and preservation of special resource values (e.g., flora and fauna, geologic, visual). WSMR surrounds the monument and borders Holloman AFB to the north, west, and south. This area is essentially undeveloped and supports a variety of military and test and development activities at specific locations and in airspace over the range.

A combination of BLM, state-owned, and private lands is located to the east, southeast, and southwest of the base. Private lands fall under the jurisdiction of Otero County. The city of Alamogordo has joint jurisdiction with the county for land use regulations for land within five miles of the city limits. Grazing is the primary use close to the base. Scattered commercial and light industrial development is found along U.S. 70 between Holloman AFB and Alamogordo. On the south side of U.S. 70, a mix of residential, commercial, and light industrial uses occurs closer to the city limits.

The incorporated boundary of the city of Alamogordo is about 3 miles east of the base. Although the city controls land use through zoning, neither the city nor the county has policies that consider noise exposure from aircraft operations at Holloman AFB. However, the AICUZ program, which considers noise and compatible land use, actively involves city and county officials. Holloman AFB does not have an encroachment problem because of close coordination among the base, the city of Alamogordo, and Otero County.

Approximately 60 percent of the land exposed to noise levels of 65 L_{dn} or greater is used for military activities. Grazing is the dominant use of most of the off-base land with some commercial/industrial development along U.S. 70. These uses are compatible with the current noise exposure levels. Government entities own and manage the majority of the land surrounding the airfield. Wetlands to the south of the base have been preserved and public open space recreational activities are permitted.

Some facilities at White Sands National Monument are exposed to noise levels that are not optimal for the monument's visitors; however, flight patterns used by aircraft avoid direct overflight of facilities to the greatest extent possible (Air Force 1998b). Under baseline conditions, approximately 14 percent of White Sands National Monument is exposed to 65 dB or greater. Private parcels along the eastern and southern boundaries of the installation are undeveloped (Holloman AFB 2004c).

Transportation. The main gate to Holloman AFB is located on U.S. 70 approximately 6 miles west of U.S. 54. The west gate, located at the intersection of U.S. 70 and West Gate Avenue 1 mile west of the Main Gate, serves all commercial traffic and west side workers. The La Luz gate is located on a northeast corner of the base and provides service for base personnel who live in the area north of Alamogordo.

The road network on Holloman AFB is organized into arterials, collector, and local streets. Primary arterials include First Street and West Gate Avenue leading directly to and from the main cantonment gates. Other arterials include Delaware Avenue, 49er Avenue, and Eleventh Street. Kelly Road is classified as a collector street, and provides access around the far west side of the airfield.

The General Plan for Holloman AFB describes some of the most noticeable transportation issues for the base, including traffic backing up onto U.S. 70 at the Main Gate, the intersection of First Street and Delaware Avenue, and the school bus drop-off on Arnold Avenue. Only two intersections on base, First Street at New York Avenue and Arizona, warrant a traffic signal (Holloman AFB 2004b).

3.8.2 Environmental Consequences

As described in Chapter 2.0, the key elements of the Proposed Action are flight activities, facility construction, and personnel changes. Established and recognized noise models have been applied to estimate the off base and on base noise conditions. These models are described in Appendix E. For the land use and transportation resources, changes are associated with changes in noise due to a change in aircraft capability or are temporary and short-term associated with construction on base. Potential effects to land use plans, land use patterns, and circulation due to construction or personnel increases are considered.

3.8.2.1 Proposed Action

Under the Proposed Action the total geographic area exposed to L_{dn} 65 or greater would be approximately 25.6 percent less than under current conditions. As described in Section 3.2, overall noise levels associated with the Proposed Action decrease. The area affected by noise under the Proposed Action is presented in Figure 3.2-2. Although some areas on base would experience higher noise levels due to a shift in the noise exposure, these changes in the noise environment should not result in changes to land management, land use, or land ownership.

Table 3.8-3 presents the land ownership on and off base in the vicinity of the base. The DoD and FAA adopted the concept of land use compatibility as an accepted measure of aircraft noise effect. USEPA has reaffirmed these concepts (see Section 3.2). The FAA has guidelines that establish the best means for determining noise impact in airport communities. Industrial land uses are compatible within the 65 dB noise contours. The Holloman AFB noise abatement programs limits flight operations between 10 p.m. and 7 a.m., to those necessary for night training missions.

Table 3.8-3. Projected Noise Levels and Existing Land Ownership

		Vicinity of Holloman AFB				
	Acres Off-base	*BLM*	*Private*	*State*	*White Sands Missile Range*	*White Sands National Monument*
65 – 70	16,940	4,648	2,266	1,287	335	0
70 – 75	7,516	2,100	518	596	1,590	2,711
75 – 80	3,456	912	354	175	655	1,360
80 – 85	1,734	371	156	0	861	347

Proposed facility and infrastructure renovation and construction are consistent with the current Base General Plan. No changes to the safety zones are anticipated under the Proposed Action.

An approximate 5.3 percent decrease in on-base assigned personnel associated with the Proposed Action is likely to reduce vehicle trips in the long term. Increased traffic during construction would contribute to increased congestion at gates and in the processing of access passes. Commuters to and from the installation during the morning and evening peak travel periods would be expected to face increased traffic during the approximately 3 year construction schedule. The short-term increase and long-term reduction in traffic are not likely to substantially affect commute times; however, adjacent intersections and access gates may experience temporary increased congestion during construction.

3.8.2.2 Alternative A

Alternative A would have the same base effects as those described for the Proposed Action.

3.8.2.3 No Action

Under the No Action Alternative, F-22A aircraft would not be assigned to Holloman AFB at this time and F-117A and T-38 aircraft would continue to operate. Consequently, there would be no change to the existing noise environment and no F-22A related facility renovation, construction, or personnel changes would occur.

3.9 Socioeconomics

The definition of socioeconomics and the ROI are included in Section 2.8.9.

3.9.1 Existing Conditions

3.9.1.1 Demographics

The 2000 census established the Otero County population as 62,298 persons (Table 3.9-1), an increase of approximately 20 percent from the 1990 population of 51,928 (Census 2000a, 2005). The 2004 population of the county is estimated to be 63,282 persons. Fifty-seven percent of the county's population resides in the city of Alamogordo, which includes Holloman AFB residents. The population of Alamogordo was 36,211 persons in 2004, just slightly higher than the 2000 population of 35,582 persons, and represents a 1.4 percent annual growth rate since 1990 (Census 2000a, 2005, Bureau of Business and Economic Research 2005). As explained by commentors during the scoping meetings, population in Alamogordo is directly tied to economic activity at Holloman AFB. Population growth in Alamogordo accounted for two-thirds of the overall county growth since 1990.

Table 3.9-1. Population in Otero County and the City of Alamogordo

Location	*Population*			*Annual % Change*
	1990	*2000*	*2004*	
Otero County	51, 928	62,298	63,282	1.4
City of Alamogordo	27, 986	35,582	36,211	1.9

Source: Census 2000a, 2005, Bureau of Business and Economic Research 2005

According to the U.S. Census Bureau, there were 22,984 households in Otero County with an average household size of 2.66 persons in 2000. Population density in the county is 9.4 persons per square mile, compared to 15.0 for the State of New Mexico (Census 2005). The residential population is concentrated in Alamogordo, where population density is 1,612 persons per

square mile (Bureau of Business and Economic Research 2000a). The remaining 98 percent of the county's land area has a population density of less than five persons per square mile.

Air Force military personnel assigned to Holloman AFB and their dependents number approximately 7,747 persons (Holloman AFB 2005b). Persons associated with the GAF at Holloman AFB, including both active duty military and their dependents, number 1,703 persons. An additional 1,136 appropriated fund civilian personnel are employed at Holloman AFB. The total population associated with Holloman AFB amounts to 10,694 persons. Including the estimated 6,700 military retirees in the region increases this number to 17,394 persons. Assuming all these individuals reside in the vicinity of Alamogordo, the base-related population directly comprises nearly one-half the Alamogordo and one-quarter of the county population.

3.9.1.2 Economic Activity

Alamogordo is the county seat and commercial center of Otero County. The region's economic activity is closely tied to military operations, including those at Holloman AFB and at nearby WSMR. Tourism and light manufacturing also contribute to the local economy (Alamogordo Chamber of Commerce 2004).

Employment steadily increased between 1980 and 2003. The total number of employed persons was 22,977 workers in 1980; 25,322 in 1990; 27,278 in 2000; and 28,230 in 2003 (Bureau of Economic Analysis 2005). The unemployment rate decreased in 2000 to 8.1 percent, down from over 10 percent in the early 1990s, and continued its decline in 2005 to current levels of about 5.2 percent (New Mexico Department of Labor 2005).

By far, the largest employer in Otero County is the federal government, with the Air Force contributing over 5,000 military and civilian jobs at Holloman AFB. WSMR, partially in Otero County, employs about 6,200 military and civilians, with residences divided between Otero and Doña Ana Counties in New Mexico and El Paso County in Texas (Holloman AFB 2005b). The GAF at Holloman AFB supports an additional 700 jobs. Other major employers in Otero County include Alamogordo Public Schools with 800 employees, the Mescalero Resort and Casino with 750 employees, and Wal-Mart with 600 employees (Otero County Economic Development Council 2004).

In 2002, Otero County had a per capita personal income of $19,450, compared to the state and national averages of $21,931 and $29,469, respectively (Bureau of Economic Analysis 2004b). Average earnings per job in the county in 2002 were $31,380.

The total annual economic impact generated by Holloman AFB activities is estimated at $454 million (Holloman AFB 2005b). Military and civilian payroll total $266 million. Contracts for services and the purchases of supplies and equipment amount to $94 million annually. An estimated 2,047 secondary jobs are generated by Holloman AFB activities, with an associated payroll of $77 million.

A study commissioned in 2002 by the Otero County Economic Development Council estimated that Holloman AFB generated $207 million in annual sales to the regional economy, representing 52 percent of total annual retail and wholesale trade (Institute for Policy & Economic Development 2002). This total economic contribution is comprised of both direct and secondary (indirect and induced) effects. The economic activity generated by base operations supports an estimated 4,550 additional civilian jobs. Discounting the number of these jobs held

by dependents of Holloman AFB personnel, the incremental employment effect is approximately 2,600 jobs.

3.9.2 Environmental Consequences

Existing demographic and economic characteristics in Alamogordo and Otero County were analyzed to assess the potential socioeconomic impacts of the proposed transformation. The Proposed Action, described in detail in Chapter 2.0, involves two factors that may affect socioeconomic resources: personnel changes and facility renovation and construction. Socioeconomic impacts would occur if changes associated with the proposed action substantially affected demand for housing or community services, such as schools, or substantially affected economic stability in the region.

3.9.2.1 Proposed Action

Construction-Related Consequences

Facility modifications under the proposed action would include a total of 26 renovation, construction, or infrastructure improvement projects with a total cost of $37 million implemented over the period from 2006 to 2009 (refer to Table 2.1-4). The proposed construction activity would generate a number of direct construction-related jobs and additional indirect jobs through the multiplier effect of regional purchases, as depicted in Table 3.9-2. Construction activity also would contribute to regional economic output and household incomes. These potential effects would be temporary however, lasting only for the duration of the construction activity. The regional construction industry could accommodate the proposed projects, since proposed construction would represent a continuation of the economic activity generated by Holloman AFB in the local area and region. Depending on the flow of funding, demand for labor could be cyclical or intermittent, and could generate minor, temporary in-migration or commuting from surrounding communities. For the purpose of this analysis, the jobs are expected to be filled by individuals currently in the Alamogordo region.

Table 3.9-2. Construction-Related Economic Impacts

Estimated Construction Cost	Direct Impacts		Total Impacts		
	Jobs	*Income*	*Jobs*	*Income*	*Output*
$37,000,000	175	$9,405,998	370	$14,333,800	$54,164,300

Operations-Related Consequences

For the purpose of this analysis, the personnel numbers represent Air Force authorizations rather than actual persons. In many cases, actual personnel may be approximately 80 percent of authorized personnel.

Transformation of the 49 FW would require 1,180 personnel to operate and maintain the aircraft and provide necessary support services. Retirement of the F-117A and T-38A squadrons would affect approximately 1,454 authorized military and civilian personnel. Because the F-22A incorporates advanced computer checks and different maintenance, fewer personnel would be needed for the F-22A squadron than for the equivalent F-117A and T-38 squadrons. In addition to the anticipated reduction in government positions, 35 contractor jobs would be eliminated as well as 12 positions associated with the 417 Weapons School (10 government, 2 contractor).

Total personnel under the Proposed Action would decline by a net 321 positions, comprised of 25 officer, 251 enlisted, 8 federal civilian, and 37 contractor positions (see Table 3.9-3). A reduction of this amount represents 5.3 percent of the 6,111 personnel employed at Holloman AFB. On average, this would reflect a payroll reduction of $13 million. The reduction in base employment would have a secondary effect of reducing an estimated 95 off base positions, and $3 million in secondary payroll, currently supported by this portion of base activity and payroll.

Table 3.9-3. Operations-Related Economic Impacts

	Direct Impacts		Secondary Impacts		*Potential Population Impact*
	Net personnel[1]	*Payroll*	*Jobs*	*Income*	
Officers[2]	-25	-$1,054,775	-7	-$233,291	-52
Enlisted[2]	-251	-$10,589,941	-73	-$2,342,237	-527
Civilian[2]	-8	-$334,968	-3	-$110,692	-17
Contractor	-37	-$1,530,949	-16	-$511,952	-78
TOTAL	-321	-$13,510,633	-99	-$3,198,171	-674

Note: 1. Includes weapons school positions.
2. Authorized positions.

It is estimated that 70 percent of departing personnel would have family members, while the remaining 30 percent are unaccompanied. Based on the average family size of active duty personnel at Holloman AFB, an estimated 339 family members would depart, for a total anticipated population decline of 648 persons. A decrease of this size represents six percent of the Holloman AFB base-related population and two percent of the Alamogordo population.

The Air Force makes on-base housing vacated by departing personnel available for military personnel who would otherwise reside off-base. Approximately 70 percent of the military personnel at Holloman AFB are accompanied. If 70 percent of the departing military personnel have a housing unit and the remainder unaccompanied personnel share a housing unit with another military person, an estimated 227 off-base housing units would be vacated by this reduction in military personnel. This would represent approximately 1.3 percent of housing units in the city of Alamogordo and, depending on the timing, could increase residential vacancy rate from approximately 5.8 percent to approximately 7.1 percent of single family and duplex-type rentals. The Alamogordo school system had approximately 9,000 students in 2004. The reduction in base personnel and associated reassignment of military personnel would be expected to reduce the number of school students by 90 students. This represents approximately 1 percent of Alamogordo students.

Holloman AFB is a dynamic installation with regular changes in missions and personnel, therefore the anticipated changes in regional employment, population, housing, and students would not be expected to result in significant socioeconomic impacts.

One factor identified during scoping meetings was the Alamogordo experience when the F-15 squadrons were relocated and a period of time lapsed prior to the beddown of the F-117A aircraft. The degree of socioeconomic effects normally depends upon schedules for the F-117A retirement and the proposed buildup for F-22A. If the transition occurs relatively seamlessly, the effects would be as described for the Proposed Action, above. If the transition were to have

a delay of 2 or more years, the socioeconomic consequences could be proportional to the base authorized personnel numbers. The F-117A and T-38A aircraft represent approximately 25 percent of the base authorized personnel. If the F-117A and T-38A aircraft were retired and construction for the F-22A occurred without a buildup of F-22A authorized positions, there could be a reduction in base personnel and economic activity followed by a buildup as the F-22A aircraft arrived.

3.9.2.2 Alternative A

Alternative A consists of a change in airspace use and would not have different socioeconomic effects from those described for the Proposed Action.

3.9.2.3 No Action

Under the No Action Alternative, the transformation of the 49 FW would not occur at Holloman AFB at this time. The proposed facility modifications and personnel changes would not take place; therefore no socioeconomic effects would occur.

3.10 Environmental Justice

The definition of environmental justice and the ROI are included in 2.8.10.

3.10.1 Existing Conditions

Disadvantaged socioeconomic groups within the ROI are specifically considered in order to assess the potential for disproportionate occurrence of impacts. Based on Census 2000 data (the most recent year for which detailed demographic data is available), the percentage of persons and families in the ROI with incomes below the poverty level was just slightly higher than state levels (Table 3.10-1). In Otero County during 2000, 19.3 percent of the population was living below the poverty level, compared to 18.4 percent in the State of New Mexico as a whole. The city of Alamogordo had a slightly lower 2000 individual poverty rate of 16.5 percent.

Table 3.10-1. 2000 Population and Environmental Justice Data

		Minority Persons		Persons Below Poverty		Children under 18	
Area	*Population*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
State of New Mexico	1,819,046	1,005,551	55.3	328,933	18.4	508,574	28.0
Otero County	62,298	27,598	44.3	11,737	19.3	18,352	29.5
City of Alamogordo	35,582	15,012	42.2	5,771	16.5	10,196	28.7

Notes: 1. The U.S. Census calculates percent low-income population for individual counties based on total county populations that differ slightly from the county populations reported in the first column.
2. Population figures for each category are from different reporting years. Therefore, except for minority population, the percentage figures are not based on the total population presented in this table but from the relevant data year.

Source: Census 2000a, b, c

Minority persons represent 44.3 percent of the county population and 42.2 percent of the city population. Hispanic or Latino persons are the largest minority group, representing 32.2

percent of the total county population and 72.7 percent of the minority population. Native Americans, including those associated with the Mescalero Apache Reservation, are a concentrated minority population addressed in Section 4.10. By comparison, minority persons represent 55.3 percent of the state population, with Hispanic or Latino persons accounting for 76.1 percent of the state minority population. The youth population, which includes children under the age of 18, accounts for 29.5 percent of the county population and 28.7 percent of the city population, compared to 28.0 percent at the state level.

3.10.2 Environmental Consequences

Disadvantaged groups within the vicinity of Holloman AFB, including minority, low-income, and youth populations, do not represent a disproportionate segment of the population when compared with the region and the state. Nevertheless, potential health and safety factors associated with the proposed action are analyzed to determine whether any disproportionately high or adverse human health or environmental effects could occur. In addition, potential environmental health or safety risks associated with the proposed action are examined to assess potential affects to children.

3.10.2.1 Proposed Action

Construction Impacts

Facility modifications under the Proposed Action would include a total of 19 renovation, construction, or infrastructure improvement projects implemented over the period from 2006 to 2009 (refer to Table 2.1-4). Implementation of the Proposed Action would not result in any increased environmental health risks or safety risks to children. While there is residential housing on Holloman AFB, no specific groups of children are known to occur in the immediate vicinity of the construction projects. Short-term safety risks associated with renovation and facility construction could occur, but standard safety practices would minimize any potential risks. Similarly, intermittent and short-term noise from renovation and construction would not affect the health and well being of children.

Operational Impacts

The flight activity, facility modifications, and personnel changes associated with the Proposed Action options are not expected to create significantly adverse environmental or health effects.

No off-base residential land or minority or disadvantaged populations would be under the projected 65 dB noise contour. The reduction in long-term employment and the short-term increase in construction employment are not expected to disproportionately affect disadvantaged populations. There would be no disproportionate impact upon children. No adverse health or safety risks to children are anticipated as a result of implementation of the proposed action.

3.10.2.2 Alternative A

Alternative A is not different from the Proposed Action for environmental justice.

3.10.2.3 No Action

Under the No Action Alternative, the transformation of the 49 FW would not occur at Holloman AFB at this time. The proposed facility modifications and personnel changes would not take place; therefore no impacts to disadvantaged or youth populations would occur.

THIS PAGE INTENTIONALLY LEFT BLANK.

4.0 TRAINING AIRSPACE AFFECTED ENVIRONMENT AND CONSEQUENCES

This chapter contains both the affected environment and environmental consequences analysis for the Proposed Action, Alternative A, and No Action Alternative within the training airspace associated with Holloman AFB. NEPA requires that the analysis address those areas and the components of the environment with the potential to be affected; locations and resources with no potential to be affected need not be analyzed.

The *Existing Condition* of each relevant environmental resource is described to give the public, agencies, and Air Force decisionmakers a meaningful point from which they can compare potential future environmental, social, and economic effects. The *Environmental Consequences* section for each resource considers the direct and indirect effects of the Proposed Action, Alternative A, and No Action Alternative described in Chapter 2.0 of this EA. Cumulative effects are discussed in Chapter 5.0.

4.1 Airspace Management and Control

The definition of airspace management and air traffic control are included in Section 2.8.1 and Appendix H.

4.1.1 Existing Conditions

The MOAs and associated ATCAAs supporting Holloman-based aircrew training that would also be used for F-22A training are described in Table 4.1-1.

Several Restricted Areas support operations conducted by Holloman-based aircrews. For the purpose of this EA, WSMR is defined as the R-5107 series and R-5111 A and B. R-5103 A and B are the McGregor Range. These complexes of restricted airspace are grouped into functional elements, with each element containing specifically designated restricted airspace units. These units are described in Table 4.1-2 and shown on Figure 4.1-1.

During FY 2005, six New Mexico MTRs supported training for Holloman-based aircrews. Five are Instrument Routes (133, 134, 192, 194, and 195), and one is a Visual Route (176). The F-22A does not use MTRs for training and no MTRs are involved in the Proposed Action or Alternative A. MTRs are used by Holloman-based T-38As, QF-4s, and Tornados. MTR usage will decline with the retirement of most T-38As from Holloman AFB.

Airspace over WSMR and McGregor has been historically used by the Army and the Air Force. The Air Force and Army have been able to schedule airspace use to meet the combined needs of the services. The availability of the Beak and Talon MOA/ATCAAs and Cowboy ATCAA has permitted Air Force training flexibility, and has enabled Air Force training consistent with airspace requirements for ongoing research and development activities at WSMR.

Table 4.1-1. MOA/ATCAA Identification and Description

Airspace	Altitudes		Hours of Use		Controlling ARTCC
	Minimum	*Maximum*	*From*	*To*	
Beak A MOA	12,500 feet MSL	UTBNI FL 180	0600	1800	Albuquerque
Beak B MOA	12,500 feet MSL	UTBNI FL 180	0600	Sunset	Albuquerque
Beak C MOA	12,500 feet MSL	UTBNI FL 180	0600	Sunset	Albuquerque
Beak ATCAAs	FL 180	FL 290	As scheduled and coordinated		Albuquerque
Cowboy ATCAA	FL 310	FL 500	As scheduled and coordinated		Albuquerque
Talon High East MOA	12,500 feet MSL	UTBNI FL 180	Sunrise	Sunset	Albuquerque
Talon High West MOA	12,500 feet MSL	UTBNI FL 180	Sunrise	Sunset	Albuquerque
Talon High East and West ATCAAs	FL 180	FL 290	As scheduled and coordinated		Albuquerque
Talon Low MOA	300 feet AGL	UTBNI 12,500 feet MSL	Sunrise	Sunset	Albuquerque

Notes: 1. By NOTAM - Times of use are intermittent and are published in NOTAMs.
UTBNI = Up To, But Not Including; AGL = above ground level; FL = Flight Level. FL 180 is approximately 18,000 MSL; MSL = mean sea level; NOTAM = Notice to Airmen.
Source: DOT 2003

Table 4.1-2. Restricted Airspace Description

Restricted Area	Altitudes		Hours of Use [1]		Controlling ARTCC
	Minimum	*Maximum*	*From*	*To*	
R-5103B (McGregor)	Surface	Unlimited	0700	2000	Albuquerque
R-5103C (McGregor)	Surface	Unlimited	0700	2000	Albuquerque
R-5107A (WSMR)	Surface	Unlimited	Continuous		Albuquerque
R-5107B (WSMR)	Surface	Unlimited	Continuous		Albuquerque
R-5107C (WSMR)	9,000 feet MSL	Unlimited	Continuous Mon-Fri Other times by NOTAM		Albuquerque
R-5107D (WSMR)	Surface	FL 220	Continuous		Albuquerque
R-5107E (WSMR)	Surface	Unlimited	By NOTAM 12 Hrs in Advance		Albuquerque
R-5107H (WSMR)	Surface	9,000 feet MSL	By NOTAM 12 Hrs in Advance		Albuquerque
R-5107J (WSMR)	Surface	9,000 feet MSL	Continuous Mon-Fri Other times by NOTAM		Albuquerque
R-5111A (WSMR)	13,000 feet MSL	Unlimited	By NOTAM 12 Hrs in Advance		Albuquerque
R-5111B (WSMR)	Surface	13,000 feet MSL	By NOTAM 12 Hrs in Advance		Albuquerque

Note: 1. Days of use are Monday through Friday. Times of use are local.
MSL = mean sea level; FL = Flight Level; NOTAM = Notice to Airmen; ARTCC = Air Route Traffic Control Center

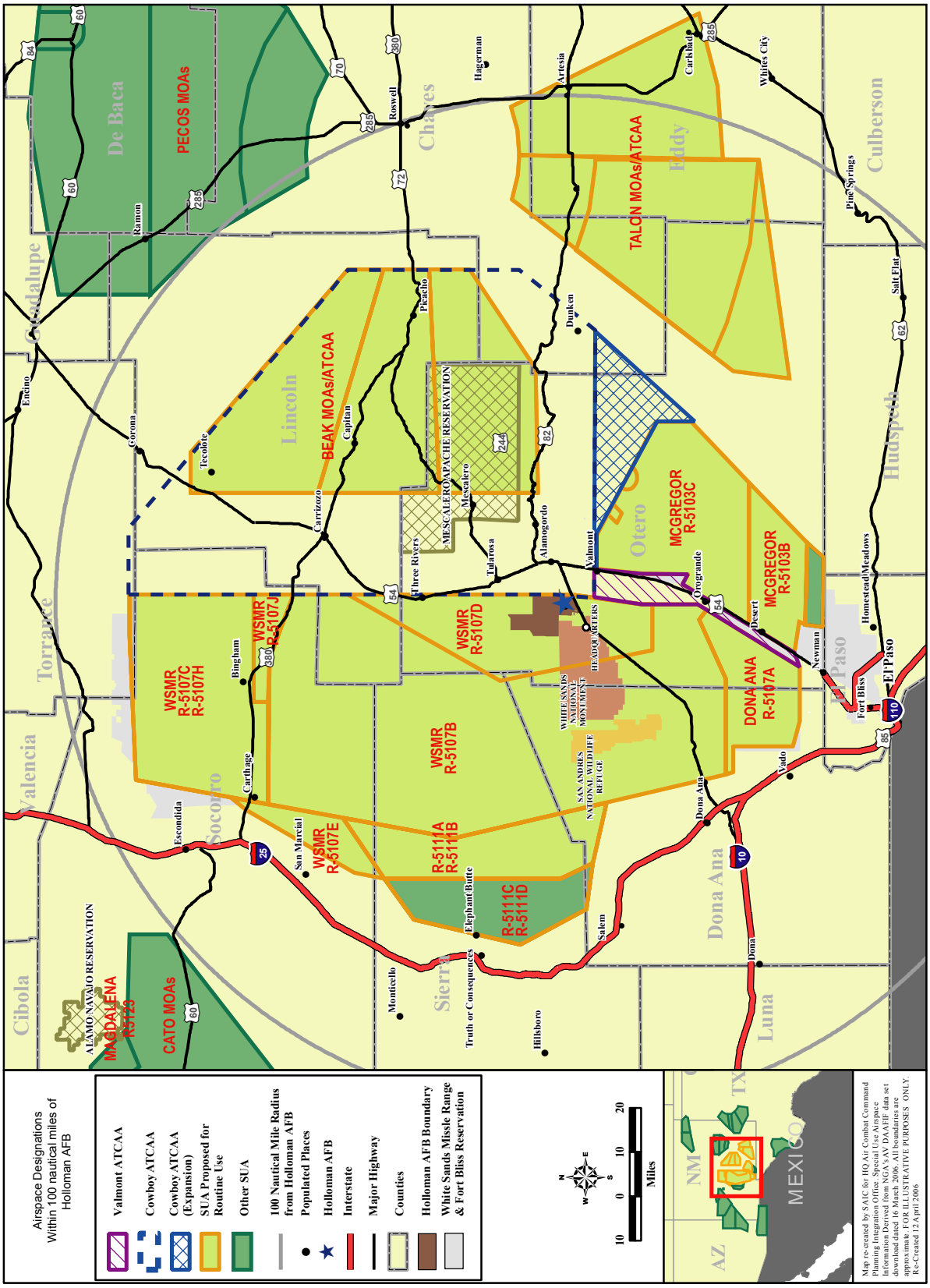


Figure 4.1-1. Airspace Designations

4.1.2 Environmental Consequences

4.1.2.1 Proposed Action

The Proposed Action would enhance training airspace to support realistic F-22A training. One new ATCAA would be added and four existing ATCAAs would be modified. Three would be reduced vertically and one would be expanded vertically and horizontally. In addition to these modifications, the proposal also includes a proposed expansion of the airspace wherein supersonic flight would be authorized and a proposed use of defensive chaff and flares within specified airspaces. Supersonic flight at the lower-proposed altitudes requires specific Air Force approval, in accordance with AFI 13-201.

Table 4.1-3 summarizes and compares existing conditions with the airspace modifications associated with the proposal.

Table 4.1-3. Proposed Airspace Changes

Airspace Element	*Existing*	*Proposed*
Donã Ana	Surface to Unlimited	Surface to FL 600 (60,000 MSL) SS Above 10,000 feet MSL SS
McGregor	Surface to Unlimited	Surface to FL 600 SS Above 10,000 feet MSL
WSMR	Surface to Unlimited	Surface to FL 600 SS Above 10,000 feet MSL
Cowboy ATCAA	FL 310 to FL 500	Expand lateral boundaries above FL 230 Change altitude structure to FL 230 to FL 600 SS above FL 230 (23,000 MSL)
Talon Low MOA	300 feet AGL to 12,499 feet MSL	No Change
Talon High East/West MOA/ATCAA	12,500 feet MSL to FL 290	12,500 feet MSL to FL 600
Beak A/B/C MOA/ATCAA	12,500 feet MSL to FL 290	12,500 feet MSL to FL 230
Valmont ATCAA	Does Not Exist	FL 180 to FL 600

FL = Flight Level; SS = supersonic; MSL = mean sea level; AGL = above ground level; ATCAA = Air Traffic Control Assigned Airspace

Overall operations at Holloman AFB would be reduced with the retirement of F-117A aircraft, and the retirement of 14 of the 17 T-38A aircraft currently assigned. This would be expected to create positive impacts on the regional ATC system.

Supersonic flight, in and of itself, does not create any specific issues for airspace management. The proposed airspace enhancements are not expected to create any significant issues with Albuquerque ARTCC regarding other aviation uses in the ROI. Two high-altitude jet routes pass in a generally east-west track through the WSMR airspace. Through coordination between WSMR managers and Albuquerque ARTCC, aircraft are not routed on these tracks when the applicable WSMR airspace is active. The two routes are used when the airspace is made

available to Albuquerque Center. Control of high-altitude traffic on the two jet routes would continue as under current conditions.

There is a narrow corridor separating portions WSMR and McGregor. This corridor essentially follows U.S. Highway 54 and a Union Pacific railroad line, which run northeast – southwest linking El Paso, Texas with Alamogordo, New Mexico. General Aviation and other civil aircraft use this corridor to avoid restricted airspace. The Proposed Action includes a new ATCAA (Valmont ATCAA) above 18,000 feet MSL linking WSMR with McGregor. This airspace would permit general aviation to follow the U.S. Highway 54 corridor below military training aircraft. There are no aspects of the proposal that would limit general aviation below 18,000 feet MSL and other civil aircraft traffic along the "Route 54 Corridor" between Alamogordo and El Paso.

There is an Airborne Warning and Control System orbit overlying the Talon High MOA complex. It is under the control of Albuquerque Center, and extends from FL 280 to FL 330. Albuquerque Center deconflicts E-3A aircraft using this orbit from other aircraft using the Talon High ATCAAs.

Questions raised during scoping included whether the use of chaff or any other materials associated with the F-22A could affect the Army's test or training. Items of concern were the fixed tactical internet and laser testing. Chaff fibers reflect radar signals, and although they become widely dispersed, they can remain in the air for more than an hour. The thinner than human hair and less than 2-inch long chaff fibers, break down on the ground and rapidly become indistinguishable from soil materials. Fibers or residual materials should not affect the Army's fixed tactical internet or related systems. Scheduling of Army laser testing and Air Force training to allow for the dispersion and settling of chaff, should prevent chaff from affecting Army testing or operations on WSMR or McGregor Range. The Proposed Action, in conjunction with existing and proposed Army and other missions at WSMR, could result in restrictions on some training and missions within the airspace. See Chapter 5.0 for cumulative discussion.

4.1.2.2 Alternative A

Existing R-5107 airspace with supersonic capabilities and use of defensive flares and chaff meets the minimum requirements for F-22A training. Concentration of nearly all F-22A training over WSMR could increase the complexity of scheduling and impact airspace management among competing users of the airspace.

4.1.2.3 No Action

Under the No Action Alternative, operations at Holloman AFB and in the surrounding military training airspace would continue as under current conditions. No change in the aircraft inventory stationed at Holloman AFB would occur, and training would continue under existing conditions. No adverse impacts to the management and control of the airspace resource would be expected under this alternative.

4.2 Noise

The definition and region of influence for noise is included in Section 2.8.2 and expanded in Appendix E.

Subsonic and supersonic noise levels in the airspace were calculated for baseline and the proposed action. Subsonic noise was computed using MR_NMAP (Lucas and Calamia 1996).

Sonic booms from supersonic flight were computed using BooMap (Frampton 1993; Plotkin *et al.* 1996; Plotkin *et al.* 2002). Noise metrics and their interpretation are described in detail in Appendix E.

The primary effect associated with aircraft noise is annoyance, which is based on perception. Attitudinal surveys conducted over the past 30 years show a consistent relationship between L_{dn} and the percentages of groups of people who express various degrees of annoyance. Studies of community annoyance to numerous types of environmental noise show that L_{dn} correlates well with effects, and Schultz (1978) showed a consistent relationship between noise levels and annoyance. The Schultz study has been periodically re-examined and reaffirmed. The updated relationship by Finegold *et al.* (1994), which does not differ substantially from the original, is the current preferred form, and is shown in Table 4.2-1. Also shown in Table 4.2-1 is the equivalent relation between annoyance and L_{Cdn} from sonic booms (Committee on Hearing, Bioacoustics, and Biomechanics for the National Academy of Sciences 1980).

Table 4.2-1. Relation Between Annoyance, L_{DN} and L_{CDN}

L_{dn}/L_{dnmr}	L_{Cdn}	*% Population Highly Annoyed*
40	37	0.4
45	42	0.8
50	46	1.7
55	51	3.3
60	56	6.5
65	60	12.3

L_{dn} and L_{dnmr} are interpreted on a common scale, while L_{Cdn} is interpreted on a slightly different scale. Subsonic noise and supersonic noise can be related by matching annoyance, e.g., L_{Cdn} of 51 dB is said to be equivalent to L_{dn} of 55 dB.

There are three key levels against which aircraft may be compared:

- 65 dB, the criterion used for communities near airbases
- 55 dB, the level identified by the USEPA as "requisite to protect the public health and welfare with an adequate margin of safety" (USEPA 1974). This is generally interpreted as a level below which adverse effects would not normally be expected in communities
- 25 to 50 dB, the range of ambient noise levels (from very rural to active community) expected in areas similar to those in this ROI (USEPA 1971; Air National Guard 1996; Fidell 2003)

The first two are absolute values for comparison. The third is of interest because people respond to differences in noise as well as to absolute levels.

L_{dn} is an annual average measurement, and not a specific individual event. Because annoyance is a long-term quality of life issue, it is best quantified by averages such as L_{dn} and L_{Cdn}. While this is scientifically appropriate, those metrics are not intuitively meaningful to non-experts.

This EA addresses the noise of individual events as well as cumulative averages. The amplitude of individual events is directly relevant for non-annoyance impacts, especially the effects of sonic booms on structures. Sonic booms are quantified, as appropriate, by their peak pressure as well as by their sound level. Peak pressures relate to the probability of structural damage from sonic booms (see Appendix E).

4.2.1 Existing Conditions

4.2.1.1 Subsonic Flight

Table 4.2-2 shows the baseline and projected noise levels for the airspaces currently used for F-117A and T-38 training and projected for use for F-22A training. These levels were computed with MR_NMAP, using the airspace definitions and sortie rates presented in Chapter 2.0. F-22A environmental consequences are discussed in Section 4.2.3.

Table 4.2-2. Baseline and Projected Subsonic Noise by Airspace Unit

Airspace Unit	*Baseline Use*	*Projected Use*
Beak A, B, C	21.8	31.3
Cowboy[1]	21.8	31.3
McGregor (R-5103)	<20	43.6
Talon Low	37.9	36.2
Talon High West[2]	36.3	36.8
Talon High East	24.5	30.1
R-5107H (Mesa)	49.1	49.8
R-5107B (Lava)	48.9	51.3
R-5107B (Yonder)	25.8	47.9
R-5107E	48.9	51.3
R-5111	25.8	47.9
R-5107A Doña Ana	25.8	47.9

Notes: 1. Portion coincident with Beak A, B, C. Below 25 dB elsewhere.
2. Portion coincident with Talon Low. Below 30 dB elsewhere.

Baseline and proposed action noise levels are all below the USEPA identified level of 55 dB, and within the 25 to 50 dB range of ambient levels noted above. Noise in the northern part of R-5107B (Lava) will be slightly above 50 dB, but that is within the WSMR range. For the Proposed Action, noise levels will decrease slightly in some airspace units and increase in others. The largest increases will be in R-5103 (McGregor) and R-5107 (Doña Ana), including areas where use of R-5107 will be expanded.

Appendix E contains detailed descriptions of noise effects at various levels. These subsonic levels do not pose any threat to health.

Intrusions that may occur are associated with noise from individual overflight events. Table 4.2-3 shows the maximum noise levels from direct overflights of types of aircraft that use this airspace today and for the proposed action. More than 95 percent of proposed F-22A flight operations for the Proposed Action will be above 5,000 feet AGL, so maximum noise levels, even for range overflights directly overhead, will generally be less than about 85 dB, which is comparable to the noise of a passing truck.

Table 4.2-3. Representative Maximum Sound Levels for Direct Overflights of Airspace Operations[1]

		LMAX, dB, AT VARIOUS HEIGHTS AGL, FEET				
Aircraft	*Power*	*500*	*1,000*	*2,000*	*5,000*	*10,000*
F-117	92% RPM	110.9	102.8	93.8	79.3	65.0
T-38A	90% RPM	88.3	81.1	73.1	60.7	49.4
F-22A	70% ETR	115.3	107.8	99.1	84.9	71.0
Tornado	89% RPM	99.0	91.7	83.8	71.9	61.5

Note: 1. Airspeed 400 knots, temperature 59°F, 70 percent relative humidity.

4.2.1.2 Supersonic Flight

Supersonic flight by fighter aircraft is primarily associated with air combat training. Supersonic activity is proposed in the ATCAAs and over the ranges under specific altitude restrictions. Supersonic flight produces a shock wave that may reach the ground as a sonic boom. The amplitude of an individual sonic boom is measured by its peak overpressure, in psf, and depends on an aircraft's size, weight, geometry, Mach number, and flight altitude. Altitude is the biggest single parameter affecting boom amplitude. Aircraft exceeding Mach 1 always create a sonic boom, although not all supersonic flight activities will cause a boom at the ground. As altitude increases, air temperature decreases, and the resulting layers of temperature cause booms to be turned upward as they travel toward the ground. This phenomenon, referred to as "cutoff," also acts to limit the width (area covered) of the sonic booms that reach the ground

Table 4.2-4 shows sonic boom overpressures, directly under the flight path, for the F-22A aircraft in steady level flight at various altitudes. Similar data are shown for the F-15, which was based at Holloman and flew in the training airspace before 1992. The F-117A, which is currently flying in the airspace, is not a supersonic aircraft. Overpressure associated with the F-22A is slightly higher than for the F-15, although the difference would not be discernible to a listener hearing both. Boom levels not directly under the flight track are lower than those shown in Table 4.2-4.

Table 4.2-4. Sonic Boom Peak Overpressures (psf) for F-15 and F-22A Aircraft at Mach 1.2 Level Flight

	ALTITUDE AGL, FEET			
Aircraft	*10,000*	*20,000*	*30,000*	*40,000*
F-15	5.40	2.87	1.90	1.46
F-22A	5.68	3.00	1.97	1.50

Maneuvers can affect boom peak overpressures, increasing or decreasing overpressures from those shown in Table 4.2-4. Because air combat training involves maneuvers, the steady level boom values shown in Table 4.2-4 are rarely seen. Instead, there is a statistical distribution of booms of various amplitudes. Figure 4.2-4 shows the distribution of boom amplitudes measured in WSMR in 1988-1989, when F-15s were active. Note that the average boom

overpressure is less than 1 psf. On an energy-average basis (the method used to compute L_{Cdn}), the average boom overpressure for this kind of activity is about 1 psf.

Community effects from sonic booms, in the form of annoyance, correlate well with the L_{Cdn}. L_{Cdn} is similar to L_{dn}, but uses C-weighting to account for the low frequency impulsive nature of sonic booms. A given numeric value of L_{Cdn} generally represents more annoyance than the same numeric value of L_{dn}. The relationship between annoyance, L_{dn} and L_{Cdn} is presented in Table 4.2-1.

In addition to community annoyance, sonic booms have the potential to cause structural damage. Appendix E contains data on the vulnerability of various types of structures to sonic booms. There is also a potential for adverse effects on animals, both domestic and wild. These effects are noted in appropriate sections of this EA.

When a sonic boom reaches the ground, it impacts an area which is referred to as a "footprint" or (for sustained supersonic flight) a "carpet." The size of the footprint depends on the supersonic flight path and on atmospheric conditions. Sonic booms are loudest near the center of the footprint, with a sharp "bang-bang" sound. Near the edges, they are weak and have a rumbling sound like distant thunder.

Sonic booms from air combat training activity have an elliptical pattern. F-22A training aircraft will set up at positions close to 100 nm apart before proceeding toward each other for an engagement. The airspace used tends to be aligned with the setup points, connecting the setup points in an elliptical shape that corresponds to the available airspace (Frampton *et al*. 1993). Airspeed will become supersonic at various times during an engagement exercise. Supersonic events can occur as the aircraft accelerate toward each other, during dives in the engagement itself, and during disengagement. The long-term average sonic boom patterns, described by L_{Cdn} and numbers of booms per month, also tend to be elliptical.

Long-term sonic boom measurement projects have been conducted in four airspaces: White Sands, New Mexico (Plotkin *et al.* 1989); the eastern portion of the Goldwater Range, Arizona (Plotkin *et al.* 1992); the Elgin MOA at Nellis AFB, Nevada (Frampton *et al.* 1993); and the western portion of the Goldwater Range (Page *et al.* 1994). These studies included analysis of schedule and air combat maneuvering instrumentation data, and they supported development of the 1992 BooMap model (Plotkin *et al.* 1992). The current version of BooMap (Frampton *et al.* 1993; Plotkin 1996; Plotkin *et al.* 2002) incorporates results from all four studies. Because BooMap is directly based on long-term measurements, it implicitly accounts for maneuvers, statistical variations in operations, atmospheric effects and other factors.

Figure 4.2-1 shows the maneuver ellipse associated with the current supersonic airspace, which is primarily over WSMR and two rectangular areas denoting supersonic corridors. The corridor within WSMR is used for special flights at altitudes as low as 500 feet AGL. There may be up to five such flights a month. The corridor over the Cowboy ATCAA is used for functional check flights, involving supersonic flight above 30,000 feet MSL and is authorized for supersonic use 50 minutes a month. Figure 4.2-1 also presents the baseline contours of L_{Cdn} and numbers of booms per month for current baseline operation. Supersonic operations are from a mix of various aircraft including F-16, F-15, QF-4, T-38, and Tornado aircraft. L_{Cdn} from air combat training is just under 50 dB in the center of the airspace, and there are an average of about nine booms per month. The boom environment in Cowboy ATCAA due to functional check flights is about 40 dB.

The Proposed Action would extend supersonic operations to a larger part of WSMR, to McGregor, and to the Cowboy ATCAA. Operations for this larger area are expected to occur in five ellipses, illustrated in Figure 4.2-2. There will be two primary north south ellipses: one exclusively over WSMR, and one over the Cowboy ATCAA and McGregor Range. There will also be two northwest-southeast ellipses, one to the north over the northern part of WSMR and the central part of the Cowboy ATCAA, and the second to the south over the southern part of the Cowboy ATCAA, McGregor Range, and the southern part of WSMR. There will also be a northern east-west ellipse over the northern part of WSMR and the Cowboy ATCAA.

Figure 4.2-2 also presents contours of L_{Cdn} and numbers of booms per month for the Proposed Action. Supersonic activity is dominated by F-22A operations.

Alternative A allocates all supersonic operations in the revised north-south ellipse in WSMR that has extended supersonic airspace and use of defensive chaff and flares. The results of the BooMap analysis for Alternative A are shown in Figure 4.2-3.

Table 4.2-5 summarizes the number of sonic booms per month, in the affected airspaces, for Baseline, Proposed Action, and Alternative A. Together with the variations shown in Figure 4.2-4, this provides a synopsis of the boom environment.

For the Proposed Action, there will be about 60 booms per month near the center of WSMR, and L_{Cdn} will be around 55 dB. If that were a populated area, community annoyance would be about 6 percent. The largest boom environment outside the range is under the Cowboy ATCAA, where L_{Cdn} is up to 50 dB and there will be about 20 booms per month. Referring to Table 4.2-1, this is comparable to an equivalent A-weighted L_{dn} of 55 dB, the USEPA identified level. Some adverse affects should be expected, with about 3 percent of the population likely to be highly annoyed by the booms.

In addition to the booms associated with the Proposed Action, corridor booms (low altitude supersonic flights in WSMR, and functional check flights in Cowboy) will continue, as described under baseline. For clarity, these are not shown in the Proposed Action or Alternative A contour plots, but will continue unchanged.

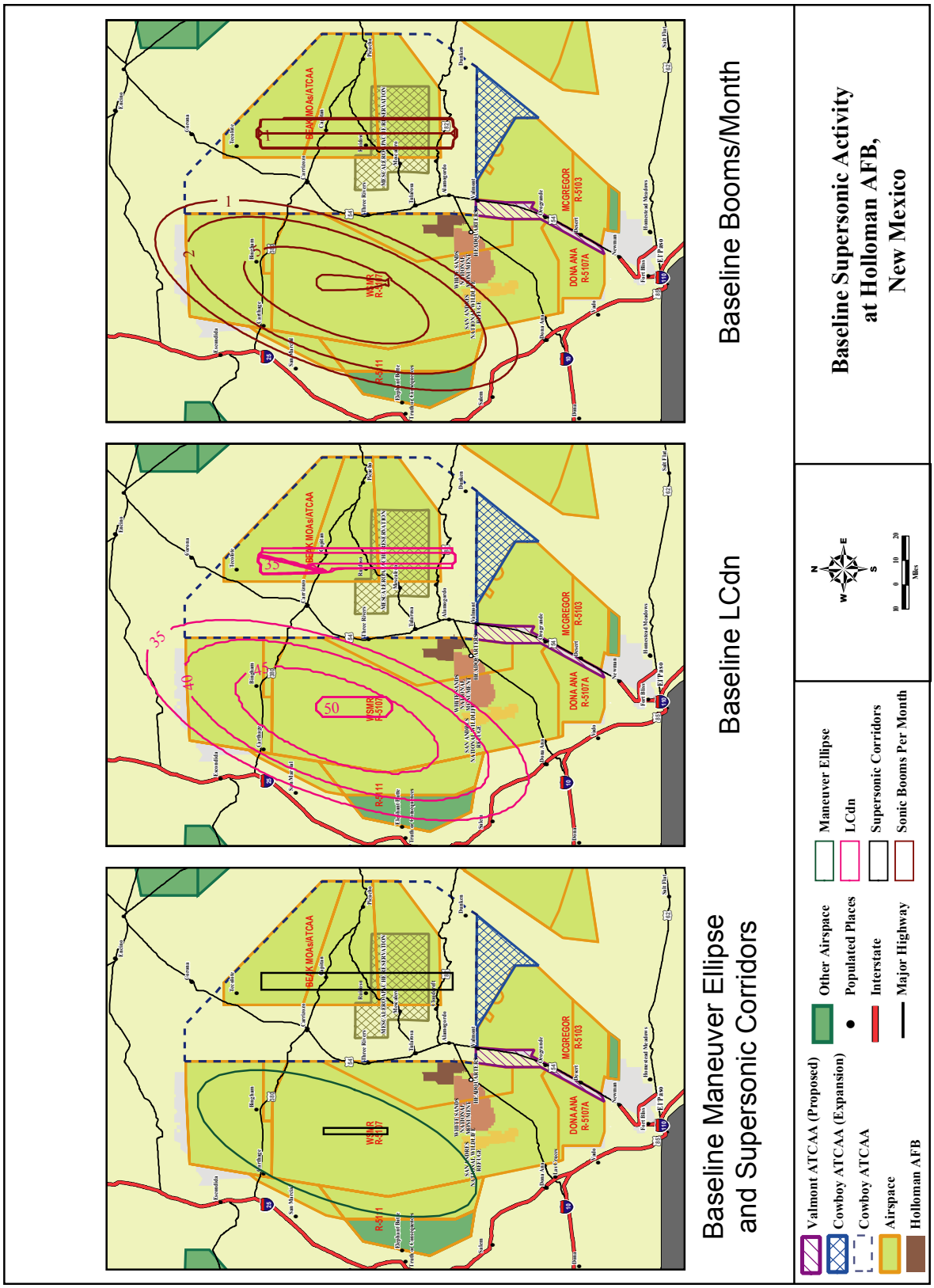


Figure 4.2-1. Baseline Supersonic Maneuver Ellipse and Corridors, L_{CDN} Values, and Sonic Booms

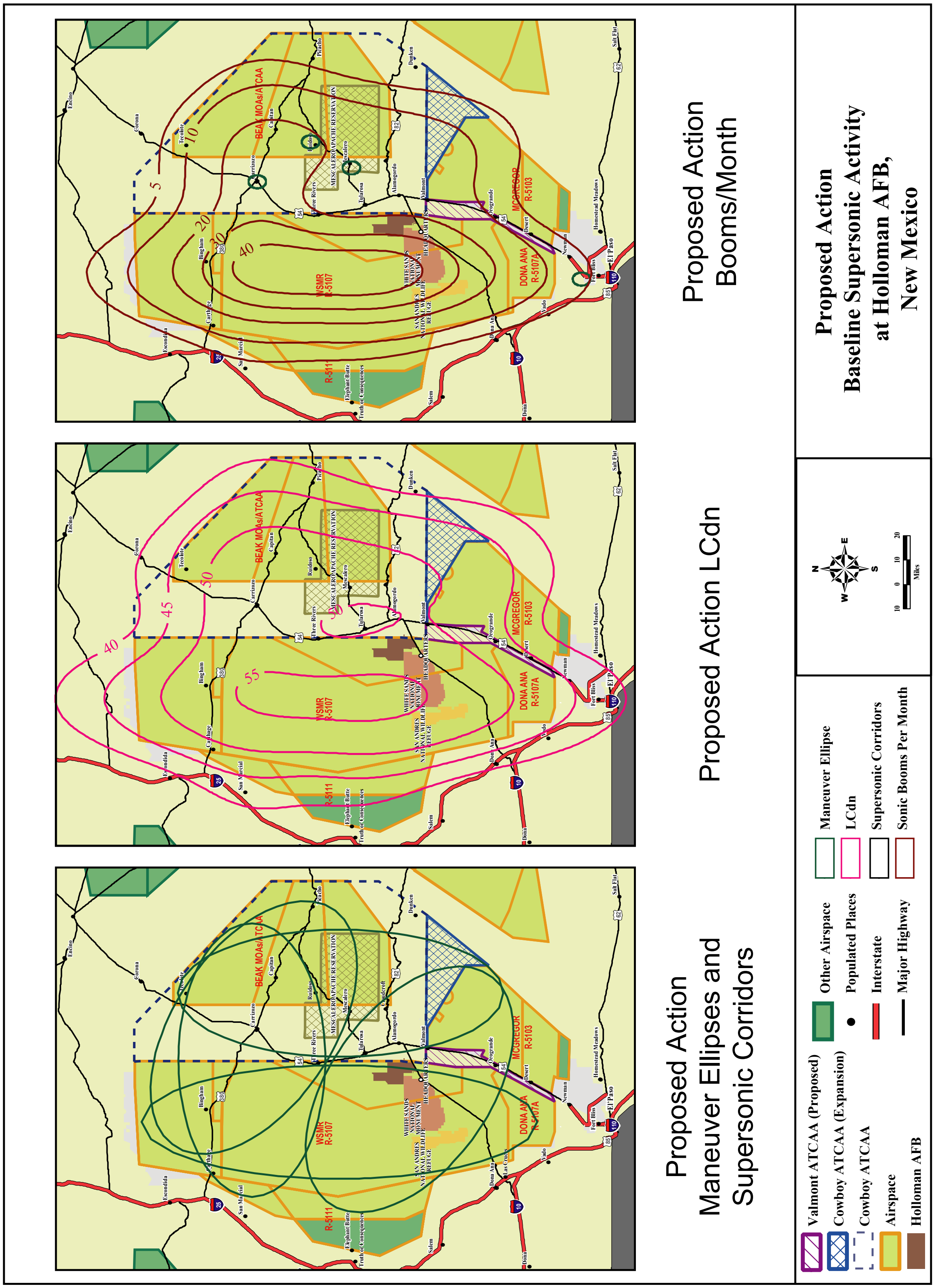


Figure 4.2-2. Proposed Action Supersonic Maneuver Ellipses and Corridors, L_{CDN} Values, and Sonic Booms

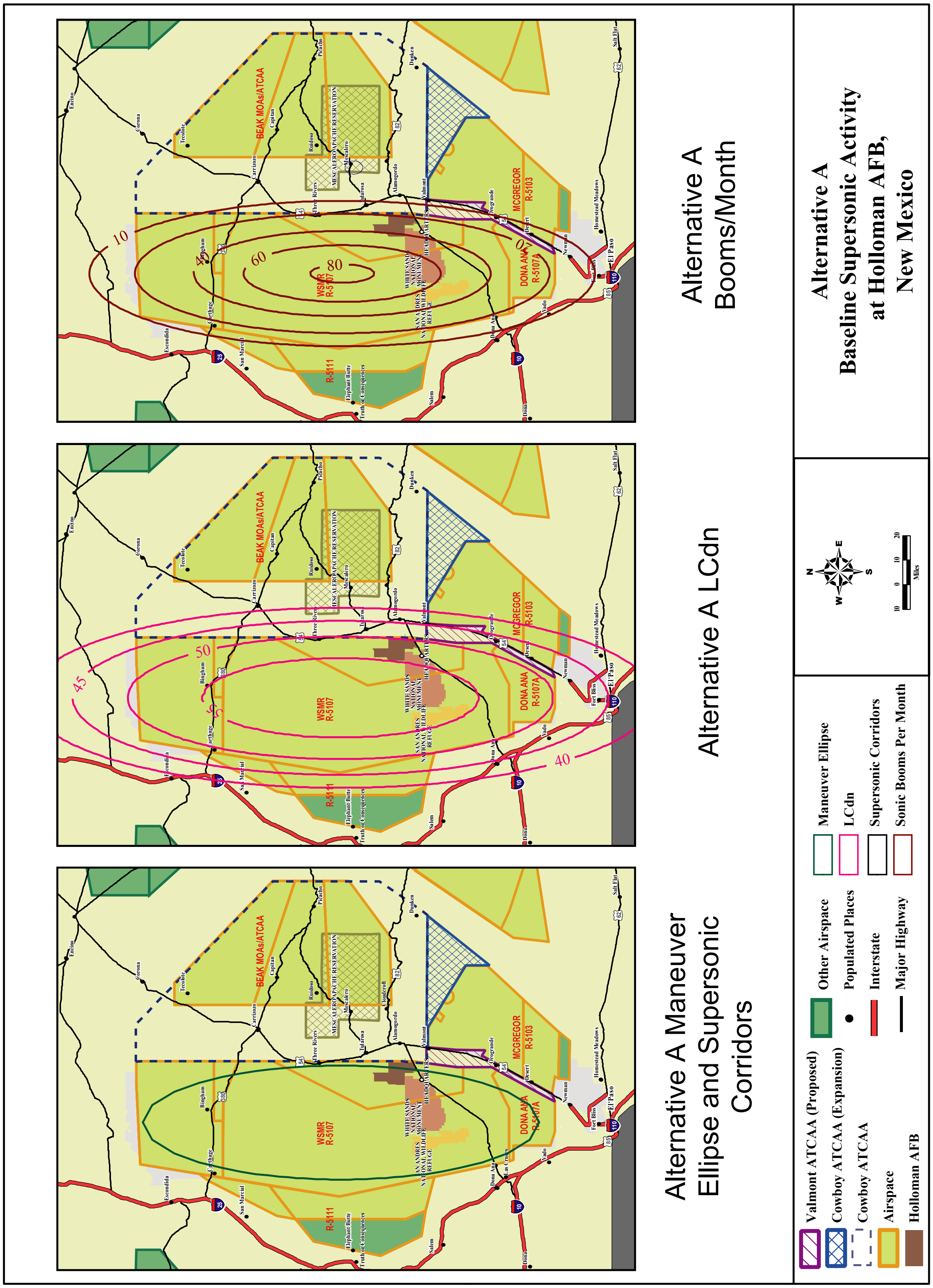


Figure 4.2-3. Proposed Action Supersonic Maneuver Ellipse, L_{CDN} Values, and Sonic Booms

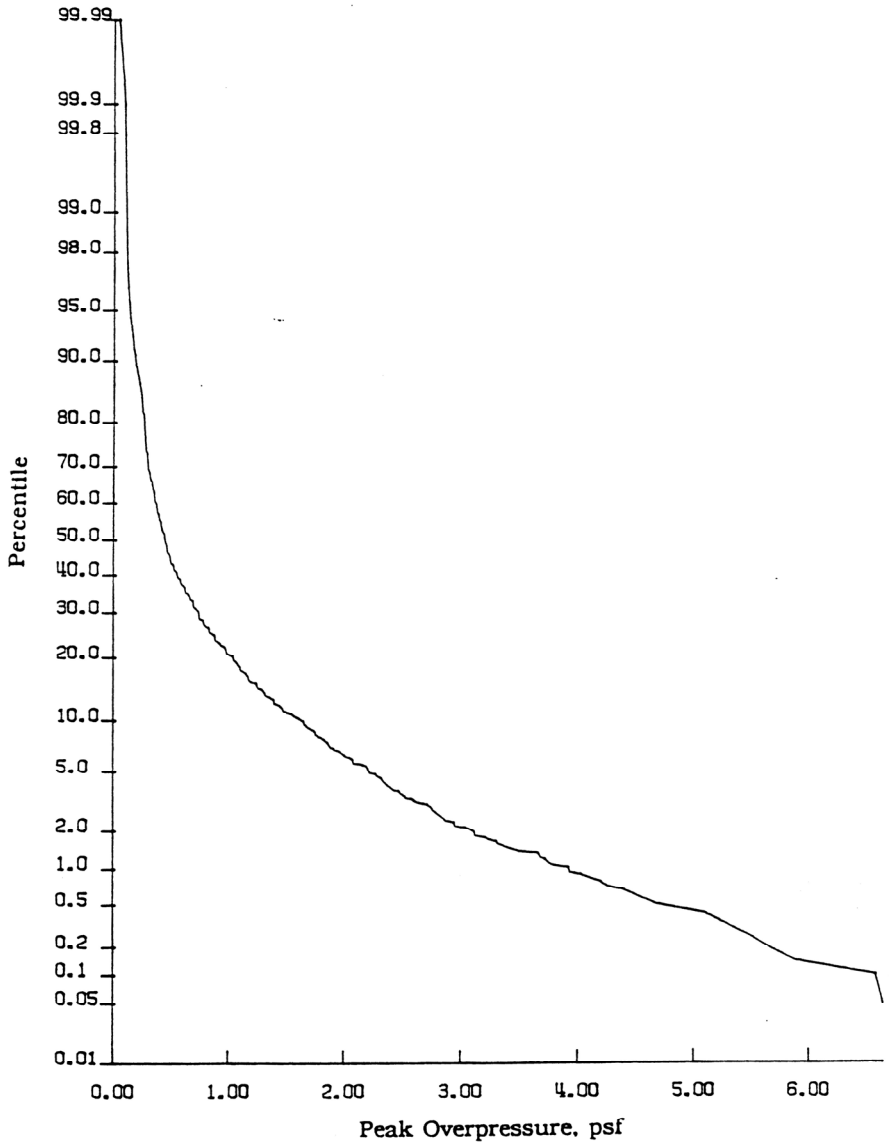


FIGURE 4.2-4. CUMULATIVE PROBABILITY DISTRIBUTION OF PEAK SONIC BOOM OVERPRESSURES

Table 4.2-5. Baseline and Projected Sonic Booms Per Month

	Baseline		Proposed Action		Alternative A	
Airspace Unit	*Booms/ Month*	*Percent Highly Annoyed*[1]	*Booms/ Month*	*Percent Highly Annoyed*[1]	*Booms/ Month*	*Percent Highly Annoyed*[1]
Cowboy ATCAA	1-2	1	5-30	4	1-5	1
Concentrated Population	1-2	1	20-25	4	5-10	2
Mescalero Reservation	1-2	1	12-18	4	1-2	1
McGregor Range	0	1	5-15	3	1-5	1
Doña Ana Range	0	1	10-15	3	20-25	4
Fort Bliss/North El Paso	0	0	5-8	1	10-15	3
WSMR Existing Supersonic	8-10	1	10-45	6	10-80	12
WSMR Expanded Supersonic	0	1	10-40	6	20-70	10
Holloman	4-5	1	25-30	4	30-40	6

Note: 1. Represents highly annoyed percent from Table E-3.

The boom environment outside of the WSMR range will be around or less than L_{Cdn} of 51 dB, equivalent to the USEPA A-weighted L_{dn} identified level of 55 dB. About 3 percent of the population will be highly annoyed.

In addition to annoyance, sonic booms have the potential to damage structures. For the magnitude of boom associated with the proposed action, the probability is extremely small, but is a concern nonetheless. At 1 psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). At 10 psf, the probability of breakage is between one in a hundred and one in a thousand (Haber and Nakaki 1989). Damage to plaster is in a comparable range but depends on the condition of the plaster. Adobe faces small risks similar to plaster, but assessment is complicated by adobe structures being exposed to weather, where they can deteriorate in the absence of any specific loads (Sutherland *et al.* 1990). In general, structures in poor condition tend to be at greater risk than structures in good condition. For example, White (1972) was unable to break properly installed windows at overpressures of less than 10 psf, although it is well established that windows can be broken at lower overpressures.

Ranchers often express concern about risk to water tanks. The pressure exerted by a foot of water is slightly over 60 psf. Even with liberal assumptions about dynamic amplification, sonic booms are not expected to damage a water tank that is capable of holding water. Similarly, other outdoor structures such as buildings, windmills, radio towers, etc., are resilient and routinely subject to wind loads far in excess of sonic boom pressures. Foundations and retaining walls, which are intended to support substantive earth loads, are at no risk from sonic booms. Appendix E contains tables of sonic boom risk to a variety of structures.

The distribution of sonic boom overpressures in Figure 4.2-4, when combined with the probability of damage, indicates a very small likelihood of damage to fragile items such as windows. Vibration from sonic booms could affect fragile items on the edges of shelves. The probability of damage to fragile items is not zero, so some damage is expected. The Air Force follows established procedures for claims against the government in cases where damage is claimed to result from sonic booms.

4.2.2 Environmental Consequences

4.2.2.1 Proposed Action

Proposed F-22A flight activities would not appreciably increase subsonic noise levels in most of the airspace units. Sortie operations change little under the Proposed Action (refer to Table 2.2-1), so no overall change in noise is expected. Operations will be expanded into some areas that are not currently heavily used, and noise in those areas will increase. Referring to Table 4.2-2, subsonic noise levels will increase in McGregor, Doña Ana, R-5111A/B, and parts of R-5107B, E, H. The increased noise levels in those areas will be well below the USEPA identified level of 55 dB, so no significant adverse impact is expected.

The F-22A beddown at Holloman AFB and training airspace will not have a discernible effect on subsonic noise over baseline conditions. The enhanced supersonic performance of the F-22A which contributes to its success in combat results in increased sonic booms on lands under the training airspace.

F-22A training in the ranges and ATCAAs will enable use of its enhanced supersonic capability. The F-22A is projected to spend 25 percent of training time at or above supersonic speeds. This means that during a typical 14-minute air-to-air engagement, the F-22A would be supersonic 3 to 4.5 minutes. The F-22A would also commonly achieve Mach numbers up to or above 1.3.

Table 4.2-5 presents the baseline and projected sonic booms per month for each airspace. The monthly number of sonic booms would increase in the airspace units where supersonic is proposed. On McGregor and Doña Ana Ranges, the number of sonic booms would increase from 0 to 15 per month. In the Cowboy ATCAA, booms would experience an increase from an existing occasional boom from a functional check flight to 5 to 30 booms per month, all originating above 23,000 feet MSL. The Proposed Action could increase the number of highly annoyed individuals from an existing approximately 1 percent of the population to an estimated approximately 5 percent of the population under the populated portion of the airspace (see Table 4.2-1 and Appendix E). Population concentrations are generally located under the Cowboy ATCAA. Portions of WSMR have supersonic use approved and currently experience 8 to 10 booms per month. This would increase to up to 45 booms per month with the Proposed Action.

Individual sonic boom footprints could affect areas from about 10 square miles to 100 square miles. The cumulative estimate of sonic booms associated with F-22A training is based on distributing aircraft activity among four elliptical areas shown in Figure 4.2-2. Subsonic noise would remain largely unchanged from existing conditions with the transformation of the 49 FW. Supersonic performance capabilities of the F-22A would increase the number of sonic booms throughout the airspace. One area affected by the Proposed Action would be residential and tourist areas under the Cowboy ATCAA. The projected 20 to 25 sonic booms experienced per month under this area would not have any effect on human health but could increase annoyance on the part of residents or long-term visitors who may notice the change in sonic booms.

Table 4.2-5 also presents the sonic booms per month under Alternative A. Alternative A assumes that some supersonic flights would occur above 30,000 feet MSL in the corridors (shown on Figure 4.2-1) where supersonic operation is currently limited. Alternative A assumes that all F-22A supersonic training would occur over the primary ellipse within WSMR.

4.2.2.2 Alternative A

Alternative A would place all supersonic activity in the main north-south ellipse over WSMR (see Figure 4.2-3). That would result in no substantial number of booms under most of the Cowboy ATCAA except along the western edge of the ATCAA. There would be no substantial number of booms on the McGregor Range. There would be up to 80 booms per month in WSMR. Table 4.2-5 also presents the sonic booms per month under Alternative A.

For Alternative A, L_{Cdn} in the center of WSMR will be just under 60 dB and there will be about 80 booms per month. If this was a populated area, about 12 percent of the population would be highly annoyed. The boom environment around the White Sands National Monument would be above L_{Cdn} of 55 dB, which exceeds the equivalent USEPA identified level. This level of booms could adversely impact residents, workers, and recreationists. The number of booms could affect adobe structures at the White Sands National Monument. Most of the Cowboy ATCAA would continue to experience the baseline one to two sonic booms per month from functional check flights. The western edge of the Cowboy ATCAA, adjacent to WSMR, would experience 10 to 20 booms per month.

4.2.2.3 No Action

No Action means that the beddown of the F-22A at Holloman AFB would not occur at this time. No Action would continue baseline noise levels presented in Table 4.2-5.

4.3 Safety

The definition of safety is included in Section 2.8.3.

4.3.1 Affected Environment

4.3.1.1 Training Areas/Ranges

Airspace safety includes wildlife strike hazard, mishap rates in airspace, and safety under the training airspaces. Current Holloman-based aircraft use Red Rio, Oscura, and Centennial ranges for bombing and aerial gunnery practice. The GAF, F-117As, and T-38s use MTRs for low level navigation and tactics training. WSMR and McGregor are used for both high and low altitude training and Talon High is used for high altitude training. Restricted areas R-5107 B/C/D/E/H/J, R-5103 B/C, R-5111 A/B and the Beak, Talon, Pecos, and Valentine MOAs are used for both high and low altitude training.

4.3.1.2 Bird/Wildlife Strike Hazard

Raptors of the greatest concern in the ROI may be encountered in any of these areas, particularly near areas of thermal activity. A few examples of areas with significant raptor activity include the Guadalupe Mountains, Black Range, and western escarpment of the Sacramento Mountains. The largest body of permanent standing water within WSMR airspace is the 600 to 700 acre wetland called Malpais Springs (HMN 310 Radial, 34 DME). Refuges outside the airspace that support waterfowl include Bosque Del Apache National Wildlife Refuge, Sevilleta National Wildlife Refuge, Bitter Lakes National Wildlife Refuge, and La Joya State Waterfowl Management Unit. All of these bodies of water provide seasonal habitat for up to a hundred thousand waterfowl and Sandhill Cranes. The San Andres National Wildlife Refuge is under WSMR airspace.

Songbirds are small birds, usually less than one pound. During nocturnal migration periods, they navigate along major rivers, typically between 500 to 3,000 feet AGL. The potential for bird-aircraft strikes is greatest in areas used as migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands). These have historically been the most frequent species involved in aircraft bird strikes at Holloman. The Horned Lark and Sparrow accounted for the majority of the identified strikes in FY05 and through July of FY06.

While any bird-aircraft strike has the potential to be serious, many result in little or no damage to the aircraft, and only a minute portion result in a Class A mishap. During the years 1985 to 2004, the Air Force BASH Team documented 59,156 bird strikes worldwide. Of these, 25 resulted in Class A mishaps where the aircraft was destroyed. These occurrences constituted approximately 0.04 percent of all reported bird-aircraft strikes (Air Force Safety Center 2004). During FY05, Holloman-based aircraft recorded 11 bird strikes, none of which resulted in damage to the aircraft. For the first half of FY06 there were 16 reported strikes with one resulting in reportable engine damage to a T-38A aircraft.

4.3.1.3 Mishap Rates for Training Aircraft

Historically, when new military aircraft first enter the inventory, the flight safety accident rate is higher. Safety data are limited for the F-22A because it is a new aircraft with multiple complex systems. These systems are undergoing refinement as the F-22A transitions from a test and training platform to an operational system. Class A mishaps are calculated on a basis of 100,000 flight hours. The F-22A has not yet achieved the level of flight hours. During test activities and weapons system development, the F-22A has had three Class A mishaps; this is not unusual for a new aircraft.

4.3.1.4 Defensive Countermeasures

Lands under the training airspace include some cities and communities, uninhabited desert-like ranges, timbered mountains, and private and government-owned lands used for ranching and grazing. Currently, the 49 FW does not use defensive chaff or flares although other aircraft currently or previously based at Holloman AFB have or do use chaff or flares during training over ranges. The use of chaff and flares for defensive training was identified as a concern during scoping. Appendices B and C present the characteristics and risks of chaff and flare use and residual materials.

4.3.2 Environmental Consequences

4.3.2.1 Proposed Action

There would be no substantive change in or impacts to flight, ground, or other safety aspects. The F-22A would not use New Mexico MTRs for low level navigation training. Enhanced F-22A electronics substantially improve situational awareness of other aircraft in the airspace. All aircraft flying in MOAs and ATCAAs have a responsibility to apply see-and-avoid measures.

The 49 FW has developed a BASH Plan (Holloman AFB 2006) which establishes aggressive procedures designed to minimize the occurrence of bird-aircraft strikes. The document contains detailed procedures to monitor and react to heightened risk of bird-strikes, and when risk increases, limits are placed on low altitude flight and some types of training (e.g., multiple approaches, closed pattern work, etc.) in the airport environment. Special briefings are

provided to pilots whenever the potential exists for greater bird-strike sightings within the airspace. The likelihood of wildlife or bird strikes under the Proposed Action is somewhat less than existing conditions due to the reduction in total operations and the higher altitudes flown by the F-22A.

As the F-22A becomes operationally mature, the aircraft mishaps rate is expected to become comparable to that of the F-15C, a similar aircraft with a similar mission. The F-15C has a Class A mishap rate of 2.46 per 100,000 hours. Historical trends show that mishaps of all types decrease the longer an aircraft is operational as operations and maintenance personnel learn more about the aircraft's capabilities and limitations. Some of this experience has already been gained for the F-22A. Experience gained with F-22A test programs, aircrew training and the Initial Operational Wing currently at Langley AFB, Virginia will provide substantial knowledge about the F-22A safest flight regime. Such safety factors as computer self checks and simplified maintenance will permit the F-22A to operate as safely as, if not more safely than, the F-15C.

The amount of munitions associated with the two F-22A squadrons are projected to be lower than that associated with the existing F-117A and T-38A squadrons. However, the F-117A does not use defensive chaff or flares. The F-22A would expend chaff or flares in approved airspace during training. Appendix A explains the RR-188 chaff is expected to be used. Combat chaff would constitute a safety risk to FAA airspace control and is not approved for use in SUA.

Appendix B explains MJU-10/B flares and their constituents. Policies requiring flare release at altitudes above 2,000 feet AGL and restricting flare use during times of very high or extreme fire danger would mitigate risk of a flare caused fire. Residual materials from chaff or flare deployment include up to 2-inch by 2-inch plastic or nylon pieces and up to 4-inch by 13-inch aluminum-coated mylar wrappings. These pieces would not affect safety or biological resources, but, if found and identified by a resident, rancher, or recreationist, the individual could be annoyed.

No flare or chaff component constitutes a safety risk except the extremely rare (0.01 percent) case of a dud flare falling to the ground. Appendix C further describes that the likelihood of an individual being struck by any flare materials or especially by a falling dud flare is extremely remote. If an individual were struck by a falling dud flare, it could result in serious injury or death. A slightly greater possibility exists for an individual locating a dud magnesium flare on the ground under the airspace. Although the risk of combustion of such a dud is low, it could be ignited by an extremely hot (2,000 degrees) fire or by friction from a strike with something like a saw or a bullet. The basic rule for a dud flare is to identify its location, do not touch it or experiment with it, and notify a safety authority of its location. Holloman AFB has the personnel and facilities to handle the level of munitions, as well as chaff and flares, associated with implementing the proposed action.

The F-22A does not have a fuel dump valve that could provide a radar signature. Fuel dumping in an emergency would not occur.

4.3.2.2 Alternative A

Environmental consequences would generally be the same as those described for the Proposed Action except that Alternative A would concentrate F-22A training activity in WSMR. This means that chaff and flare use would only occur in WSMR and primarily above existing ranges.

4.3.2.3 No Action

No Action for the transformation would not change operations from existing conditions.

4.4 Air Quality

The definition of air quality is included in Section 2.8.4 and expanded in Appendix I.

This section discusses air quality considerations and conditions of the airspaces affected by the proposed action. The approach to the air quality analysis was to estimate any increase in emission levels due to the proposed transformation of the 49 FW from the F-117A stealth to the F-22A stealth aircraft.

4.4.1 Existing Conditions

This section discusses air quality considerations and conditions of the airspaces affected by the Proposed Action. Areas under the training airspace are in air quality attainment.

Air Basins. Federal regulations at 40 CFR 81 have defined certain AQCRs, which were originally designated based on population and topographic criteria closely approximating each air basin. The potential effects on air quality would typically be confined to the air basin in which the emissions occur. Therefore, aircraft emissions were evaluated and summed by AQCR, rather than by the type of airspace, in order to provide a realistic estimate of the impacts on a particular air basin or airshed. The majority of sorties associated with ATCAAs, MOAs, and restricted areas would occur in the following four AQCRs:

- AQCR 153, which includes Doña Ana, Lincoln, Otero, and Sierra Counties in New Mexico and Brewster, Culberson, Hudspeth, Jeff Davis, and Presidio Counties in Texas.
- AQCR 154, which includes Guadelupe and Torrance Counties in New Mexico.
- AQCR 155, which includes Chaves, Curry, De Baca, Eddy, Quay, and Roosevelt Counties in New Mexico.
- AQCR 156, which includes Catron and Socorro Counties, New Mexico.

For individual airspaces that cross two or more AQCRs, the proportion of the airspace in each AQCR was estimated. Emission totals for each AQCR were calculated by estimating the percentage of each airspace in each affected AQCR. The impact on each air basin was then estimated based on total emissions within the corresponding AQCR.

Class I Areas. Mandatory PSD Class I areas established under the CAA Amendments of 1977 for the states of Arizona, New Mexico, and Texas are listed under 40 CFR 81.403, 81.421, and 81.429, respectively. These are areas where visibility has been determined to be an important issue by the Administrator, in consultation with the Secretary of the Interior. The closest PSD Class I areas to the airspaces potentially affected by the proposed action include Bosque del Apache National Wildlife Refuge, White Mountain Wilderness Area, and Salt Creek Wilderness Area. Regional PSD Class I areas include Carlsbad Caverns National Park, Guadalupe Mountains National Park, and Salt Creek Bitter Lake National Wildlife Refuge (see Figure 3.4-1).

Current Aircraft Emissions by AQCR. Flying operations outside the Holloman airfield included sorties within ATCAAs, MOAs, and Restricted Areas. Emissions from these operations were calculated from current sortie data, using emission factors obtained primarily

from *Calculation Methods for Criteria Air Pollution Emission Inventories* (Jagielski and O'Brien 1994) and *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources* (USEPA 1992). Aircraft are assumed to be flying at military power for the entire duration of the sortie.

A summary of baseline aircraft emissions by AQCR is presented in Table 4.4-1.

Table 4.4-1. Aircraft Emissions by AQCR, Baseline

AQCR	Aircraft Emissions (tons/yr)				
	CO	*VOC*	*NO_x*	*SO_x*	*PM*
14	< 0.1	< 0.1	0.8	< 0.1	< 0.1
154	8.3	0.6	87.1	2.1	2.2
155	80.4	9.9	1051.7	24.4	22.3
153	754.4	223.9	1110.0	33.7	153.3
12	0.2	< 0.1	3.5	< 0.1	< 0.1
156	72.3	22.5	1066.0	24.8	105.3

CO = carbon monoxide; NO_x = nitrogen oxides include NO_2 and other nitrogen-related compounds; PM = particulate matter, is equivalent to TSP and includes PM_{10} as a component; SO_x = sulfur oxides include SO_2 and other sulfur-related compounds; VOCs = volatile organic compounds are precursors to the formation of O_3 in the atmosphere
Source: Holloman 2004c

4.4.2 Environmental Consequences

The approach to the air quality analysis was to estimate any increase in emission levels due to the proposed transformation of the 49 FW. Air emissions resulting from the proposed action were evaluated in accordance with federal, state, and local air pollution standards and regulations. Air quality impacts from a proposed activity or action would be significant if they:

- increase ambient air pollution concentrations above any NAAQS;
- contribute to an existing violation of any NAAQS;
- interfere with or delay timely attainment of NAAQS; or
- impair visibility within any federally mandated federal Class I area.

4.4.2.1 Proposed Action

Air emissions for proposed aircraft flying operations were calculated and apportioned by AQCR using the same methodology and assumptions as were used for calculating baseline emissions in Section 4.4.1. The airspaces potentially affected by the Proposed Action span a large area. Emissions were apportioned by AQCR according to the counties over which each airspace exists. Emission totals for each AQCR were calculated by estimating the percentage of the airspace in each affected AQCR. The emissions in each air basin were then estimated based on total emissions within the corresponding AQCR.

A summary of the changes in aircraft emissions by AQCR is presented in Table 4.4-2.

Table 4.4-2. Aircraft Emissions by AQCR, Proposed Action

AQCR	Aircraft Emissions (tons/yr)				
	CO	*VOC*	*NO_x*	*SO_x*	*PM*
154	0.0	0.0	0.0	0.0	0.0
155	-0.5	-0.1	33.1	1.4	2.0
153	15.5	-34.8	670.3	30.0	44.2
156	2.4	-1.4	163.1	7.5	9.2

CO = carbon monoxide; NO_X = nitrogen oxides include NO_2 and other nitrogen-related compounds; PM = particulate matter, is equivalent to TSP and includes PM_{10} as a component; SO_X = sulfur oxides include SO_2 and other sulfur-related compounds; VOCs = volatile organic compounds are precursors to the formation of O_3 in the atmosphere.

The projected change in aircraft emissions would be dispersed over millions of acres and the flight altitude of the F-22A aircraft is above the mixing height over 95 percent of the time. There would be no measurable effects on air quality and no effect upon PSD Class I areas.

4.4.2.2 Alternative A

Alternative A would concentrate more F-22A operations above WSMR. The flight altitudes would primarily remain above the mixing height and there would be no effects upon air quality.

4.4.2.3 No Action

Under the No Action Alternative, aircraft operations would not change from current conditions.

4.5 Physical Resources

The definition of physical resources is included in Section 2.8.5 and expanded in Appendix J.

The proposed transformation of the 49 FW would not involve construction or any similar ground disturbing activities related to the airspace. In addition to air-to-air gunnery over the long established Yonder range within WSMR, the only potential impacts to physical resources, primarily soil and water, would be derived from chaff and flare materials landing on the ground. In August 1997, Headquarters ACC of the Air Force conducted a study of the environmental effects of using self-protection chaff and flares in military aircraft training (ACC 1997). This section addresses effects of chaff and flare deposition on soil chemistry, including the potential for flare-caused fire, for chaff and flare debris to accumulate in water bodies and sediments, and for debris to leach toxic chemicals into or alter the chemical composition of surface water bodies. Additional details on flare residual materials and flare risks are contained in Section 4.6.2.2 and Appendix C. Impacts would not be considered significant if toxic chemicals would not be released or if accumulated debris would not alter soil or water.

4.5.1 Existing Conditions

Land and water

Resources under consideration below the proposed airspace extend from the Texas border to the south to just over the boundary of Torrance County, New Mexico to the north, west to Truth

or Consequences, New Mexico and east nearly to Carlsbad, New Mexico. There are no proposed ground disturbing activities under the airspace. Earth and water resources extend over portions of eight counties in New Mexico: Chaves, Doña Ana, Eddy, Lincoln, Otero, Sierra, Socorro, and Torrance. The Sacramento Mountains under the Cowboy ATCAA reach elevations or 12,000 feet MSL and receive sufficient snowfall to support developed winter recreation areas.

4.5.2 Environmental Consequences

A project element that could directly interact with physical resources under the airspace is the use of defensive countermeasures in training. This consequences section focuses on the RR-188 chaff and MJU-10/B flare. Combat chaff is the only chaff currently available for F-22A aircraft but this chaff is not approved for use in the Continental U.S. because it substantially interferes with FAA radars. This EA assumes that a modified RR-188 training chaff will be available for F-22A aircraft training in New Mexico SUA.

Water resources under the airspace include snow pack in the Sacramento Mountains. Although sonic booms could potentially impact snow pack, a combination of high snowfall and steep slopes along with high overpressure sonic booms would be required to trigger an avalanche. There is no reason to believe ski areas in the Sacramento Mountains would be impacted by sonic booms.

4.5.2.1 Proposed Action

Chaff

Chaff use is proposed for use in WSMR and McGregor Airspaces. All training using chaff and flares would occur in accordance with the operational procedures outlined in Section 2.2.6

Chaff and flares are not currently deployed by F-117A or T-38A aircraft. As described in Appendix B, chaff consists of aluminum-coated silica fibers one inch or less in length, and thinner than a very fine human hair. Chaff disperses widely when deployed. Ultimate disposition depends upon the altitude of release and the prevailing winds at different altitudes at the time of release. All chaff and plastic pieces consisting of a slider, an end cap, and three pieces of 2-inch by 4-inch mylar wrapping are assumed to be deposited on the ground under the airspace. The amount of chaff distributed within the airspace would amount to fewer than 0.015 grams (0.0005 ounces) per acre per year. Chaff rapidly breaks up to become particles of aluminum and silica that are indistinguishable from native soils. Mylar wrapping is similar to strips from a mylar balloon. Plastic pieces are inert and are not expected to be concentrated in any way that could impact soil or water resources. The mylar pieces are expected to disintegrate after exposure to sunlight and other weather conditions for a period of time. No impact to water bodies would be anticipated, even in the case of a highly unlikely event such as an entire clump of undispersed chaff falling into a small, confined water body (see Appendix B). No significant impact to physical resources would occur due to the deployment of chaff.

Flares

Flare use is proposed for all training airspace authorized for Holloman AFB pilot training. The flare pellet is designed to be fully consumed before reaching the ground. A flare failure that would result in a dud on the ground is estimated to be 0.01 percent of flares used. In extremely rare cases, if a dud flare reaches the ground, the components that have the greatest potential to affect soil and water chemistry are small quantities of chromium, magnesium, aluminum,

boron, and barium. Only magnesium and boron showed levels in sufficient concentrations for concern in field and laboratory tests on flares, and then only in acidic environments that do not occur in soil or water within the ROI (ACC 1997).

There is a low probability for fires to occur as a result of the Proposed Action due to the low (less than 1 percent) failure rate of flares and Holloman AFB policies that restrict flare use during times of very high or greater fire risk and do not permit flare use below 2,000 feet AGL. The F-22A will be training in higher airspace altitudes as presented in Figure 2.1-4, thereby giving flare materials more time to be fully consumed before reaching the ground. There would be no significant impacts to physical resources due to the chemical composition of flare materials that reach the ground or fire risk associated with defensive flare deployment.

4.5.2.2 Alternative A

Alternative A concentrates most F-22A training in WSMR with all chaff and flare residual materials falling on or around WSMR. Concentrations of chaff fibers and effects from chaff and flare deployment would essentially be the same as described for the Proposed Action.

4.5.2.3 No Action

The No Action Alternative would not change use of the training airspace. Defensive countermeasures are not used by F-117A aircraft. There would be no effects to earth and water resources beneath the airspace.

4.6 Biological Resources

The definition of biological resources is included in Section 2.8.6 and expanded in Appendix G.

4.6.1 Existing Conditions

4.6.1.1 Regional Vegetation

Vegetation in the general project area is determined by regional precipitation, elevation gradients, and the land use of southern New Mexico. The region is generally arid Chihuahuan desert vegetation including xeric grasslands, scrublands, and forests. Vegetation in the areas underlying training airspace follows an elevation gradient that begins with grasses and shrubs at lower elevations, transitions to shrubland-forest at mid-elevations, and switches to completely forest at the upper elevations. Approximately 60 percent of the area underlying designated airspace is grassland or scrub formations (Table 4.6-1, Figure 4.6-1) (Dick-Peddie 1993). Cool- and warm-season grasses are common throughout the ROI. Lower elevation shrubs likely to occur in the ROI include creosotebush and tarbush. Upper elevation shrubs include mountain mahogany and sumac species. Common tree species found throughout the region include Gambel oak, piñon pine and juniper species at lower elevations; cottonwood, salt cedar, and willow species along drainages; and pines, spruces, and firs at upper elevations.

Wetlands and aquatic habitat represent a very small fraction of the habitat under the airspace. Wetlands and aquatic habitat under the WSMR airspace include springs, seeps in mountainous areas, and extensive wetland marshes and creeks in the Tularosa Basin. These habitats occupy approximately 700 acres, mostly in the Malpais Spring and Brazel Lake areas (WSMR 2002). There are approximately 1,200 acres of wetland habitats under the McGregor airspace (U.S. Army 2001). Almost all of these are ephemeral wetlands, commonly known as playas.

Table 4.6-1. Vegetation/Land Cover Types under All Proposed F-22A Training Airspace in New Mexico

Vegetation/Land Cover Classification[1]	*Acres*	*Percentage*
Alpine Tundra	2,150	>0.1%
Chihuahuan Desert Scrub	1,121,920	11.0%
Closed Basin Scrub	824,610	8.1%
Coniferous and Mixed Woodland	1,574,530	15.4%
Desert Grassland (Ecotone)	2,098,380	20.5%
Juniper Savanna (Ecotone)	1,105,040	10.8%
Lava Beds	137,600	1.3%
Montane Coniferous Forest	595,430	5.8%
Montane Grassland	3,710	>0.1%
Montane Scrub	285,390	2.8%
Plains-Mesa Grassland	1,053,350	10.3%
Plains-Mesa Sand Scrub	956,370	9.4%
Sand Dunes	237,050	2.3%
Subalpine Coniferous Forest	93,260	0.9%
Urban, Farmland or Open Water	136,020	1.3%
Total	**10,224,810**	

Note: 1. Vegetation/land cover classification follows Dick-Peddie (1993).

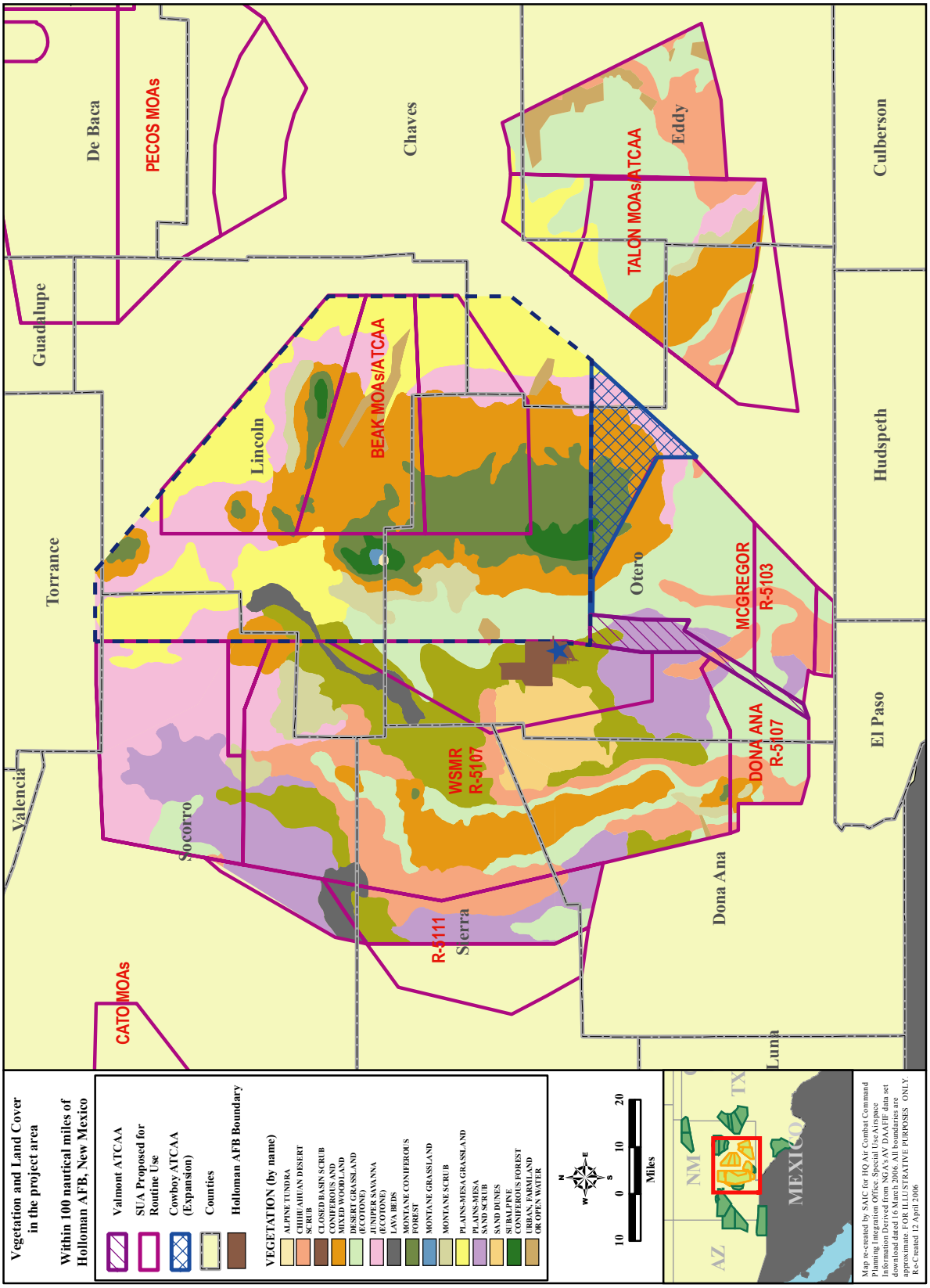


Figure 4.6-1. Vegetation and Land Cover in the Project Area

4.6.1.2 Regional Wildlife

In general, wildlife species are associated with specific habitats defined by the vegetation composition. Some species are obligate to certain habitats while other species are generalist and do not require one specific habitat type. Wildlife species are described below according to their affinity to the floristic communities described in the vegetation Section 4.6.2.1.

Plains, Great Basin, and Desert Grassland habitats are represented by the plains and mesa grassland and desert grassland (ecotone) floristic communities (Dick-Peddie 1993). Appendix G (Table 3) summarizes species associated with this community. In addition to those species listed in Appendix G (Table 3), a range of small rodent species are likely to occur in this community type as well. As classified by Bailey (1995), the ROI includes the Southwest Plateau and Plains Dry Steppe and Shrub Province, Chihuahuan Desert Province, and Great Plains-Palouse Dry Steppe Province.

Shrubland habitats are represented by the following floristic types: plains-mesa scrub; Chihuahuan desert scrub; montane scrub; and closed basin scrub (Dick-Peddie 1993). Species associated with this community are summarized in Appendix G (Table 3). This includes portions of the Mountain Semidesert Province, Southwest Plateau and Plains Dry Steppe and Shrub Province, Chihuahuan Desert Province, and Great Plains-Palouse Dry Steppe Province (Bailey 1995).

Forest habitats in the ROI are primarily coniferous with few deciduous species. Forest types are composed of the following communities: juniper savanna, coniferous and mixed woodland, montane coniferous forest, subalpine coniferous forest (Dick-Peddie 1993). Table 3 summarizes the species associated with this community. As classified by Bailey (1995), portions of the Mountain Semidesert Province, Southwest Plateau and Plains Dry Steppe and Shrub Province occur in the ROI (Bailey 1995).

4.6.1.3 Special-Status Species

As part of the environmental impact analysis process for this project, the USFWS and the New Mexico Department of Game and Fish (NMGF) were contacted for information on species of concern in the project area. A summary of the species designated as threatened, endangered or candidate status, occurring within all counties that are intersected by the proposed F-22A training airspace are listed in Appendix G (Table 2). Of the 31 federally listed species, 13 are likely to occur within the ROI, based on distribution and habitat association. These species will therefore be carried forward in Section 4.6.3 for analysis of effects of the proposed actions. These 13 special-status species are:

- 2 invertebrate species; Chupadera springsnail and Texas hornshell (a mussel).
- 3 bird species; bald eagle, Mexican spotted owl, and northern aplomado falcon.
- 1 fish species; Pecos bluntnose shiner.
- 7 plant species; Gypsum wild-buckwheat, Kuenzler hedgehog cactus, Lee pincushion, Sacramento Mountains thistle, Sacramento prickly poppy, Sneed pincushion cactus, and Todsen's pennyroyal.

There are no known bald eagle nests under the proposed F-22A training airspace. According to the U.S. Forest Service (1999), there are 5,763 acres of bald eagle wintering areas in the Lincoln National Forest underneath the Beak MOA/Cowboy ATCAA (see Figure 4.6-2).

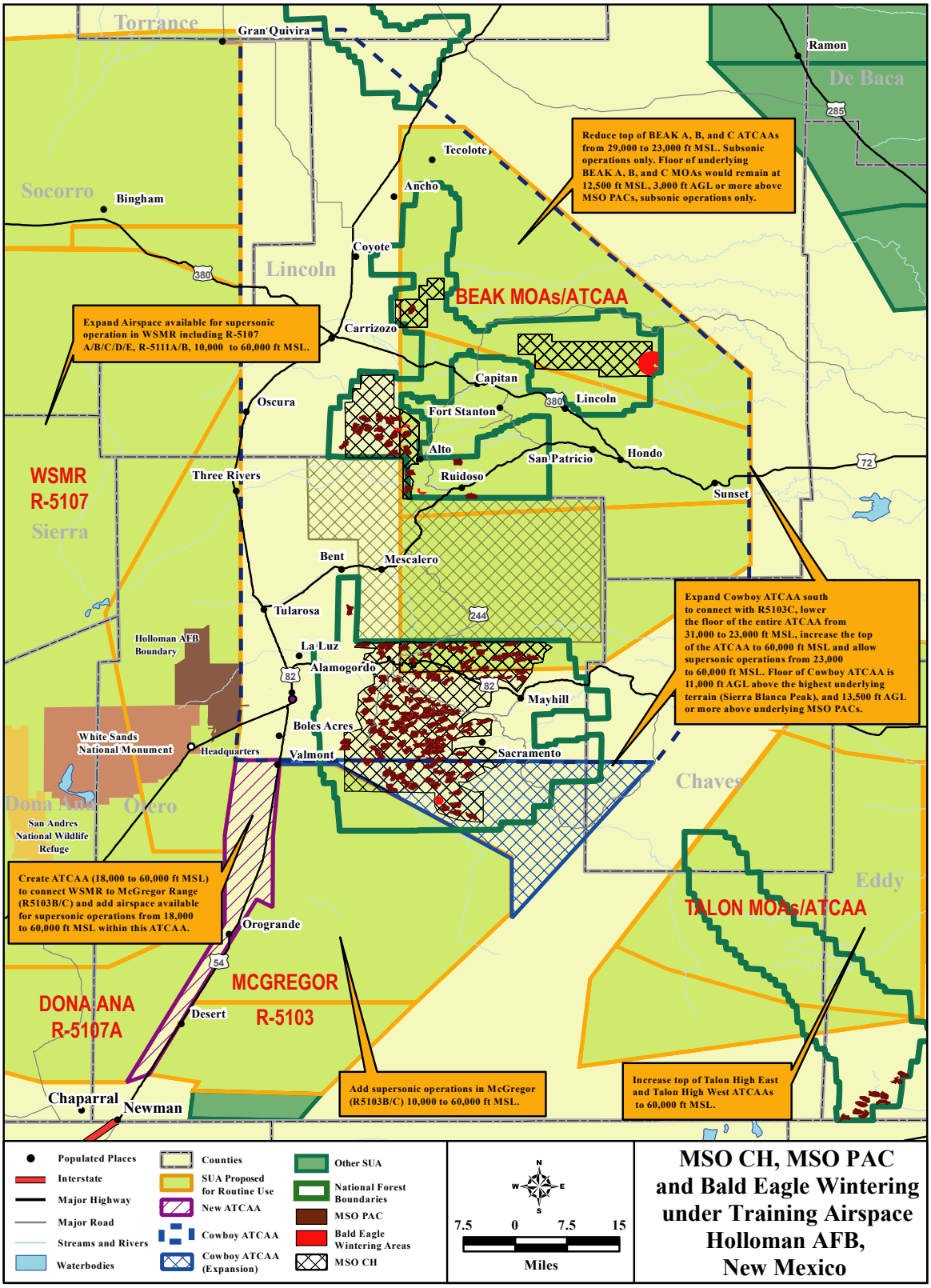


Figure 4.6-2. Mexican Spotted Owl and Bald Eagle Wintering under Training Airspace

The Mexican spotted owl has federally designated critical habitat in the ROI. Figure 4.6-2 and Table 4.6-2 summarize the extent and location of Mexican spotted owl critical habitat. The Mexican spotted owl has federally designated critical habitat in the ROI. Approximately 18 percent (368,598 acres) of the Mexican spotted owl critical habitat in New Mexico is located in the ROI, underneath the current Beak MOA/Cowboy ATCAA, the McGregor Restricted Area, and the proposed expanded Cowboy ATCAA. Correspondingly, there are also 81,550 acres of Mexican spotted owl Protected Activity Centers (PACs) in the ROI in Lincoln National Forest (U.S. Forest Service 2001).

Table 4.6-2. Mexican Spotted Owl Critical Habitat Associated with the Proposed F-22A Training Airspace

	Maximum Altitude (feet)		Minimum Altitude (feet)		*Critical Habitat Acres (Total)*	*Critical Habitat Acres (Exclusive)*
Airspace[1]	*Existing*	*Proposed*	*Existing*	*Proposed*		
Beak A/B/C MOA/ATCAA	29,000 feet MSL	23,000 feet MSL	12,500 feet MSL	12,500 feet MSL	117,976	117,976
Cowboy ATCAA	45,000 feet MSL	60,000 feet MSL	31,000 feet MSL	23,000 feet MSL	306,395	188,419
McGregor Airspace	Unlimited	60,000 feet MSL	Surface	Surface	6,002	6,002
Expanded Cowboy ATCAA Supersonic	60,000 feet MSL	60,000 feet MSL	31,000 feet MSL	23,000 feet MSL	56,158	56,158

Note: 1. Critical Habitat Total Includes Overlapping Airspace Units.

The Proposed Action and Alternative A are consistent with the GAF II Beddown-related Biological Opinion (USFWS 1998) because the F-22A would exceed the altitudinal clearances identified in that document. The F-22A would fly in excess of 3,000 feet AGL over the Mexican spotted owl PACs and Bald eagle wintering or roosting grounds. There are no known southwestern willow flycatcher populations nor critical habitat under SUA within the project ROI. The Biological Opinion puts no restriction on overflights of suitable habitat for northern aplomado falcon.

The northern aplomado falcon is infrequently observed in the project area and has not bred in the south-central New Mexico project region since the early 1950s (Corral *et al.* 2001, New Mexico Heritage Program and WSMR 2002). The nearest known breeding population is in northern Chihuahua, Mexico, about 125 miles south of Fort Bliss, Texas (Corral *et al.* 2001). It does not have federally designated critical habitat; however, recent work by the New Mexico BLM and New Mexico State University have shown that suitable habitat for this species does exist under the proposed F-22A training airspace (BLM 2005, Young *et al.* 2005). Aplomado falcon habitat is primarily concentrated around U.S. Highways 285 and 82, in Eddy County, and east of U.S. Highway 54 south of Alamogordo (Otero County). The species has been observed

but is not known to breed in the vicinity of the project airspace (USFWS 1990, USFWS 1999, NMGF 2004, BLM 2005).

The Air Force has conferred with the USFWS on their proposed reintroduction of northern aplomado falcons into southern New Mexico and Arizona with the purpose of establishing a viable resident population as described in USFWS 2005. This reintroduced population would be designated as a "non-essential experimental population (NEP)" according to section 10(j) of the ESA of 1973, as amended. The geographic boundary of the NEP would include all of New Mexico and Arizona. Regulatory restrictions are considerably reduced under a non-essential experimental population designation (Federal Register 70(26): 6819-6828.)

In the NEP proposal (Federal Register 70(26): 6819-6828), USFWS stated that they "do not expect conflicts between falcon management and agricultural, oil and gas development, military, or recreational activities." They further stated on page 6824 that "These activities on private or military lands within the proposed NEP area will continue without additional restrictions during implementation of the falcon reintroduction activities." USFWS added (page 6824) that "Any falcons that occur within the proposed NEP area will be considered part of the proposed NEP and will be subject to the protective measures in place for the proposed NEP. The decreased level of protections afforded to falcons that cross into the proposed NEP is not expected to have any significant adverse impacts to the wild population, since we do not anticipate this to occur very often."

Appendix D includes correspondence from USFWS and NMGF that provide information on endangered and threatened species.

4.6.2 Environmental Consequences

There will be no project-related construction or ground-disturbing activities under the training airspace. Therefore, no direct impacts would occur to vegetation, including special-status plants, and no wildlife habitat would be lost under the training airspace.

Specific issues and concerns for biological resources are related to the potential effects of (1) subsonic overflights, (2) sonic booms, and (3) chaff and flare use. Because there can be differences in noise characteristics between low-altitude subsonic flights and supersonic overflights (e.g., duration and frequency and accompaniment with visual stimulation), noise effects from both sources are treated separately in the discussion below. An overall review of the effects of noise and chaff and flares on biological resources is found in Appendix G.

In the final rule designating Critical Habitat for Mexican spotted owl, USFWS (2004) its states that the "designation of critical habitat will not impede the ability of military aircraft to conduct overflights nor to conduct ballistic missile testing activities. Activities such as these will not require additional Section 7 consultation beyond compliance related to the species." (Federal Register 69(168):53191).

4.6.2.1 Subsonic Training

Proposed changes to the existing training airspace summarized in Chapter 2.0 are not expected to result in adverse effects on biological resources. In general, the F-22As would fly at considerably higher altitudes than the F-117A and T-38A (see Table 2.1-8) and most training would take place during daylight hours. At least 75 percent of the time, the F-22A would fly above 30,000 feet MSL; 10 percent of flight hours would be between 10,000 and 30,000 feet AGL;

and 10 percent between 5,000-10,000 feet AGL. Less than 5 percent of the flight hours would be spent at or below 5,000 feet AGL, broken down as follows: 3.75 percent between 2,000 and 5,000 feet AGL, 1 percent between 1,000 and 2,000 feet AGL, and 0.25 percent of flight hours between 500 and 1,000 feet AGL. Lower-level flights below 1,000 feet AGL would principally be on approach and departure to the runways at Holloman AFB and over WSMR and McGregor Ranges where low-level flying is permitted. Minimal overflight at or near 500 feet AGL would be conducted by the F-22A. The replacement of F-117A and T-38A aircraft with the F-22A would result in an essentially indiscernible change in overall noise levels from subsonic aircraft activity over most of the airspace and some increase in subsonic noise on McGregor and the southern part of WSMR (see Section 4.2). Wildlife (including special-status species) and domestic animals under the training airspace would be exposed to similar levels of noise from subsonic aircraft activity compared to current conditions.

Because the F-22A spends most of its time at high altitudes the potential for bird-aircraft strikes in the training airspace would be reduced compared to the current situation. In FY 2005, there were 16 documented strikes. Most of these were near the airfield during takeoff and landing. Birds involved in the FY 2005 strikes included two Northern shovelers (ducks), one "loggerhead" (shrike), one kingbird, one warbler, one rock dove (pigeon), sparrows, horned lark, as well as several unknowns. In FY 2005 the flight phase was identified for 5 of the 16 bird strikes, all during landing. During October 2005 through March 2006 (FY 2006), 11 bird strikes have been recorded, three of which involved horned larks and the remainder unknown. In the six FY 2006 incidents in which the phase of flight was identified, three were during landing, two were during take off and one was during low-level flight. The chances of collisions with migratory birds or sensitive species are very low, and the Air Force takes a variety of measures to minimize the chances in order to prevent damages to aircraft or injury to flight personnel. Most bird-aircraft collisions occur during low level flight, especially around airfields and over water bodies. Although some migratory birds (e.g., geese, swans, white pelicans, and some vultures and raptors) may fly at altitudes over 10,000 feet during migration, the chances of a collision are so low as to be discountable.

Many birds in the region are protected by the MBTA. Under the MBTA, the intentional taking of these species requires a depredation permit. However, if a migratory bird species is involved in a bird-aircraft strike it would be considered an incidental taking not an intentional taking. Such incidental taking during military training is exempt from any permitting requirement by Section 315 of the FY 03 National Defense Authorization Act, signed 2 December 2003, which authorized the USFWS (Service) to allow DoD (Military Services) unintentional take of migratory birds during military readiness activities. The Service, in cooperation with the Military Services, is developing implementing regulations related to the migratory bird exemption.

Most studies have found few negative effects of aircraft noise on owls and raptors, as discussed in Appendix G. No studies reported on the effects of aircraft noise on the northern aplomado falcon. Ellis *et al.* (1991) examined behavioral and reproductive responses of several raptor species, including peregrine falcon, to low-level flights. No incidents of reproductive failure were observed and site re-occupancy rates were high (95 percent) the following year. In Alaska, Palmer *et al.* (2003) found small differences in nest attendance and time-activity budgets between undisturbed nesting peregrine falcons and those that were overflown by military aircraft within 500 feet; however, the differences were not correlated with specific overflights

nor did it affect reproductive success. Furthermore, they did not observe a difference in nest-provisioning rates between disturbed and undisturbed nests.

The effects of aircraft noise on the bald eagle have been studied relatively well, compared to most wildlife species. Overall, there have been no reports of reduced reproductive success or physiological risks to bald eagles exposed to aircraft overflights or other types of military noise (Fraser *et al.* 1985, Stalmaster and Kaiser 1997, Brown *et al.* 1999; see review in Buehler 2000). Most researchers have documented that pedestrians and helicopters were more disturbing to bald eagles than fixed-wing aircraft, including military jets (Fraser *et al.* 1985, Grubb and King 1991, Grubb and Bowerman 1997). Recorded responses to a total of 2,849 events involving closely-approaching aircraft (jets, light planes, and helicopters) at median distances of 550 meters, ranged from no response (67 percent), an alert posture (29 percent), taking flight (3 percent) or temporarily departing the immediate area (1 percent). There was considerably more reaction to helicopters than to jets or light planes (Grubb and King 1991). No specific studies were located on the effects of jet aircraft noise on wintering bald eagles.

Systematic observations by Johnson and Reynolds (2002) of Mexican spotted owls during overflights by F-16 jet aircraft showed a minimal response by the owls to the overflights, which were conducted at a minimum elevation of 1,500 feet (490 meters) above canyon rims. This was the lowest altitude allowed during training flights in the study area located south of Pike's Peak in Colorado. Prior to and during each overflight trial, owls were day-roosting in trees or on rock walls in narrow and steep-walled canyons between 650 and 975 feet (200 to 300 meters) below the canyon rims. Trials consisted of three sequential fly-bys, each at a greater aircraft speed and noise level (up to 95 dBA), over owl territories. Documented observations of behavior during the 10-minute prefly-by observation periods showed that owl responses to low altitude F-16 overflights did not exceed, and were often less than, responses to naturally occurring events. All owls exhibiting any response very quickly returned to normal day-roosting behavior (sleeping, awake but quiet, preening). Delaney and others (1999) also noted a quick return to normal behavior by Mexican spotted owls after disturbance by closely approaching helicopters.

Plants, fish, or terrestrial or aquatic invertebrates, including special status species within the ROI have not been reported to be affected by aircraft noise. Other species such as bighorn sheep and pronghorn antelope may have individuals that react to jet noise; however, no research has reported significant long-term effects on these populations and habituation is commonly reported. No significant adverse impacts on wildlife species from aircraft noise are projected with the proposed action.

Wild ungulates appear to vary in sensitivity to aircraft noise. Novel or new noises may or may not result in a response by an animal. Animals may habituate to regular, predictable noises. Similarly, loud and close aircraft including helicopters typically result in a more pronounced response (MacArthur *et al.* 1979, Stockwell *et al.* 1991).

Weisenberger *et al.* (1996) measured the heart rate responses of captive bighorn sheep and mule deer to simulated aircraft noise ranging from 92 to 112 decibels (dB). For both species, heart rates increased following the simulated aircraft noise, but returned to normal levels within 60–180 seconds. Behavioral responses were relatively rare, and the animals returned to normal behavior within 253 seconds. Furthermore, the animals exhibited decreased responses to increased exposure, suggesting habituation. Similarly, Krausman *et al.* (1998) studied the response of bighorn sheep in a 790-acre enclosure to actual and frequent F-16 overflights at 395

feet AGL. Heart rate increased above preflight level during 7 percent of the overflights but returned to normal within 120 seconds. No behavioral response by the bighorn sheep was observed during the overflights. Luz and Smith (1976) observed that pronghorn antelope did not run until a helicopter was within 150 feet AGL.

As with wildlife, the startle reflex is the most commonly documented effect on domestic animals. Results of the startle reflex are typically minor (e.g., increase in heart rate or nervousness) and do not result in injury. Espmark *et al.* (1974) did not observe any adverse effects due to minor behavioral reactions to low-altitude flights with noise levels of 95 to 101 dBA. More severe reactions may occur when animals are crowded in small enclosures, where loud, sudden noise may cause a panic reaction (Air Force 1993). Such negative impacts were typically only observed when aircraft were less than 330 feet AGL (U.S. Forest Service 1992). Several studies have found little direct evidence of decreased milk production, weight loss, or lower reproductive success, which would indicate levels of stress, in response to aircraft noise or sonic booms. For example, Head *et al.* (1993) did not find any reduction in milk yields with aircraft SEL levels of 105 to 112 dBA. Many studies documented that domestic animals habituate to aircraft noise (Head *et al.* 1993; see reviews in Manci *et al.* 1998).

4.6.2.2 Supersonic Training

Supersonic flight would increase with the Proposed Action. Minimum altitude for supersonic flight in WSMR would remain at 10,000 feet MSL; however, the area within WSMR for supersonic flight would be expanded. Supersonic operations would be allowed in McGregor down to 10,000 feet MSL. The F-22As would fly above 30,000 feet during most of their supersonic flight. During training flight, the F-22A would be at supersonic speeds approximately 25 percent of the time. The sonic booms generated at higher altitudes will produce less overpressure on the ground compared to sonic booms generated at low altitudes. F-22A training would result in an increased number of sonic booms per month under specific airspaces (see Table 4.2-5). In WSMR, sonic booms would increase from an estimated 9 sonic booms per month to an estimated 10 to 45 per month. In the McGregor airspace, sonic booms are projected to increase from 0 per month to 5 to 15 sonic booms per month. Under the Cowboy ATCAA, an existing 0 sonic booms per month would increase to a projected 5 to 30 sonic booms per month. Section 4.2.3 provides details on aircraft noise associated with the proposed F-22A training beddown.

The sound of a sonic boom can be like thunder, a sharp double clap if the aircraft is directly overhead or a distant rumble if the aircraft is at a distance. Overall, studies of wildlife and domestic animals have demonstrated that behavioral responses are of short duration and rarely result in injury or negative population effects. Habituation to more frequent sonic booms may also occur (e.g., Workman *et al.* 1992; Ellis *et al.* 1991). Habituation to thunderclaps and rumble associated with seasonally frequent thunderstorms within the ROI would also be expected to minimize response of birds, mammals, and domestic animals to sonic booms.

Responses of seven raptor species to real and mid-to high-level simulated sonic booms (Ellis *et al.* 1991 and Ellis 1981) generally indicated minimal responses to booms and never appeared productivity limiting. The studies were conducted at several locations in Arizona. Ninety five percent of nest sites subjected to low-level jet overflights and/or simulated sonic booms fledged young that year and were reoccupied during the following year by pairs or lone birds of the same species. Limited data on heart rate of prairie falcons indicated that stimulus-induced changes in heart rate were comparable to heart rate changes for the same birds settling to

incubate following flight. Behavioral responses such as agitation or taking flight were infrequent and attributed by the investigators as a response to the activities of the monitors rather than to the stimulus. The investigators emphasized that the exposed, wild birds were not naïve (i.e., they had more than likely been previously exposed to low-level overflight and sonic booms by virtue of their location under airspace with frequent military jet activity) suggesting that the prevalence of no response or minimal response to sonic boom or overflight stimuli may have been influenced by habituation.

Although the responses of Mexican spotted owls to sonic booms have not been directly studied, observations made during a multi-year observational study of the species conducted in New Mexico on behalf of the Air Force have documented the response of Mexican spotted owls to thunder, which occurs frequently in their environment and has somewhat similar characteristics to a sonic boom. F-22A training would occur primarily during the daylight hours when owls are inactive. According to Dr. Ann Bowles, the Principal Investigator of the study (personal communication 2006), the study team collected observations of thunder opportunistically in every year of the six year study, but broke down their observation stations during heavy storms, so they do not have any direct observations during worst-case exposures. During exposure to thunder, the investigators did not observe flight responses in the sense of owls panicking out of the nest and leaving the area, however, they did observe some high intensity behaviors in response to thunder including short flights to congregate (usually owlets and parents flying to get closer to one another) and an increase in contact vocalizations, particularly owlet whistling. The investigators could not attribute any abandonment of a nest, young, or territory to thunder based on their direct observations in the field."

Although few studies have been conducted on the response of wild ungulates to sonic booms, they appear to have little to no adverse reactions. Workman *et al.* (1992) studied the physiological and behavioral responses of pronghorn, elk, and bighorn sheep to sonic booms. All three species exhibited an increase in heart rate lasting from 30 seconds to 1½ minutes in response to their first exposure to a sonic boom. Behaviorally, the animals responded to their first exposure to a sonic boom by running a short distance (less than 30 feet reported for elk). After successive sonic booms, the heart-rate response decreased greatly and the animals remained alert, but did not run. The authors suggested the animals habituated with successive exposure.

There is little direct evidence that aircraft noise or sonic booms can cause domestic chicken eggs to crack or result in lower hatching rates. Stadelman (1958) did not observe a decrease in hatchability when domestic chicken eggs were exposed to loud noises measured at 96 dB inside incubators and 120 dB outside. Bowles and Seddon (1994) found no difference in the hatch rate of four groups of chicken eggs exposed to 1) no sonic booms (control group), 2) sonic booms of 3 psf, 3) sonic booms of 20 psf, and 4) sonic booms of 30 psf. No eggs were cracked by the sonic booms and all chicks hatched were normal.

Espmark *et al.* (1974) noted only minimal reactions of domestic cattle and sheep to sonic booms, such as muscle and tail twitching and walking or running short distances (up to 65 feet). More severe reactions may occur when domestic animals are crowded within small enclosures where loud, sudden noise may cause a panic reaction. An animal, such as a high strung racehorse, in the footprint of a sonic boom may react to the sharp clap from an aircraft directly overhead, which is different than the rumble they may hear on a regular basis from more distant sonic booms or thunder.

These and other studies on noise effects to wildlife and domestic animals are reviewed in Appendix G. Based on previous research and the minimal change in projected subsonic noise levels under the airspace associated with the proposed F-22A training at Holloman AFB, exposures of wildlife (including special-status species) and domestic animals under the airspace to subsonic aircraft noise would be similar compared to baseline conditions but with a substantially reduced amount of nighttime activity. However, because supersonic flight will increase with the proposed action, some animals may startle in response to a sonic boom. The frequency of sonic booms would vary under the airspace as described above but would generally range from zero to several booms in a day, with an average of less than one per day. Habituation to sonic booms at this frequency may also occur (e.g., Workman *et al.* 1992; Ellis *et al.* 1991). Overall, studies have demonstrated that behavioral responses are of short duration and rarely result in injury or negative population effects. The Air Force has established procedures for damage claims that begin by contacting the Holloman Public Affairs Office.

The project may affect but is not likely to adversely affect Mexican spotted owl, northern aplomado falcon, or bald eagle due to the increase in supersonic flight in the ROI. Because supersonic flight would only be approved above 23,000 feet MSL in the Cowboy ATCAA, Mexican spotted owls and wintering bald eagles on the Lincoln National Forest would not likely experience the clap of close sonic booms. Moreover, there would be no visual perception accompanying the noise and they would occur during daytime when owls are inactive. A very small portion of Mexican spotted owl critical habitat (6,000 acres) underlies the northern section of McGregor, where supersonic activity would occur in the proposed action. However, there is no evidence that suggests that sonic booms would result in nest failure or otherwise affect the population status of Mexican spotted owl. Naturally occurring northern aplomado falcons are very rare in the ROI and there are no reported nests; therefore, the aplomado falcon would not likely be adversely affected by the proposed action. Similarly, it is expected that the success of a proposed reintroduction of an NEP in southern New Mexico described in Section 4.6.1.3 would not be adversely affected.

4.6.2.3 Chaff and Flares

Because of its speed and stealth characteristics, F-22As are expected to use fewer defensive countermeasures per sortie than other fighter aircraft that have operated in Restricted Areas out of Holloman AFB. Use of training chaff and flares would increase in volume and area under the proposed action, because the F-117 does not employ these defensive countermeasures. A minimum altitude (10,000 feet MSL) restrictions on flare release and restrictions during very high or greater fire danger would reduce the already very low risk of a flare-caused fire (see Section 4.3). It is not anticipated that use of flares associated with the Proposed Action would cause fires because the flares would burn out within 5 seconds and within about 400 feet from the aircraft release point, as explained in Appendix C. On non-military lands (i.e., outside of air to ground training ranges), ACC policy restricts flare use to 2,000 feet AGL and above. Flares could be used in all airspace discussed under the proposed action; chaff would be used only in McGregor Range and on WSMR. The training chaff used by F-22A is bundled with three additional pieces (mylar) that fall to the ground. The potential environmental consequences and characteristics of chaff and flares are reviewed in Appendices B and C; literature on potential effects of chaff and flares on biological resources is reviewed in Appendix G (Biological Resources).

Specific issues for biological resources are the potential for and consequences of (1) ingestion of chaff fibers or chaff or flare plastic, nylon, or mylar materials; (2) inhalation of chaff fibers; (3) physical external effects from chaff fibers, such as skin irritation; (4) effects on water quality and forage quality; (5) increased fire risk; and (6) probability of being struck by large flare debris. This review in Appendix G demonstrates that no reports or studies to date have documented negative impacts of training chaff or flares to biological resources from any of these potential sources of impacts. No impacts to biological resources would be expected from the use of training chaff and flares. The use of chaff and flares may affect, but is not likely to adversely affect, Mexican spotted owl, bald eagle, or northern aplomado falcon.

4.6.2.4 Alternative A Aircraft Overflight

Alternative A would reduce sonic booms under the Cowboy ATCAA, in McGregor Range, and in Doña Ana Range to approximately 5 per month for each location. The number of sonic booms, as explained for the Proposed Action (20 booms/month) would not be expected to adversely affect wildlife or domestic animals under the airspace. The increase toward the center of WSMR from 9 sonic booms per month to 80 or more per month would represent a substantial increase. Mexican spotted owls, bald eagles, and northern aplomado falcons would occur under this airspace as transient non-resident species and Alternative A may affect, but would not likely adversely affect, these species. Although most animals habituate to a level of sonic booms, this large change in the number of sonic booms could affect behavior of some species.

4.6.2.5 Alternative A Training Chaff and Flares

Alternative A concentrates most training flights in R-5107 and over WSMR. Chaff and flare effects would be as described for the proposed action. There would be no flares used in the Cowboy ATCAA or Talon airspaces. No impacts to biological resources would be expected with Alternative A to the use of training chaff and defensive flares in R-5107. The use of chaff and flares under Alternative A may affect, but is not likely to adversely affect, Mexican spotted owl, bald eagle, or northern aplomado falcon.

4.6.3 No Action

Under the No Action Alternative, the transformation of the 49 FW would not occur at Holloman AFB at this time. The noise environment under the airspace would not change from existing conditions.

4.7 Cultural Resources

The definition of cultural resources is included in Section 2.8.7 and historical background is provided in Appendix F.

4.7.1 Existing Conditions

The various blocks of airspace overlay at least part of eight New Mexico counties; Socorro, Lincoln, Chaves, Eddy, Otero, Doña Ana, Sierra, and Torrance. Archaeological sites under the airspace include native burials, village and settlement sites, historic trails, battle sites, and historic mining sites (Holloman AFB 2005a). Architectural resources under the proposed MOAs and ATCAAs include structures relating to mining, ranching, settlement, the railroad and the military (Holloman AFB 2005a). The documented, historic trails that crisscross New Mexico

span the period from the first Spanish explorers to the 20th century. Many of these routes followed Native American travel and trading roads that long pre-dated the historic period.

The Mescalero Reservation is under the Cowboy ATCAA, and partially under the Beak MOAs. There are traditional cultural properties located within the reservation boundaries and there are likely to be additional cultural resources that are either eligible or potentially eligible for NRHP under the airspace.

Beak A MOA/ATCAA

Beak A is under the Cowboy ATCAA and overlies the central portion of Lincoln County. Although there are no NRHP-listed sites located beneath the airspace, there is one New Mexico State Register listed site, and portions of one historic trail. The State Register-listed Ancho Railroad Depot, located in the Village of Ancho, is now a museum that features the history of the local railroad and the Ancho area. Ancho was the location of a plaster mill and later a brick works that shipped bricks to San Francisco for reconstruction after the 1906 earthquake. The area also holds a portion of the Long Walk National Historic Trail that was used by the Mescalero Apache in their historic journey to Fort Sumner.

Beak B MOA/ATCAA

Beak B is under the Cowboy ATCAA and overlies southern Lincoln County and the northern edge of Otero County which is also coincident to a portion of the Mescalero Reservation. There are 35 recorded NRHP and State Register cultural resources as well as one National Historic Landmark and segments of a National Historic Trail beneath Beak B. The National and State Register resources include Native American archaeological sites, late historic era ranches, urban structures, schools and churches. Most historic cultural resources are directly or indirectly related to the area's 150 year history of farming, ranching, and mining. The Native American sites illustrate a 12,000 year occupation of the area from the early use of rockshelters to the construction of permanent pueblos housing, later semi-agrarian cultures.

The Lincoln Historic District located in the Village of Lincoln is designated a National Historic Landmark as well as being listed on the National and State registers. Like Beak A, Beak B also holds a segment of the Long Walk National Historic Trail.

Beak C MOA/ATCAA

Beak C is under the Cowboy ATCAA, is primarily over Otero County, and also overlies small portions of Lincoln and Chaves Counties. The airspace also overlies a substantial portion of the Mescalero Apache Reservation. Cultural resources beneath the airspace include seven NRHP-listed resources and a segment of the Long Walk National Historic Trail. The listed sites include log chutes and train trestles related to area mining.

Cowboy ATCAA

This section discusses cultural resources that are under the Cowboy ATCAA outside of the Beak airspaces. On the Mescalero Reservation in the town of Mescalero, and of particular concern to the Mescalero Apache, is the NRHP-listed St. Joseph Apache Mission. The mission is currently undergoing extensive restoration that has included repair to aging mortar, roof tiles, windows and other structural aspects. The Air Force is consulting with the Mescalero Tribe in compliance with Section 106 of NHPA, requirements of NEPA and Air Force regulations. Other resources under the Cowboy ATCAA include numerous historic and prehistoric archaeological sites and the Three Rivers Petroglyphs, a BLM-managed archaeological resource with over

21,000 glyphs or figures of birds, insects, mammals, humans, plants, and abstract figures, probably carved by the Jornada Mogollon people.

McGregor Range

McGregor Range overlies the southern central portion of Otero County. There are no NRHP-listed properties on the range. Two 19th century ranch house complexes are also located on the range and are used as recreation sites for range visitors. There are two State Register-listed properties along the western edge of the range: the Escondido Ruin and the Grapevine Canyon Archaeological District. Both illustrate the long and rich history of Native American cultures in southwestern Otero County. Over 4,000 prehistoric and historic archaeological sites have been recorded on McGregor Range. Of these, over 500 are eligible for the NRHP, including at least 12 historic landscapes (Fort Bliss 2005). Resources on McGregor Range are managed according to the Fort Bliss ICRMP (Fort Bliss 2005).

Talon MOAs

The Talon airspace is composed of the Talon West High, the Talon Low, and the Talon East High MOAs. Although the blocks of airspace overlie portions of Chaves, Eddy, and Otero Counties, the only documented cultural resources are found beneath the Talon East High MOA in Eddy County. There are 25 NRHP and State Register-listed resources. Most are structural resources, one is also listed as a National Historic Landmark, and one is an historic trail.

The listed sites include historic structures in the towns of Artesia and Carlsbad, and an early oil well near the town of Eddy. The single National Historic Landmark is the Carlsbad Irrigation District, which includes the Pecos Flume that was once the largest concrete structure in the world (New Mexico Discoveries 2006). The Talon High MOA also overlies a portion of the Goodnight-Loving Historic Trail that followed the Pecos River valley to markets in states to the north.

White Sands Missile Range (WSMR) and Doña Ana Range

WSMR airspace overlies portions of Lincoln, Torrance, Socorro, Sierra, Otero, and Doña Ana Counties. There are 16 State Register-listed properties, 14 of which are also listed on the NRHP, which includes one National Historic Monument. Additionally, there are two National Historic Landmark sites on WSMR. Although there are historic era resources on WSMR, the majority of the listed properties are Native American archaeological sites and sites related to the long-standing military presence. Most notably, WSMR is the home of the Trinity Site National Historic Landmark, where the first nuclear device was detonated. The other National Historic Landmark is the V-2 Launch Complex where post WWII work included V-2 firings and developmental testing of such missiles as Nike, Viking, Corporal, Lance and Multiple Launch Rocket System (Global Security 2006). The three part Salinas Pueblo Missions National Monument in Gran Quivira is what remains of several outposts that represent the earliest contact between Puebloan populations and Spanish colonists (National Park Service 2006). The National Historic Monument consists of the prehistoric pueblos and historic Spanish mission churches at Abo, Quarai, and Gran Quivira, near Mountainair, New Mexico. Of these, the Gran Quivira is under the far northeastern corner of WSMR.

4.7.2 Environmental Consequences

Numerous NRHP-listed properties underlie the airspace of the Proposed Action. These range from archaeological sites to historic structures to historic districts, and can be found throughout

the ROI. Although no traditional cultural resources have been specifically identified in the project area, a portion of the Mescalero Apache Reservation lies beneath the Cowboy ATCAA and Beak B and C MOAs/ATCAAs; also, the part of the Long Walk National Historic Trail traversed by the Mescalero Apache passes beneath Beak A, B and C MOAs. Current conditions for all resources include overflights by military and civilian aircraft, including one to two flights at supersonic speeds per month. Neither the noise nor the visual presence of these overflights have affected the NRHP eligibility of the resources.

Under the Proposed Action, subsonic noise as measured by L_{dnmr} would increase slightly, with the increase ranging from less than 1 dB to no more than 2 dB in all areas except the southern end of McGregor Range. In no case would L_{dnmr} exceed approximately 50 dB. Subsonic noise would not have an adverse effect on cultural resources.

The number of sonic booms throughout the airspace will increase relative to current conditions, from 1 to 2 per month to approximately 30 per month toward the center of the Cowboy ATCAA. The increase in booms would be from an existing 8 to 10 per month to and 60 per month toward the center of WSMR. Gran Quivira would increase from none to approximately 5 booms per month. Although most resources under WSMR and portions of the Cowboy ATCAA currently experience limited exposure to the effects of sonic booms, the Proposed Action will noticeably increase sonic booms. Existing areas underneath Doña Ana and McGregor currently are not exposed to sonic booms; their exposure would increase to 5 to 15 per month.

The St. Joseph Apache Mission on the Mescalero Reservation has badly deteriorated mortar. Although restoration work is focusing on repointing the stonework, vibrations from sonic booms have the potential to damage the structure. The same could be true of other historic structures, including adobe buildings, throughout the airspace and White Sands National Monument Headquarters. The sonic booms would have to be at a frequency and overpressure severe enough to cause such damage. All flights and sonic booms would occur at an altitude in excess of approximately 18,000 feet over the mission. The peak overpressure from a single supersonic event could be in the range of 3.0 to 4.0 psf or less (0.02 pounds per square inch). At 1 psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). See Appendix E for a discussion on potential effects of sonic booms. Impacts from sonic boom overpressure are difficult to control due to aircraft speed and altitude and meterological conditions that affect the formation and overpressure of a sonic boom. Supersonic events may produce conditions that could adversely affect cultural resources. The Cowboy ATCAA includes airspace over the Mescalero Apache Reservation. Although no traditional cultural properties have been specifically identified, they could be affected by the intrusion of sonic booms.

Chaff and flare use are not expected to significantly impact historic properties under the airspace. The material residue from both falls to the ground in a dispersed fashion and does not collect in quantities great enough to adversely affect the NRHP status of archaeological or historical resources. Residual chaff or flare materials, if located and identified, could cause annoyance to the observer.

4.7.3 Alternative A

Under Alternative A, supersonic flight would be concentrated in WSMR, increasing the potential effects from sonic booms on WSMR. Resources underneath the Cowboy ATCAA and

McGregor Range would not be adversely affected by Alternative A. However, those archaeological or historic structures exposed to the increased frequency and vibration from up to 80 sonic booms per month toward the center of WSMR could be expected to be adversely affected, including structures on White Sands National Monument.

4.7.4 No Action

Under the No Action Alternative, the 49 FW would not transform to the F-22A. Existing military flight training would continue under this alternative and resources would continue to be managed in compliance with federal law and Air Force regulation.

4.8 Land Use

The definition of land use is included in Section 2.8.8.

4.8.1 Existing Conditions

Land use underlying the airspace may be generally characterized as extensive areas of ranch and undeveloped rural land surrounding one city, two military bases, several villages, and a scattering of unincorporated rural communities. There are large areas withdrawn for military use as well as extensive State and Federal public lands. The public lands and ranches are primarily open rangeland used for livestock grazing, with few isolated ranch homes. Figure 4.8-1 presents the land ownership within the ROI. Other land uses include agriculture, mining, oil and gas exploration and extraction, forestry, tourism and recreation. The DoD and BLM manage the largest land areas, followed by the U.S. Forest Service, the State of New Mexico, the Mescalero Apache Tribe, private land owners, the National Park Service and other small government holdings.

Special use areas under the ATCAAs, MOAs, and Restricted Areas have been identified and include national monuments and parks, wilderness areas, wildlife refuges. Table 4.8-1 summarizes acres of special use areas under the airspace. Special use areas are presented on Figure 4.8-2.

Restricted areas overlie land owned by the DoD. These areas include all of WSMR and Fort Bliss and the Doña Ana and McGregor Ranges. There is no public access to the Air Force bombing and gunnery ranges on WSMR or Fort Bliss.

WSMR Restricted Area

As a national military test range, WSMR contains an extensive complex of launch sites, impact areas, instrumentation sites, facilities, and equipment. Missile launch sites are located throughout the 2,281,659 acre range. These systems, together with the launch complexes, impact areas, and control centers, are linked by an extensive network of timing and communications systems. WSMR has over 1,000 instrumentation sites and approximately 700 types of optical and electronics instrument systems. The range also provides experimental payload and missile component recovery, target support, air-to-ground multiple target control, calibration and standards, ordnance and propellants storage, geodetic surveying, and photography (U.S. Army 1991; USASDC 1991; U.S. Army 1998).

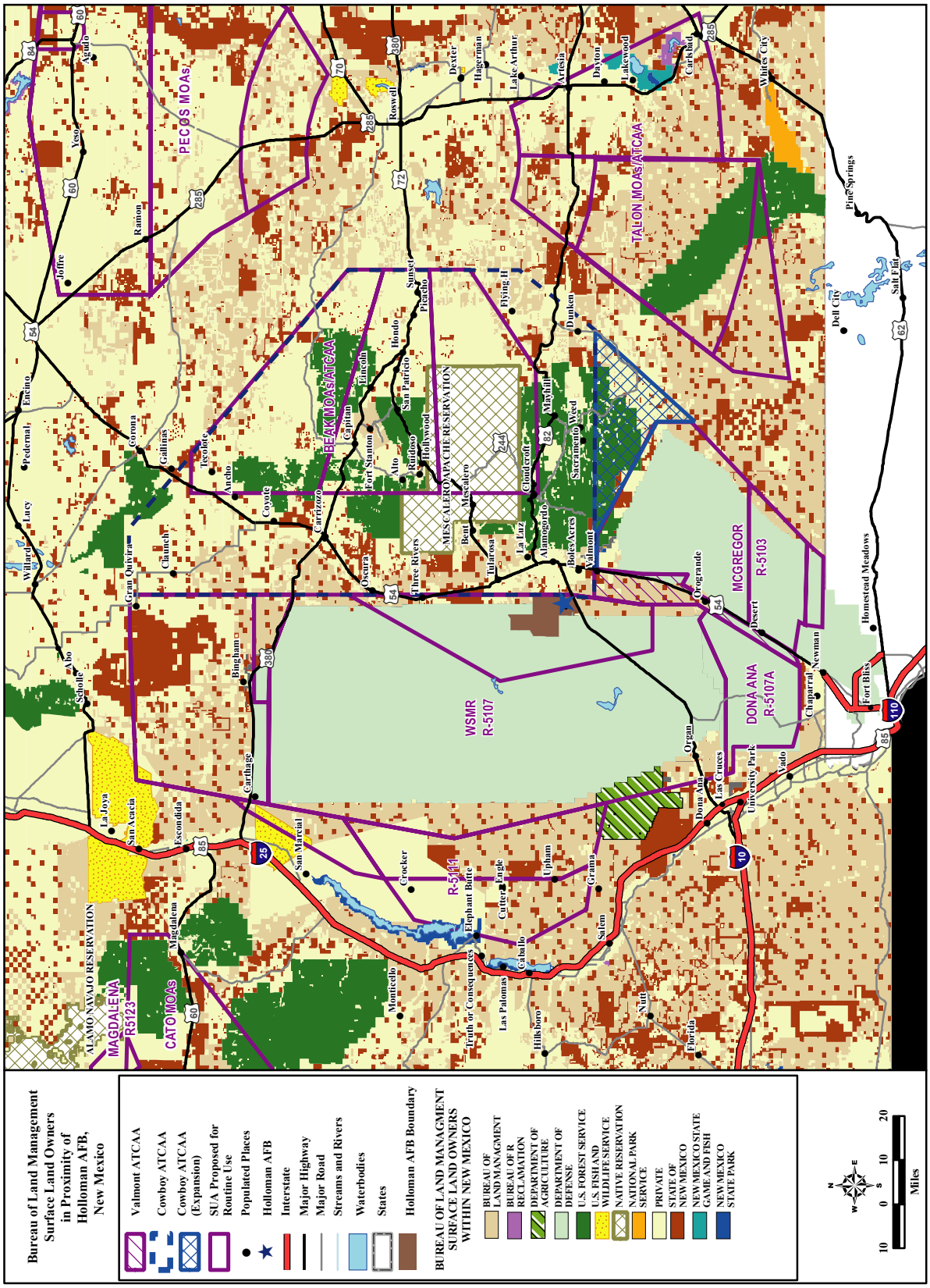


Figure 4.8-1. Land Ownership under Training Airspace

Table 4.8-1. Special Use Areas Larger than 5,000 Acres under Training Airspace

	Acres under Airspace					
	WSMR	*Cowboy ATCAA[1]*	*Expanded Cowboy ATCAA (Proposed)*	*McGregor Range*	*Valmont ATCAA (Proposed)*	*Talon MOAs/ATCAAs*
Cibola National Forest		28,000				
Lincoln National Forest		796,937	125,896	18,004		195,837
Mescalero Apache Indian Native Reservation		495,565				
Valley of Fires State Park	24,276					
Capitan Mountain Wilderness Area		35,877				
White Mountain Wilderness Area		50,595				
Wilderness Study Area	86,048	30,537	11,746	7,361		10,988
White Sands National Monument	194,759					
Bosque Del Apache National Wildlife Refuge	14,355					
San Andres National Wildlife Refuge	59,457					

Note: 1. Includes Beak A,B,C, MOAs/ATCAAs

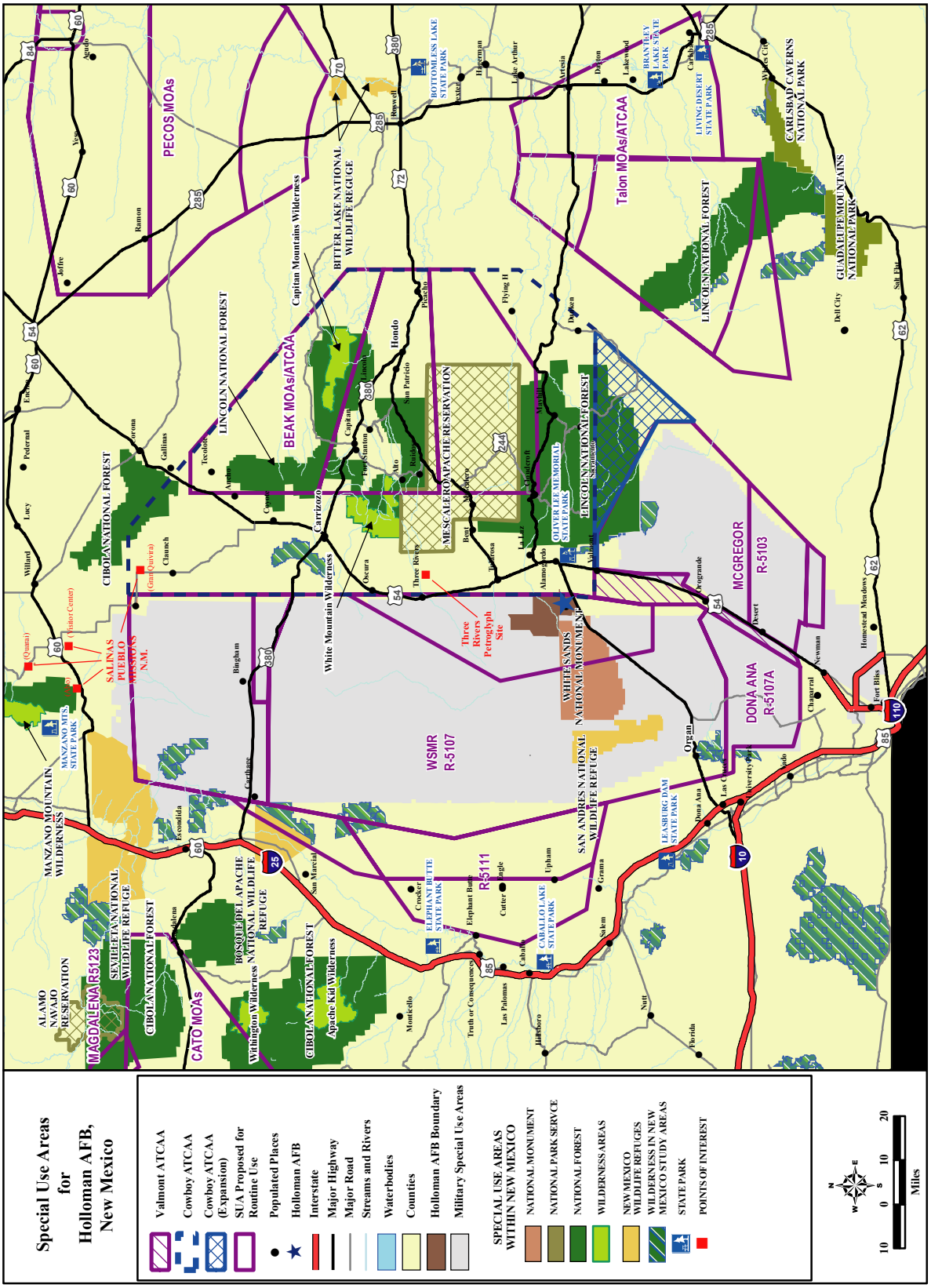


Figure 4.8-2. Special Use Areas under Training Airspace

With the exception of White Sands Test Facility, White Sands National Monument, San Andres National Wildlife Refuge, and the U.S. Department of Agriculture (USDA) Jornada Experimental Range, that are operated under co-use agreements, WSMR ranges are under the direct control of the U.S. Army on an exclusive-use basis, with unlimited use of the restricted airspace. The range is the largest overland test range available for U.S. Army, Air Force and Navy, National Aeronautics and Space Administration (NASA), and other agency or corporate ordnance, rocket, missile, and flight tests.

White Sands National Monument. Testing at WSMR often involves overflights of White Sands National Monument. WSMR has Memorandum of Understanding with the National Park Service to allow this activity over the western portion of the monument. Such tests may require the closure of U.S. Highway 70 and the evacuation of White Sands National Monument. These precautions are used during tests, under terms of agreements with the New Mexico Highway and Transportation Department and the National Park Service. Recovery operations are conducted in accordance with guidelines established by the National Park Service (U.S. Army 1998).

White Sands Test Facility. NASA's Lyndon B. Johnson Space Center is located 20 miles northeast of Las Cruces, New Mexico, on the west edge of WSMR. About 65 miles north of El Paso, Texas, it occupies approximately 60,800 acres along the western side of the San Andres Mountains in southwestern New Mexico.

White Sands Space Harbor. The White Sands Space Harbor is an airfield and operations complex built on a dry gypsum lakebed. It is located north of U.S. Highway 70 within WSMR boundaries, about 30 miles northwest of Holloman AFB, and 2.5 miles east of the San Andres Mountains. White Sands Space Harbor is scheduled for use nearly every weekday for Space Shuttle pilots to practice approach and landing maneuvers in the Shuttle Training Aircraft. Approximately 80 percent of all Space Shuttle training flights, an average of 10 per week, are conducted at White Sands Space Harbor.

San Andres National Wildlife Refuge. The San Andres National Wildlife Refuge, located within the WSMR boundary, was established in 1941 to protect the desert bighorn sheep and hosted limited ranching activity as recently as 1951. The Refuge comprises approximately 60,000 acres. There is a 2,000 feet AGL flight avoidance area over the San Andres National Wildlife Refuge.

WSMR Joint-use Areas. WSMR requires the use of adjacent areas to the west and north of the range to test ground-launched missiles that cannot be accommodated within the 40- by 100-mile main range. These "call-up" areas are BLM, State of New Mexico, and private lands used for public safety during tests, military security and, in some instances, missile impact on non-WSMR land. Land use in these areas consists primarily of livestock grazing, limited small-scale mining, and recreation.

McGregor and the Fort Bliss Training Complex

The Fort Bliss Training Complex consist of three major areas: McGregor Ranges, Doña Ana Ranges, and the North and South Training Areas. McGregor Ranges include McGregor Range, Meyer Small Arms Range, SHORAD Range, and Orogrande Range. Each of the ranges has an appropriate complement of range support facilities. Within the Fort Bliss Training Complex, there are three base camps (McGregor, Doña Ana, and Orogrande). McGregor Range is comprised of 697,472 acres, of which 71,083 acres are owned by the U.S. Army, 608,385 acres are

public lands withdrawn for military use, and 18,004 acres within the Lincoln National Forest are managed by the USDA Forest Service. McGregor Range has areas for overnight camping and other recreational uses when mission safety permits.

Doña Ana Range Camp is located about 10 miles east of Interstate 10, and 20 miles or so to the southeast of Las Cruces, New Mexico. The site is also about 20 miles west of McGregor Missile Range, and about 30 miles south Condron AAF. Doña Ana Range nearly connects the main cantonment area of Fort Bliss (through the McGregor Range) with WSMR. U.S. Highway 54 is the boundary between the McGregor and Doña Ana ranges. Doña Ana Range is comprised of 297,005 acres, 60,140 acres owned by the U.S. Army and 236,865 acres of public land withdrawn for military purposes.

Doña Ana Range includes the Multi-Purpose Range Complex – Heavy which is fully automated with computer driven scenarios. This range contains 7 target lanes with 59 armor stationary pits, 57 moving targets, and 153 stationary pop-up targets. The Doña Ana Range Complex also has 14 ranges for small arms, crew served, armor, mechanized infantry, and aerial gunnery. Doña Ana Base Camp has 6 dining facilities, 2 available maintenance facilities, and the capability to billet 1,100 personnel.

Cowboy/Expanded Cowboy ATCAA and Beak MOA/ATCAAs

Centered on the White Mountains, lands in this area include BLM, private and State of New Mexico grazing lands, USDA Forest Service lands, and the Mescalero Apache Reservation. The Cibola and Lincoln National Forests underlie the airspace with large areas used for timber, grazing, and all types of seasonal recreation. These National Forests include Wilderness and Wilderness Study Areas. The Mescalero Apache Indian Reservation, Inn of the Mountain Gods resort, and Ski Apache are under this airspace (see Section 4.7). The mountain villages and rural communities have an economy built on tourism, second homes, and diversified recreation ranging from major gaming facilities to horse racing at Ruidoso Downs to back country adventures.

Talon MOAs/ATCAA

Land ownership is primarily of BLM, then Lincoln National Forest, New Mexico State, and private lands used for grazing, oil and gas production, and agriculture along the Pecos River. Brantley State Park and the Living Desert State Park are under the Talon MOAs.

4.8.2 Environmental Consequences

The Air Force expects the F-22A to routinely use the training airspace associated with Holloman AFB in a manner substantially different from the F-117s. The F-22A will fly supersonic regularly train at altitudes in excess of 30,000 feet, and use defensive chaff and flares. All these are different from the current 49 FW aircraft. These training activities have a potential to affect lands under the airspace. Supersonic flights will result in sonic booms throughout the airspace, but with over 90 percent of the supersonic activity above 30,000 feet AGL, the sonic booms will cover a large area at low intensity. The Proposed Action increases sonic booms from an existing 1 to 2 per month to 30 per month toward the center of the Cowboy ATCAA. This could annoy some people involved in recreational activities. Chaff and flare residual materials are not expected to have a physical (Section 4.5) or biological (Section 4.6) impact, but a person finding and identifying a residual piece of nylon, aluminum-coated mylar wrapping, or plastic piece in an unanticipated location could be annoyed.

Sonic booms or training with chaff and flares are not expected to change land use patterns or management, but they could affect some perceived environmental characteristics associated with recreation and would be expected to leave an estimated 1 to 6 percent of the population highly annoyed.

Under the Proposed Action, subsonic noise is not expected to noticeably change except in the southern WSMR, Doña Ana, and McGregor Range areas. In these two areas, average noise levels will increase, but not approach the level of 55 dB (see Section 4.2). It is unlikely the land use patterns, ownership, or management practices would be affected by the use of the airspace for F-22A training.

WSMR airspace flight activities would increase sonic booms from the existing 8 to 10 per month to a projected 10 to 45 per month. On Doña Ana and McGregor, sonic booms would increase from an existing zero booms to a projected 5 to 15 per month.

These changes would likely be noticed over each of the ranges. Range residents and visitors would experience more sonic booms as a result of the Proposed Action. Individuals there on military business are less likely to be annoyed by the increase in supersonic activities. Specific management goals for special use areas under the airspace may be difficult to be met and the increase in supersonic activity could be perceived by visitors to special use areas as an unwanted intrusion. The increased frequency and potential of sonic booms would not be expected to affect land use patterns or ownership; however, the increase could cause annoyance to some residents and visitors.

Defensive chaff and flare residual materials described in Appendices B and C. Fire risk associated with flare use would be minimized by restrictions on use during very high or extreme fire conditions and minimum altitude release of 2,000 feet AGL.

4.8.3 Alternative A

Alternative A would reduce sonic booms to 5 or fewer per month under all airspaces except WSMR. Under WSMR, the number of sonic booms would increase to 80 per month toward the center of the airspace and 5 to 15 per month in cities such as Alamogordo and the northern part of El Paso. This level of sonic booms would very likely be perceived as a disturbance and an annoyance to workers, residents, and visitors to locations under the airspace. White Sands National Monument may choose to modify land use management practices based on the changes in the noise environment.

4.8.4 No Action

Under the No Action Alternative, the Air Force would continue to use the training airspace with Holloman AFB-based aircraft. No changes associated with aircraft overflights and aircraft noise to special land use or recreational areas would be anticipated.

4.9 Socioeconomics

The definition of socioeconomics is included in Section 2.8.9.

4.9.1 Existing Conditions

Socioeconomic factors are associated with the human environment, including population and economic activity. Economic activities on lands under the affected airspace are those associated with a sparsely settled rural area containing local communities serving government,

agricultural, resource extraction, recreation, and related businesses. With the exception of the Cowboy ATCAA, rural lands comprise an estimated 95 percent of the affected region and population density is less than one person per square mile. Communities under the Cowboy ATCAA reflect the higher population density on Table 4.9-1. The average household size in the affected areas is approximately 2.6 persons per household. This is essentially the same as the state and national average household sizes of 2.63 and 2.59 persons per household, respectively. Housing vacancy rates are affected by the large number of second homes in the White Mountains. In communities such as Alamogordo, vacancy rates are in the 6 percent range. Vacancy rates driven by secondary homes under the Cowboy ATCAA are estimated to be in the 15 to 20 percent range.

Table 4.9-1. Socioeconomic Characteristics of Affected Regions

	2004 Population	*Population Density/ sq. mi.*	*Housing Units*	*Employment*
Cowboy ATCAA	77,291	9.9	42,281	28,083
Cowboy ATCAA Extension[1]	1,900	2.2	800	950
McGregor Range[1]	40	0.05	12	300
Valmont ATCAA (new) [1]	600[2]	3.0	120	200
Doña Ana Range[1]	1,000	2.0	500	2,000
WSMR (Remaining Airspace) [1]	3,000	0.5	2,000	5,600
Talon MOA[1]	38,000	2.7	15,000	18,000

Notes: 1. Estimated.
2. Includes correctional facility.
Source: Census 2000a, 2005.

Economic activity in the regions under the training airspace revolves primarily around New Mexico's natural resources and recreation. While government and government enterprises provide many jobs in these regions and provide a measure of stability through year-round employment, recreation, agriculture and related industries are an important source of income.

Recreation areas and second homes are found in and around Ruidoso, Alto, and Cloudcroft Capitan, Lincoln, and Mahill. Year round sports opportunities exist on public, private, and tribal lands. Recreational destinations include Lincoln national Forest outdoor resources, Ruidoso Downs horse racing, the Mescalero Inn of the Mountain Gods, Ski Apache and gaming establishments.

Seasonal employment and the general rural nature of the area contribute to median household income and per capita personal income levels generally lower than state levels.

4.9.2 Environmental Consequences

A number of communities are under the training airspace used by Holloman-based aircraft. The proposed action would not result in any discernible change to subsonic noise except over the very sparsely populated southern portion of WSMR and the McGregor Range. All areas would have subsonic noise below the 55 dB range. The F-22A generally flies at higher altitudes

and would not have as many night sorties as the F-117A. The resulting average noise levels from subsonic aircraft activity would have no environmental effects on socioeconomic activities.

The exception is in the area of sonic booms. The supersonic capabilities of the F-22A permit it to fly at supersonic speed an estimated 25 percent of its training mission. Although the F-22A spends most of its time at higher altitudes and the energy from sonic booms is likely to dissipate, there would be a noticeable increase in sonic booms from the existing 1 to 2 per month to an estimated 30 per month toward the center of the Cowboy ATCAA and 45 booms per month toward the center of WSMR. The nature of sonic booms is such that they can be heard, often as a rolling thunder sound, in areas distant from the aircraft.

Economic questions raised during public scoping meetings in communities located under the airspace included the following:

- What would be the potential effects of sonic booms on recreational activities such as ski lift gondolas or hunting?
- What would be the potential effects of airspace changes on the Sierra Blanca Airport?
- What would be the potential effects on the gaming and recreational activities if the F-117As were retired and the F-22As were not beddown at Holloman AFB?
- Could flare use cause fires and impact timber harvesting or recreation?

Sonic booms or the increase in sonic booms are not expected to significantly affect recreational activities, including hunting or fishing, under the airspace. The increase of sonic booms from 1 or 2 per month to 20 to 25 per month could be viewed as an unwelcome intrusion to activities in populated areas. Ski lift gondolas are designed to withstand substantially greater overpressure than those from sonic booms (see Appendix E). Since the F-22A supersonic activity would be in excess of 23,000 MSL, and the tallest mountains in the area under Cowboy ATCAA are approximately 12,000 feet MSL, the overpressure from a sonic boom two miles above the tallest peak would not be expected to damage recreational facilities. In rare cases, sonic booms could damage windows such as those not in the best condition and vibration from sonic booms could affect fragile objects on the edges of shelves. In a rare case of a damage claim associated with a sonic boom, the Air Force has established procedures that begin by contacting a Holloman AFB Public Affairs Office.

Lowering the floor of the Cowboy ATCAA to 23,000 feet should not affect civil aviation traffic at the Sierra Blanca Airport. The current floor of the Beak MOA would not change, so the floor of special use airspace above the Sierra Blanca Airport would not change.

The expansion of the Cowboy ATCAA southward to connect to McGregor airspace is expected to have little to no impact on general aviation traffic as the floor of FL230 allows airspace for both IFR and VFR operations below that altitude. The creation of the new Valmont ATCAA between McGregor and WSMR would have no impact on general aviation traffic as the floor of the ATCAA would be at FL180, and the corridor is to narrow to allow IFR operations, hence no GA aircraft can transit the corridor above FL180 when the restricted airspace on both sides is active. The Valmont ATCAA would not be activated unless the restricted airspace on both sides of the corridor is activated.

Noise levels under the Talon MOA are not projected to change discernibly from those under the existing condition. Talon airspace would not be used for supersonic activity. There would be no effects under the Talon airspace.

Supersonic training in WSMR would produce 45 or more sonic booms per month toward the center of WSMR. Although the area is currently subject to an estimated 8 to 10 sonic booms per month, this increase could be perceived as an annoyance to visitors and resident workers at the White Sands National Monument and other areas. Sonic booms at the level of 45 per month could be noticeable to recreationists in McGregor or parts of WSMR and Doña Ana Ranges, but would not be inconsistent with activities at a military training range.

Chaff and flare use in WSMR and flare use in the Cowboy ATCAA and the other training airspaces would not be expected to affect any socioeconomic activities. Through numerous studies, chaff has never been found to be specifically harmful to wildlife, domestic animals, or humans. Chaff, comprised of fine material, dispenses widely when ejected from aircraft and can travel for long distances before settling to the ground. Once settled to the surface of the earth, chaff breaks down to constituent parts indistinguishable from soil. Chaff is highly unlikely to accumulate in quantities that would result in any negative impact to surface conditions on land or water. Furthermore, it is highly unlikely that chaff debris or residual flare components would accumulate in sufficient quantities to affect property values or land uses. Some individuals could express annoyance if a chaff or flare end cap, other plastic part, or wrapping materials were found on their property or at a recreation location, but this is not expected to affect land values or regional economics.

Flares used in training missions are designed to be fully consumed before reaching the ground. Under the Proposed Action, flare use would occur in the new and expanded airspace. The risk of fire as a result of flare use is minimal due to the low failure rate and procedures that require flare use only above 2,000 feet AGL. Concerns with fire of any cause, however, are real. Flare use would be suspended under periods of very high or extreme fire danger to reduce those concerns expressed by scoping meeting participants. The Air Force follows established procedures for claims in the unlikely event that an Air Force-caused fire should occur and subsequently damage livestock or infrastructure.

The airspace use and related activities associated with the Proposed Action are not expected to have significant adverse impacts on the human, social, or economic resources of the region. Sonic booms, and possible flare and chaff residual materials, could cause up to 6 percent of the population to be highly annoyed and specific individuals could make recreational or other decisions based on this annoyance. Overall, recreation, forestry, grazing, and other economic pursuits are not expected to experience any limitations as a result of implementation of the Proposed Action.

4.9.3 Alternative A Consequences

Alternative A would have essentially no effects under the Cowboy ATCAA, McGregor Range, or Talon MOA/ATCAA. Sonic booms in the Cowboy ATCAA would be the existing 1 to 2 per month. Under the Cowboy ATCAA, subsonic noise would be comparable to existing conditions. This would not be expected to affect economic activity under any of these airspaces.

Concentrations of all training under WSMR with Alternative A produces approximately 80 sonic booms per month over the central part of WSMR. This level of sonic booms would be expected to cause annoyance among an estimated 12 percent of visitors, residents, and

employees who work under the airspace. Vibrations associated with this number and regularity of sonic booms could affect other structures or measuring instruments located under the WSMR airspace. Although this is not expected to change overall social or economic activity under WSMR, it could affect individual decisions regarding activity on WSMR.

On the periphery of WSMR, the northern areas of El Paso, Texas, the city of Alamogordo, and other areas north, west, and southeast of WSMR would have an estimated 5 to 15 thunder-like sonic booms per month. This change in the noise environment is not expected to affect socioeconomic activity in these areas.

4.9.4 No Action

Under the No Action alternative, no changes in flight activity, facilities, or personnel are anticipated. No impacts to socioeconomic resources in communities under the training airspace would occur.

4.10 Environmental Justice

The definition of environmental justice is included in Section 2.8.10.

4.10.1 Existing Conditions

As with socioeconomics, evaluation of environmental justice includes areas around Holloman AFB, as well as geographic areas under or proximate to the training airspace. Affected lands occur in portions of the New Mexico counties identified in Section 4.9.1.

Based on 2000 Census data and estimates of current population, the incidence of persons and families in the ROI with incomes below the poverty level are generally not more than 18 percent, which is approximately the same as state levels of 18.4 percent (see Table 4.10-1). State and airspace low-income levels are higher than the national average of 12.4 percent.

Table 4.10-1. Minority and Low-Income Populations by Area (2000)

	Total Population	*Minority*	*Low-Income*	*Youth*
State of New Mexico	1,819,046	1,005,932	334,704	509,333
Cowboy ATCAA[1]	77,000	31,500	14,000	22,000
Cowboy ATCAA Extension[1]	1,900	840	350	560
McGregor Range[1]	40	18	10	10
Valmont ATCAA (new) [1]	600[2]	400	300	70
Doña Ana Range[1]	20	12	6	6
WSMR (Remaining Airspace) [1]	3,000	800	500	500
Talon MOA[1]	38,000	15,000	6,500	11,000

Notes: 1. Estimated.
2. Includes correctional facility.
Source: Census 2000a, 2005.

Minority persons represent approximately 40 percent of the regions' population. Persons of Hispanic origin are by far the largest minority group, with the Mescalero Apache Reservation representing a large Native American population under the airspace. By comparison, minority persons represent 55 percent of the state population. Youths under the age of 18 comprise

approximately 30 percent of the population under the airspace, which is comparable to 28 percent at the state level.

4.10.2 Environmental Consequences

The random nature and intensity of sonic booms throughout the area under an airspace make it impossible to avoid a specific community. Sonic boom intensity can vary from the rolling sound of distant thunder to a sharp double crack (see Section 4.2). Although the number of sonic events would be expected to increase under the Cowboy ATCAA and other airspaces, the booms would not be expected to disproportionately affect minority communities. The change in aircraft and associated increase in sonic booms would not be expected to disproportionately affect children in any specific community.

Chaff and flare use in the airspace would be random and widely dispersed. If residual flare or chaff materials were identified in areas under the airspace, there would be no disproportionate use over any minority or low-income populations.

4.10.3 Alternative A

Alternative A would continue the number of monthly sonic booms under the Cowboy ATCAA at 1 to 2 per month. This level of sonic booms is not expected to disproportionately affect minority or low-income populations or children. Any populations living under or working under the existing WSMR supersonic airspace would be impacted by Alternative A's estimated 10 to 80 booms per month. The northern portion of El Paso, Texas, and the city of Alamogordo would have an estimated 5 to 15 sonic booms per month under Alternative A. The affected population is not expected to disproportionately be minority, low-income, or children.

4.10.4 No Action Alternative

Under the No Action Alternative, no changes in flight activity, facilities, or personnel are anticipated. No impacts to socioeconomic resources in communities under the training airspace would occur.

5.0 CUMULATIVE EFFECTS AND OTHER ENVIRONMENTAL CONSIDERATIONS

CEQ regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7).

The first step in assessing cumulative effects involves defining the scope of other actions and their interrelationship with the Proposed Action or alternatives (CEQ 1997). The scope must consider other projects that coincide with the location and timetable of the Proposed Action and other actions. Cumulative effects analyses evaluate the interactions of multiple actions.

5.1 Past, Present, and Reasonably Foreseeable Holloman Air Force Base and Other Military Actions

Past and ongoing actions

Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the ROI. As presented in Table 5.1-1, these actions were considered for their relevance to the F-22A proposal.

Each action and any published environmental documents were reviewed to consider the implication of each action and its synergy with the Proposed Action. Of particular concern were potential overlap in affected area, and project timing. As depicted in Table 5.1-1, several of these actions were considered to have potential for cumulative effects, mostly due to the overlapping region of influence of the proposed F-22A airspace arena. This is summarized below.

U.S. Air Force's Centennial Range on McGregor Range

An EIS completed in 1998 evaluated expansion of GAF operations (flying Tornado aircraft) at Holloman and construction of a new bombing range on McGregor Range of Fort Bliss, for use by units stationed at Holloman AFB. Consultation with USFWS for this action resulted in a Biological Opinion that set terms and conditions for use of military training airspace in the region and initiated a bird survey and monitoring study effort by the Air Force that is ongoing. The surveys and monitoring involve Mexican spotted owl, northern aplomado falcon, southwestern willow flycatcher, and Bald eagle under airspace in New Mexico, Texas, and western Arizona. Findings continue to be shared with USFWS, BLM, U.S. Forest Service, National Park Service, and NMGF to support updates to Recovery Plans and improvements to conservation of bird species.

Table 5.1-1. Past and Ongoing Military Actions

Action	*Environmental Documentation*[1]	*Relevance to F-22 proposal*
Expansion of German Air Force Operations at Holloman AFB, New Mexico	Air Force 1998b	Yes, ongoing operations in some overlapping airspace elements
Inactivation of 20th Fighter Squadron at Holloman AFB, New Mexico	Air Force 2004c	Yes, some airspace elements in common
Holloman Wing Infrastructure Development Outlook (WINDO) EA	Holloman AFB 2004a	Yes, ongoing construction at the Holloman AFB
New Mexico Training Range Initiative (NMTRI)	In process	No, F-22A airspace does not overlap with NMTRI airspace; however, they have some users in common
Base Realignment and Closure (BRAC) decisions for Cannon AFB	Not applicable	No, closure has been postponed, and would not affect Holloman activities or F-22 airspace
Fort Bliss, Texas and New Mexico, Mission and Master Plan Programmatic EIS	U.S. Army 2000	Yes, F-22A would use some airspace scheduled by Fort Bliss
Fort Bliss, Texas and New Mexico, Mission and Master Plan Supplemental Programmatic EIS	In process	Yes, F-22A would use airspace scheduled by Fort Bliss
Future Combat System Initial Integration Phase EA	In process	Yes, F-22A would use airspace overlying WSMR
Draft Programmatic EIS for Defense Threat Reduction Agency (DTRA) Activities on WSMR	Defense Threat Reduction Agency 2006	Yes, F-22A would use airspace overlying WSMR
Joint Training Exercise (JTX) Roving Sands	U.S. Army Forces Command 1999	Yes, F-22A would use airspace scheduled by Fort Bliss and WSMR

Note: 1. Full citations are provided in Section 6.0, References, of this Draft EA.

The Air Force issued a Final EA in September 2004, entitled "Inactivation of 20 Fighter Squadron and F-4F Training by German Air Force at Holloman Air Force Base, New Mexico." This removed 17 F-4 aircraft from the inventory when the GAF ended its F-4 pilot training program. This action reduced flights in the Beak and Talon MOAs near Holloman AFB by 50 to 60 percent (Air Force letter 16 July 2004 included in the Final EA referenced above), and slightly reduced operations in the Pecos MOA. It also resulted in a reduction in sorties along MTRs associated with Holloman AFB by 111 per year. The action also resulted in loss of about 180 jobs on base and reduction in aircraft operations at the airfield (Holloman AFB 2004c).

The Holloman AFB Wing Infrastructure Development Outlook Plan (WINDO) documents known projects required at Holloman AFB in support of the current mission. Most of the new

construction recently has occurred in the south and southwest part of the airfield. In general, the projects improve circulation and mission facilities and functions. Some projects are aimed at improving safety for flight operations by clearing and grading the clear zones areas to meet safety standards. A small reduction in wetlands developed in storm drainage channels has recently occurred. Using measures to minimize impacts, the analysis concluded no significant impact. Holloman would incorporate any measures that may be required by the USACE for affected wetlands.

As an active military installation, Holloman AFB undergoes changes in mission and training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the base requires new construction, facility improvements, infrastructure upgrades, and maintenance and repairs on an ongoing basis. Although such known construction and upgrades are a part of the analysis contained in this EA, some future requirements cannot be predicted. As those requirements surface, future NEPA analysis will be conducted, as necessary. Other recent or ongoing actions on Holloman AFB include:

- Installation of new perimeter fencing around the F-117A enclave as part of anti-terrorism protection requirements.
- Repairs along 2 miles of 49er Avenue. The projected resurfaced, widened and added paved shoulders to the roadway.
- The 49 MMG is undertaking a phased development of the 49 MMG compound (also known as the BEAR Base Area) over the next several years. Construction projects would alleviate existing shortfalls, improve operating conditions, and keep pace with anticipated mission demands in the future. The compound occupies the land between the proposed MPC and the F-117A area. Short-range projects include constructing a K-Span training area and utility element, repairing the ramp and some roadways, constructing an access road to mobility area, enclosing a drainage ditch, and expanding Building 953. Future development would expand ramp, mobility, training, and storage areas within the compound and to the south and east of the existing area. Long-term redevelopment could expand the BEAR Base Area on the south side of the airfield.
- A new 18-hole golf course.
- The Military Family Housing project involves extensive redevelopment of family housing on Holloman AFB over the next several years. Most of this activity would occur in the general vicinity of the existing family housing areas in the southeast corner of the base. About 970 existing units are being demolished and 1,063 new units constructed. There would be a net increase of 93 family housing units on base.
- In the fall of 2004, saltcedar lining the ditch in the south clear zone was treated with the herbicide Arsenal. Removal of the stumps should follow after two years, and will create a body of open water where none previously existed.
- Holloman AFB may pursue a project to repair and replace a portion of one of its water supply pipelines located within the city of Alamogordo.

The Defense Base Realignment and Closure (BRAC) Commission received and considered a May 2005 recommendation from the Secretary of the DoD to close Cannon AFB, in eastern New Mexico. A final report (September 2005) from the Commission to the President recommended Cannon AFB remain open as an enclave until at least December 31, 2009, and that the 27th

Fighter Wing be disestablished. In the interim, the Secretary of Defense is to seek other missions for possible assignment thus enabling Cannon to revert from enclave status to the status appropriate for the designated mission.

The New Mexico Training Range Initiative is a proposal for Cannon AFB. A Draft EIS is currently being prepared and analyzes the potential environmental consequences of providing more realistic training opportunities for the 27th Fighter Wing and the New Mexico Air National Guard in Cannon AFB-managed airspace. NMTRI includes modifying the configuration of existing airspace, creating new airspace, authorizing supersonic flight above 10,000 feet MSL in the airspace, or about 5,000 to 6,000 feet AGL, and expanding the use of defensive countermeasures (chaff and flares) into the new and modified airspace. The Proposed Action would expand the size, operational altitudes, and usefulness of the Pecos MOA and associated ATCAA. The resulting airspace would allow pilots to train in the full range of missions and tactics they require to prepare for combat, including supersonic simulated weapons delivery and defensive maneuvers. The New Mexico Training Range Initiative airspace does not overlap with the F-22A airspace area.

THE INTRODUCED ORYX HAS ADAPTED TO THE TULAROSA BASIN ON MCGREGOR RANGE AND OTHER AREAS.

Fort Bliss is currently updating its Mission and Master Plan and preparing a supplemental EIS. This effort evaluates proposed changes in land use on its 1.1-million acre training area complex. The action addresses changes needed to support training of a Heavy Armored Division assigned to Fort Bliss under BRAC and other Army transformation initiatives. While some units currently at Fort Bliss will leave, four heavy Brigade Combat Teams and a combat aviation brigade will arrive over the next 4 years. The proposal expands the areas used for off-road vehicle maneuvering from about 335,000 acres to 687,000 acres. With this, the level of use of the training complex would increase. To meet increased training demands, Fort Bliss also proposes to construct several new weapons ranges to serve specific functional training requirements. Extensive redevelopment will occur on the Main Cantonment area located in the City of El Paso, Texas, involving about 4,000 acres, and 22 million square feet of new construction. The action would increase Fort Bliss personnel from 25,400 (in FY 2005) to about 47,500 by FY 2010. The associated effects from projected increase in soldiers and other support personnel and family members are also being evaluated. The overall region affected by this action is west Texas and southern New Mexico.

White Sands Missile Range is currently evaluating a proposal to support initial operations for the Future Combat System maneuver-to-test program. The test program will evaluate system components in phases, so that they can be fielded into the Current Force as soon as possible. Test activities would require limited use of the southeast portion of WSMR for off-road track vehicles operations, as well as use of existing roads, trails and developed sites on WSMR. Test activities would take place over the next few years. The test program would use soldiers from active training units in the test phases so that the dimension of soldier performance can be part of the feedback in system development and refinement. Some test events would schedule WSMR restricted airspace for aircraft overflights, unmanned aerial vehicles, acquiring targets, and use of countermeasures. The initial phase for Future Combat System would use portions of

the southeast area of WSMR (below U.S. Highway 70) that do not have critical habitat or threatened and endangered species. These areas and activities would overlap with areas identified for F-22A training both for the Proposed Action and Alternative A.

The **Defense Threat Reduction Agency** is proposing to expand existing weapons effect test facilities and construct new ones on WSMR, and to expand the range of test types performed at WSMR. Most of the facilities and tests take place in the northern part of WSMR. Some tests involve the use of weapons delivered from aircraft, and require scheduled use of airspace. Some tests involve the use of high explosives, lasers, electromagnetic pulse devices, chemical, biological, and radiological simulants, and unmanned devices. These areas and activities would overlap with areas identified for F-22A training both for the Proposed Action and Alternative A.

JTX Roving Sands is an annual joint-services exercise in New Mexico and Texas sponsored by the U.S. Army. It generally takes place for one month in the spring. This exercise has included Holloman AFB-managed airspace and aircraft in the past. The exercise also involves ground and airspace use at WSMR and Fort Bliss, New Mexico. A variety of aircraft, including helicopters, may use restricted and military airspace during such an exercise. The exercise has been less frequent in recent years and its future requirements and size are unknown. These areas and activities would overlap with areas identified for F-22A training both for the Proposed Action and Alternative A.

5.2 Other Federal, State, and Local Actions

Other past, current, and future federal actions in the area could also contribute to cumulative effects of the Proposed Action or alternatives. Federal agencies with jurisdiction within the ROI include the BLM, USFWS, FAA, Federal Highway Administration, and Federal Energy Regulatory Commission. Potential actions, within the area and occurring in the same time frame as the F-22A proposal, were identified and considered in preparation of this Draft EIS.

Otero Mesa on McGregor Range.

The **BLM** manages a sizeable portion of the land within the region affected by the F-22A proposal. The primary uses in this region are oil and gas production, grazing, and dispersed recreation. There are also several specially designated areas with special resource values. BLM revises its management plans periodically to keep pace with changing conditions and demands. Recently, The Las Cruces Field Office completed a Resource Management Plan amendment and EIS for McGregor Range at Fort Bliss, an EIS was completed for Federal Fluid Minerals leasing on over 2 million acres in Sierra and Otero Counties. Currently, the Las Cruces Field Office is also preparing a plan revision and EIS for the tri-county area, including Otero, Sierra, and Doña Ana Counties in New Mexico. Parts of these areas and activities would overlap with areas identified for F-22A training both under the Proposed Action and Alternative A.

The Roswell Field Office published its *Resource Management Plan* in 1997 (BLM 1997). The BLM completed an EA for its *Fire and Fuels Management Plan Amendment*; the Decision Record was signed in September 2004. A Draft EIS is currently available for a proposal to upgrade and

operate a refined petroleum products pipeline in New Mexico. This pipeline runs through Chavez, Lincoln, and Guadalupe counties.

The **USFWS** is currently preparing an EA to evaluate the proposed release an experimental population of northern aplomado falcons in eastern New Mexico and west Texas. It is not known at this time whether aplomado falcons would be released in the ROI.

The **FAA** routinely evaluates modifications to local airports including new runways, runway extensions, and air traffic control towers. A number of projects in the area were evaluated for relevance to F-22A activities. For example, a FONSI was issued for a new airport in Vaughn. Section 3.1 describes the coordination of overlapping airspace in the vicinity of the Proposed Action.

5.3 Non-Federal Actions

Non-federal actions include State of New Mexico, county, and private projects. General ongoing state activities include oil, gas, and grazing leases on state trust lands, land exchanges, road projects, and improvements to state parks and monuments.

The New Mexico State Land Office has signed an agreement for the development of the **Southwest Regional Spaceport** on 15,000 acres of state trust lands near Upham, New Mexico, about 20 miles north of Las Cruces (New Mexico State Land Office 2006). Before construction and operations can begin, the FAA Office for Commercial Space Transportation must approve and issue a license to the operator and facility. This process involves completion of an EIS and an in-depth safety review. The facility would be adjacent to WSMR restricted airspace. An economic study projects that commercial space operations could begin by 2010, with a potential market for 65 launches in 2010, increasing to 430 by 2020 (Futron 2005). The study also projects that construction may generate about 2,460 jobs in the near-term. Once operating, space transportation could generate as much as $400 million in economic activity and over 2,500 jobs in the local and regional economy. These activities would overlap with portions of the airspaces proposed for F-22A training.

A new water **desalination plant** is being constructed on **Fort Bliss**, east of El Paso International Airport. The facility will be part of the water supply system for the City of El Paso. Several million people in the region (including southern New Mexico), west Texas, and northern Mexico) get water from underground aquifers. The supply of high-quality water is finite, while brackish water is plentiful (Hill 2005). Two other plants are in development in the region. The Tularosa Basin national Desalination Research Facility is conducting initial operations in Alamogordo. An Alamogordo Municipal Desalination Plan is proposed to treat new water sources being developed for the city. Alamogordo currently gets most of its water from spring runoff from the Sacramento Mountains, but some of this water exceeds allowable levels of dissolved solids (U.S. Water News 2001). The Alamogordo Municipal plant would process water from a well field proposed about 10 miles north of Tularosa.

5.4 Cumulative Effects Analysis

Other military actions in the region overlap in space or time with the proposed action but these overlaps have historically been handled through Army and Air Force coordinated scheduling. This scheduling has not resulted in cumulative impacts. In some cases there is potential interaction with some projects identified in 5.1. These interactions have the potential to either increase or offset possible environmental consequences. The following sections describe what

these potential outcomes may be. Due to a lack of specific description of other major actions (past, present or future), these are assessed qualitatively.

Airspace and Range Management, Noise, and Safety

Several actions have taken place at Holloman AFB over the last decade that have increased or decreased operations and changed aircraft mix. As a result, noise levels at the airfield and immediate environs have also varied. The base has sporadically experienced noise levels nearly as high as under the Proposed Action. Noise levels associated with Alternative A are higher than those generally experienced. These variations are likely to continue as part of the normal dynamics of the base in response to Air Force mission changes.

In regional airspace, the primary cumulative effects would occur over the military ranges, where the airspace is used by a variety of other users. In the future, the level of use of restricted airspace is likely to increase, requiring more coordination between airspace managers and users to meet the varying needs for test and training. Priorities in scheduling for specific uses would be an important determinant in how to allocate limited airspace resources safely. There could be an increase in civil aviation adjustments required when new ATCAA changes are activated in addition to other temporary or MOA/ATCAA airspace that is used for other activities (such as large exercises) and regional training units. Other proposed regional supersonic airspace (such as New Mexico Training Range Initiative) does not overlap with the F-22A region of impact. A future State of New Mexico Spaceport Operation could also require special airspace and times for launch and recovery events, adding to the regional increase in air traffic management.

Most other actions in the region may produce localized noise increases, primarily from ground activities (such as weapons firing ranges or construction sites), so cumulative noise impacts would be localized and primarily on federally-owned land. None of the cumulative impacts identified for airspace, ranges, noise or safety would be significant, but will likely require more coordination between regional FAA and military airspace managers.

Physical and Biological Resources

The physical and biological effects associated with the 49 FW transformation do not coincide with areas where other ground-based activities occur or may increase in the region (such as at Fort Bliss training areas). F-22A construction at Holloman would add to projected development on the base over the next few years, but none of these actions, in previously disturbed and developed areas, would cause significant impacts to water, soils, or biological resources.

Underneath affected airspace, dust and air emissions from increased activities, primarily on the military ranges, may be considerable. The net increase in air emissions from the contribution of the F-22A flying mission in combination with these other actions would be small. Cumulative dust generation is not an issue since F-22A construction would take place in a different area from the anticipated dust effects of other future actions, and would produce minimal amounts of dust and the F-22A spends nearly all training time at altitudes above the air quality mixing levels.

The 20th Fighter Squadron was inactivated at Holloman AFB in 2005 and all F-4F training by the GAF was terminated and the planes removed from Holloman AFB. These actions reduced aircraft use in the Beak and Talon MOAs by 50 to 60 percent (AF letter 16 July 2004, in GAF F-4 drawdown EA) over occupied Mexican spotted owl habitat and reduced sorties in MTRs

covered by the 1998 Biological Opinion by 111 per year (Holloman AFB 2004c). These recent developments coupled with discontinuing overflights by F-117As and accompanying T-38As associated with the Proposed Action result in a reduction in flights in the Beak and Talon MOAs. In the Proposed Action, the overflights would be replaced by the high altitude overflights of F-22As which would spend 75 percent of their time at altitudes above 30,000 feet MSL. The F-22As would fly below 5,000 feet AGL only 5 percent of their time. Flights lower than 5,000 feet AGL would most frequently be on WSMR or McGregor Range, outside of Mexican spotted owl PACs or Bald Eagle wintering habitat. Due to established limits in the Beak A, B, C MOAs and Cowboy ATCAAs which overlie Mexican spotted owl PACs and Bald Eagle wintering habitat, there would be 3,000 to 4,000 feet AGL vertical clearance of these habitats at a minimum under the Beak MOAs and 13,500 to 14,500 feet AGL clearance under the floor of the Cowboy ATCAA.

Water supply and impact on regional aquifers is a concern in the region. However, the slight drop in personnel and population from the F-22A proposal would tend to lessen demand on local surface and ground water supplies for Holloman AFB and the city of Alamogordo.

Cultural Resources

The F-22A proposal should not directly add to any adverse effects to cultural resources resulting from other projects, either recently completed, ongoing, or proposed on Holloman AFB. The number of sonic booms for the Proposed Action under the Cowboy ATCAA and on WSMR and especially the number of sonic booms on WSMR with Alternative A, could have consequences to cultural resources. Any federal project in the region that includes ground-disturbing activities has the potential to adversely affect cultural resources and is subject to NEPA compliance and Section 106 consultation. Such projects include construction, oil and gas development, off-road tracked vehicle training, pipelines or other facilities; highway work; or any other ground-disturbing undertaking that affects public land.

Land Use, Transportation, and Recreation Resources, and Socioeconomics

Proposed air operations at Holloman AFB may expose visitors and workers at White Sands National Monument to lower subsonic and substantially higher supersonic noise levels than recently experienced. These effects may also be coupled with additional future test and training activity on WSMR. Of concern may be blowing dust and additional noise.

The airspace use and related activities associated with the F-22A proposal are not expected to have significant adverse impacts on land use or ownership, or to populations or economic activity in the ROI. Recreational land use, ranching operations, oil and gas exploration and production, ongoing grazing activities, other military uses, and other economic pursuits could have individuals annoyed by the sonic booms or chaff and flare debris. These effects are not expected to change regional socioeconomic activities with implementation of the Proposed Action or Alternative A either separately or concurrent with cumulative actions.

Some test activities proposed on WSMR may be sensitive to noise and sonic booms. This could result in cumulative impacts to resources on WSMR with either the Proposed Action or, especially, Alternative A. Incompatibilities would be handled through a process of coordinated scheduling between WSMR and Holloman AFB. Under Alternative A, scheduling to meet competing demands would, at times, reduce accessibility of the WSMR airspace to one or more entities needing to use the airspace.

The incremental effects of the Proposed Action, in combination with the reasonably foreseeable future actions described in the previous sections, would need to be minimized to avoid any significant or adverse cumulative effect to land use or socioeconomics in the region. The balance of ongoing and anticipated military actions is likely to have a strong positive effect on regional economy, even though there may be local differences in effects.

The potential composite future construction projects in the region may exhaust the available labor pool and cause temporary immigration or exceed capacity of local and regional accommodation for out-of-region laborers. The positive impact of construction expenditures and temporary workers could benefit local economies but place a strain on infrastructure.

Environmental Justice

The Proposed Action or Alternative A would not cause any cumulative disproportionate impacts on minorities, low-income populations, or children in the vicinity of the base or under the airspace. Supersonic operations in regional airspace and defensive training with chaff and flare are not expected to disproportionately affect minorities or low-income populations or children. No disproportionate adverse impacts separately or cumulatively are projected on minority or low-income communities.

The incremental effects of the proposed transformation of the 49 FW, in combination with potential impacts associated with the past and reasonably foreseeable future actions described in this section, would not be expected to have any cumulative effects on minority or low-income projects and would not be expected to impact children.

5.5 Other Environmental Considerations

5.5.1 Relationship Between Short-Term Uses and Long-Term Productivity

CEQ regulations (Section 1502.16) specify that environmental analysis must address "…the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Special attention should be given to impacts that narrow the range of beneficial uses of the environment in the long-term or pose a long-term risk to human health or safety. This section evaluates the short-term benefits of the proposed alternatives compared to the long-term productivity derived from not pursuing the proposed alternatives.

A short-term use of the environment is generally defined as a direct consequence of a project in its immediate vicinity. Short-term effects could include localized disruptions and higher noise levels. Under the F-22A Proposed Action or Alternative A, short-term uses of the environment would result in noise and chaff and flare debris. Chaff and flare debris would not accumulate in sufficient volume to effect environmental resources. Noise effects would be short term and would not be expected to result in permanent damage or long-term changes in wildlife and livestock productivity or habitat use.

The F-22A proposal largely involves minor changes in airspace and would not impact the long-term productivity of the land. Use of chaff and flares would not negatively affect the long-term quality of the land, air, or water. Airspace changes are procedural and do not affect long-term productive use of natural resources.

5.5.2 Irreversible and Irretrievable Commitment of Resources

NEPA CEQ regulations require environmental analyses to identify "...any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented" (40 CFR Section 1502.16). Primary irreversible effects result from permanent use of a nonrenewable resource (e.g., minerals or energy). Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., disturbance of a cultural site) or consumption of renewable resources that are not permanently lost (e.g., old growth forests). Secondary impacts could result from environmental accidents, such as explosive fires. Natural resources include minerals, energy, land, water, forestry and biota. Nonrenewable resources are those resources that cannot be replenished by natural means, including oil, natural gas and iron ore. Renewable natural resources are those resources that can be replenished by natural means, including water, lumber and soil.

For the Proposed Action or Alternative A, most impacts are short-term and temporary, or longer lasting but negligible. Short-term reactions of wildlife or livestock could include temporary shifts in habitat use or activity, but long-term habituation is expected. Military training necessarily involves consumption of nonrenewable resources, such as gasoline for vehicles and jet fuel for aircraft. No irreversible or irretrievable effects are expected for cultural resources or other natural resources, including land and water.

Secondary impacts to natural resources could occur in the unlikely event of an accidental fire, such as caused by an aircraft mishap. However, while any fire can affect agricultural resources, wildlife, and habitat, the increased risk of fire hazard due to operations under the Proposed Action or Alternative A is very low.

6.0 REFERENCES

Air Combat Command (ACC). 1997. U.S. Air Force, Headquarters Air Combat Command. 1997 Environmental Effects of Self-Protection Chaff and Flares, Final Report. U.S. Air Force, Langley Air Force Base, Virginia. August.

_____ . 2004. Air Combat Command. 2004. Noise Contours for Holloman Air Force Base (DNL). Vector Digital Data: ESRI Shapefile. Holloman Air Force Base, New Mexico.

_____ . 2006. Draft Description of the Proposed Action and Alternatives, Annual Aircraft Operations Holloman AFB, New Mexico.

Air Force Safety Center. 2002. Class A Mishaps by Year 1973-2000 and Wildlife Strikes By Year 1985-2002. http://safety.kirtland.af.mil/AFSC/BASH/stats

_____ . 2004. Class A Mishaps and Wildlife Strikes http://safety.kirtland.af.mil/AFSC/BASH/stats

Air National Guard. 1996. Draft Environmental Impact Statement for the Colorado Airspace Initiative. Appendix H: Ambient Noise Monitoring Survey. Air National Guard, National Guard Bureau. March.

Alamogordo Chamber of Commerce. 2004. Alamogordo Chamber of Commerce 2004. Alamogordo Community Profile http://alamogordo.com/profile/index.html

Bailey, R.G. 1995. Descriptions of the Ecoregions of the United States: 313 Colorado Plateau Semidesert Province. USDA Forest Service. Arizona, New Mexico, Utah. Available at: http://www.nearctica.com/ecology/ecoreg/313.htm

Bowles, Dr. Ann. 2006. Personal communication.

Bowles, A.E., and M.D. Seddon. 1994. Effects of Simulated Sonic Booms on the Hatchability of White Leghorn Chicken Eggs. Armstrong Laboratory, Air Force Materiel Command, Brooks Air Force Base, TX. AL/OE-TR-0179.

Brown, B.T., G.S. Mills, C. Powels, W.A. Russell, G.D. Therres, and J.J. Pottie. 1999. The Influence of Weapons-Testing Noise on Bald Eagle Behavior. Journal of Raptor Research 33(3):227-232.

Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). *In* The Birds of North America, No. 506 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Bureau of Business and Economic Research. 2000a. Population estimates for New Mexico counties and incorporated places. Prepared by University of New Mexico Bureau of Business and Economic Research based on data from U.S. Bureau of the Census Population Division.

_____ . 2005. Population estimates for New Mexico counties and incorporated places. Prepared by University of New Mexico Bureau of Business and Economic Research based on data from U.S. Bureau of the Census Population Division.

Bureau of Land Management (BLM). 1997. Roswell Approved Resource Management Plan and Record of Decision. Roswell Resource Area, Roswell District, Roswell, New Mexico. Department of the Interior. October.

Committee on Hearing, Bioacoustics, and Biomechanics for the National Academy of Sciences. 1981. "Assessment of Community Noise Response to High-Energy Impulsive Sounds," Report of Working Group 84, Committee on Hearing, Bioacoustics and Biomechanics, Assembly of Behavioral and Social Sciences. National Research Council, National Academy of Sciences. Washington, DC.

Corral, R.D., A.W. Leary, and B. Locke. 2001. Endangered Species Management Plan for the Northern Aplomado Falcon (*Falco femoralis septentrionalis*). Fort Bliss Texas. Pages D-9-D-19 In Fort Bliss INRMP (See United States Army 2001).

Defense Threat Reduction Agency. 2006. Draft Programmatic EIS for Defense Threat Reduction Agency (DTRA) Activities on WSMR.

Delaney, D.K.; T.G. Grubb, P. Beier, L.L. Pater, M.H. Reiser. 1999. Effects of helicopter noise on nesting Mexican spotted owls. Journal of Wildlife Management. 63: 60–76.

Delaney, D.K., T.G. Grubb, and L.L. Pater. 1997. Effects of Helicopter Noise on Nesting Mexican Spotted Owls. Project Order No. DE P.O. 95-4, U.S. Air Force, Holloman Air Force Base, New Mexico.

Dick-Peddie, W.A. 1993. New Mexico Vegetation: Past, Present, and Future. University of New Mexico Press. Albuquerque, New Mexico.

Ellis, D.H., C.H. Ellis, and D.P. Mindell. 1991. Raptor Responses to Low-Level Jet Aircraft and Sonic Booms. Environmental Pollution 74:53-83.

Espmark, Y., L. Falt, and B. Falt. 1974. Behavioral Responses in Cattle and Sheep Exposed to Sonic Booms and Low-altitude Subsonic Flight Noise. The Veterinary Record 94:106-113.

Fidell, S., P. White, and M. Sneddon. 2003. Monitoring of Aircraft Noise in the Owyhee and Jarbidge MOAs, prepared by Fidell Associates, Inc., for Science Applications International Corporation, September.

Finegold, L.S.; C.S. Harris, H.E. v on Gierke. 1994. Community Annoyance and Sleep Disturbance: Updated Criteria For Assessing The Impacts Of General Transportation Noise On People. Noise Control Engineering Journal, Jan-Feb 1994.

Fort Bliss. 2005. Integrated Cultural Resources Management Plan, Fort Bliss.

Frampton, K.D., M.J. Lucas, and B. Cook. 1993. Modeling the Sonic Boom Noise Environment in Military Operating Areas, AIAA Paper 93-4432.

Frampton, K.D., M.J. Lucas, and B. Cook. 1993. Modeling the Sonic Boom Noise Environment in Military Operating Areas, AIAA Paper 93-4432.

Fraser, J.D., L.D. Frenzel, and J.E. Mathisen. 1985. The Impact of Human Activity on Breeding Bald Eagles in North-Central Minnesota. Journal of Wildlife Management 49(3):585-592.

Global Security. 2006. Holloman AFB, http://www.globalsecurity.org/military/facility/holloman.htm

Grubb, T.G. and R.M. King. 1991. Assessing Human Disturbance of Breeding Bald Eagles with Classification Tree Models. Journal of Wildlife Management 55(3):500-511.

Grubb, T.G. and W.W. Bowerman. 1997. Variations in Breeding Bald Eagle Responses to Jets, Light Planes and Helicopters. Journal of Raptor Research 31(3):213-222.

Haber, J. and D. Nakaki. 1989. Sonic Boom Damage to Conventional Structures. HSD-TR-89-001. April.

Head, H.H., R.C. Kull, Jr., M.S. Campos, K.C. Bachman, C.J. Wilcox, L.L. Cline, and M.J. Hayen. 1993. Milk Yield, Milk Composition, and Behavior of Holstein Cows in Response to Jet Aircraft Noise before Milking. Journal of Dairy Science 76:1558-1567.

Hershey, R.L. and T.H. Higgins. 1976. "Statistical Model of Sonic Boom Structural Damage." FAA-RD-76-87, July.

Holloman AFB. 2001. Final Storm Water Pollution Prevention Plan for Holloman Air Force Base, New Mexico. 49 CES. January 25.

_____ . 2003. Holloman AFB Instruction 11-250; Flying Operations; Airfield Operations and Base Flying Procedures. 16 December.

_____ . 2003a. Potable Water Vulnerability and Risk Assessment. Holloman Air Force Base, New Mexico. Part I. Sanitary Survey and Contingency Response. Alamogordo, New Mexico. September.

_____ . 2004a. Wing Infrastructure Development Outlook (WINDO). U.S. Air Force, 49th Fighter Wing Holloman Air Force Base. Alamogordo, New Mexico. May.

_____ . 2004b. General Plan Update. U.S. Air Force, Holloman Air Force Base. Alamogordo, New Mexico. July.

_____ . 2004c. Environmental Assessment Inactivation of the 20th Fighter Squadron (German Air Force) at Holloman Air Force Base, New Mexico. U.S. Air Force, Air Combat Command. Langley Air Force Base, Virginia. September.

_____ . 2005a. Holloman Air Force Base Integrated Cultural Resources Management Plan. 49 CES/CEVA.

_____ . 2005b. Holloman Air Force Base Economic Impact Statement 2005. 49th Fighter Wing Public Affairs, Holloman AFB, New Mexico.

_____ . 2006. Bird Aircraft Strike Hazard Plan.

Institute for Policy & Economic Development. 2002. 2002 Economic Impact of Holloman Air Force Base (HAFB) on Otero County.

Jagielski, K. and J. O'Brien. 1994. Calculations Methods for Criteria Air Pollution Emission Inventories. USAF, Armstrong Laboratory, AL/OE-TR-1994-0049. Brooks Air Force Base, Texas.

Johnson, C.L. and R.T. Reynolds. 2002. Responses of Mexican Spotted Owls to Low-flying Military Jet Aircraft. USDA Forest Service Rocky Mountain Research Station Research Note RMRS-RN-12. 4 pages. January 2002

King, K.W., D.L. Carver, and D.M. Worley. 1998. *Vibration Investigations of the Museum Building at White Sands National Monument, New Mexico.* U.S. Department of the Interior Geological Survey. Open-File Report 88-544

Krausman, P.R., M.C. Wallace, K.L. Hayes, and D.W. DeYoung. 1998. Effects of Jet Aircraft on Mountain Sheep. Journal of Wildlife Management 62(4):1246-1254.

Lucas, M.A. and P.T. Calamia. 1996. Military Operations Area and Range Noise Model: MR_NMAP User's Manual. Wright-Patterson AFB, Ohio, AL/OE-MN-1996-0001.

Luz, G.A. and J.B. Smith. 1976. Reactions of Pronghorn Antelope to Helicopter Overflight. Journal of the Acoustical Society of America 59(6):1514-1515.

Manci, K.M., D.N. Gladwin, R. Villella, and M. Cavendish. 1988. Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: a Literature Synthesis. U.S. Fish and Wildlife Service National Ecology Research Center, Ft. Collins, CO. NERC-88/29.

McArthur, R.A., R.H. Johnson, and V. Geist. 1979. Factors Influencing Heart Rate in Free-Ranging Bighorn Sheep: A Physiological Approach to the Study of Wildlife Harassment. Canadian Journal of Zoology 57:2010-2021.

National Park Service. 2006. Salenias Pueblo Missions Accessed April 14, 2006. http://www.nps.gov/sapu/

Natural Resources Conservation Service (NRCS). 1998. National Resources Conservation Service. Soil Information for Environmental Modeling and Ecosystem Management, Western Range and Irrigated Region (D). http://www.soilinfo.psu.edu/soil_lrr/. Accessed May 3.

New Mexico Administrative Code. 2006. Ambient Air Quality Standards. New Mexico Administrative Code, Title 20, Chapter 2, Part 3. Effective 10/31/2002. http://www.nmenv.state.nm.us/aqb/regs/20_2_03nmac_103102.pdf, last updated January 26, 2006.

New Mexico Department of Game and Fish (NMGF). 2004. Biota Information System of New Mexico (BISON-M) database. New Mexico Department of Game and Fish, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, U.S. Forest Service and the University of New Mexico. Available at: http://nmnhp.unm.edu/bisonm/bisonquery.php.

New Mexico Discoveries. 2006. http://www.pieceoftheblock.com/New_Mexico_pages/South.htm

New Mexico Natural Heritage Program and White Sands Missile Range Environment and Safety Directorate. 2002. White Sands Missile Range Integrated Natural Resources Management Plan. White Sands Missile Range, Department of the Army. White Sands, New Mexico 99002-5048.

New Mexico Department of Labor. 2005. New Mexico Department of Labor, Economic Research and Analysis. Table A: Civilian Labor Force, Employment, Unemployment and Unemployment Rate 2005.

Otero County Economic Development Council. 2004. Economic information, Otero County, New Mexico.

Page, J.A., B.D. Schantz, R. Brown, K.J. Plotkin, and C.L. Moulton. 1994. Measurements of Sonic Booms Due to ACM Training in R2301 W of the Barry Goldwater Air Force Range. Wyle Research Report WR 94-11.

Palmer, A.G., D.L. Nordmeyer, and D.D. Roby. 2003. Effects of Jet Aircraft Overflights on Parental Care of Peregrine Falcons. Wildlife Society Bulletin 31(2):499-509.

Plotkin, K.J. 1996. PCBoom3 Sonic Boom Prediction Model: Version 1.0c, Wyle Research Report WR 95-22C. May.

Plotkin, K.J., C.L. Moulton, V.R. Desai, and M.J. Lucas. 1992. Sonic Boom Environment under a Supersonic Military Operations Area. *Journal of Aircraft* 29(6): 1069-1072.

Plotkin, K.J., V.R. Desai, C.L. Moulton, M.J. Lucas, and R. Brown. 1989. Measurements of Sonic Booms Due to ACM Training at White Sands Missile Range. Wyle Research Report WR 89-18.

Schultz, T.J. 1978. Synthesis of Social Surveys on Noise Annoyance. *Journal of the Acoustical Society of America*, Vol. 64, pp. 377-405. August.

Soil Conservation Service. 1980. Major Land Resource and Subresource Areas, New Mexico. Map and subresource area descriptions. U.S. Department of Agriculture. June.

Stadelman, W.J. 1958. The Effect of Sounds of Varying Intensity on Hatchability of Chicken Eggs. Poultry Sciences 37:166-169.

Stalmaster, M.V. and J.L. Kaiser. 1997. Flushing Responses of Wintering Bald Eagles to Military Activity. Journal of Wildlife Management 61(4):1307-1313.

Stockwell, C.A., G.C. Bateman, and J. Berger. 1991. Conflicts in National Parks: A Case Study of Helicopters and Bighorn Sheep Time Budgets at the Grand Canyon. Biological Conservation 56:317-328.

Sutherland, L.C. 1990. Effects of Sonic Boom on Structures, Lecture 3 of Sonic Boom: Prediction and Effects, AIAA Short Course, October.

Sutherland, L.C., R. Brown, and D. Goerner. Evaluation of Potential Sonic Boom Damage to Unconventional Structures. HSD-TR-90-021, April 1990.

United States Air Force (Air Force). 1972. Aircraft Accident Analysis for AICUZ. HQ Strategic Air Command. Langley Air Force Base, Maryland.

_____ . 1993. The Impact of Low Altitude Flights on Livestock and Poultry. AF Handbook, Volume 8.

_____ . 1998a. Interim Guide for Environmental Justice with the Environmental Impact Analysis Process.

_____ . 1998b. Proposed Expansion of German Air Force Operations At Holloman AFB, New Mexico, Final Environmental Impact Statement, Vol. 1. Alamogordo, NM. April

_____ . 2005a. The Holloman Air Force Base Environmental Restoration Program Management Action Plan.

_____ . 2005b. The Holloman Air Force Base Environmental Restoration Program Site Status Summaries.

United States Army. 1998. White Sands Missile Range, Range-wide Environmental Impact Statement. Headquarters Department of the Army, Office of the Chief of Staff of the Army, Test and Evaluation Management Agency.

_____ . 2000. Fort Bliss, Texas and New Mexico, Mission and Master Plan Programmatic EIS.

_____ . 2001. Fort Bliss Integrated Natural Resource Management Plan. Fort Bliss, El Paso, Texas.

United States Army Forces Command. 1999. Joint Training Exercise (JTX) Roving Sands. New Mexico.

United States Bureau of Economic Analysis. 2004b. Regional Economic Profile for Otero County, New Mexico. Table CA30 http://www.bea.doc.gov/bea/regional/reis

_____ . 2005. U.S. Bureau of Economic Analysis. Table CA30 Regional Economic Profile for Otero County, New Mexico. Available at http://www.bea.doc.gov/bea/regional/reis.

United States Bureau of Land Management. 2005. Draft McGregor Range RMPA Environmental Impact Statement. U.S. Bureau of Land Management, Las Cruces Field Office. Las Cruces, New Mexico. http://www.nm.blm.gov/lcfo/mcgregor/docs/Draft%20RMPA_EIS_01_05_low.pdf

United States Census Bureau. 2000a. Highlights from the Census 2000 Demographics Profiles for Alamogordo, New Mexico. http://alamogordo.com/pr/ofile/index.html

_____ . 2000b. Highlights from the Census 2000 Demographics Profiles for Alamogordo, New Mexico. http://alamogordo.com/profile/index.html

_____ . 2000c. Highlights from the Census 2000 Demographics Profiles for Alamogordo, New Mexico. http://alamogordo.com/pr/ofile/index.html

_____ . 2005. State and County QuickFacts for New Mexico, Otero County, City of Alamogordo. Available at http://quickfacts.census.gov.

United States Environmental Protection Agency (USEPA). 1971. Community Noise. U.S. Environmental Protection Agency, Report NTID300.3, Washington, DC.

_____ . 1974. Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare With an Adequate Margin of Safety. EPA Report 550/9-74-004.

_____ . 2006. National Emissions Inventories for the U.S. http://www.epa.gov/ttn/chief/net/, last updated on March 7, 2006.

United States Fish and Wildlife Service (USFWS). 2004. Final Designation of Critical Habitat for the Mexican Spotted Owl. 50 CFR Part 17 Endangered and Threatened Wildlife and Plants; Final rule. Federal Register 69(168): 53181-53298. Tuesday, August 31, 2004.

_____ . 1999. Interim Survey Methodology for the Northern Aplomado Falcon. New Mexico Ecological Services, Albuquerque, New Mexico.

_____ . 1998. Biological Opinion regarding Proposed Expansion of German Air Force (GAF) Operations at Holloman Air Force Base (AFB), New Mexico and the continued use of the Air National Guard's military training route (MTR) Visual Route (VR) 176. Cons. #2-22-96-F-334. May 8, 1998. From New Mexico Ecological Services Field Office, Albuquerque, New Mexico.

_____ . 1990. Recovery Plan for the Northern Aplomado Falcon. New Mexico Ecological Services, Albuquerque, New Mexico.

United States Forest Service. 1992. Report to Congress: Potential Impacts of Aircraft Overflights of National Forest System Wilderness. Prepared pursuant to Public Law 100-91, The National Parks Overflights Act of 1987.

_____ . 1999. Bald Eagle Wintering Areas GIS arc export (.e00) file. Lincoln National Forest, Alamogordo, New Mexico.

_____ . 2001. Mexican Spotted Owl Primary Activity Centers (PACs) GIS arc export (.e00) file. Lincoln National Forest Alamogordo, New Mexico.

Wasmer, F. and F. Maunsell 2005. NMPlot Computer Program. Wasmer Consulting.

Weisenberger, M.E., P.R. Krausman, M.C. Wallace, D.W. De Young, and O.E. Maughan. 1996. Effects of Simulated Jet Aircraft Noise on Heart Rate and Behavior of Desert Ungulates. Journal of Wildlife Management 60(1):52-61.

White Sands Missile Range (WSMR). 2002. White Sands Missile Range Integrated Natural Resource Management Plan. Department of the Army, White Sands, New Mexico.

Workman, G.W., T.D. Bunch, L.S. Neilson, E.M. Rawlings, J.W. Call, R.C. Evans, N.R. Lundberg, W.T. Maughan, and J.E. Braithwaite. 1992. Sonic Boom/Animal Disturbance Studies on Pronghorn Antelope, Rocky Mountain Elk, and Bighorn Sheep. Utah State University. Contract number F42650-87-0349. Submitted to U.S. Air Force, Hill Air Force Base, Utah.

Wunker , D. 2001. Personal Communication with David Wunker, New Mexico Air Quality Bureau.

Young, K.E., B.C. Thompson, R. Valdez, W.R. Gould, and A. Lafón Terrazas. 2005. Assessment of Predictive Values from the Aplomado Falcon Habitat Suitability Model: Validation Information for Conservation Planning in the Northern Chihuahuan Desert. New Mexico Cooperative Fish and Wildlife Research Unit. Las Cruces, New Mexico.

7.0 LIST OF PREPARERS

Taylor Michael Carroll, Environmental Scientist
B.S., Biology, University of California San Diego, 2000
M.S., Environmental Science and Management, Bren School of Environmental Science and Management, University of California Santa Barbara, 2005
Years of Experience: 3

Tyrone Corn, Staff Archeologist
B.S., Anthropology, University of Idaho, 1997
Years of Experience: 9

Linda DeVine, REM, Project Manager, HQ ACC/CEVP
A.S., Thomas Nelson Community College, 2001
Undergraduate Studies, Environmental Science, Christopher Newport University
Years of Experience: 21

David M. Dischner, Description of Proposed Action and Alternatives; Physical Resources
B.A., Urban Affairs, Virginia Polytechnic Institute and State University, Blacksburg, 1974
Hazardous Materials Management Certificate, University of California, Riverside, 1988
Years of Experience: 32

Michele Fikel, Environmental Planner
B.A., Geography, 1985
Years of Experience: 17

Sheri Freemuth, Environmental Planner
B.A., Political Science, Scripps College, 1982
M.C.P., City Planning, San Diego State University, 1985
Certified Planner, American Institute of Certified Planners, 1996
Years of Experience: 20

Andrew R. Gomolak, JR, 49 CES/CEV
B.S., Earth Sciences, New Mexico State University, 1978
B.A. Anthropology, New Mexico State University, 1978
Geologist, Archaeologist, NEPA Analyst
Years Experience: 28

Lorraine S. Gross, Cultural Resources
B.A., Anthropology, Pomona College, 1975
M.A., Anthropology, Washington State University, 1986
Years of Experience: 25

Deborah L. Hiller-LaSalle, Public Involvement Specialist
J.D., University of Utah, 1997
B.S., Chemistry, University of Idaho, 1992
Years of Experience: 9

Irene Johnson, Socioeconomics and Environmental Justice
B.S., Economics, George Mason University, 1989
M.A., Economics, University of Washington, 1991
Years of Experience: 16

Daniel R. King, Chief, Airspace Management, 49 OSS/OSOA
B.S., New Mexico State University, 1963
Undergraduate Studies, Business, Mechanical Engineering, NMSU
Undergraduate Studies, Industrial Arts, Eastern New Mexico University
USAF Pilot Training
F-100 Combat Crew Training
Airline Transport Pilot, Commercial multi-engine and single engine land ratings
Years of Experience: 43

Claudia Laughlin, Graphics
Years of Experience: 11

David Lingner, Air Quality Specialist
B.S., Chemistry and Mathematics, Bates College, 1978
Ph.D., Chemistry, Purdue University, 1985
Years of Experience: 21

Brent McBroom, GIS Analyst
Certified GIS Professional (by GISCI)
Years of Experience: 10

Ann Moser, Biological Resources
B.A., Biology, Washington University, 1987
M.S., Wildlife Resources, University of Idaho, 1996
Certified Wildlife Biologist, The Wildlife Society, 2002
Years of Experience: 12

Thomas W. Mulroy, Biological Resources
B.A., Zoology, Pomona College, 1968
M.S., Biology, University of Arizona, 1971
Ph.D., University of California, Irvine, 1976
Years of Experience: 30

Kenneth J. Plotkin, Wyle Labs, Deputy Director of Research and Chief Scientist
Ph.D., Aerospace Engineering, Cornell University, 1971
Years of Experience: 35

Kristi Regotti, Environmental Specialist
B.S., Political Science, Boise State University, 2001
M.P.A., Environmental and Natural Resource Policy, Boise State University, 2003
Years of Experience: 4

Brad Rock, Project Manager, Airspace Management, Safety
B.A., Biology, Virginia Wesleyan College, 1974
Years of Experience: 32

Christa Stumpf, Land Use, Transportation, and Recreation
B.S., Resource Recreation and Tourism, University of Idaho, 1995
M.S., Forest Resources and Land Use Planning, University of Idaho, 1996
Years of Experience: 10

Robert E. Van Tassel, Program Manager
B.A., Economics, University of California, Santa Barbara, 1970
M.A., Economics, University of California, Santa Barbara, 1972
Years of Experience: 34

Kimberly Wilson, Production Manager
Years of Experience: 20

William Wuest, Airspace Management and Noise
B.S., Political Science, St. Joseph's College, 1963
M.P.A., Public Administration, Auburn University, 1974
Years of Experience: 39

Acronyms and Abbreviations

°F	degrees Fahrenheit
49 FW	49th Fighter Wing
ACC	Air Combat Command
ACM	asbestos-containing material
AFB	Air Force Base
AFI	Air Force Instruction
AGE	Aerospace Ground Equipment
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
Air Force	United States Air Force
AIRFA	American Indian Religious Freedom Act
AMU	Aircraft Maintenance Unit
AOC	Area of Concern
APZ	Accident Potential Zone
AQCR	Air Quality Control Region
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
BAA	Backup Aircraft Authorization
BAI	Backup Aircraft Inventory
BASH	Bird-Aircraft Strike Hazard
BLM	Bureau of Land Management
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CWA	Clean Water Act
CZ	Clear Zone
dB	decibel
dBA	A-weighted decibel
dBC	C-weighted decibel
DoD	Department of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FL	Flight Level
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GAF	German Air Force
GBU	Guided Bomb Unit
GPS	Global Positioning System
HAP	High Accident Potential
HAZMART	Hazardous Materials Pharmacy
Hz	hertz (cycles per second)
IAP	Initial Accumulation Point
ICRMP	Integrated Cultural Resources Management Plan
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
IMIS	Information Management System
INRMP	Integrated Natural Resources Management Plan
JDAM	Joint Direct Attack Munition
LBP	lead-based paint
L_{Cdn}	C-weighted Day/Night Average Sound Level
L_{dn}	Day/Night Average Sound Level
L_{dnmr}	Onset Rate Adjusted Day/Night Average Sound Level
L_{max}	maximum sound level
LRSOW	Long Range Stand-Off Weapons
MBTA	Migratory Bird Treaty Act
MILCON	Military Construction
MOA	Military Operations Area
MSL	mean sea level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEP	non-essential experimental population
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical mile
NMGF	New Mexico Department of Game and Fish
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	Operations and Maintenance
O_3	ozone
OSHA	Occupational Safety and Health Administration
P.L.	Public Law
PAC	Protected Activity Center
PAI	Primary Aircraft Inventory
Pb	lead
PM_{10}	particulate matter less than or equal to 10 micrometers in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 micrometers in diameter
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
QD	quantity-distance
QDR	Quadrennial Defense Review
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
S&I	Safe and Initiation
SCS	Soil Conservation Service
SDB	Small Diameter Bomb
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_x	sulfur oxides
SS	Supersonic
SUA	Special Use Airspace
SWMU	solid waste management unit
SWPPP	Storm Water Pollution Prevention Plan System
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Agency
UTBNI	Up to But Not Including
VOC	volatile organic compound
WINDO	Wing Infrastructure Development Outlook
WSMR	White Sands Missile Range

Environmental Assessment

Transforming the 49th Fighter Wing's Combat Capability

America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

DRAFT

June 2006

Appendices

Table of Contents

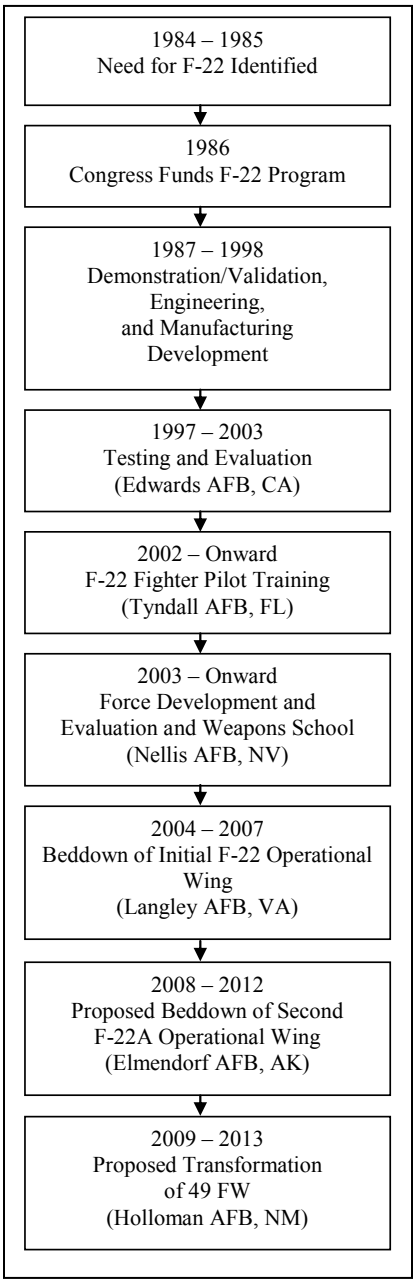
APPENDIX A F-22A DEVELOPMENT PROGRAM AND F-117A CHARACTERISTICS
APPENDIX B CHARACTERISTICS OF CHAFF
APPENDIX C CHARACTERISTICS AND ANALYSIS OF FLARES
APPENDIX D PUBLIC AND AGENCY OUTREACH
APPENDIX E AIRCRAFT NOISE ANALYSIS AND AIRSPACE OPERATIONS
APPENDIX F HOLLOMAN AFB AND REGIONAL HISTORICAL CONTEXT
APPENDIX G BIOLOGICAL RESOURCES – SUPPLEMENTAL INFORMATION
APPENDIX H AIRSPACE MANAGEMENT
APPENDIX I AIR QUALITY
APPENDIX J PHYSICAL RESOURCES

Appendix A
F-22A Development Program and F-117A Characteristics

APPENDIX A F-22A DEVELOPMENT PROGRAM AND F-117A CHARACTERISTICS

F-22A Development Program

The requirement leading to development of the F-22A was identified through the process described in Air Force Instruction (AFI) 10-601, *Mission Needs and Operational Requirements Guidance and Procedures*. During the early 1980s, the Air Force assessed its tactical capabilities against projected threats and determined that a mission deficiency for stealth penetration and air superiority would emerge in the near future. Such a deficiency could jeopardize the ability of the U.S. to ensure that its forces have the freedom of action to conduct operations against opposing forces. By 1984, the Air Force had defined the requirements for an advanced tactical fighter, presented in a *Statement of Operational Need*.



F-22A Force Development and Evaluation (FDE) flight activities began in 2003 at Nellis AFB, Nevada, after completion of Initial Operational Test and Evaluation (IOT&E) at Edwards AFB, California. FDE, like IOT&E, is a part of the overall Operational Test and Evaluation program for the F-22A. While IOT&E ensures that the F-22A meets mandatory operational capabilities, FDE tests and evaluates the aircraft and its systems to ensure that it continues to meet operational requirements for as long as the aircraft is used. FDE also explores the use of new flight techniques and tactics and develops F-22A training programs. By testing capabilities of an aircraft in tactical situations, including air-to-air, air-to-ground, and electronic combat operations, FDE provides essential input on tactics to the Weapons School and operational units. F-22A tactics developed at FDE become the training activities for operational squadrons, including the proposed two operational squadrons of the 49 FW transformation.

In 2003, the Air Education and Training Command began qualifying F-22A fighter pilots to fly the F-22A at Tyndall AFB. The Air Education and Training Command has advanced pilot training squadrons at Tyndall AFB, Florida. Members of these squadrons complete advanced F-22A pilot training to successfully perform the academic work and develop flying skills necessary to achieve instructor status. A number of these new instructor pilots are scheduled to be assigned to operational units that will receive F-22As, including the F-22A Initial Operational Wing at Langley AFB, 3 WG at Elmendorf AFB, and the 49 FW at Holloman AFB.

Operational F-22A squadrons proposed for Holloman AFB would be integrated into the Air Force's Expeditionary Air Force (EAF) Construct. The EAF Construct grew out of the need for the U.S. to deploy forces worldwide despite the reduction in U.S. overseas basing and personnel. Under the EAF, the Air Force has divided its forces into 10 AEFs and 2 Aerospace Expeditionary Wings (AEWs) to make worldwide deployments more predictable and manageable. An AEF is a "package" (group of different types of aircraft with a mixture of capabilities suited to the assigned tasking) deployed to overseas locations for about 120 days. These AEFs consist of wings or squadrons from multiple U.S. bases that operate as a unit or are integrated with other forces overseas. Pre- and/or post-deployment training, at locations other than a "home" base, also occurs for about another 45 days out of the year. Squadrons or wings at the bases are rotated into the AEF program on a 20-month cycle. Holloman AFB's F-117A squadrons are currently part of the AEF program.

On average, each squadron (18 PAI aircraft) would be deployed for 165 days every 20 months (120 days AEF and 45 days pre- or post-AEF training). In addition, each squadron would participate in training exercises and operate out of another U.S. or overseas base for an average of one week per year, flying another 220 sorties at remote locations other than Holloman AFB. Some of the F-22A sorties while deployed could involve ordnance delivery training or missile firing at approved ranges such as the Nellis Range Complex in Nevada, Utah Test and Training Range, or Eglin AFB ranges.

F-22A Training Munitions

The F-22A has the capability to carry a variety of conventional and Long Range Stand-Off Weapons for air-to-ground ordnance delivery. The F-22A can internally carry two Global Positioning System-aided 1,000-pound Joint Direct Attack Munition (JDAM) air-to-ground bombs. The new Small Diameter Bomb (SDB) (Guided Bomb Unit [GBU]-39/B) is designed to provide the F-22A with multiple targeting capabilities. Weapons training in New Mexico would occur within approved airspace and ranges for either air-to-ground or air-to-air munitions.

Air-to-ground training would include accelerating to launch speeds at high altitude with simulated launches where no munitions would be released. Existing air-to-ground ranges would be used for munitions training. Release profiles, altitudes, and speeds would be restricted for training at approved ranges to ensure any air-to-ground munitions would be deployed within existing range safety footprint areas.

For air-to-air combat, the F-22A can carry six radar-guided AIM-120 Advanced Medium-Range Air-to-Air Missiles, two heat-seeking AIM-9 Sidewinder short-range missiles, and has a 20-millimeter multi-barrel cannon for close-in air-to-air engagements.

Aircraft Characteristics of the F-117A

The F-117A is a low observable air-to-ground fighter which achieved initial operational capability in 1983. The aircraft was developed to take maximum benefit of currently available low observable technologies and to provide first strike capabilities over a heavily defended battlefield. The F-117A mission is to be a survivable interdictor. From Desert Storm through subsequent Gulf actions, as well as during Panama and Yugoslavia actions, the F-117A demonstrated it

could successfully carry out that mission with minimum losses.

The F-117A routinely operates at night at medium altitudes (20,000 to 30,000 feet above mean sea level [MSL]) and flies missions up to 2 hours in duration. Powered by two engines that each provides approximately 10,600 pounds of thrust, the F-117A is a high subsonic aircraft with a cruising speed around 680 miles per hour (mph) and a service ceiling of 45,000 feet. Each F-117A is 66 feet long, has a wingspan of 43 feet, and is 12.5 feet in height.

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix B
Characteristics of Chaff

APPENDIX B CHARACTERISTICS OF CHAFF

Chaff is currently authorized for use in the specific training airspaces and under the Proposed Action, training chaff would continue to be employed in the airspace. The chaff used during training consists of extremely small strands (or dipoles) of an aluminum-coated crystalline silica core. When released from an aircraft, chaff initially forms a sphere, then disperses in the air and eventually drifts to the ground. The chaff effectively reflects radar signals in various bands (depending on the length of the chaff fibers) and forms a very large image or electronic "cloud" of reflected signals on a radar screen. When the aircraft is obscured from radar detection by the cloud, the aircraft can safely maneuver or leave an area.

Chaff is made as small and light as possible so that it will remain in the air long enough to confuse enemy radar. The chaff fibers are approximately the thickness of a human hair (i.e., generally 25.4 microns in diameter), and range in length from 0.3 to over 1 inch. The weight of chaff material in the RR-170 or RR-188 chaff cartridge is approximately 95 grams or 3.35 ounces (Air Force 1997). Since chaff can obstruct radar, its use is coordinated with the Federal Aviation Administration (FAA). RR-170B/AL or RR-180A/AL are new combat chaffs designed for use by F-22A aircraft. RR-188 chaff has D and E band dipoles removed to avoid interference with FAA radar. Combat chaff dipoles are cut to disguise the aircraft and produce a more realistic training experience in threat avoidance. Based on experience with the stealth airframe and chaff discharge from the F-22A, the chaff approved for use by the F-22A as of 2006 is the RR-170B/AL or RR-180A/AL combat chaff with three to six mylar wrapping materials. Combat chaff is not approved for use at WSMR or in the Continental U.S. because it significantly interferes with FAA radars. For the purpose of this EA, no combat chaff is assumed to be used. Instead, a new RR-188 type dipole cut chaff with three 2-inch by 4-inch mylar wrappers is assumed to be available by the time F-22A aircraft would arrive at Holloman AFB.

Chaff Composition

Chaff is comprised of silica, aluminum, and stearic acid, which are generally prevalent in the environment. Silica (silicon dioxide) belongs to the most common mineral group, silicate minerals. Silica is inert in the environment and does not present an environmental concern with respect to soil chemistry. Aluminum is the third most abundant element in the earth's crust, forming some of the most common minerals, such as feldspars, micas, and clays. Natural soil concentrations of aluminum ranging from 10,000 to 300,000 parts per million have been documented (Lindsay 1979). These levels vary depending on numerous environmental factors, including climate, parent rock materials from which the soils were formed, vegetation, and soil moisture alkalinity/acidity. The solubility of aluminum is greater in acidic and highly alkaline soils than in neutral pH conditions. Aluminum eventually oxidizes to Al_2O_3 (aluminum oxide) over time, depending on its size and form and the environmental conditions.

The chaff fibers have an anti-clumping agent (Neofat – 90 percent stearic acid and 10 percent palmitic acid) to assist with rapid dispersal of the fibers during deployment (United States Air Force [Air Force] 1997). Stearic acid is an animal fat that degrades when exposed to light and air.

A single bundle of chaff consists of the filaments in an 8-inch long rectangular tube or cartridge, a plastic piston, a cushioned spacer, and two plastic end caps (1/8-inch thick, 1-inch x 1-inch or 1-inch x 2-inch). The chaff dispenser remains in the aircraft. The plastic end caps and spacer fall to the ground when chaff is dispensed. The spacer is a spongy material (felt) designed to absorb the force of release. Figure 1 illustrates the components of a chaff cartridge. Table 1 lists the components of the silica core and the aluminum coating. Table 2 presents the characteristics of RR-188 chaff.

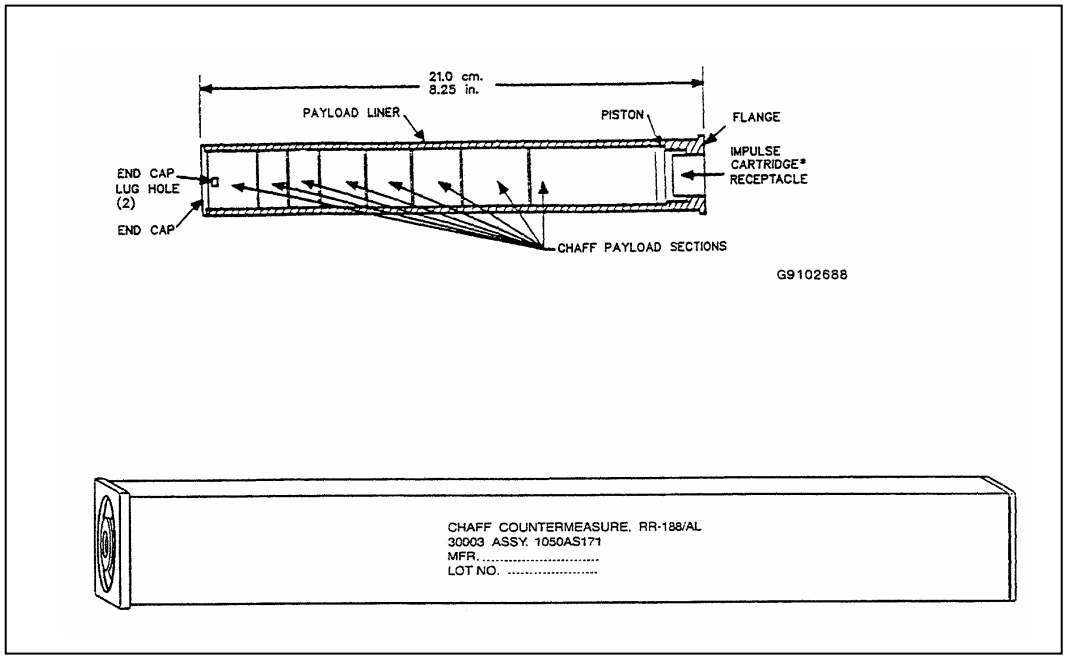


Figure 1. RR-188 Chaff Cartridge

Table 1. Components of RR-188 Chaff

Element	*Chemical Symbol*	*Percent (by weight)*
Silica Core		
Silicon dioxide	SiO_2	52-56
Alumina	Al_2O_3	12-16
Calcium Oxide and Magnesium Oxide	CaO and MgO	16-25
Boron Oxide	B_2O_3	8-13
Sodium Oxide and Potassium Oxide	Na_2O and K_2O	1-4
Iron Oxide	Fe_2O_3	1 or less
Aluminum Coating (Typically Alloy 1145)		
Aluminum	Al	99.45 minimum
Silicon and Iron	Si and Fe	0.55 maximum
Copper	Cu	0.05 maximum
Manganese	Mn	0.05 maximum
Magnesium	Mg	0.05 maximum
Zinc	Zn	0.05 maximum
Vanadium	V	0.05 maximum
Titanium	Ti	0.03 maximum
Others		0.03 maximum

Source: Air Force 1997

Table 2. Characteristics of RR-188 Chaff

Attribute	*RR-188*
Aircraft	F-15C, F-15E, F-22A (assumed)
Composition	Aluminum coated silica
Ejection Mode	Pyrotechnic
Configuration	Rectangular tube cartridge
Size	8 x 1 x 1 inches (8 cubic inches)
Number of Dipoles	5.46 million
Dipole Size (cross-section)	1 mil (diameter)
Impulse Cartridge	BBU-35/B
Other Comments	Cartridge stays in aircraft; less interference with FAA radar (no D and E bands)

Source: Air Force 1997

For this EA, the F-22A is assumed to use the same chaff material in a slightly different chaff wrapping to expedite clean ejection of the chaff. The chaff cartridge design with mylar wrapping is less likely to leave debris of any kind in the dispenser bay yet still provides robust chaff dispensing. Figure 2 is a photograph of this type of RR-170B/AL chaff cartridge. The F-22A is assumed to use chaff packaged in soft packs that retain the same number of dipoles per cut as RR-188 chaff. The RR-170B/AL has a 1-inch by 1-inch end cap, a piston of the same size, and three mylar wraps that facilitiate deployment. One end cap, one piston, and three approximately 2-inch by 4-inch mylar pieces of wrap fall to the ground with each chaff cartridge deployed. The rubber bands in the photograph are removed before loading. RR-180A/AL chaff cartridges are dual cartridges with the same type of chaff material and six mylar wrappings slightly smaller than those of RR-170B/AL chaff. Both RR-170B/AL and RR-180A/AL have chaff dipoles cut to combat lengths and cannot be used because of excessive interference with FAA radars. An equivalent RR-188AL chaff is assumed to be produced and available for training within the Holloman AFB SUA by F-22A aircraft.

Chaff Ejection

Chaff is typically ejected pyrotechnically using a BBU-35/B impulse cartridge. Pyrotechnic ejection uses hot gases generated by an explosive impulse charge. The gases push the small piston down the chaff-filled tube. A small plastic end cap with an attached felt spacer is ejected, followed by the chaff fibers, the piston, and, in the case of F-22A chaff, three to six mylar pieces. The plastic tube remains within the aircraft. Debris from the ejection consists of two 1-inch by 1-inch square pieces of plastic 1/8-inch thick (i.e., the piston and the end cap), three to six mylar strips, and the felt spacer. Table 3 lists the characteristics of BBU-35/B impulse cartridges used to pyrotechnically eject chaff.

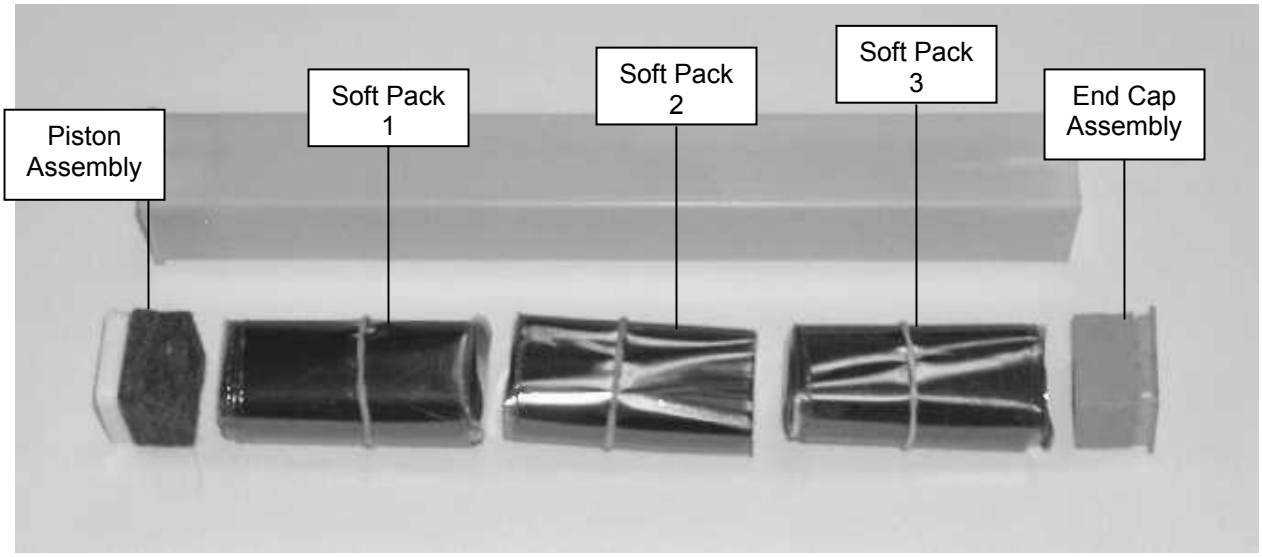


Figure 2. RR-170B/AL Layout

Table 3. BBU-35/B Impulse Charges Used to Eject Chaff

Component	*BBU-35/B*
Overall Size Overall Volume Total Explosive Volume	0.625 inches x 0.530 inches 0.163 inches^3 0.034 inches^3
Bridgewire	Trophet A 0.0025 inches x 0.15 inches
Initiation Charge	0.008 cubic inches 130 mg 7,650 psi boron 20% potassium perchlorate 80% *
Booster Charge	0.008 cubic inches 105 mg 7030 psi boron 18% potassium nitrate 82%
Main Charge	0.017 cubic inches 250 mg loose fill RDX ** pellets 38.2% potassium perchlorate 30.5% boron 3.9% potassium nitrate 15.3% super floss 4.6% Viton A 7.6%

Source: Air Force 1997

Upon release from an aircraft, chaff forms a cloud approximately 30 meters in diameter in less than one second under normal conditions. Quality standards for chaff cartridges require that they demonstrate ejection of 98 percent of the chaff in undamaged condition, with a reliability of 95 percent at a 95 percent confidence level. They must also be able to withstand a variety of environmental conditions that might be encountered during storage, shipment, and operation.

Table 4 lists performance requirements for chaff.

Table 4. Performance Requirements for Chaff

Condition	*Performance Requirement*	
High Temperature	Up to +165 degrees Fahrenheit	
Low Temperature	Down to –65 °F	
Temperature Shock	Shock from –70 °F to +165 °F	
Temperature Altitude	Combined temperature altitude conditions up to 70,000 feet	
Humidity	Up to 95 percent relative humidity	
Sand and Dust	Sand and dust encountered in desert regions subject to high sand dust conditions and blowing sand and dust particles	
Accelerations/Axis	G-Level	Time (minute)
Transverse-Left (X)	9.0	1
Transverse-Right (-X)	3.0	1
Transverse (Z)	4.5	1
Transverse (-Z)	13.5	1
Lateral-Aft (-Y)	6.0	1
Lateral-Forward (Y)	6.0	1
Shock (Transmit)	Shock encountered during aircraft flight	
Vibration	Vibration encountered during aircraft flight	
Free Fall Drop	Shock encountered during unpackaged item drop	
Vibration (Repetitive)	Vibration encountered during rough handling of packaged item	
Three Foot Drop	Shock encountered during rough handling of packaged item	

Note: Cartridge must be capable of total ejection of chaff from the cartridge liner under these conditions.
Source: Air Force 1997

Policies and Regulations on Chaff Use

Current Air Force policy on use of chaff and flares was established by the Airspace Subgroup of Headquarter Air Force Flight Standards Agency in 1993. It requires units to obtain frequency clearance from the Air Force Frequency Management Center and the FAA prior to using chaff to ensure that training with chaff is conducted on a non-interference basis. This ensures electromagnetic compatibility between the FAA, the Federal Communications Commission, and Department of Defense (DoD) agencies. The Air Force does not place any restrictions on the use of chaff provided those conditions are met (Air Force 1997).

Air Force Instruction (AFI) 13-201, U.S. Air Force Airspace Management, September 2001. This guidance establishes practices to decrease disturbance from flight operations that might cause adverse public reaction. It emphasizes the Air Force's responsibility to ensure that the public is protected to the maximum extent practicable from hazards and effects associated with flight operations.

AFI 11-214 Aircrew and Weapons Director and Terminal Attack Controller Procedures for Air Operations, July 1994. This instruction delineates procedures for chaff and flare use. It prohibits use unless in an approved area.

References

Air Force. 1997. *Environmental Effects of Self-Protection Chaff and Flares*. Prepared for Headquarters Air Combat Command, Langley Air Force Base, Virginia.

_____. 1999. *Description of the Proposed Action and Alternatives (DOPAA) for the Expansion of the Use of Self-Protection Chaff and Flares at the Utah Test and Training Range, Hill Air Force Base, Utah*. Prepared for Headquarters Air Force Reserve Command Environmental Division, Robins AFB, Georgia.

Appendix C
Characteristics and Analysis of Flares

APPENDIX C CHARACTERISTICS AND ANALYSIS OF FLARES

1.0 Introduction

The F-22A employs MJU-10/B self-protection flares. Self-protection flares are magnesium pellets that, when ignited, burn for 3.5 to 5 seconds at 2,000 degrees Fahrenheit. The burn temperature is hotter than the exhaust of an aircraft, and therefore attracts and decoys heat-seeking weapons targeted on the aircraft. Flares are used in pilot training to develop the near instinctive reactions to a threat that are critical to combat survival. This appendix describes flare composition, ejection, risks, and associated regulations.

2.0 Flare Composition

Self-protection flares are primarily mixtures of magnesium and Teflon (polytetrafluoroethylene) molded into rectangular shapes (United States Air Force [Air Force] 1997). Longitudinal grooves provide space for small amounts of materials that aid in ignition such as:

- First fire materials: potassium perchlorate, boron powder, magnesium powder, barium chromate, Viton A, or Fluorel binder.
- Immediate fire materials: magnesium powder, Teflon, Viton A, or Fluorel
- Dip coat: magnesium powder, Teflon, Viton A or Fluorel

Typically, flares are wrapped with an aluminum-coated mylar or filament-reinforced tape (wrapping) and inserted into an aluminum (0.03 inches thick) case that is closed with a felt spacer and a plastic end cap (Air Force 1997). The top of the case has a pyrotechnic impulse cartridge that is activated electrically to produce hot gases that push a piston, a safe and initiation (S&I) device, the flare material, and the end cap out of the aircraft into the airstream. Table 1 provides a description of MJU-10/B and, for comparison, MJU-7 A/B flare components. Typical flare composition and debris are summarized in Table 2. Figure 1 is an illustration of an MJU-10/B flare.

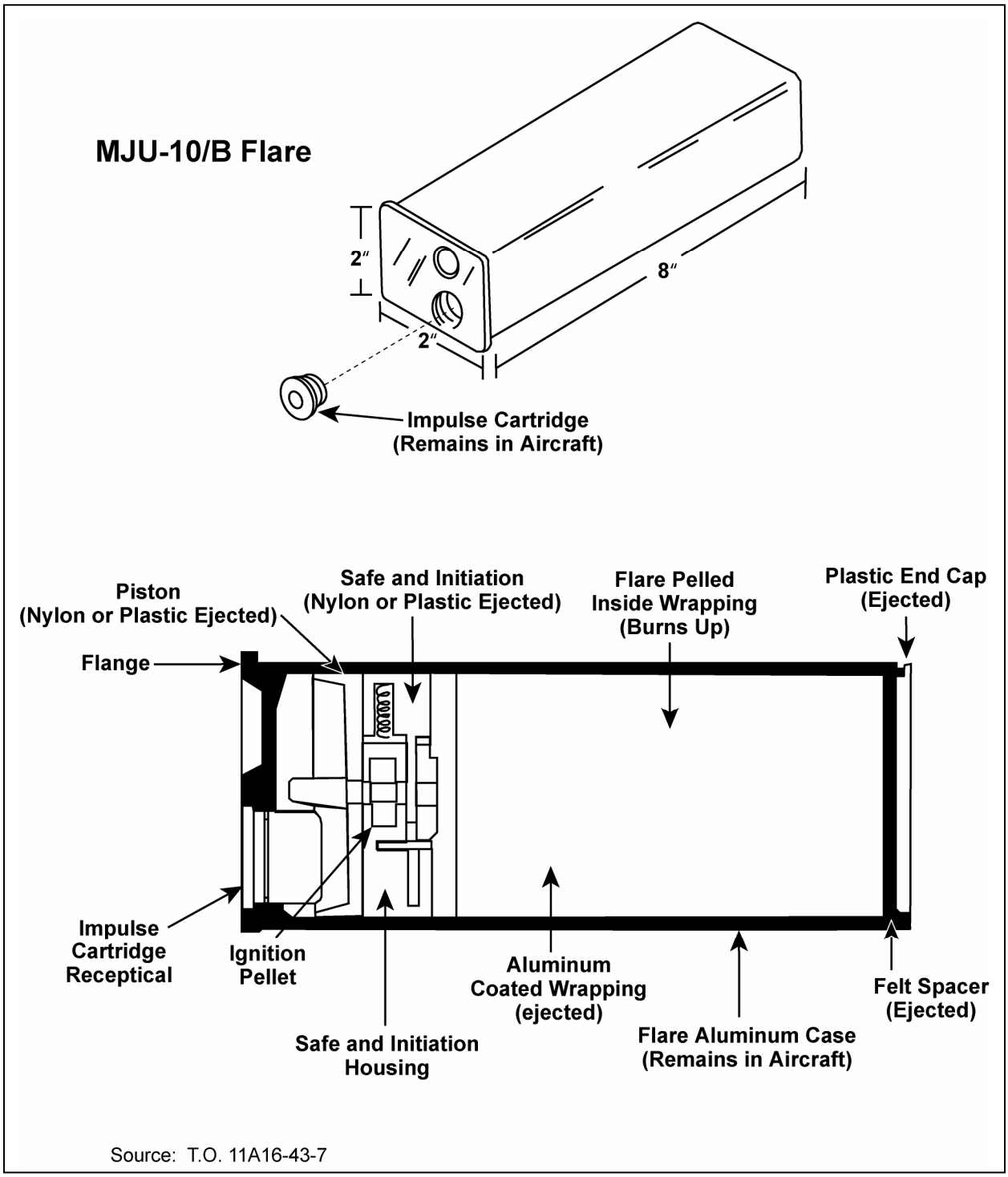
Table 1. Description of MJU-10/B and MJU-7 A/B Flares

Attribute	*MJU-10/B*	*MJU-7 A/B*
Aircraft	F-15, F-22	F-15
Mode	Semi-Parasitic	Semi-Parasitic
Configuration	Rectangle	Rectangle
Size	2 x 2 x 8 inches (32 cubic inches)	1 x 2 x 8 inches (16 cubic inches)
Impulse Cartridge	BBU-36/B	BBU-36/B
Safe and Initiation Device (S&I)	Slider Assembly	Slider Assembly
Weight (nominal)	40 ounces	13 ounces

Table 2. Typical Composition of MJU-10/B and MJU-7 A/B Self-Protection Flares

Part	*Components*
Combustible	
Flare Pellet	Polytetrafluoroethylene (Teflon) (-$[C_2F_4]_n$ – n=20,000 units) Magnesium (Mg) Fluoroelastomer (Viton, Fluorel, Hytemp)
First Fire Mixture	Boron (B) Magnesium (Mg) Potassium perchlorate ($KClO_4$) Barium chromate ($BaCrO_4$) Fluoroelastomer
Immediate Fire/ Dip Coat	Polytetrafluoroethylene (Teflon) (-$[C_2F_4]_n$ – n=20,000 units) Magnesium (Mg) Fluoroelastomer
Assemblage (Residual Components)	
Aluminum Wrap	Mylar or filament tape bonded to aluminum tape
End Cap	Plastic (nylon)
Felt Spacers	Felt pads (0.25 inches by cross section of flare)
Safe & Initiation (S&I) Device	Plastic (nylon, tefzel, zytel)
Piston	Plastic (nylon, tefzel, zytel)

Source: Air Force 1997



Source: T.O. 11A16-43-7

Figure 1. MJU-10/B Flare

3.0 Flare Ejection

The MJU-10/B is a semi-parasitic type flare that uses a BBU-36/B impulse cartridge. In these flares, a slider assembly incorporates an initiation pellet (640 milligrams of magnesium, Teflon, and Viton A or Fluorel binder). This pellet is ignited by the impulse cartridge, and hot gases reach the flare as the slider exits the case, exposing a fire passage from the initiation pellet to the first fire mixture on top of the flare pellet. Table 3 describes the components of BBU-36/B impulse charges.

Flares are tested to ensure they meet performance requirements in terms of ejection, ignition, and effective radiant intensity. If the number of failures exceeds the upper control quality assurance acceptance level, the flares are returned to the manufacturer. A statistical sample is taken to ensure that approximately 99 percent must be judged reliable for ejection, ignition, and intensity. Flare failure would occur if the flare failed to eject, did not burn properly, or failed to ignite upon ejection. For training use within the airspace, a dud flare would be one that successfully ejected but failed to ignite. That probability of a dud flare on the ground is estimated to be 0.01 percent based upon dud flares located during military range cleanup.

4.0 Risks Associated with Flare Use

Environmental risks associated with the use of defensive flares fall within two main categories: the risk of fire from a flare and the risk of being struck by a residual flare component.

4.1 Fire Risk

Fire risk associated with flares stems from an unlikely, but possible scenario which results in the flare reaching the ground or vegetation while still burning. The altitude from which flares are dropped is strictly regulated by the airspace manager, and is based on a number of factors including flare burn-out rate. The flare burn-out rate is shown in Table 4. Defensive flares typically burn out in 3.5 to 5 seconds, during which time the flare will have fallen between 200 and 400 feet. Specific defensive flare burn-out rates are classified. Table 4 is based on conditions that assume zero aerodynamic drag and a constant acceleration rate of 32.2 feet per second per second.

$D = (V_o * T) + (0.5 * (A * T^2))$

Where:

D = Distance
Vo = Initial Velocity = 0
T = Time (in Seconds)
A = Acceleration

Flares used in training missions are designed to be fully consumed before reaching the ground. Under the Proposed Action, flare use would occur in the new and expanded airspace. The risk of fire as a result of flare use is minimal due to the low failure rate and procedures that require flare use only above 2,000 feet AGL. Concerns with fire of any cause, however, are real. Flare use would be suspended under periods of very high or extreme fire danger to reduce those concerns expressed by scoping meeting participants. The Air Force follows established procedures for claims in the unlikely event that an Air Force-caused fire should occur and subsequently damage livestock or infrastructure.

Table 3. Components of BBU-36/B Impulse Charges

Component	*BBU-36/B*
Overall Size Overall Volume Total Explosive Volume	0.740 x 0.550 inches 0.236 cubic inches 0.081 cubic inches
Bridgewire	Trophet A
Closure Disk	Scribed disc, washer
Initiation Charge	
Volume Weight Compaction Composition	0.01 cubic inches 100 mg 6,200 psi 42.5% boron 52.5 % potassium perchlorate 5.0% Viton A
Booster Charge	
Volume Weight Compaction Composition	0.01 cubic inches 150 mg 5,100 psi 20% boron 80% potassium nitrate
Main Charge	
Volume Weight Compaction Composition	0.061 cubic inches 655 mg Loose fill Hercules #2400 smokeless powder (50-77% nitrocellulose, 15-43% nitroglycerine)

Source: Air Force 1997

Table 4. Flare Burn-out Rates

Time (in Sec)	*Acceleration*	*Distance (in feet)*
0.5	32.2	4.025
1.0	32.2	16.100
1.5	32.2	36.225
2.0	32.2	64.400
2.5	32.2	100.625
3.0	32.2	144.900
3.5	32.2	197.225
4.0	32.2	257.600
4.5	32.2	326.025
5.0	32.2	402.500
5.5	32.2	487.025
6.0	32.2	579.600
6.5	32.2	680.225
7.0	32.2	788.900
7.5	32.2	905.625
8.0	32.2	1030.400
8.5	32.2	1163.225
9.0	32.2	1304.100
9.5	32.2	1453.025
10.0	32.2	1610.000

Note: Initial velocity is assumed to be zero.

A slightly greater possibility exists for an individual locating a dud magnesium flare on the ground under the airspace. Although the risk of combustion of such a dud is low, it could be ignited by an extremely hot (2,000 degree) fire or by friction from a strike with something like a saw or a bullet. The basic rule for a dud flare is to identify its location, do not touch it or experiment with it, and notify a safety authority of its location.

4.2 Flare Strike Risk

Residual flare materials are those that are not completely consumed during ignition and fall to the ground, creating the risk of striking a person or property. Residual material from the MJU-10/B consists of an end cap, an initiation assembly (safe and initiation device [S&I]), a piston, one or two felt spacers, and an aluminum-coated mylar wrapper (Table 5). The wrapper may be partially consumed during ignition, so the wrapping residual material could range in size from the smallest size, 2 inches by 2 inches, to the largest size, 4 inches by 13 inches. The size of the residual wrapping material would depend upon the amount of combustion that occurred as the flare was deployed.

Table 5. Residual Material from MJU-10/B Flares

Component	*Weight*
MJU-10/B	
End cap	0.0144 pounds
Safe & Initiation (S&I) device	0.0453 pounds
Piston	0.0144 pounds
Felt spacer	0.0025 pounds
Wrapper (4 inches x 13 inches)	0.0430 pounds

After ignition, as described in section 3.0, most residual components of the MJU-10/B flare have high surface to mass ratios and are not judged capable of damage or injury when they impact the surface. One component of the MJU-10/B flare, the S&I device, has a weight of approximately 0.725 ounces (0.0453 pounds). It is sized and shaped such that it is capable of achieving a terminal velocity that could cause injury if it struck a person.

The following discussion addresses the likelihood of an S&I device striking a person and the effect if such a strike were to occur.

4.2.1 Technical Approach

Aircraft training flights are distributed randomly and uniformly within the Restricted Areas, Air Traffic Control Assigned Airspace (ATCAAs), or Military Operations Areas (MOAs). Avoidance areas that are designated for low altitude flight need not be avoided for higher altitude flight. Flare component release altitudes and angles of release are sufficiently random that ground impact locations of flare materials are also assumed to be uniformly distributed under the airspace.

For any particular residual component of a released flare, the conditional probability that it strikes a particular object is equal to the ratio of the object area to the total area under the airspace. For multiple objects (i.e., people, structures, vehicles), the probability of striking any one object is the ratio of the sum of object areas to the airspace. The frequency of a residual component striking one of many objects is the frequency of releasing residual components times the conditional probability of striking one of the many objects per given release.

In equation form, this relationship is:

$$Strike\ frequency = drop\ frequency\ in\ airspace \times \frac{area\ of\ object \times number\ of\ objects\ in\ airspace}{airspace\,(area)}$$

The potential consequences of a residual component with high velocity and momentum striking particular objects are postulated as follows:

- Striking the head of an unprotected individual: possible concussion
- Striking the body of an unprotected individual: possible injury
- Striking a private structure: possible damage
- Striking a private vehicle: possible damage (potential injury if vehicle moving)

The effect of the impact of a residual MJU-7 A/B or MJU-10/B component from Table 6 is judged by computing the component's terminal velocity and momentum.

Terminal velocity (V_T) is calculated by the equation:

$$V_T = \left[\frac{2}{\rho}\left(\frac{W}{A \times C_d}\right)\right]^{0.5} = 29 \times \left(\frac{W}{A}\right)^{0.5}$$

Where: V_T = Terminal Velocity (in Feet/Second)
ρ = Nominal Air Density (2.378×10^{-3} lbs-sec^2/feet^4)
W = Weight (in Pounds)
A = Surface Area Facing the Air stream (in feet^2)
C_d = Drag Coefficient = 1.0

Drag coefficients are approximately 1.0 over a wide range of velocities and Reynolds numbers (Re) for irregular objects (e.g., non-spherical). Using this drag coefficient, the computed terminal velocities (Table 7) produce Re values within this range ($Re < 2\times10^5$), which justifies the use of the drag coefficient.

The weights and geometries of major flare components are approximately as listed in Table 6.

Table 6. MJU-10/B Flare Major Component Properties

Component	*Geometry*	*Dimensions (inches)*	*Weight (Pounds)*
MJU-10/B			
S&I device	Rectangular solid	2 x 0.825 x 0.5	0.0453
Piston	Rectangular open	2 × 2 × 0.25	0.0144
End Caps	Rectangular plate	2 × 2 × 0.125	0.0144

Terminal velocity momentums of these components are computed based on maximum (two square inches) and minimum (one square inch) areas and are listed in Table 7. Actual values would be between these extremes. The momentum values are the product of mass (in slugs) and velocity. A slug is defined as the mass that, when acted upon by a 1-pound force, is given an acceleration of 1.0 feet/sec^2.

Table 7. MJU-10/B Flare Component Hazard Assessment

	MAXIMUM SURFACE AREA			MINIMUM SURFACE AREA		
Component	*Area (in^2)*	*Terminal Velocity (ft/sec)*	*Momentum (lb-sec)*	*Area (in^2)*	*Terminal Velocity (ft/sec)*	*Momentum (lb-sec)*
MJU-10/B						
S&I device	1.65	58	0.08	0.41	115	0.16
Piston	4.0	21	0.009	0.50	59	0.03
End Cap	4.0	21	0.009	0.25	84	0.04

The focus of this analysis will be the S&I device. Other flare components are not calculated to achieve a momentum that could cause damage.

The maximum momentum of the S&I device would vary between 0.08 and 0.16 pound-seconds depending upon orientation. In this momentum range, an injury is postulated that could be equivalent to a bruise from a large hailstone. Approximately 20 percent of any strikes could be to the head. A potentially more serious injury could be expected if the head were struck.

What would be the likelihood of a hailstone sized S&I device striking an individual? People at risk of being struck by a dropped S&I device are assumed to be standing outdoors under a training airspace (people in structures or vehicles are assumed protected). The dimensions of an average person are approximately 5 feet 6 inches high by 2 feet wide by 1 foot deep (men 5 feet 10 inches; women 5 feet 4 inches; children varied). The S&I device is expected to strike ground objects at an angle of 80 degrees or greater to the ground to allow for possible wind or other drift effects. With the flare component falling at 80 degrees to the ground, a person's body (5.5 × 2 × 1 feet) projects an area of 3.9 feet^2 normal to the path of the dropped component. In a normal case, a person would be outdoors and unprotected 10 percent of the time based on Department of Energy and Environmental Protection Agency national studies (Tennessee Valley Authority 2003; Klepeis et al. 2001). In the case of hunting or fishing, a person is assumed to be out of doors and unprotected 2/3 of the day (although a person would probably be wearing a hat or other head covering during such activity).

The frequencies of a strike to an unprotected person can be computed based on the data and assumptions presented above. Flight maneuvers to deploy flares are assumed to be randomly distributed throughout the training airspace.

A personnel injury could occur if an S&I device struck an unprotected person. The frequency of striking a person is:

$$Injury\ frequency = comp\ drop\ freq \times \frac{body\ area \times pop.density \times Fract\ unprot \times area}{area}$$

Under an area the size of the Cowboy ATCAA, this calculates to approximately:

$$Injury\ frequency = 2{,}000 / year \times 3.9\ ft^2 / pers \times 10.0\ pers / mi^2 \times 0.67 \times 3.59 \times 10^{-8}\ mi^2 / ft^2$$
$$= 0.0019 \text{ injuries/year}$$

This means that in a representative New Mexico area beneath the Cowboy ATCAA used for F-22A pilot training (see Table 2.2-4), the annual expected person strike frequency would be approximately one person in every 500 years.

The maximum momentum of the S&I device, either from an MJU-10/B flare, would vary between 0.08 and 0.16 pound-seconds depending upon orientation of the falling S&I device. In this momentum range, an injury is postulated that could be equivalent to a bruise from a large hailstone. Approximately 20 percent of any strikes could be to the head.

As a basis of comparison, laboratory experimentation in accident pathology indicates that there is a less than a 1 percent probability of a brain concussion from an impulse of less than 0.10 pound-seconds to the head, and a 90 percent probability that brain concussions would result from an impulse of 0.70 pound-seconds to the head (Air Force 1997). The only MJU-10/B component with momentum values near 0.10 pound-seconds is the S&I device with a momentum between 0.08 and 0.16 pound-seconds. A strike of an S&I device to the head has approximately a 1 percent probability of causing a concussion.

This means that there would be an approximately 1 in 100 chance of a concussion in 1,000 years of flare use in the Cowboy ATCAA. This level of risk is negligible.

The S&I device maximum momentum would vary between 0.08 and 0.16 pound-seconds depending upon orientation. A strike to a vehicle could cause a cosmetic dent similar to a

hailstone impact. Although not numerically estimated, a strike to a moving vehicle could result in a vehicle accident.

5.0 Policies and Regulations Addressing Flare Use

Air Force policy on flare use was established by the Airspace Subgroup of Headquarters Air Force Flight Standards Agency in 1993 (Memorandum from John R. Williams, 28 June 1993) (Air Force 1997). This policy permits flare drops over military-owned or controlled land and in Warning Areas. Flare drops are permitted in MOAs and ATCAAs only when an environmental analysis has been completed. Minimum altitudes must be adhered to. Flare drops must also comply with established written range regulations and procedures.

Air Force Instruction (AFI) 11-214 prohibits using flare systems except in approved areas with intent to dispense, and sets certain conditions for employment of flares. Flares are authorized over government-owned and controlled property and over-water Warning Areas with no minimum altitude restrictions when there is no fire hazard. If a fire hazard exists, minimum altitudes will be maintained in accordance with the applicable directive or range order. An Air Combat Command supplement to AFI 11-214 (15 October 2003) prescribes a minimum flare employment altitude of 2,000 feet above ground level (AGL) over non-government owned or controlled property (Air Force 1997).

References

Klepeis, Neil E., William C. Nelson, Wayne R. Ott, John P. Robinson, Andy M. Tsang, Paul Switzer, Joeseph V. Behar, Stephen C. Hern, and William H. Engelmann. The National Human Activity Pattern Survey (NHAPS) a resource for assessing exposure to environmental pollutants. http://exposurescience.org/research.shtml#NHAPS

Science Applications International Corporation. 2006. Draft Environmental Effects of Defensive Countermeasures: An Update. Prepared for U.S. Air Force Air Combat Command.

Tennessee Valley Authority. 2003. On the Air, Technical Notes on Important Air Quality Issues, Outdoor Ozone Monitors Over-Estimate Actual Human Ozone Exposure. http://www.tva.gov/environment/air/ontheair/pdf/outdoor.pdf

United States Air Force (Air Force). 1997. Environmental Effects of Self Protection Chaff and Flares. Final Report. August.

United States Bureau of the Census. 2000. Table DP-1 Profile of General Demographic Characteristics. Census 2000 SF-1. Available on-line at http://factfinder.census.gov.

Appendix D
Public and Agency Outreach

APPENDIX D PUBLIC AND AGENCY OUTREACH

Table of Contents

Interagency and Intergovernmental Coordination for Environmental Planning Letters and Distribution Lists

Public and Agency Responses

Public Outreach Fact Sheets and Informational Displays

Draft Environmental Assessment Distribution List

Repository List for Draft Environmental Assessment Distribution

Interagency and Intergovernmental Coordination for Environmental Planning (IICEP)
Letters and Distribution Lists

DEPARTMENT OF THE AIR FORCE

HQ ACC/A7Z
129 Andrews Street, Suite 102
Langley AFB VA 23665-2769

President Mark Chino
Mescalero Apache Tribe
PO Box 227
Mescalero NM 88340

Dear President Chino:

The United States Air Force is in the process of preparing an Environmental Assessment (EA) to determine the potential environmental consequences of a proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB by replacing the retiring F-117 aircraft and T -38A aircraft supporting the F-117 mission with two F-22A squadrons. The Air Force has identified Holloman AFB as the preferred location for the third operational wing of the Air Force's F-22A, which would enhance the low observable, precision weapons system capability of the 49th Fighter Wing.

The EA for the proposed action will be prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321-4347), the Council on Environmental Quality NEPA Regulations (40 CFR 1500-1508); and the Air Force's Environmental Impact Analysis Process (EIAP) (Air Force Instruction 32-7061 as promulgated at 32 CFR 989). As part of the proposal, the Air Force will analyze the following:

- Retire the F-117 and T-38A aircraft currently based at Holloman AFB
- Beddown and operate two F-22A aircraft squadrons
- Renovate existing facilities and construct new facilities to support the F-22A squadrons
- Adjust base manning to reflect F-22A beddown requirements
- Conduct F-22A training routinely in airspace within 100 miles of Holloman AFB, to include supersonic operations
- Expand chaff and flare use in military airspace

Alternatives meeting the underlying purpose and need of the proposed action will be developed during the EIAP process. This process includes gathering information from the scoping meetings.

The accompanying map identifies the area of potential impact. Based on the proximity of the project area to the Mescalero Reservation, the Air Force will initiate a government-to-government dialogue with you to elicit comments, concerns, and suggestions. We would also like to incorporate your concerns into the planning of the proposal. In order to give your concerns full consideration in the development of this EA, we would appreciate receiving your response by May 4, 2006.

As requested during our courtesy call with you on March 23, 2006, we will hold a separate scoping meeting on the Reservation. The Air Force will provide flyers for your use in publicizing the meeting time and location as soon your confirmation is received.

Thank you for your consideration of this proposed action in New Mexico, we look forward to hearing from you concerning this matter. If you have any questions or comments about this proposal, please contact Ms. Linda DeVine, HQ ACC/A7ZP, c/o SAIC, 200 Enterprise Parkway, Suite 261, Hampton VA 23666, (757) 827-2659; for general questions, please contact Mr. Andrew "JR" Gomolak, (505) 572-3931 or Major John Mihaly, 49 FW/CCIO, (505) 572-1819.

BRUCE W. MACDONALD, GM-14, DAF
Acting Deputy Chief, Programs Division

1 Attachment:
Map

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

MEMORANDUM FOR UNITED STATES FISH AND WILDLIFE SERVICE
2105 OSUNA ROAD, NE
ALBUQUERQUE NM 87113

APR 05 2006

FROM: HQ ACC/A7Z
129 Andrews St., Suite 102
Langley AFB VA 23665-2969

SUBJECT: Environmental Assessment for Transforming the 49th Fighter Wing's Combat Capability Through F-117A Retirement and F-22A Beddown at Holloman Air Force Base (AFB), New Mexico

1. The United States Air Force will be preparing an Environmental Assessment (EA) to determine the potential environmental consequences of a proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB by replacing the retiring F-117A aircraft and T - 38A aircraft supporting the F-117A mission with two F-22A squadrons. The Air Force has identified Holloman AFB as the preferred location for the third operational wing of the Air Force's F-22A, which would enhance the low observable, precision weapons system capability of the 49th Fighter Wing.

2. As part of the proposal, the EA will address changes in personnel, numbers of constructed or renovated facilities, use of military airspace for supersonic training flights, and the expanded use of chaff and flares in military airspace. Alternatives to meeting the underlying purpose and need of the proposed action, if any, will be developed during the EIAP process. A no-action alternative will also be addressed.

3. Pursuant to analysis of the proposed beddown, as well as compliance with the Endangered Species Act, we request information regarding federally listed threatened, endangered, candidate, and proposed to be listed species that occur or may occur on Holloman AFB or within the 100 nm areas under the training airspace (Atch 1). Request the information be sent directly to Ms. Linda DeVine, HQ ACC/A7ZP, c/o SAIC, 22 Enterprise Parkway, Suite 200, Hampton VA 23666 at your earliest convenience. Should you have comments or concerns regarding this proposed action, we request those be provided later than May 4, 2006 to ensure its incorporation in the preparation of the draft EA.

4. In an effort to analyze the potential effects of this proposed beddown, the Air Force or its contractor, SAIC, may be contacting you in their data collection efforts and we would appreciate your identifying a point of contact for any follow-up questions we may have.

5. If you have any specific questions about the proposal, please feel free to contact Ms. Linda DeVine at (757) 827-2659. General questions may be directed to the Holloman AFB Public Affairs Office at 505-572-5406 . Thank you for your assistance in this matter.

BRUCE W. MACDONALD, GM-14, DAF
Acting Deputy Chief, Programs Division

1 Attachment:
1. Airspace Map

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

HQ ACC/A7Z
129 Andrews Street, Ste 102
Langley AFB VA 23665-2769

The Honorable Steve Pearce
400 N Teshor Drive
Suite E
Las Cruces, NM 88011

Dear Representative Pearce

The United States Air Force will be preparing an Environmental Assessment (EA) to determine the potential environmental consequences of a proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB by replacing the retiring F-117A aircraft and T -38A aircraft supporting the F-117A mission with two F-22A squadrons. The Air Force has identified Holloman AFB as the preferred location for the third operational wing of the Air Force's F-22A, which would enhance the low observable, precision weapons system capability of the 49th Fighter Wing.

As part of the proposal, the EA will address changes in personnel, numbers of constructed or renovated facilities, use of military airspace for supersonic training flights, and the expanded use of chaff and flares in military airspace. Alternatives to meeting the underlying purpose and need of the proposed action, if any, will be developed during the Environmental Impact Analysis Process (EIAP). A no-action alternative will also be addressed.

The Air Force will host public scoping meetings for the public and government agencies to help identify environmental resources for consideration and to focus the EA. The Air Force will publish notices of EA preparation and upcoming community outreach/scoping in local newspapers. Community outreach/scoping meetings will be held on April 19 through 21 in Ruidoso, Truth or Consequences and Alamogordo from 5:30 to 7:30 p.m.

Date	Town	Location
April 17, 2006 5:30 p.m. – 7:30 p.m.	**Ruidoso**	**Best Western Pine Springs Inn 1420 West Highway 70 Ruidoso Downs, NM**
April 18, 2006 5:30 p.m. – 7:30 p.m.	**Truth or Consequences**	**Truth or Consequences Civic Center 400 W 4th Ave Truth or Consequences, NM**
April 19, 2006 5:30 p.m. – 7:30 p.m.	**Alamogordo**	**Sergeant Willie Estrada Memorial Civic Center 800 East First Street Alamogordo, NM**

During these meetings, the Air Force will provide additional information about the F-22A aircraft and the beddown at Holloman AFB. Public and agency comments presented at the meetings, as well as written comments received by the Air Force during the scoping period and throughout the environmental process, will be considered in the preparation of the EA.

As part of this EA process, the Air Force would like to hear your concerns regarding the proposed beddown. The Air Force will accept comments at any time during the environmental process. However, to ensure the Air Force has sufficient time to consider public input in the preparation of the Draft EA, comments should be submitted to Ms. Linda DeVine, HQ ACC/A7ZP c/o SAIC, 22 Enterprise Parkway, Suite 200, Hampton VA 23666, by May 4, 2006.

If you have any specific questions about the proposal, please feel free to contact Ms. Linda DeVine, (757) 827-2659. General questions may also be directed to the Holloman AFB Public Affairs Office at 505-572-5406. Thank you in advance for your assistance in this matter.

Sincerely

BRUCE W. MACDONALD, GM14, DAF
Acting Deputy Chief, Programs Division

1 Attachment
Map

Legislative and Local Representation Distribution List

The Honorable Steve Pearce
400 N Teshor Drive, Suite E
Las Cruces, NM 88011

The Honorable Rod Adair
New Mexico Senate
Room 416D
State Capitol
Santa Fe, NM 87503

The Honorable Gay Kernan
New Mexico Senate
Room 415E
State Capitol
Santa Fe, NM 87503

The Honorable Bill Owen
City of Roswell
425 N Richardson Avenue
Roswell, NM 88201

The Honorable Stuart Ingle
New Mexico Senate
Room 109A
State Capitol
Santa Fe, NM 87503

The Honorable Jeff Bingaman
148 Loretto Towne Centre
505 South Main, Suite 148
Las Cruces, NM 88001

The Honorable Bill Richardson
State of New Mexico
Office of the Governor
State Capital Building
Santa Fe, NM 87503

The Honorable Pete Domenici
505 South Main Street
Suite 118
Las Cruces, NM 88001

The Honorable Timothy Z. Jennings
New Mexico Senate
P.O. Box 1797
Roswell, NM 88201

The Honorable Daniel R. Foley
New Mexico House of Representatives
57 North Sky Loop
Roswell, NM 88202

The Honorable Avon Wilson
New Mexico House of Representatives
P.O. Box 381
Roswell, NM 88202

The Honorable W.C. Dub Williams
New Mexico House of Representatives
Room 230JCN
State Capitol
Santa Fe, NM 87503

The Honorable Clinton D. Harden
New Mexico Senate
Room 416E
State Capitol
Santa Fe, NM 87503

The Honorable Jose A. Campos
New Mexico House of Representatives
Room 204B
State Capitol
Santa Fe, NM 87503

The Honorable Candy Spence Ezzell
New Mexico House of Representatives
Box 2125
Roswell, NM 88202

The Honorable Keith J. Gardner
New Mexico House of Representatives
4500 Verde Drive
Roswell, NM 88201

The Honorable Pete Campos
New Mexico Senate
Room 302B
State Capitol
Santa Fe, NM 87503

Legislative and Local Representation Distribution List

The Honorable Gloria Vaughn
New Mexico House of Representatives
503 E 16th Street
Alamogordo, NM 88310

The Honorable Dr. Terry T. Marquardt
New Mexico House of Representatives
903 New York Avenue
Alamogordo, NM 88310

The Honorable Joe Stell
New Mexico House of Representatives
22 Colwell Ranch Road
Carlsbad, NM 88220

The Honorable Vernon Asbill
New Mexico Senate
1502 Mountain Shadow
Carlsbad, NM 88220

The Honorable Dianna Duran
New Mexico Senate
909 8th Street
Tularosa, NM 88352

The Honorable Naomi Montoya
New Mexico Legislature
359 Old Las Vegas Hwy 85
Las Vegas, NM 87701

The Honorable Richard Vigil
New Mexico Legislature
P.O. Box 456
Ribera, NM 87560

The Honorable Don Tripp
New Mexico Legislature
P.O. Box 1369
Socorro, NM 87801

The Honorable Rhonda King
New Mexico Legislature
P.O. Box 103
Stanley, NM 87056

The Honorable Nathan Cote
New Mexico Legislature
15475 Space Murals Lane
Las Cruces, NM 88011

The Honorable Christy Bourgeois
New Mexico Legislature
P.O. Box 819
Carlsbad, NM 88221

The Honorable William Gray
New Mexico Legislature
1503 W Dallas
Artesia, NM 88210

The Honorable Carolyn Provencher
New Mexico Legislature
P.O. Box 298
La Luz, NM 88337

The Honorable Leo Martinez
New Mexico Legislature
P.O. Box 7908
Ruidoso, NM 88355

The Honorable Wanda Valentine
New Mexico Legislature
101 Poplar Drive #2
Tularosa, NM 88352

The Honorable Steven Gavi
New Mexico Legislature
2708 Park Drive
Roswell, NM 88201

The Honorable Ellen Wedum
New Mexico Legislature
P.O. Box 1086
Cloudcroft, NM 88317

The Honorable Nora Espinoza
New Mexico Legislature
608 Golondrina
Roswell, NM 88201

Legislative and Local Representation Distribution List

The Honorable Mike Kakuska
New Mexico Legislature
1506 S Pecos
Roswell, NM 88203

The Honorable Lucille Tucker
New Mexico House of Representatives
208 S Kentucky Avenue
Roswell, NM 88203

The Honorable Joseph Fidel
New Mexico Senate
P.O. Box 968
Grants, NM 87020

The Honorable Ben D. Altamirano
New Mexico Senate
1123 Santa Rita Street
Silver City, NM 88061

The Honorable Cynthia Nava
New Mexico Senate
3002 Broadmoor
Las Cruces, NM 88001

The Honorable John Arthur Smith
New Mexico Senate
P.O. Box 998
Deming, NM 88031

The Honorable Mary Jane Garcia
New Mexico Senate
P.O. Box 22
Dona Ana, NM 88032

The Honorable Leonard Lee Rawson
New Mexico Senate
P.O. Box 996
Las Cruces, NM 88004

The Honorable Mary Kay Papen
New Mexico Senate
904 Conway Avenue
Las Cruces, NM 88005

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

APR 05 2006

HQ ACC/A7Z
129 Andrews St., Suite 102
Langley AFB VA 23665-2769

Socorro Chamber of Commerce
PO Box 743
Socorro NM 87801

Dear Sir/Madam

The United States Air Force will be preparing an Environmental Assessment (EA) to determine the potential environmental consequences of a proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB by replacing the retiring F-117A aircraft and T-38A aircraft supporting the F-117A mission with two F-22A squadrons. The Air Force has identified Holloman AFB as the preferred location for the third operational wing of the Air Force's F-22A, which would enhance the low observable, precision weapons system capability of the 49th Fighter Wing.

As part of the proposal the EA will address changes in personnel, numbers of constructed or renovated facilities, use of military airspace for supersonic training flights, and the expanded use of chaff and flares in military airspace. Alternatives to meeting the underlying purpose and need of the proposed action, if any, will be developed during the Environmental Impact Analysis Process (EIAP). A no-action alternative will also be addressed.

The Air Force will host public scoping meetings for the public and government agencies to help identify environmental resources for consideration and to focus the EA. The Air Force will publish notices of EA preparation and upcoming community outreach/scoping in local newspapers and are providing a meeting flyer for your use in posting the meeting times and locations. Community outreach/scoping meetings will be held on April 19 through 21 in Ruidoso, Truth or Consequences and Alamogordo from 5:30 to 7:30 p.m.

Date	Town	Location
April 17, 2006 5:30 p.m. – 7:30 p.m.	**Ruidoso**	**Best Western Pine Springs Inn 1420 West Highway 70 Ruidoso Downs, NM**
April 18, 2006 5:30 p.m. – 7:30 p.m.	**Truth or Consequences**	**Truth or Consequences Civic Center 400 W 4th Ave Truth or Consequences, NM**
April 19, 2006 5:30 p.m. – 7:30 p.m.	**Alamogordo**	**Sergeant Willie Estrada Memorial Civic Center 800 East First Street Alamogordo, NM**

During these meetings, the Air Force will provide additional information about the F-22A aircraft and the beddown at Holloman AFB. Public and agency comments presented at the meetings, as well as written comments received by the Air Force during the scoping period and throughout the environmental process, will be considered in the preparation of the EA.

As part of this EA process, the Air Force would like to hear your concerns regarding the proposed beddown. The Air Force will accept comments at any time during the environmental process. However, to ensure the Air Force has sufficient time to consider public input in the preparation of the Draft EA, comments should be submitted to Ms. Linda DeVine, HQ ACC/A7ZP c/o SAIC, 22 Enterprise Parkway, Suite 200, Hampton VA 23666, by May 4, 2006.

If you have any specific questions about the proposal, please feel free to contact Ms. Linda DeVine, (757) 827-2659. General questions may also be directed to the Holloman AFB Public Affairs Office at 505-572-5406. Thank you in advance for your assistance in this matter.

Sincerely

BRUCE W. MACDONALD, GM-14, DAF
Acting Deputy Chief, Programs Division

2 Attachments:
1. Map
2. Meeting Flyer

Distribution List

Socorro Chamber of Commerce
P.O. Box 743
Socorro, NM 87801

Dwight Harp
Alamogordo Chamber of Commerce
1301 N White Sands Blvd
Alamogordo, NM 88310

Anthony Chamber of Commerce,
P.O. Box 1086
Anthony, NM 88021

Richard Price
Artesia Chamber of Commerce
408 W Texas
P.O. Box 99
Artesia, NM 88210

Capitan Chamber of Commerce
P.O. Box 441
Capitan, NM 88316

Carlsbad Chamber of Commerce
P.O. Box 910
Carlsbad, NM 88220

Carrizozo Chamber of Commerce
P.O. Box 567
Carrizozo, NM 88301

Jason Baldwin
Cloudroft Chamber of Commerce
P.O. Box 1290
Cloudcroft, NM 88317

Bob Owen
Elephant Butte Chamber of Commerce
P.O. Box 1355
Elephant Butte, NM 87935

Fred Mobley
Las Cruces Chamber of Commerce
P.O. Drawer 519
Las Cruces, NM 88004

Dorothy Cole
Mountainair Chamber of Commerce
P.O. Box 595
Mountainair, NM 87036

Hatch Chamber of Commerce
P.O. Box 38
Hatch, NM 87937

Brad Treptow
Ruidoso Chamber of Commerce
720 Suddreth Drive
Ruidoso, NM 88345

Tularosa Chamber of Commerce
301 Central
Tularosa, NM 88352

Truth or Consequences
P.O. Box 31
Truth or Consequences, NM 87901

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

APR 05 2006

MEMORANDUM FOR SEE DISTRIBUTION

FROM: HQ ACC/A7Z
129 Andrews St., Suite 102
Langley AFB VA 23665-2969

SUBJECT: Environmental Assessment for Transforming the 49th Fighter Wing's Combat Capability Through F-117A Retirement and F-22A Beddown at Holloman Air Force Base (AFB), New Mexico

1. The United States Air Force will be preparing an Environmental Assessment (EA) to determine the potential environmental consequences of a proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB by replacing the retiring F-117A aircraft and T - 38A aircraft supporting the F-117A mission with two F-22A squadrons. The Air Force has identified Holloman AFB as the preferred location for the third operational wing of the Air Force's F-22A, which would enhance the low observable, precision weapons system capability of the 49th Fighter Wing.

2. As part of the proposal, the EA will address changes in personnel, numbers of constructed or renovated facilities, use of military airspace for supersonic training flights, and the expanded use of chaff and flares in military airspace. Alternatives to meeting the underlying purpose and need of the proposed action, if any, will be developed during the EIAP process. A no-action alternative will also be addressed

3. The Air Force will host public scoping meetings for the public and government agencies to help identify environmental resources for consideration and to focus the EA. The Air Force will publish notices of EA preparation and upcoming community outreach/scoping in local newspapers, and a meeting flyer is included for your use. Community outreach/scoping meetings will be held on April 19 through 21 in Ruidoso, Truth or Consequences and Alamogordo from 5:30 to 7:30 p.m.

Date	Town	Location
April 17, 2006 5:30 p.m. – 7:30 p.m.	**Ruidoso**	**Best Western Pine Springs Inn 1420 West Highway 70 Ruidoso Downs, NM**
April 18, 2006 5:30 p.m. – 7:30 p.m.	**Truth or Consequences**	**Truth or Consequences Civic Center 400 W 4th Ave Truth or Consequences, NM**
April 19, 2006 5:30 p.m. – 7:30 p.m.	**Alamogordo**	**Sergeant Willie Estrada Memorial Civic Center 800 East First Street Alamogordo, NM**

4. In an effort to analyze the potential effects of this proposed beddown, the Air Force or its contractor, SAIC, may be contacting you in their data collection efforts. The Air Force will accept comments at any time during the environmental process. However, to ensure the Air Force has sufficient time to consider public input in the preparation of the Draft EA, comments should be submitted to Ms. Linda DeVine, HQ ACC/A7ZP c/o SAIC, 22 Enterprise Parkway, Suite 200, Hampton VA 23666 by May 4, 2006.

5. If you have any specific questions about the proposal, please feel free to contact Ms. Linda DeVine (757) 827-2659. General questions may be directed to the Holloman AFB Public Affairs Office at 505-572-5406. Thank you, in advance, you for your assistance in this activity.

BRUCE W. MACDONALD, GM-14, DAF
Acting Deputy Chief, Programs Division

2 Attachments:
1. Map
2. Meeting Flyer

Bill Owen
City of Roswell
425 N Richardson Avenue
Roswell, NM 88201

Clyde Dehart
Federal Aviation
Administration
Fort Worth, TX 76193-0001

U.S. Department of
Agriculture
333 Broadway SE
Albuquerque, NM 87102

New Mexico Dept of Game
& Fish
PO Box 25112
Santa Fe, NM 87504

U.S. Department of Interior,
Office of Secretary
PO Box 649
Albuquerque, NM 87103

Tom Baca
New Mexico Aviation
Division
1550 Pacheco Street
Santa Fe, NM 87505-1149

U.S. Department of the
Interior
PO Box 27115
Santa Fe, NM 87502

Natural Resources
Conservation Service
6200 Jefferson NE
Albuquerque, NM 87109-
3734

Dr. Miley Gonzales
New Mexico Department of
Agriculture
Box 30005, Dept 3189
Las Cruces, NM 88003-8005

Bob Sivinski
New Mexico Parks and
Recreation Division
1220 St Francis Drive
Santa Fe, NM 87504-1948

Judd Nordyke
City of Hatch
PO Box 250
Hatch, NM 87937

New Mexico Department of
Parks and Recreation
PO Box 1147
Santa Fe, NM 87501

Nancy Skinner
National Park Service
PO Box 728
Santa Fe, NM 87504

John Semanek
Federal Aviation
Administration
8000 Louisiana Blvd NE
Albuquerque, NM 87109

Bill Richardson
State of New Mexico
Office of the Governor
State Capital Building
Santa Fe, NM 87503

Rex Wilson
Lincoln County
PO Box 711
County Courthouse
Carrizozo, NM 88301

Ned Farquhar
Energy and Environmental
Policy Advisor
State Capitol Building
Suite 400
Santa Fe, NM 87501

Ron Curry
New Mexico Environment
Department
Harold S. Runnels Building
1190 St Francis Drive
Santa Fe, NM 87505

Chuck Huber
United States Pilots
Association
483 S Kirkwood Road, Ste 10
St. Louis, MO 63122

Brent Hart
Aircraft Owners and Pilots
Association
421 Aviation Way
Fredrick, MD 21701-4798

Sabra W. Kaulia
Federal Aviation
Administration
800 Independence Avenue
Washington, DC 20591

Stanton Riggs
Chaves County
PO Box 1817
County Courthouse
Roswell, NM 88202

Kristine Johnson, PhD
New Mexico State Heritage
Program
UNM Biology Dept., MSC03
2020
1 U of NM
Albuquerque, NM 87131

Bureau of Indian Affairs
Intermountain Region
PO Box 26567
Albuquerque, NM 87125

Joe Yadouga
FAA AJE-C13
2601 Meacham Blvd
Fort Worth, TX 76193

Lt Col Michael Rizzo
Federal Aviation
Administration
ASW-910
Fort Worth, TX 76193-0910

Clinette Hosier
Federal Aviation
Administration
8000 Louisiana Blvd NE
Albuquerque, NM 87109

Matejka Ray-Olguin
Socorro County
PO Box I
Socorro, NM 87801

U.S. Department of
Agriculture
Lincoln National Forest
1101 New York Avenue
Alamogordo, NM 88310

New Mexico Parks and
Recreation Division
1220 St Francis Drive
Santa Fe, NM 87505

Bureau of Land Management
1800 Marquess Street
Las Cruces, NM 88005

Cliff Spencer
White Sands National
Monument
PO Box 1086
Holloman AFB, NM 88330

Mark Chino
Mescalero Apache Tribe
PO Box 227
Mescalero, NM 88340

Thom Rennie
Air Force Center for
Environmental Excellence
Regional Environmental
Office
525 S Griffin Street, Ste 505
Dallas, TX 75202

New Mexico State Land
Office
PO Box 1148
Santa Fe, NM 87504-1148

USDA Forest Service
1400 Independence Ave., SW
Washington, DC 20250-0003

NPS-2225, Recreation
Programs Division
1849 C Street NW
Washington, DC 20240

US Department of Interior
2105 Osuna NE
Albuquerque, NM 87113

Brigadier General, USAF
(Ret.) Scott
Office of Military Base
Planning & Support
Joseph M. Montoya Building,
Room 1060
1100 St Francis Drive
Santa Fe, NM 87505

Office of Environmental
Policy and Compliance
1849 C Street NW, M/S 2342
Washington, DC 20240

Jennifer Brady
1 Jerry Smith Circle
Roswell, NM 88203

Peter Bullock
Environment and Safety
Directorate
White Sands Missile Range,
NM 88002-5000

Judith Stewart
City of Artesia
PO Box 1310
Artesia, NM 88211

City of Carlsbad
101 N Halagueno
Carlsbad, NM 88221

Estelle Bulka
US Environmental Protection
Agency
1445 Ross Avenue
Dallas, TX 75202-2733

Clarissa McGinn
Otero County Commission
1000 New York Avenue
Room 101
Alamogordo, NM 88310

Marion L. Ledford Jr.
Alamogordo City
Commsision
3034 Del Sur
Alamogordo, NM 88310

Donald E. Carroll
Alamogordo City
Commission
1515 Arizona Avenue
Alamogordo, NM 88310

Thomas Wylam
Sierra Blanca Regional
Airport
313 Cree Meadows Drive
Ruidoso, NM 88345

Rosalind Tripp
City of Socorro
PO Box K
Socorro, NM 87801

New Mexico Farm and
Livestock
89 Las Flores Drive
Roswell, NM 88203

Martin Moore
Otero County Administrator
1000 New York Avenue
Room 101
Alamogordo, NM 88310

Michael Nivison
Otero County Commission
1000 New York Avenue
Room 101
Alamogordo, NM 88310

Donald L. Cooper
Alamogordo City
Commission
3433 Mesa Verde Place
Alamogordo, NM 88310

Charles Ferrell
Committee of Fifty
PO Box 550
Tularosa, NM 88352

New Mexico Dept. of Game
& Fish
PO Box 25112
Santa Fest, NM 87504

John H. Robertson
Alamogordo City
Commission
1010 Indian Wells Road
Alamogordo, NM 88310

Ed Cole
Alamogordo City
Commission
401 Sunbeam
Alamogordo, NM 88310

David C. Venable
Village of Cloudcroft
PO Box 554
Cloudcroft, NM 88317

Bradley G. Rasch
Village of Cloudcroft
PO Box 1208
Cloudcroft, NM 88317

Andy Olsen
Village of Cloudcroft
PO Box 10
Cloudcroft, NM 88317

Thomas McKean
Village of Tularosa
102 Sierra Blanca
Tularosa, NM 88352

Reynaldo Cordova
Village of Tularosa
711 5th Street
Tularosa, NM 88352

Inez M. Moncada
Alamogordo City
Commission
119 New York Avenue
Alamogordo, NM 88310

Ron Griggs
Alamogordo City
Commission
2704 Birdie Loop
Alamogordo, NM 88310

Barbara Springer
Village of Cloudcroft
PO Box 1025
Cloudcroft, NM 88317

Erich Wuersching
Village of Cloudcroft
PO Box 925
Cloudcroft, NM 88317

Demeterio Montoya
Village of Tularosa
705 St Francis Drive
Tularosa, NM 88352

Margaret Trujillo
Village of Tularosa
1208 Montezuma
Tularosa, NM 88352

Fred Utter
Village of Tularosa
303 7th Street
PO Box 315
Tularosa, NM 88352

Galen Hanson
Bureau of Rec
HC32 Box 312
Truth or Consequences, NM
87901

Steve Sederwall
City or Capitan
PO Box 246
Capitan, NM 88316

Manuel Hernandez
Town of Carrizozo
400 9th Street
Carrizozo, NM 88301

Bill Mattiace
City of Las Cruces
200 N Church Street
Las Cruces, NM 88001

Jose Frietze
City of Las Cruces
200 N Church Street
Las Cruces, NM 88001

Brian Denmark, AICP
Las Cruces International
Airport
1501 E Hadley
Building D
Las Cruces, NM 88001

Bob Barnes
City of Elephant Butte
PO Box 1080
Elephant Butte, NM 87935

Manuel Madrid
City of Artesia
PO Box 1310
Artesia, NM 88211

Bob Forrest
City of Carlsbad
101 N Halagueno
Carlsbad, NM 88221

L. Ray Nunley
Village of Ruidoso
PO Box 459
Ruidoso, NM 88355

Michael Cadena
Town of Mesilla
PO Box 10
Mesilla, NM 88046

Bob Miller
City of Ruidoso Downs
PO Box 348
Ruidoso Downs, NM 88346

Rudy Clark
Alamogordo Airport
1376 E 9th Street
Alamogordo, NM 88310

Pat Salome
Socorro Airport
PO Box K
Socorro, NM 87801

Truth or Consequences
Airport
505 Sims Street
Truth or Consequences, NM
87901

Velta Gilley
Town of Mountainair
107 N Roosevelt Avenue
Mountainair, NM 87036

Gilbert Stewart, Jr
Village of Corona
PO Box 37
Corona, NM 88318

City of Capitan
PO Box 246
Capitan, NM 88316

Lois Reaver-Black
City of Truth or
Consequences
405 West 3rd Street
Truth or Consequences, NM
87901

Jimmy Rainey
City of Truth or Consequences
505 Sims Street
Truth or Consequences, NM 87901

Jim Frost
Torrance County Commissioners
PO Box 48
Estancia, NM 87016

Ravi Bhasker
City of Socorro
PO Box K
111 School of Mines Road
Socorro, NM 87801

Carol Sue Jackson
Village of Williamsburg
PO Box 150
Williamsburg, NM 87942

John Collins
Village of Hope
PO Box 1476
Hope, NM 88250

Ronald D. Hardeman
Village of Ruidoso
PO Box 131
Ruidoso, NM 88355

Mariano Legarreta
City of Hatch
PO Box 250
Hatch, NM 87937

Lucky Briggs
Eddy County Commissioners
101 West Greene Street
Carlsbad, NM 88220

Brian Haines
County of Dona Ana
180 West Amador
Las Cruces, NM 88001

Janet Carrejo
Sierra County
100 N Date Street, Suite 11
Truth or Consequences, NM 87901

Mike Snyder
National Park Service
12795 Alameda Pkwy
Denver, CO 80225

National Park Service
PO Box 1086
Holloman AFB, NM 88330

Public and Agency Responses

Federal Agencies

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

APR 17 2006

Thank you for your recent request for information on threatened or endangered species or important wildlife habitats that may occur in your project area. The New Mexico Ecological Services Field Office has posted lists of the endangered, threatened, proposed, candidate and species of concern occurring in all New Mexico Counties on the Internet. Please refer to the following web page for species information in the county where your project occurs: http://ifw2es.fws.gov/NewMexico/SBC_intro.cfm. If you do not have access to the Internet or have difficulty obtaining a list, please contact our office and we will mail or fax you a list as soon as possible.

After opening the web page, find New Mexico Listed and Sensitive Species Lists on the main page and click on the county of interest. Your project area may not necessarily include all or any of these species. This information should assist you in determining which species may or may not occur within your project area.

Under the Endangered Species Act, as amended (Act), it is the responsibility of the Federal action agency or its designated representative to determine if a proposed action "may affect" endangered, threatened, or proposed species, or designated critical habitat, and if so, to consult with us further. Similarly, it is their responsibility to determine if a proposed action has no effect to endangered, threatened, or proposed species, or designated critical habitat. If your action area has suitable habitat for any of these species, we recommend that species-specific surveys be conducted during the flowering season for plants and at the appropriate time for wildlife to evaluate any possible project-related impacts. Please keep in mind that the scope of federally listed species compliance also includes any interrelated or interdependent project activities (e.g., equipment staging areas, offsite borrow material areas, or utility relocations) and any indirect or cumulative effects.

Candidates and species of concern have no legal protection under the Act and are included on the web site for planning purposes only. We monitor the status of these species. If significant declines are detected, these species could potentially be listed as endangered or threatened. Therefore, actions that may contribute to their decline should be avoided. We recommend that candidates and species of concern be included in your surveys.

Also on the web site, we have included additional wildlife-related information that should be considered if your project is a specific type. These include communication towers, power line safety for raptors, road and highway improvements and/or construction, spring developments and livestock watering facilities, wastewater facilities, and trenching operations.

Under Executive Orders 11988 and 11990, Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and floodplains, and preserve and enhance their natural and beneficial values. We recommend you contact the U.S. Army Corps of Engineers for permitting requirements under section 404 of the Clean Water Act if your proposed action could impact floodplains or wetlands. These habitats should be conserved through avoidance, or mitigated to ensure no net loss of wetlands function and value.

The Migratory Bird Treaty Act (MBTA) prohibits the taking of migratory birds, nests, and eggs, except as permitted by the U.S. Fish and Wildlife Service. To minimize the likelihood of adverse impacts to all birds protected under the MBTA, we recommend construction activities occur outside the general migratory bird nesting season of March through August, or that areas proposed for construction during the nesting season be surveyed, and when occupied, avoided until nesting is complete.

We suggest you contact the New Mexico Department of Game and Fish, and the New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division for information regarding fish, wildlife, and plants of State concern.

Thank you for your concern for endangered and threatened species and New Mexico's wildlife habitats. We appreciate your efforts to identify and avoid impacts to listed and sensitive species in your project area.

Sincerely,

Russell Holder
Acting Field Supervisor

077621

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

RECEIVED
APR 10 2006
LMM
HISTORIC PRESERVATION DIVISION

APR 05 2006

MEMORANDUM FOR NM HISTORIC PRESERVATION DIVISION (MS. KATHERINE SLICK)
RM 320, LAVILLA RIVERA
228 EAST PALACE AVE
SANTA FE NM 83501

FROM: HQ ACC/ A7Z
129 Andrews St., Suite 102
Langley AFB VA 23665-2969

SUBJECT: Environmental Assessment for the Drawdown of the F-117 and T-38 Aircraft and Beddown of the F-22 at Holloman Air Force Base (AFB), New Mexico

1. The United States Air Force will be preparing an Environmental Assessment (EA) to determine the potential environmental consequences of a proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB by replacing the retiring F-117A aircraft and T - 38A aircraft supporting the F-117A mission with two F-22A squadrons. The Air Force has identified Holloman AFB as the preferred location for the third operational wing of the Air Force's F-22A, which would enhance the low observable, precision weapons system capability of the 49th Fighter Wing.

2. As part of the proposal, the EA will address changes in personnel, numbers of constructed or renovated facilities, use of military airspace for supersonic training flights, and the expanded use of chaff and flares in military airspace. Alternatives to meeting the underlying purpose and need of the proposed action, if any, will be developed during the EIAP process. A no-action alternative will also be addressed.

3. The purpose of this correspondence is to initiate the Section 106 process of the National Historic Preservation Act of 1966 (as amended) in the potentially affected areas in Holloman AFB. We are in the early stages of gathering information concerning previous archaeological and historical studies for the areas under the affected region. We would appreciate any assistance you could provide in identifying and retrieving this important information, as well as concerns you may have about the potential effects of the proposal on significant cultural resources. In an effort to analyze the potential effects of this proposed beddown, the Air Force or its contractor, SAIC, may be contacting you in their data collection efforts. To ensure the Air Force has sufficient time to consider your input in the preparation of the Draft EA, please provide information and/or comments to Ms. Linda DeVine, HQ ACC/A7ZP c/o SAIC, 22 Enterprise Parkway, Suite 200, Hampton VA 23666 by May 4, 2006.

4. If you have any specific questions about the proposal, please feel free to contact Ms. Linda DeVine (757) 827-2659. General questions may be directed to the Holloman AFB Public Affairs Office at 505-572-5406. Thank you for your assistance in this matter.

BRUCE W. MACDONALD, GM-14, DAF
Acting Deputy Chief, Programs Division

1 Attachment:
1. Airspace Map

NO COMMENT

NMSHPO

Global Power For America

United States Department of the Interior

NATIONAL PARK SERVICE
White Sands National Monument
P.O. Box 1086
Holloman AFB, NM 88330

L76

April 14, 2006

Ms Linda DeVine
HQ ACC/A7ZP
c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton VA 23666

Dear Ms. DeVine:

This letter addresses questions concerning the proposed F-22A beddown at Holloman Air Force Base, New Mexico. White Sands National Monument received a scoping letter describing the proposed action. The action includes replacing the F-117A with the F-22A, supersonic training flights and the expanded use of chaff and flares in military airspace. The airspace over the national monument is used by the military. The park would be concerned if the F-22A engine noise is louder than the F-117A. The park would also be concerned if sonic booms increase over the national monument. An increase in noise could disturb visitors. An increase in noise and vibration from sonic booms might also affect the historic adobe structures at the park's entrance. Finally, if the use of chaff and flares is increased in the airspace over the monument, debris fall would increase. Increased military debris would be counter to the park's enabling legislation. We are mandated to preserve and protect the natural resources and scenic qualities of the monument.

Thank you for this opportunity to respond to your scoping letter. If you have any questions, please feel free to contact Diane White at (505) 679-2599 extension 223.

Sincerely,

Cliff Spencer
Superintendent

U.S. Department
of Transportation
**Federal Aviation
Administration**

800 Independence Ave SW
Washington, DC 20591

MAY 4 2006

Timothy A. Byers
Colonel, USAF
Director of Installations (A7)
Department of the Air Force
Headquarters Air Combat Command
129 Andrews Street, Suite 102
Langley AFB, VA 23665-2769

Dear Colonel Byers:

Thank you for your letter of April 6, requesting Federal Aviation Administration (FAA) participation in the environmental assessment (EA) associated with transforming the 49 FW by retiring the F-117A and T-38 aircraft and bedding down the F-22A aircraft.

We understand by your letter that the proposed changes to airspace surrounding Holloman AFB includes 1) extending supersonic operations in R5107, White Sands Missile Range, down to 10,000 MSA and raising the ceiling to FL600; 2) creating new Air Traffic Control Assigned Airspace (ATCAA) from FL180 to FL600 bridging R5107 and R5103 B/C (McGregor Range) with airspace approved for supersonic flight; 3) modifying Cowboy ATCAA to include supersonic flight by lowering the floor to FL230 and raising the ceiling to FL600 and extending the ATCAA to the south (FL230 and FL600) creating a bridge to R5102 B/C; 4) modifying Beak ATCAA (subsonic operations) by lowering the ceiling to FL230 to coincide with the floor of the proposed Cowboy ATCAA; and, 5) raising the ceiling on Talon High East and West ATCAA to FL600.

We are pleased to assist you with your documentation; however, these changes do not constitute an FAA Federal Action requiring environmental review in accordance with National Environmental Policy Act (NEPA). Since the proposal does not contemplate actions constituting a FAA Federal action, we will at this time be happy to provide special expertise, making staff support available to assist you as resources allow.

The FAA's Central En Route and Oceanic Operations will be the primary focal point for environmental and aeronautical matters related to this proposal. A copy of this letter and your letter are being forwarded to Mr. Paul Sheridan, Acting Director of Central En Route and Oceanic Operations. You may contact him directly at (817) 222-5500.

We look forward to coordinating this activity with the Air Force.

Sincerely,

Nancy Kalinowski

Nancy B. Kalinowski
Director, System Operations Airspace & Aeronautical Information Management

Congressionals

New Mexico
House of Representatives

GLORIA C. VAUGHN
R - Otero County
District 51

503 E. 16th Street
Alamogordo, New Mexico 88310-6606

Home Phone: (505) 434-2819
E-Mail: gloria.vaughn@nmlegis.gov

Ms. Linda Debine
Hq. ACC/A7ZP c/o SAIC
22 Enterprise Parkway
Suite 200
Hampton, Va. 23666

Apr 20, 06

Dear Ms. Linda Debine,

I have had the privilidge to attend a recent presentation on F-22 Raptor.

What an exciting program. I look forward to seeing the planes flying over Holloman/Alamogordo & surrounding area.

The presenters did a great job in explaing & answering questions from the audience.

This plane will make a wonderful addition to Holloman.

Sincerely,
Gloria C. Vaughn

State Agencies

GOVERNOR
Bill Richardson

STATE OF NEW MEXICO
DEPARTMENT OF GAME & FISH

One Wildlife Way
Post Office Box 25112
Santa Fe, NM 87504
Phone: (505) 476-8101
Fax: (505) 476-8128

DIRECTOR AND SECRETARY
TO THE COMMISSION
Bruce C. Thompson

Visit our website at www.wildlife.state.nm.us
For basic information or to order free publications: 1-800-862-9310.

STATE GAME COMMISSION

Leo V. Sims, II, Chairman
Hobbs, NM

Dr. Tom Arvas, Vice-Chairman
Albuquerque, NM

David Henderson, Commissioner
Santa Fe, NM

Alfredo Montoya, Commissioner
Alcalde, NM

Peter Pino, Commissioner
Zia Pueblo, NM

M. H. "Dutch" Salmon, Commissioner
Silver City, NM

May 4, 2006

Ms. Linda DeVine
HQ ACC/A7ZP
c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Re: Transforming 49th Fighter Wing Combat Capability through F-117A Retirement and F-22A Beddown at Holloman AFB Draft Environmental Assessment Scoping
NMGF Doc. No. 10789

Dear Ms. DeVine:

The Department of Game and Fish (Department) has reviewed your request for pertinent information for the development of the above-mentioned draft environmental assessment. The U.S. Air Force (USAF) proposes to transform the combat capability of the 49th Fighter Wing by retiring F-117A and T-38A aircraft and replacing with two F-22A squadrons at Holloman AFB.

On May 8, 1998, the U.S. Fish and Wildlife Service issued a Biological Opinion (BO) to the USAF Air Combat Command subsequent to formal consultation required by the Endangered Species Act, regarding the proposed addition of 30 German Air Force Tornado jet aircraft to the inventory of Holloman AFB, and continued use of selected military airspace located above west Texas, southern New Mexico and a small area of east-central Arizona. The concern was that military jet overflights could adversely affect four federally-listed bird species, the Northern Aplomado Falcon, Bald Eagle, Mexican Spotted Owl and Southwestern Willow Flycatcher. The BO prescribed seasonal and spatial avoidance criteria for military jet aircraft above known locations of nesting Mexican Spotted Owls, Northern Aplomado Falcons, and Southwestern Willow Flycatchers and nesting, roosting and wintering locations of Bald Eagles (Air Combat Command, October, 2004. Draft Annual Report – 2003 Biological Monitoring Activities Deliberative Draft).

It is not clear to us whether the retiring F-117A aircraft were covered under this BO. However, we request that the Draft EA for this initiative include a discussion of how and if the F-22A aircraft and mission will function under the existing BO. We also request a thorough discussion of how this modified mission will potentially affect those federally-listed species above, as compared to the retiring aircraft (i.e., how the flight paths, frequencies of overflights; minimum ceiling, noise levels,

etc., will differ), based on the findings of the extensive biological monitoring program that has been conducted under the existing BO.

We appreciate the opportunity to comment on this project. Should you have any questions regarding our comments, please contact Mark Watson, Habitat Specialist, of my staff at (505) 476-8115, or <mark.watson@state.nm.us>.

Sincerely,

Lisa Kirkpatrick

Lisa Kirkpatrick, Chief
Conservation Services Division

LK/MLW

CC: Russ Holder (Acting Ecological Services Field Supervisor, USFWS)
George Farmer (Southeast Area Habitat Specialist, NMGF)
Pat Mathis (Southwest Area Habitat Specialist, NMGF)
Sandy Williams (Non-game Ornithologist, NMGF)
Mark Watson (Conservation Services Habitat Specialist, NMGF)

City and County Governments

Email: oteroadm@co.otero.nm.us
COMMISSION / ADMINISTRATION
(505) 437-7427
FAX (505) 443-2904

1000 NEW YORK AVE., RM 101
ALAMOGORDO, NM 88310-6935

State of New Mexico
County of Otero

VIA FACSIMILE

May 9, 2006

Linda Devine,
Headquarters ACC/A7ZP C/O SIAC 22
Enterprise Parkway, Suite 200
Hampton, Virginia 23666

Dear Ms. Devine:

Thank you for informing Otero County about the initiation of an Environmental Assessment to consider a new mission for Holloman Air Force Base. We respectfully request coordinating agency status and participation as a member of the Interdisciplinary (ID Team).

As a coordinating agency and ID team member, we can provide historic, social, and economic data for the area. Further, we can host additional meetings as needed, and act as a local point of contact for residents that request information and updates.

In the future, we ask that you provide information on scheduled Environmental planning activities to Dr. Martin Moore, the Otero County Administrator.

We in Otero County proudly support our Military and look forward to working with you throughout the Environmental Assessment process.

Regards,

Doug Moore, Chairman
Board of Otero County Commissioners

DM/sec

America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

WRITTEN COMMENT SHEET
Environmental Assessment (EA)

Thank you for your input! **DATE:** 4/18/06

PLEASE PRINT

Regarding the initiative the U.S. Air Force has to retire the F-117 at Holloman AFB and replace it with the F-22, I am in support of it. I've reviewed the written material provided to me and the oral presentation by Col. David Moore and I believe the transition is beneficial to the community of Ruidoso and to the Sierra Blanca Regional Airport. I don't believe there will be any negative impact whatsoever in the transitioning of aircraft and their support elements.

I also don't believe there will be any negative impact on the environment, airspace or personnel that share this area with the F-22 in flight. The operation of the Sierra Blanca Regional Airport is currently only with general aviation aircraft but we are interested in changing it to a commercial operation by attracting an airline; even so I don't believe this change would have any impact on the "safety of flight" concerns when or if the F-22 was based at Holloman AFB.

**** CONTINUE ON BACK FOR MORE SPACE ****

NAME:	Thomas S. Wylam: Airport Director
ORGANIZATION:	Village of Ruidoso
ADDRESS:	313 Cree Meadows Dr.
CITY/STATE/ZIP:	Ruidoso, NM 88345

☑ Yes, please include me in the mailing list for distributing the EA. I would like to receive a copy of the EA in: ✓ hard copy format ___ CD (electronic format)

☐ No, please do not include me in the mailing list for distributing the EA. I do not wish to receive an EA or further information.

Your name and address will be used to compile a mailing list for distributing future information regarding the Holloman AFB Environmental Assessment (EA). Names and addresses will not be published in the EA. However, by including your name and address, it will become part of the EA public record.

Your involvement and input are essential to helping the Air Force make informed decisions during the environmental process. Listed below are tips on how to make your comments useful and effective:

- Be specific. It is helpful to state particular reasons for concerns rather than making broad statements.
- Focus your comments on particular environmental resources and provide as much detail as possible.

This type of input will help us balance the Air Force mission with the environment and the community.

Please hand this form in or mail before MAY 4, 2006 to:

MS. LINDA DEVINE
HQ ACC/A7ZP C/O SAIC
22 ENTERPRISE PARKWAY, SUITE 200
HAMPTON, VA 23666

Village Of Cloudcroft

P.O BOX 317 • 201 BURRO AVE. • CLOUDCROFT, NEW MEXICO 88317 • (505) 682-2411 • (505) 682-2042 FAX

April 19, 2006

Ms. Linda Devine
HQ ACC/A7ZP
c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

RE: Holloman Air Force Base
Environmental Assessment

Dear Ms. Devine,

The Mayor and Trustees of the Village of Cloudcroft, NM are in full support of the transformation of Holloman Air Force Base involving the 49th Fighter Wing's combat capability through F-117A Retirement and F-22A Beddown.

We support the use of military airspace for supersonic training flights and expanded use of chaff and flares.

Thank you for your consideration and if we are able to provide additional assistance in data collection or comments, please do not hesitate to contact our office.

Respectfully Submitted,

David C. Venable, Mayor

Bradley Rasch, Mayor pro tem

Andy Olsen, Trustee

Arlan Ponder, Trustee

Jerry Sutherlin, Trustee

BR/jm

Playground In The Clouds

City of Alamogordo

ARTHUR L. ALTERSON
COMMUNITY DEVELOPMENT DIRECTOR

1376 E. Ninth Street
Alamogordo, NM 88310
(505) 439-4220
Fax (505) 439-4343
e-mail: aalterson@ci.alamogordo.nm.us

rce -- No One Comes Close
FB, New Mexico
Home of the Fightin' 49ers

N COMMENT SHEET
Environmental Assessment (EA)

Thank you for your input!

DATE: 5/4/06

PLEASE PRINT

I appreciate the opportunity to comment on the Environmental Assessment for the proposed action at Holloman Air Force Base. I attended the 4/19/06 Scoping Meeting in Alamogordo and heard the Air Forces excellent presentation, which included what sounded to me like a fair assessment of both benefits and inconveniences that would arise from the proposed action. None of the six specific proposed actions listed in the Notice of Intent to Perform an Environment Assessment appear to have an adverse impact in any area of environmental concern.

One of the areas of environmental concern is the socioeconomic impact of a proposed action on neighboring communities. The symbiotic economic and cultural relationship between Holloman and the City of Alamogordo I believe is an impressive consideration. The City includes Holloman within its planning area addressed by the 2000 Alamogordo Comprehensive Plan. The Plan notes: "HAFB has played an integral part in the Tularosa Basin and southeastern New Mexico economy...In 1997, personnel associated with HAFB, including active military and civilian workers, their dependents, and retirees, accounted for more than 15,000 people which is nearly 50% of Alamogordo's population base. Approximately half ...reside ...within the city limits. (p. 6)" Further the Plan states,

**** CONTINUE ON BACK FOR MORE SPACE ****

NAME:	ARTHUR ALTERSON
ORGANIZATION:	COMMUNITY DEVELOPMENT DIR CITY OF ALAMOGORDO
ADDRESS:	1376 E. NINTH STREET
CITY/STATE/ZIP:	ALAMOGORDO, NM. 88310

☐ Yes, please include me in the mailing list for distributing the EA. I would like to receive a copy of the EA in: X hard copy format
X CD (electronic format)

☐ No, please do not include me in the mailing list for distributing the EA. I do not wish to receive an EA or further information.

Your name and address will be used to compile a mailing list for distributing future information regarding the Holloman AFB Environmental Assessment (EA). Names and addresses will not be published in the EA. However, by including your name and address, it will become part of the EA public record.

Your involvement and input are essential to helping the Air Force make informed decisions during the environmental process. Listed below are tips on how to make your comments useful and effective:

- Be specific. It is helpful to state particular reasons for concerns rather than making broad statements.
- Focus your comments on particular environmental resources and provide as much detail as possible.

This type of input will help us balance the Air Force mission with the environment and the community.

Please hand this form in or mail before MAY 4, 2006 to:

MS. LINDA DEVINE
HQ ACC/A7ZP C/O SAIC
22 ENTERPRISE PARKWAY, SUITE 200
HAMPTON, VA 23666

"HAFB will have a significant economic impact on the planning area since it employs more than 3300 civilians, nearly 20% of the county workforce. (p. 18)" The Plan anticipates the area bounded by US 70/82, Airport Road, US 54, and the Alamogordo – White Sands Regional Airport "to develop significantly ...due to its proximity to HAFB (p. 32) with multi-family and newer manufactured housing. The Plan anticipates that this Holloman-dependent population growth and residential redevelopment in part will stimulate commercial growth in the area of the US 70 and US 54 junction.

The Planning Goals and Objectives adopted within the Alamogordo Comprehensive Plan 2000 includes an active policy of the City "Coordinat[ing] planning with HAFB to assure proper land use in buffer areas for noise attenuation and safety, particularly to preserve the approach to the wide body runway. (p.36)" The Goals and Objectives further mandate the City "Work closely with HAFB to maintain and enhance the local factors that contribute to its mission success.(p.36) "This extraordinary level of municipal/ military cooperation in part is effected and symbolized by Holloman's representation on the Alamogordo Planning and Zoning Commission."

The Holloman 2005 Economic Impact Statement further points to the positive impact Holloman has on the neighboring civilian community. From this document I learn that Holloman is responsible for creating 2047 indirect jobs, with an estimated payroll of $77,376,600. The value of "temporary billeting in local community" is approximately $550,000, and of "contracts: services, supplies, equipment" is approximately $94,000,000.

The above analysis is based on the current level of activity at Holloman. Local economic factors are not the primary determinant of national security objectives. Missions will come and go on the basis of more critical considerations. For purposes of this Environmental Assessment, though, I am offering in support of the proposed action the mutual economic benefits to the local civilian community and to the Air Force of maintaining the high level of activity at Holloman, and the mutual benefits stemming from the extraordinary practical and institutionalized land use planning cooperation between the two.

Thank you for the opportunity to comment.

City of Alamogordo

OFFICE OF THE CITY CLERK
1376 E. NINTH STREET • ALAMOGORDO, NEW MEXICO 88310-5838 • (505) 439-4205 FAX (505) 439-4396

May 10, 2006

Ms. Linda Devine
HQ ACC / A7ZP C/O SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Re: Supporting the bed down of two F-22A Squadrons at Holloman Air Force Base

Dear Ms. Devine,

Please find the enclosed Resolution No. 2006-36 for the support of the Alamogordo City Commission regarding the topic referenced above.

The City Commission passed this resolution unanimously and Mayor Don Carroll asked that I send you a copy.

Please feel free to contact me if you have any questions.

Respectfully,

Reneé L. Cantin,
City Clerk

RESOLUTION NO. 2006-36
SUPPORTING THE BED DOWN OF TWO F-22A SQUADRONS AT HOLLOMAN AIR FORCE BASE

WHEREAS, the Air Force has decided to retire the F-117A aircraft currently stationed at Holloman AFB; and,

WHEREAS, the Air Force is proposing to transform the combat capability of the 49th Fighter Wing by equipping it with the F-22A aircraft; and,

WHEREAS, there is a long history of deploying state-of-the-art aircraft at Holloman AFB; and,

WHEREAS, Holloman AFB offers unique operational and training capabilities to the Air Force, such as restricted airspace, test ranges, and year around good flying weather; and,

WHEREAS, the Alamogordo community has, for over sixty years, supported the Air Force mission at Holloman AFB.

BE IT THEREFORE RESOLVED that the governing body of the City of Alamogordo expresses its support for the bed down of the F-22A aircraft at Holloman AFB.

BE IT FURTHER RESOLVED that the City of Alamogordo requests that the Air Force consider the potential negative economic impact to the community of retiring the F-117A prior to the deployment of the F-22A to Holloman AFB.

DONE, this 9th day of May, 2006.

CITY OF ALAMOGORDO, NEW MEXICO
a New Mexico municipal corporation

By: Donald E. Carroll
Donald E. Carroll, Mayor

ATTEST:

Reneé L. Cantin
Reneé L. Cantin, City Clerk

APPROVED AS TO FORM:

Rebecca Wiener Ehler
Rebecca W. Ehler, Interim City Attorney

General Public

James F. Pigg
[redacted]
Las Cruces, NM 88011

10 April 2006

Ms. Linda A. DeVine
HQ ACC/A7ZP
c/o SAIC
22 Enterprise Parkway
Suite 200
Hampton, VA 23666

RE: Request to be Placed on Mailing List, Environmental Assessment (EA) for the Retirement of the F-117A and T-38A Aircraft and Beddown of the F-22A at Holloman Air Force Base, NM

Dear Ms. DeVine,

Please place me on the mailing list for notices regarding the EA, and to receive the Draft and Final EA.

James Pigg
4851 Quail Run
Las Cruces, NM 88011

Thank you,

Jim Pigg

Southwest Air Systems

HEATING
VENTILATING
AIR
CONDITIONING

License No. 15370

P.O. Drawer 1968 Alamogordo, New Mexico 88310 505-437-0492 or 437-6484

14 April 2006

Linda DeVine
HDQTRS ACC / A7ZZP c/o SAIC
22 Enterprise Pkwy, Ste 200
Hampton VA 23666

Dear Ms. Linda DeVine

As a life long resident of New Mexico, it is my opinion that the military is our bread and butter. We are in a very prime location for the F-22 mission and we have the opportunity to be partner and leader in Otero & Lincoln County to help secure the future of our great country in keeping our homelands safe in the future for generations and any impacts can be worked out.

Sincerely

William Keith Blazer

William Keith Blazer

General Hydronics Inc.

SHANNAN T WRIGHT - PRESIDEN
DAVID L CARAWAY - VICE-PRESIDEN

REFRIGERATION - PLUMBING - UTILITIES LICENSE # NM26970 BUSINESS REG. 01239
TELEPHONE (505) 437-6512 FAX (505) 434-67
1001 ZUNI DRIV
P.O. BOX 19
ALAMOGORDO NM 88311-19

14 April 2006

Linda DeVine
HDQTRS ACC / A7ZZP c/o SAIC
22 Enterprise Pkwy, Ste 200
Hampton VA 23666

Dear Ms. Linda DeVine

As a 28 year resident of New Mexico, it is my opinion that the military is our bread and butter. We are in a very prime location for the F-22 mission and we have the opportunity to be partner and leader in Otero & Lincoln County to help secure the future of our great country in keeping our homelands safe in the future for generations and any impacts can be worked out.

Sincerely

Shannan T Wright

ZUNI ELECTRIC, INC.

PO Box 1909

Alamogordo, NM 88311-1909

(505) 437-6514 FAX (505) 434-6721

License 27073

14 April 2006

Linda DeVine
HDQTRS ACC / A7ZZP c/o SAIC
22 Enterprise Pkwy, Ste 200
Hampton VA 23666

Dear Ms. Linda DeVine

As a 33 year resident of New Mexico, it is my opinion that the military is our bread and butter. We are in a very prime location for the F-22 mission and we have the opportunity to be partner and leader in Otero & Lincoln County to help secure the future of our great country in keeping our homelands safe in the future for generations and any impacts can be worked out.

Sincerely

Fred Sullivan

Overstreet & Associates, P.C.

Law Corporation

1011 New York Ave.
Alamogordo, NM 88310-6921

Phone: (505) 437-5800
Fax: (505) 437-1567

April 24, 2006

Linda A. Devine
HQ ACC/A72P, c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Re: ***Environmental Assessment for F-22 Holloman AFB, New Mexico***

Dear Ms. Devine:

This is a letter in support of the F-22 being at Holloman AFB. The news that the F-22 Rapture is to be stationed at Holloman AFB is welcomed by this community. We have a long-standing history of strongly supporting the Air Force and the missions that have been stationed at Holloman AFB. The relationships between this community and Holloman AFB have been outstanding because both parties have strived to work together so that the men and women who are dedicated to serve our country and come this way truly enjoy there stay here. They quickly become part of our community, assume leadership roles, and are active in almost every aspect.

There will be no adverse impact when the F-22 is stationed at Holloman AFB.

Sincerely,

S. Thomas Overstreet

STO/nem

CHARLES, GARLAND AND HARRIS AGENCY

April 25, 2006

Ms. Linda A. DeVine
HQ ACC/A7ZP, c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

RE: F-22 at Holloman AFB, NM

Dear Ms. DeVine,

As a citizen of Alamogordo, NM, I heartily welcome the news of the future bed down of the F-22 Raptor at Holloman AFB. Our community has always been a great supporter of the United States Air Force and national defense. Our economy is also very dependent upon what goes on at Holloman AFB. Air Force personnel and dependents are a great asset to Alamogordo. There is plenty of room at Holloman for the F-22's as well as plentiful flying space.

Sincerely,

Jim Harris

Jim Harris, President
CHARLES, GARLAND & HARRIS AGENCY, INC.

3310 N. WHITE SANDS BLVD. • P.O. BOX 360 • ALAMOGORDO, NEW MEXICO 88311
(505) 437-6910 • FAX (505) 437-8187 • www.cgh-insurance.com

NMSU-Alamogordo
Small Business Development Center

Our Mission: To Help You Make Informed Business Decisions

Since 1989

April 27, 2006

Ms. Linda A. DeVine
HQ ACC/A7ZP, c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Dear Ms. DeVine:

Per the *Federal Register* notice of April 10, 2006 (Volume 71, Number 68) concerning the Notice of Intent (NOI) for an Environmental Assessment of the F-22 at Holloman Air Force Base, the Alamogordo Chamber of Commerce Committee of Fifty wishes to express our support for the addition of the F-22 mission at Holloman.

Since World War II, Holloman Air Force Base has been the home of numerous aircraft - from the B-17 to the F-117. For over six decades Alamogordo has supported our Air Force and the nation at Holloman Air Force Base. We in the Alamogordo community feel that this tradition should continue at Holloman with the stationing of the Air Force's newest fighter, the F-22A Raptor.

For years Alamogordo has heard the "sound of freedom" including sonic booms from the many generations of jet fighters. Alamogordo is proud of its support to our nation, and we hope to continue for many years to come.

Sincerely,

G. Dwight Harp
Small Business Development Center

2230 Lawrence Boulevard, Alamogordo, NM 88310
Phone: (505) 434-5272 FAX: (505) 434-1432

Ms Linda Devine
HQ ACC/A7ZP c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 2366

Scott T. Weaver
[redacted]
T or C, NM 87901

April 28, 2006

Dear Ms. Devine,

I was at the presentation in Truth or Consequences, NM when the representatives from Holloman Air Force Base presented on the proposed plans. I am concerned about the environmental impact of continued build up of our industrial military complex. I am interested in seeing more non-military resolution to international conflict. In my work I teach children to resolve conflicts non-violently. I would like to be able to site examples of our government's attempts to the same.

I am concerned about the plan to combine the restricted airspace for supersonic practice areas. I believe that increased military activity, especially supersonic activity, will negatively impact our tourism base. I can just see it now, "Come to T or C the land of enchanted, calming, healing waters – and supersonic military exercises."

I am concerned about the release of these new flares that pose a fire hazard over precious natural resources. Additional areas of concern include what ever wild life impact may be made by chemicals associated with these exercises.

I am frightened by the trend to increase the no fly zones across the US. I am disappointed by the insufficient attempt made to make the public aware of the town hall meeting. My city manager knew nothing about it when I called him. The City Airport director knew nothing about it either. The news paper office read me the legal notice you sent in and it sounded so benign that I question whether it actually describes your plans at all. What a disappointment. I have not yet called my County Manager, but want to make sure to get this letter in the mail before the cut off date. I recall the Colonel specifically stating that all the city and county offices were notified.

Scott T. Weaver

[redacted]
Alamogordo, NM 88311
May 1, 2006

Ms. Linda A. DeVine
HQ ACC/A7ZP, c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

RE: F-22's at Holloman Air Force Base

Dear Ms. DeVine:

I am definitely in favor of bringing the two squadrons of F-22's to Holloman as proposed by the US Air Force. My only concern was the effect that supersonic flight would have on the quality of life in this area. After attending the Environmental Impact Assessment meeting in Alamogordo, and learning more about the subject, I am satisfied that sonic boom will not have a significant negative impact on the community. The economic impact of not having this mission at Holloman would be devastating.

As a community, Alamogordo has embraced Holloman Air Force Base, and the contribution to our nation's defense that it provides. We will proudly continue to do so with the F-22's stationed here. We have always thought of the roar of the F-117's as "The Sound of Freedom". We will think of this each time we hear a sonic boom form an F-22.

Sincerely,

Jerry S. Johnson

P.O. Box 386
Alamogordo, NM 88310
(505) 437-7623 (505) 430-7532 Cell
(505) 439-8242 Home (505) 439-8107 Fax

May 1, 2006

Ms. Linda A. DeVine
HQ ACC/A7ZP c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Dear Ms.DeVine,

In regards to the public hearing I attended Wednesday, April 19, 2006 concerning the F-22 mission at Holloman Air Force Base.

I am a 78 native born Alamogordian. I have been a booster of Holloman since it's inception. I hardily recommend the F-22A Raptor to be our next wonderful mission.

Hopefully, as was stated at the hearing, we won't have a down time at Holloman as the F-117's depart and the F-22's arrive for bed down.

Holloman is our "heartbeat" for Alamogordo and when we don't hear jet noise, our heart skips a beat like an irregular Model T.

I thought your had a good hearing and was well conducted.

Thank you.

Sincerely,

Aubrey Dunn

America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

WRITTEN COMMENT SHEET
Environmental Assessment (EA)

Thank you for your input! **DATE:** 05-02-06

PLEASE PRINT

The mission of the Raptor is vital to the defense of USA. The community support of this platform is paramount to its success. Any environmental impact - Noise etc. - takes a back seat to the necessity of Holloman Housing this program.

As a Committee of 50 Member, Forum Member and business owner I strongly support the Raptor initiative.

****** CONTINUE ON BACK FOR MORE SPACE ******

NAME:	LINDA N. GULLEY
ORGANIZATION:	State Farm Ins.
ADDRESS:	101 N. White Sands blvd.
CITY/STATE/ZIP:	Alamogordo, NM 88310

☑ Yes, please include me in the mailing list for distributing the EA. I would like to receive a copy of the EA in: ___ hard copy format ✓ CD (electronic format)

☐ No, please do not include me in the mailing list for distributing the EA. I do not wish to receive an EA or further information.

Your name and address will be used to compile a mailing list for distributing future information regarding the Holloman AFB Environmental Assessment (EA). Names and addresses will not be published in the EA. However, by including your name and address, it will become part of the EA public record.

Your involvement and input are essential to helping the Air Force make informed decisions during the environmental process. Listed below are tips on how to make your comments useful and effective:

- Be specific. It is helpful to state particular reasons for concerns rather than making broad statements.
- Focus your comments on particular environmental resources and provide as much detail as possible.

This type of input will help us balance the Air Force mission with the environment and the community.

Please hand this form in or mail before MAY 4, 2006 to:

MS. LINDA DEVINE
HQ ACC/A7ZP C/O SAIC
22 ENTERPRISE PARKWAY, SUITE 200
HAMPTON, VA 23666

America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

WRITTEN COMMENT SHEET
Environmental Assessment (EA)

Thank you for your input! **DATE:** 5-2-06

PLEASE PRINT

Holloman Air Force Base is very important to our Community. We have an excellent relationship with them.
The F-22 will fit very well in our Community. and we are so pleased to have them Come here. We enjoy the noise because it is the Sound of freedom.

****** CONTINUE ON BACK FOR MORE SPACE ******

NAME: Toots Green	
ORGANIZATION: Co-50 - Chamber of Commerce	
ADDRESS: 1019 S Canyon Road	
CITY/STATE/ZIP: Alamogordo, NM 88310	

☐ Yes, please include me in the mailing list for distributing the EA. I would like to receive a copy of the EA in: ___ hard copy format ___ CD (electronic format)

☐ No, please do not include me in the mailing list for distributing the EA. I do not wish to receive an EA or further information.

Your name and address will be used to compile a mailing list for distributing future information regarding the Holloman AFB Environmental Assessment (EA). Names and addresses will not be published in the EA. However, by including your name and address, it will become part of the EA public record.

Your involvement and input are essential to helping the Air Force make informed decisions during the environmental process. Listed below are tips on how to make your comments useful and effective:

- Be specific. It is helpful to state particular reasons for concerns rather than making broad statements.
- Focus your comments on particular environmental resources and provide as much detail as possible.

This type of input will help us balance the Air Force mission with the environment and the community.

Please hand this form in or mail before MAY 4, 2006 to:

MS. LINDA DEVINE
HQ ACC/A7ZP C/O SAIC
22 ENTERPRISE PARKWAY, SUITE 200
HAMPTON, VA 23666

May 2, 2006

Ms. Linda A. DeVine
HQ ACC/A7ZP, c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Dear Ms. DeVine,

Per the *Federal Register* notice of April 10, 2006 (Volume 71, Number 68) concerning the Notice of Intent (NOI) for an Environmental Assessment for the F-22 at Holloman Air Force Base, I wish to express my support for the addition of the F-22 mission to Holloman. Since World War II Holloman Air Force Base has been the home of numerous aircraft from the B-17 to the F-117. For over six decades Alamogordo has supported our Air Force and the nation at Holloman Air Force Base. I feel this tradition should continue with the stationing of the Air Force's newest fighter the F-22A Raptor at Holloman Air Force Base.

The F-22 program will not only preserve the community it will enhance the community growth.

Sincerely,

Beth Crabbe

Beth R. Crabbe

RE/MAX of Alamogordo, LTD
3410 N. White Sands Blvd
Alamogordo, New Mexico 88310
Office: (505) 437-0914
Fax: (505) 434-3704
Each Office Independently Owned and Operated

WESTSOURCE
Corporation

April 17, 2006

Linda Devine
Headquarters ACC/A7ZP
c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Re: Public Meeting Concerning F22A Relocation to Holloman Air Force Base

Dear Mrs. Devine:

The United States Air Force has announced its plans to replace the F117 fighter aircraft currently at Holloman Air Force Base with the new F22A Raptor fighter aircraft. The F117 is a subsonic aircraft. However, the F22A is a supersonic fighter aircraft and has the potential to create "sonic booms" which would be felt by inhabitants of the real estate beneath the flight area.

I have lived in Alamogordo, New Mexico since 1957. I own a home in the Alamogordo area and a second home in the mountainous Cloudcroft area at 9,600 elevation. My family has owned a mountain home in the Cloudcroft area since 1957. Thus, being in either the valley or the mountains I have experienced sonic booms when Holloman Air Force Base was a Missile Development Center and Holloman had numerous supersonic aircraft and significant fighter aircraft test pilot activity.

There has been some concern expressed over the issue of sonic booms created by the F22A. However, **a sonic boom is a sonic boom, whether it was created by a 1958 supersonic fighter aircraft or a 2010 supersonic fighter aircraft.**

With this history of experience with sonic booms in the past, I have no reason to believe the F22A Raptor will create any inconvenience to life in Alamogordo and in the mountain areas to the east of the city and of Holloman Air Force Base.

In fact, **I look forward to the F22A Raptor coming to Holloman and am honored our nation chose Holloman Air Force Base to be one of the four homes to this new fighter aircraft, the pride of America.**

Thank you for all you have done and are doing to bring the F22A Raptor to Holloman Air Force Base, New Mexico.

Respectfully submitted,

Michael Shyne, President
Westsource Corporation

MS:rc

500 Tenth Street, Suite 301 • P. O. Box 1705, Alamogordo, NM 88311-1705
(505) 437-0220 • Fax (505) 437-0042

Norm Arnold
[redacted]
Alamogordo, NM 88310
[redacted]

Ms. Linda A. DeVine
HQ ACC/A7ZP, c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Dear Ms. DeVine,

I attended the Ruidoso and Alamogordo public environmental assessment meetings and was impressed by the team's professional presentation. Extend my appreciation to the Air Force personnel for there part.

I have lived in Alamogordo since 1952. My father started traveling to Holloman from Seattle for missions supported by Boeing in 1947 and then worked full time at Holloman from 1952 to 1964. My father and I have had various businesses in Alamogordo from 1957 to the present. We have experienced many activates at Holloman including many sonic booms none of which has interfered with our businesses or deterred from our ability to enjoy life in or around Alamogordo.

We strongly support your efforts to bed down the F-22A Raptor at Holloman AFB.

Sincerely,

Norm Arnold

America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

WRITTEN COMMENT SHEET
Environmental Assessment (EA)

Thank you for your input!

DATE: 4/21/06

PLEASE PRINT

Ms. DeVine:

My wife and I moved to Alamogordo in 1978, first stationed at Holloman AFB for two years and subsequently practicing medicine in Alamogordo for the past 26 yrs.

The F-15 Eagles were at Holloman when we arrived and subsequently were replaced by the F-117 squadrons. We also have hosted the German Airforce flying Tornadoes for the past several years. With both the F-15 and subsequent Tornadoes being super-sonic, we have heard very few complaints from surrounding citizens of Otero County about sonic booms.

We personally strongly support the deployment of F-22's to Holloman AFB as do all the people we know and work with.

****** CONTINUE ON BACK FOR MORE SPACE ******

NAME: Arthur W. Austin M.D.

ORGANIZATION: GCRMC (Gerald Champion Regional Med Center)

ADDRESS: 46 High Sierra Drive

CITY/STATE/ZIP: Alamogordo, N.M. 88310

☒ Yes, please include me in the mailing list for distributing the EA. I would like to receive a copy of the EA in: ___ hard copy format (CD electronic format)

☐ No, please do not include me in the mailing list for distributing the EA. I do not wish to receive an EA or further information.

Your name and address will be used to compile a mailing list for distributing future information regarding the Holloman AFB Environmental Assessment (EA). Names and addresses will not be published in the EA. However, by including your name and address, it will become part of the EA public record.

Your involvement and input are essential to helping the Air Force make informed decisions during the environmental process. Listed below are tips on how to make your comments useful and effective:

- Be specific. It is helpful to state particular reasons for concerns rather than making broad statements.
- Focus your comments on particular environmental resources and provide as much detail as possible.

This type of input will help us balance the Air Force mission with the environment and the community.

Please hand this form in or mail before MAY 4, 2006 to:

MS. LINDA DEVINE
HQ ACC/A7ZP C/O SAIC
22 ENTERPRISE PARKWAY, SUITE 200
HAMPTON, VA 23666

Mesa Verde Enterprises, Inc. NM Lic. 2967

P.O. Box 907 • Alamogordo, NM 88311-0907
Ph. (505) 437-2995 • Fax (505) 437-8358 • contracting@mesaverdeinc.com

Ms. Linda A. DeVine
HQ ACC/A7ZP, c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Dear Ms. DeVine,

My name is Timothy A. Rabon, and I am the President of Mesa Verde Enterprises Inc. Along with my two brothers we own and operate a construction and land development company in Alamogordo, and a working cattle ranch adjacent to Holloman Air Force Base. Per the *Federal Register* notice of April 10, 2006 (Volume 71, Number 68) concerning the Notice of Intent (NOI) for an Environmental Assessment for the F-22 at Holloman Air Force Base, the Rabon family wishes to express our support for the addition of the F-22 mission at Holloman. Since World War II Holloman Air Force Base has been the home of numerous aircraft from the B-17 to the F-117. For over six decades Alamogordo and Otero County has supported our Air Force and the nation at Holloman Air Force Base. We in the Alamogordo community feel that this tradition should continue with the stationing of the Air Force's newest fighter the F-22A Raptor at Holloman Air Force Base.

For years Alamogordo has heard the "sound of freedom" including sonic booms from many generations of jet fighters. Alamogordo is proud of its support to our nation and we hope to have the opportunity to continue that support for many years to come.

Timothy A. Rabon
President/Mesa Verde Enterprises Inc., Partner/Mesa Verde Ranch

Ms. Linda A. DeVine
HQ ACC/A7ZP, c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

Dear Ms. DeVine,

I would like to respond the to the *Federal Register* notice of April 10, 2006 (Volume 71, Number 68) concerning the Notice of Intent (NOI) for an Environmental Assessment for the F-22 at Holloman Air Force Base, New Mexico. I support the addition of the F-22 mission to Holloman Air Force Base.

For nearly 60 years, Holloman Air Force Base has been the home of numerous aircraft from the B-17 to the F-117. Alamogordo enthusiastically supports the Air Force in it's mission and looks forward to the continuing relationship with Holloman. I believe the Alamogordo community feels that this tradition should continue with the stationing of the Air Force's newest fighter the F-22A Raptor at Holloman Air Force Base.

For years Alamogordo has heard the "sounds of freedom" including sonic booms from many generations of jet fighters. Alamogordo is proud of its support to our nation and the Military that supports it. I hope we can continue this for many years to come, and remain available for any questions you may have.

Sincerely,

Bill Mayton
[redacted]
Alamogordo, NM 88311

Public Outreach Fact Sheets and Informational Displays

Holloman AFB, New Mexico

Home of the Fightin' 49ers

The U.S. Air Force will prepare an Environmental Assessment to determine the potential environmental consequences of a proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB.

The Proposed Action includes the following:

Aircraft

- Retire the F-117A (50 aircraft) and supporting T-38A (14 aircraft) currently based at Holloman AFB
- Beddown and operate two F-22A squadrons (36+4 aircraft)

Airspace

- Minor modifications to airspace
- Expand chaff and flare use in military airspace
- The F-22A pilots would routinely train in airspace within 100 miles of Holloman AFB including the following:
  - White Sands Missile Range *(supersonic)*
  - McGregor Range *(supersonic)*
  - Dona Ana Range *(supersonic)*
  - Cowboy Air Traffic Control Assigned Airspace (ATCAA) *(supersonic)*
  - Beak (A, B, C) Military Operations Area (MOA) / ATCAA *(subsonic)*
  - Talon (High East, High West, Low) MOA / ATCAA *(subsonic)*

Manpower

- Changes in personnel to reflect F-22A beddown requirements

Military Facilities

- Renovate existing and construct new facilities on Holloman AFB to support F-22A squadrons

The National Environmental Policy Act (NEPA) guides the Environmental Assessment.

The Draft Environmental Assessment (EA) will analyze the following resources to determine potential environmental consequences of the Air Force proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB.

- **Airspace Operations**
  Airspace, Noise, Air Quality, and Safety (ground and air)
- **Natural Resources**
  Geology, Soils, Water, and Biological Resources
- **Cultural Resources**
  Archaeological, Architectural, and Traditional Resources
- **Human Resources**
  Land Use, Recreation, Socioeconomics, and Environmental Justice
- **Community Infrastructure**
  Public Services, Transportation, Hazardous Materials and Waste

The EA Process

Opportunities for Public Involvement
Where Are We Now?

1. Notice of Intent to Prepare EA Published
2. Community Outreach/Scoping
3. Refine Proposed Action and Alternatives
4. Prepare Draft EA
5. Notice of Availability Published
6. Public and Agency Comment Period
7. Prepare Final EA
8. Notice of Availability of Final EA Published

Your involvement and input are essential to the environmental process.

Your comments will be used to help shape the proposal and focus the analysis.

Submit written comments before **May 4, 2006** to:

Ms. Linda DeVine
HQ ACC/A7ZP c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

SONIC BOOM FACT SHEET

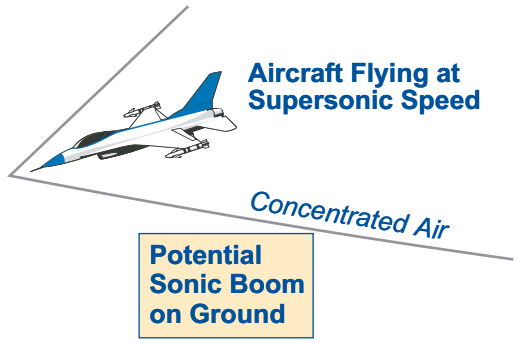
Why do pilots need to train at supersonic speeds?

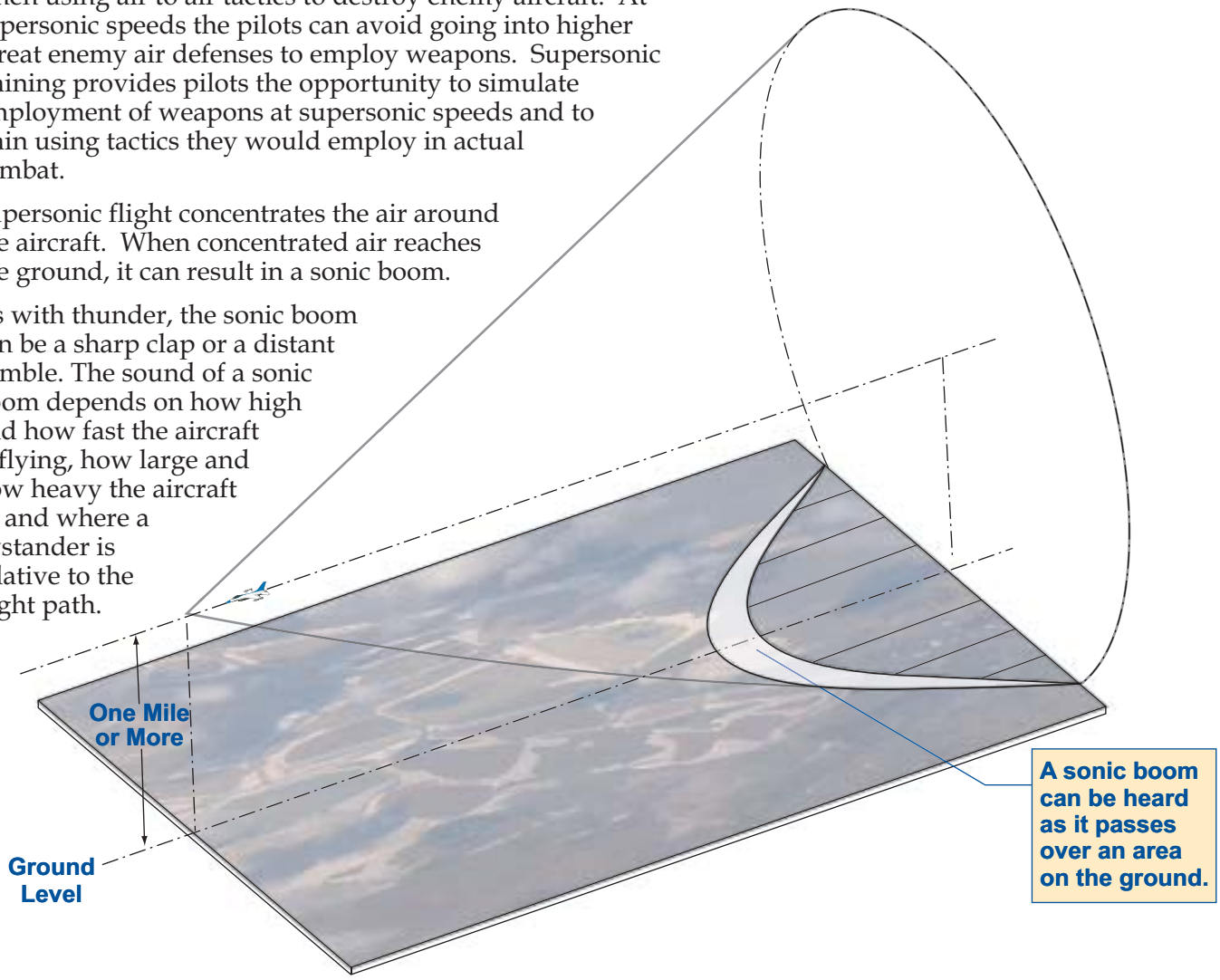
When pilots are threatened by enemy action, such as hostile radar tracking their aircraft, they need to react quickly to the threat and avoid or neutralize it. When pilots attack a target, they must fly briefly at a steady altitude and speed to launch weapons. During the steady launch period they are vulnerable to increasingly sophisticated enemy missiles. By flying at supersonic speeds, pilots can launch weapons at a greater distance, their weapons go farther, they avoid enemy threats, and the pilots are less vulnerable.

Flying supersonic into an enemy target area enhances the pilot's survivability because standoff air to ground weapons, like the Joint Direct Attack Munition (JDAM), can be dropped further away from the target. Supersonic tactics also apply when using air to air tactics to destroy enemy aircraft. At supersonic speeds the pilots can avoid going into higher threat enemy air defenses to employ weapons. Supersonic training provides pilots the opportunity to simulate employment of weapons at supersonic speeds and to train using tactics they would employ in actual combat.

Supersonic flight concentrates the air around the aircraft. When concentrated air reaches the ground, it can result in a sonic boom.

As with thunder, the sonic boom can be a sharp clap or a distant rumble. The sound of a sonic boom depends on how high and how fast the aircraft is flying, how large and how heavy the aircraft is, and where a bystander is relative to the flight path.





SONIC BOOM FACT SHEET

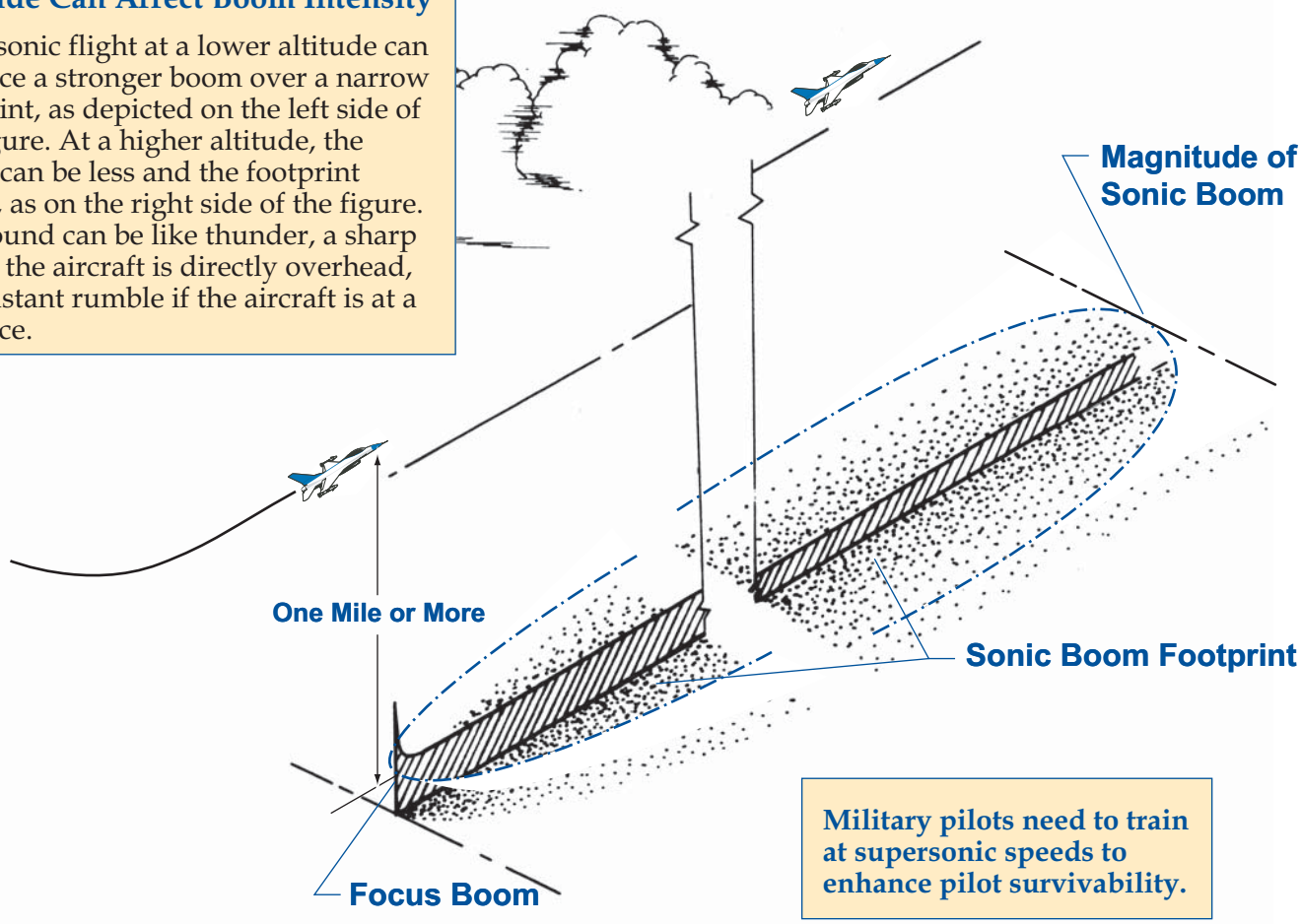
A sonic boom can be heard as it passes over an area on the ground.

Whether or not a sonic boom reaches the ground depends on the aircraft flight pattern and weather. As the aircraft flies at supersonic speeds, a sonic boom can travel along the ground. The area that experiences a sonic boom is referred to as a "footprint."

The width of the footprint depends on flight altitude, speed, and maneuvers. For a supersonic simulated ground attack, a footprint can be about 10 miles long. For air combat maneuvering, the footprint can be two to four miles long. Some maneuvers, such as the initial acceleration to supersonic speed, a pushover into a dive, or a sharp turn, can produce a louder focus boom in a localized area of less than a tenth of a square mile.

Altitude Can Affect Boom Intensity

Supersonic flight at a lower altitude can produce a stronger boom over a narrow footprint, as depicted on the left side of the figure. At a higher altitude, the boom can be less and the footprint wider, as on the right side of the figure. The sound can be like thunder, a sharp clap if the aircraft is directly overhead, or a distant rumble if the aircraft is at a distance.



Military pilots need to train at supersonic speeds to enhance pilot survivability.

Holloman AFB F-22A Fact Sheet page 1

FACT SHEET

U.S. Air Force Fact Sheet

F-22A RAPTOR

Mission
The F-22A Raptor is the Air Force's newest fighter aircraft. Its combination of stealth, supercruise, maneuverability, and integrated avionics, coupled with improved supportability, represents an exponential leap in warfighting capabilities. The Raptor performs both air-to-air and air-to-ground missions allowing full realization of operational concepts vital to the 21st century Air Force.

The F-22A , a critical component of the Global Strike Task Force, is designed to project air dominance, rapidly and at great distances and defeat threats attempting to deny access to our nation's Air Force, Army, Navy and Marine Corps. The F-22A cannot be matched by any known or projected fighter aircraft.

Features
A combination of sensor capability, integrated avionics, situational awareness, and weapons provides first-kill opportunity against threats. The F-22A possesses a sophisticated sensor suite allowing the pilot to track, identify, shoot and kill air-to-air threats before being detected. Significant advances in cockpit design and sensor fusion improve the pilot's situational awareness. In the air-to-air configuration the Raptor carries six AIM-120 AMRAAMs and two AIM-9 Sidewinders.

The F-22A has a significant capability to attack surface targets. In the air-to-ground configuration the aircraft can carry two 1,000-pound GBU-32 Joint Direct Attack Munitions internally and will use on-board avionics for navigation and weapons delivery support. In the future air-to-ground capability will be enhanced with the addition of an upgraded radar and up to eight small diameter bombs. The Raptor will also carry two AIM-120s and two AIM-9s in the air-to-ground configuration.

Advances in low-observable technologies provide significantly improved survivability and lethality against air-to-air and surface-to-air threats. The F-22A brings stealth into the day, enabling it to not only protect itself but other assets.

The F-22A engines produce more thrust than any current fighter engine. The combination of sleek aerodynamic design and increased thrust allows the F-22A to cruise at supersonic airspeeds (greater than 1.5 Mach) without using afterburner -- a characteristic known as supercruise. Supercruise greatly expands the F-22A 's operating envelope in both speed and range over current fighters, which must use fuel-consuming afterburner to operate at supersonic speeds.

The sophisticated F-22A aerodesign, advanced flight controls, thrust vectoring, and high thrust-to-weight ratio provide the capability to outmaneuver all current and projected aircraft. The F-22A design has been extensively tested and refined aerodynamically during the development process.

Holloman AFB F-22A Fact Sheet page 2

The F-22A's characteristics provide a synergistic effect ensuring F-22A lethality against all advanced air threats. The combination of stealth, integrated avionics and supercruise drastically shrinks surface-to-air missile engagement envelopes and minimizes enemy capabilities to track and engage the F-22A . The combination of reduced observability and supercruise accentuates the advantage of surprise in a tactical environment.

The F-22A will have better reliability and maintainability than any fighter aircraft in history. An F-22A squadron will require less than half as much airlift as an F-15 squadron to deploy. Increased F-22A reliability and maintainability pays off in less manpower required to fix the aircraft and the ability to operate more efficiently.

Background
The Advanced Tactical Fighter entered the Demonstration and Validation phase in 1986. The prototype aircraft (YF-22 and YF-23) both completed their first flights in late 1990. Ultimately the YF-22 was selected as best of the two and the engineering and manufacturing development effort began in 1991 with development contracts to Lockheed/Boeing (airframe) and Pratt & Whitney (engines). EMD included extensive subsystem and system testing as well as flight testing with nine aircraft at Edwards Air Force Base, Calif. The first EMD flight was in 1997 and at the completion of its flight test life this aircraft was used for live-fire testing.

The program received approval to enter low rate initial production in 2001. Initial operational and test evaluation by the Air Force Test and Evaluation Center was successfully completed in 2004. Based on maturity of design and other factors the program received approval for full rate production in 2005. Air Education and Training Command and Air Combat Command are the primary Air Force organizations flying the F-22A . The aircraft designation was the F/A-22 for a short time before being renamed F-22A in December 2005.

General Characteristics
Primary Function: Air dominance, multi-role fighter
Builder: Lockheed-Martin, Boeing
Power Plant: Two Pratt & Whitney F119-PW-100 turbofan engines with afterburners and two-dimensional thrust vectoring nozzles.
Thrust (each engine): 35,000-pound class.
Length: 62 feet, 1 inch (18.9 meters).
Height: 16 feet, 8 inches (5.1 meters).
Wingspan: 44 feet, 6 inches (13.6 meters).
Speed: Mach 2 class.
Ceiling: Above 50,000 feet (approximately 15 kilometers).
Empty Weight: 40,000-pound class (approximately 18,000 kilograms).
Armament: One M61A2 20-millimeter cannon with 480 rounds; side weapon bays can carry two AIM-9 infrared (heat seeking) air-to-air missiles and main weapon bays can carry (air-to-air loadout) six AIM-120 radar-guided air-to-air missiles or (air-to-ground loadout) two 1,000-pound GBU-32 JDAMs and two AIM-120 radar-guided air-to-air missiles.
Crew: One
Initial Operational Capability:
Inventory: Unavailable.

Point of Contact
Air Combat Command, Public Affairs Office, 115 Thompson St., Suite 211; Langley AFB VA 23665-1987; DSN 574-5014 or (757) 764-5014; e-mail: acc.pai@langley.af.mil.

December 2005

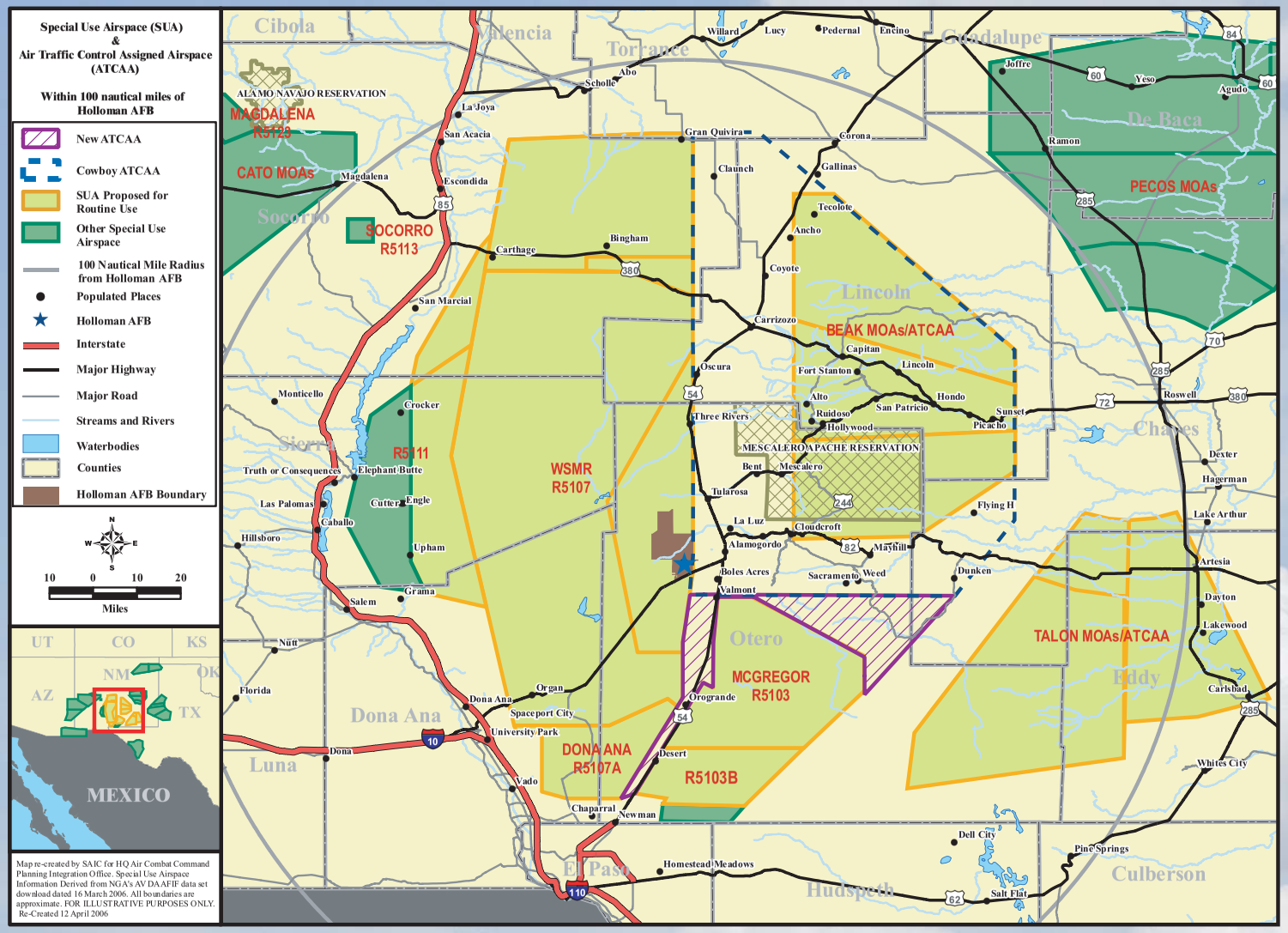
America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

The F-22A pilots would routinely train in airspace within 100 miles of Holloman AFB including the following:

- **White Sands Missile Range *(supersonic)***
- **McGregor Range *(supersonic)***
- **Dona Ana Range *(supersonic)***
- **Cowboy Air Traffic Control Assigned Airspace (ATCAA) *(supersonic)***
- **Beak (A, B, C) Military Operations Area (MOA) / ATCAA *(subsonic)***
- **Talon (High East, High West, Low) MOA / ATCAA *(subsonic)***



Holloman AFB Airspace Display

America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

Holloman AFB Elements Display

The U.S. Air Force will prepare an Environmental Assessment to determine the potential environmental consequences of a proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB.

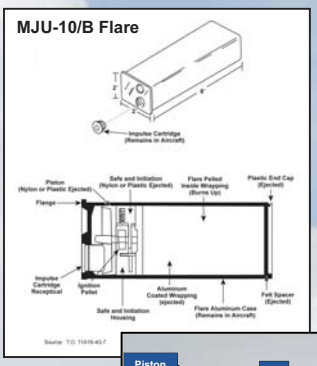
The Proposed Action includes the following:

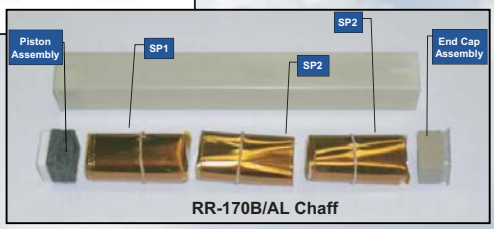
Aircraft

- Retire the F-117A (50 aircraft) and supporting T-38A (14 aircraft) currently based at Holloman AFB
- Beddown and operate two F-22A squadrons (36+4 aircraft)

Airspace

- Routinely conduct F-22A training in airspace within 100 miles of Holloman AFB, to include supersonic operations
- Minor modifications to airspace
- Expand chaff and flare use in military airspace





Manpower

- Changes in personnel to reflect F-22A beddown requirements

Military Facilities

- Renovate existing and construct new facilities on Holloman AFB to support F-22A squadrons

Holloman AFB F-22A Display

The F-22A provides state-of-the-art technology, advanced tactics, and skilled pilots to ensure air dominance during the initial phase of deployment into an area of conflict. The F-22A operates primarily at altitudes above 30,000 feet MSL.

Attributes of the F-22A:

- **Supercruise Capability**
  Ability to cruise at supersonic airspeeds without using afterburner
- **Low Observability**
  Stealth even during daylight hours
- **Maneuverability**
  Enhances all air-to-air and air-to-ground missions
- **Integrated Avionics**
  Advances that improve a pilot's situational awareness

America's Air Force -- No One Comes Close

Holloman AFB, New Mexico

Home of the Fightin' 49ers

The National Environmental Policy Act guides the Environmental Assessment.

The Draft Environmental Assessment (EA) will analyze the following resources to determine potential environmental consequences of the proposal to transform the combat capability of the 49th Fighter Wing and maximize the use of available infrastructure at Holloman AFB.

- **Airspace Operations**
  Airspace, Noise (subsonic and supersonic), Air Quality, and Safety (ground and air)
- **Natural Resources**
  Geology, Soils, Water, and Biological Resources
- **Cultural Resources**
  Archaeological, Architectural, and Traditional Resources
- **Human Resources**
  Land Use, Recreation, Socioeconomics, and Environmental Justice
- **Community Infrastructure**
  Public Services, Transportation, Hazardous Materials and Waste

Your involvement and input are essential to the environmental process.

The EA Process

Opportunities for Public Involvement
Where Are We Now?

Notice of Intent to Prepare EA Published
↓
Community Outreach/Scoping
↓
Refine Proposed Action and Alternatives
↓
Prepare Draft EA
↓
Notice of Availability Published
↓
Public and Agency Comment Period
↓
Prepare Final EA
↓
Notice of Availability of Final EA Published

Please take this opportunity to:

- Learn more about the proposal
- Identify community-specific issues
- Make sure you are included on our mailing list

Public Comment Period

Submit written comments during this meeting or mail written comments before May 4, 2006 to:

Ms. Linda DeVine
HQ ACC/A7ZP c/o SAIC
22 Enterprise Parkway, Suite 200
Hampton, VA 23666

The Air Force will consider public and agency comments and will use this information to focus the analysis.

Holloman AFB NEPA Display

Draft Environmental Assessment Distribution List

Holloman Mailing list by distribution

Draft EA	First Name	Last Name	Title	Organization Name	City
CD					
	Katherine	Slick	Director	New Mexico Historic Preservation Division	Santa Fe
	Charles	Foster		Dyn Corp	Alamogordo
	Jennifer	Smith		AND	Cloudcroft
	Kateri	Cewarter		Mescalero	Bent
	Peter	Bullock	NEPA Customer Support Div	Environment and Safety Directorate	White Sands Missile Range
				New Mexico State Land Office	Santa Fe
	Jennifer	Brady	Roswell Airport Contact		Roswell
	Thom	Rennie		Air Force Center for Environmental Excellence	Dallas
	Galen	Hanson	Facility Manger	Bureau of Rec	Truth or Consequences
	Brigadier General, USAF (Ret.)	Scott	Director	Office of Military Base Planning & Support	Santa Fe
	Carolyn Dawn	Provencher		Canidate for House	La Luz
	The Honorable Keith J.	Gardner	Representative	New Mexico House of Representatives	Roswell
	Cliff	Spencer	Park Superintendent	White Sands National Monument	Holloman AFB
				US Department of Interior	Albuquerque
	The Honorable Candy Spence	Ezzell	Representative	New Mexico House of Representatives	Roswell
			Public Contact Rep	Bureau of Land Management	Las Cruces
				NPS-2225, Recreation Programs Division	Washington

Draft EA	First Name	Last Name	Title	Organization Name	City
				New Mexico Parks and Recreation Division	Santa Fe
			Director	Office of Environmental Policy and Compliance	Washington
	Estelle	Bulka		US Environmental Protection Agency	Dallas
	Ron	Griggs	Commissioner	Alamogordo City Commission	Alamogordo
	John	Wheeler		John Wheeler & Associates	Alamogordo
	Charles	Ferrell	Chair	Committee of Fifty	Tularosa
	The Honorable Steve	Pearce	Representative		Las Cruces
	Clarissa	McGinn	Commissioner	Otero County Commission	Alamogordo
	The Honorable Dianna	Duran	Senator	New Mexico Senate	Tularosa
	The Honorable Vernon	Asbill	Senator	New Mexico Senate	Carlsbad
	Robert	Wilson		Dyn International	Alamogordo
	The Honorable Dr. Terry T.	Marquardt	Representative	New Mexico House of Representatives	Alamogordo
	Charles	Marble		CIV	Alamogordo
	The Honorable Pete	Campos	Senator	New Mexico Senate	Santa Fe
	John	Gardiner		Committee of 50	Alamogordo
	Ed	Brabson		Committee of 50	Alamogordo
	David	Garcia		Dyn Corp	Alamogordo
	Michael	Zaragoza		Dyn Corp	Alamogordo
			Regional Director	New Mexico Farm and Livestock	Roswell
	Scott	Goldmar		Mesa Verde Enterprises	Alamogordo
				USDA Forest Service	Washington

Draft EA	First Name	Last Name	Title	Organization Name	City
	The Honorable Joe	Stell	Representative	New Mexico House of Representatives	Carlsbad
			Chief	New Mexico Dept of Game & Fish	Santa Fe
	Frederick	Kanesewah		ABCD	Mescalero
	The Honorable Bill	Richardson	Governor	State of New Mexico	Santa Fe
	Jeff	Bingaman	Senator		Las Cruces
	John	Semanek		Federal Aviation Administration	Albuquerque
			State Director	U.S. Department of the Interior	Santa Fe
	Nancy	Skinner	Chief	National Park Service	Santa Fe
	Tom	Baca	Aviation Director	New Mexico Aviation Division	Santa Fe
	Stanton	Riggs	Commissioner, Chair	Chaves County	Roswell
			Environmental Officer	U.S. Department of Interior, Office of Secretary	Albuquerque
	Rex	Wilson	Commissioner, Chair	Lincoln County	Carrizozo
	Bob	Sivinski		New Mexico Parks and Recreation Division	Santa Fe
	The Honorable Stuart	Ingle	Senator	New Mexico Senate	Santa Fe
			Regional Forester	U.S. Department of Agriculture	Albuquerque
	Dr. Miley	Gonzales	Secretary of Agriculture	New Mexico Department of Agriculture	Las Cruces
	Clyde	Dehart	ASW-900/AF Representative	Federal Aviation Administration	Fort Worth
				Natural Resources Conservation Service	Albuquerque
	The Honorable Gay	Kernan	Senator	New Mexico Senate	Santa Fe
	The Honorable Rod	Adair	Senator	New Mexico Senate	Santa Fe
			Director	New Mexico Department of Parks and Recreation	Santa Fe

Draft EA	First Name	Last Name	Title	Organization Name	City
	Ron	Curry	Cabinet Secretary	New Mexico Environment Department	Santa Fe
			Director	New Mexico Dept. of Game & Fish	Santa Fest
			Forest Supervisor	U.S. Department of Agriculture	Alamogordo
	Matejka	Ray-Olguin	County Manager	Socorro County	Socorro
				Socorro Chamber of Commerce	Socorro
	Sabra W.	Kaulia	Program Director, Air Tra	Federal Aviation Administration	Washington
	Clinette	Hosier		Federal Aviation Administration	Albuquerque
	Brent	Hart		Aircraft Owners and Pilots Association	Fredrick
	The Honorable Pete	Domenici	Senator		Las Cruces
	The Honorable Heather	Wilson	Representative		Albuquerque
	William	Magoosh		Mescalero Elderly Program	Mescalero
			Regional Director	Bureau of Indian Affairs Intermountain Region	Albuquerque
	Ned	Farquhar	NM SPOC	Energy and Environmental Policy Advisor	Santa Fe
	Kristine	Johnson, PhD	Director	New Mexico State Heritage Program	Albuquerque
	The Honorable Jose A.	Campos	Representative	New Mexico House of Representatives	Santa Fe
	The Honorable Clinton D.	Harden	Senator	New Mexico Senate	Santa Fe
	The Honorable Avon	Wilson	Representative	New Mexico House of Representatives	Roswell
	The Honorable Daniel R.	Foley	Representative	New Mexico House of Representatives	Roswell
	The Honorable Timothy Z.	Jennings	Senator	New Mexico Senate	Roswell
	Chuck	Huber		United States Pilots Association	St. Louis

Draft EA	First Name	Last Name	Title	Organization Name	City
			Executive Director	Truth or Consequences Chamber of Commerce	Truth or Consequences
			Executive Director	Anthony Chamber of Commerce	Anthony
	The Honorable Nathan	Cote	Representative	New Mexico Legislature	Las Cruces
	The Honorable Rhonda	King	Representative	New Mexico Legislature	Stanley
	The Honorable Don	Tripp	Representative	New Mexico Legislature	Socorro
	The Honorable Richard	Vigil	Representative	New Mexico Legislature	Ribera
	The Honorable Naomi	Montoya	Representative	New Mexico Legislature	Las Vegas
	Janet	Carrejo	County Manager	Sierra County	Truth or Consequences
	Brian	Haines	County Manager	County of Dona Ana	Las Cruces
	The Honorable William	Gray	Representative	New Mexico Legislature	Artesia
	Lucky	Briggs	Chairman	Eddy County Commissioners	Carlsbad
	The Honorable Carolyn	Provencher	Representative	New Mexico Legislature	La Luz
			Executive Director	Tularosa Chamber of Commerce	Tularosa
	Brad	Treptow	Executive Director	Ruidoso Chamber of Commerce	Ruidoso
			Executive Director	Hatch Chamber of Commerce	Hatch
	Dorothy	Cole	President	Mountainair Chamber of Commerce	Mountainair
	Fred	Mobley	Chair	Las Cruces Chamber of Commerce	Las Cruces
	Jason	Baldwin	Director	Cloudroft Chamber of Commerce	Cloudcroft
			Executive Director	Carlsbad Chamber of Commerce	Carlsbad
			Executive Director	Capitan Chamber of Commerce	Capitan

Draft EA	First Name	Last Name	Title	Organization Name	City
	Richard	Price	Executive Director	Artesia Chamber of Commerce	Artesia
	Jim	Frost	Chairman	Torrance County Commissioners	Estancia
	The Honorable John Arthur	Smith	Senator	New Mexico Senate	Deming
	Steve	Helfert	DoD Liaison	USFWS	Albuquerque
			San Andres NWR	U.S. Fish & Wildlife Service	Las Cruces
	Sid	Alford			Glencoe
	Norm	Arnold		Alomo Forum	Alamogordo
	Mike	Snyder	Regional Director	National Park Service	Denver
				National Park Service	Holloman AFB
	Dr. Benjamin	Tuggle	Regional Director	US Fish and Wildlife Service	Albuquerque
	The Honorable Mary Kay	Papen	Senator	New Mexico Senate	Las Cruces
	The Honorable Christy	Bourgeois	Representative	New Mexico Legislature	Carlsbad
	The Honorable Mary Jane	Garcia	Senator	New Mexico Senate	Dona Ana
			Executive Director	Carrizozo Chamber of Commerce	Carrizozo
	The Honorable Cynthia	Nava	Senator	New Mexico Senate	Las Cruces
	The Honorable Ben D.	Altamirano	Senator	New Mexico Senate	Silver City
	The Honorable Joseph	Fidel	Senator	New Mexico Senate	Grants
	The Honorable Lucille	Tucker	Representative	New Mexico House of Representatives	Roswell
	The Honorable Mike	Kakuska	Representative	New Mexico Legislature	Roswell

Draft EA	First Name	Last Name	Title	Organization Name	City
	The Honorable Nora	Espinoza	Representative	New Mexico Legislature	Roswell
	The Honorable Steven	Gavi	Representative	New Mexico Legislature	Roswell
	The Honorable Wanda	Valentine	Representative	New Mexico Legislature	Tularosa
	The Honorable Leo	Martinez	Representative	New Mexico Legislature	Ruidoso
	The Honorable Leonard Lee	Rawson	Senator	New Mexico Senate	Las Cruces
	Rudy	Clark	Manager	Alamogordo Airport	Alamogordo
	Aubrey	Dunn			Alamogordo
	Andrew	Riggs		Committee of 50	Alamogordo
	Norm	Arnold		Super 8 Motel	Alamogordo
	Lance and Brittany	Grace			Alamogordo
	Michael	Johnson			Timberon
	Manuel	Gonzales			Alamogordo
	Pete	Sarmiento			Ruidoso
	Bob	Owen	President	Elephant Butte Chamber of Commerce	Elephant Butte
	Brian	Denmark, AICP		Las Cruces International Airport	Las Cruces
	Leighton	Davis			Alto
	Pat	Salome		Socorro Airport	Socorro
				Truth or Consequences Airport	Truth or Consequences
	Robert	Brennan			Alamogordo
	Robert	Martinez			Alamogordo
	Tommy	French			Alamogordo

Draft EA	First Name	Last Name	Title	Organization Name	City
	Tania	Proctor		Village of Ruidoso	Ruidoso
HC					
	Shannan T.	Wright	President	General Hydronics Inc.	Alamogordo
	Bill	Williams		RUI, Inc.	Ruidoso
	Harold	Oakes		Walton Stations	Ruidoso
	Cynthia	Culbertson			Carrizozo
	Crystal	Melendrez		Mescalero Apache Boys & Girls Club	Mescalero
	Thomas	Wylam	Airport Director	Sierra Blanca Regional Airport	Ruidoso
	John	Marquardt			Ruidoso
	Bill	Burt		Committee of 50	Alamogordo
	Elva	Osterreich		Alamogordo Daily News	Alamogodo
	Richard	Coltharp		Alamogordo Daily News	Alamogordo
	Toots	Green			Alamogordo
	Mark	McColl		Burt Broadcasting	El Sol
HC/CD					
	The Honorable Bill	Mattiace	Mayor	City of Las Cruces	Las Cruces
	The Honorable Judd	Nordyke	Mayor	City of Hatch	Hatch
	The Honorable Ravi	Bhasker	Mayor	City of Socorro	Socorro
	The Honorable Velta	Gilley	Mayor	Town of Mountainair	Mountainair
	The Honorable Demeterio	Montoya	Mayor	Village of Tularosa	Tularosa
	The Honorable Manuel	Madrid	Mayor	City of Artesia	Artesia

Draft EA	First Name	Last Name	Title	Organization Name	City
	David	Scruggs		WSMR	White Sands Missile Range
	Nan	Terry		FAA	Fort Worth
	The Honorable Steve	Sederwall	Mayor	City of Capitan	Capitan
	The Honorable Bill	Owen	Mayor	City of Roswell	Roswell
	The Honorable Bob	Forrest	Mayor	City of Carlsbad	Carlsbad
	The Honorable Manuel	Hernandez	Mayor	Town of Carrizozo	Carrizozo
	The Honorable Carol Sue	Jackson	Mayor	Village of Williamsburg	Williamsburg
	The Honorable L. Ray	Nunley	Mayor	Village of Ruidoso	Ruidoso
	The Honorable Michael	Cadena	Mayor	Town of Mesilla	Mesilla
	The Honorable Bob	Barnes	Mayor	City of Elephant Butte	Elephant Butte
	Mark	Chino	President	Mescalero Apache Tribe	Mescalero
	Donald E.	Carroll	Mayor/ Commissioner	Alamogordo City Commission	Alamogordo
	Ed	Carr		Alamogordo Chamber	Alamogordo
	The Honorable Gilbert	Stewart, Jr	Mayor	Village of Corona	Corona
	James	Burrus		FAA-ZAB	Albuquerque
	The Honorable Bob	Miller	Mayor	City of Ruidoso Downs	Ruidoso Downs
	The Honorable Ellen	Wedum	Representative	New Mexico Legislature	Cloudcroft
	The Honorable Jimmy	Rainey	Mayor	City of Truth or Consequences	Truth or Consequences

Draft EA	First Name	Last Name	Title	Organization Name	City
	The Honorable John	Collins	Mayor	Village of Hope	Hope
	Arthur	Alterson		City of Alamogordo	Alamogordo
	The Honorable David C.	Venable	Mayor	Village of Cloudcroft	Cloudcroft

Repository List for Draft EA Distribution

Holloman Repositories

Alamogordo Public Library
Paul Miller
920 Oregon
Alamogordo, NM 88310

Artesia Public Library
306 West Richardson
Artesia, NM 88210

Branigan Memorial Library
Senior Reference Librarian
200 E. Picacho
Las Cruces, NM 88001

Carlsbad Municipal Library
Ellen Harbaugh, library Director
101 S. Halagueno
Carlsbad, NM 88220

Cloudcroft Library
Judy Henry, Library Director
20 Curlew Place
Cloudcroft, NM 88317-9998

Dona Ana Community College
Attn: Library
3400 South Espina
Las Cruces, NM 88003

El Paso Community College
Northwest Center
Attn: Library
6701 S. Desert Blvd.
El Paso, TX 79835

El Paso Community College
Rio Grande Campus
Attn: Library
100 W. Rio Grande Ave.
El Paso, TX 79902

El Paso Community College
Transmountain Campus
Attn: Library
919 Hunter
El Paso, TX 79902

El Paso Public Library
Mary Kaye Donahue-Hooker, Director
501 N. Oregon
El Paso, TX 79901

Las Cruces Public Library
Laura Wright, Director
201 E. Picacho
Las Cruces, NM 88001

New Mexico State University
Branson Library
Attn: Karen George
Department 3475
P.O. Box 30006
Las Cruces, NM 88003

New Mexico State University Alamogordo
Attn: Library
2400 Scenic Drive
Alamogordo, NM 88310

Ruidoso Public Library
107 Kansas City Road
Ruidoso, NM 88345

Truth or Consequences Public Library
325 Liberty Lane
Truth or Consequences, NM 87901

Village of Carrizozo
P. Carol Schlarb, Town Clerk
P.O. Box 247
Carrizozo, NM 88301

Holloman AFB Library
596 4th St.
Holloman AFB, NM 88330

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

Mescalero Community Library
P.O. Box 227
Mescalero, NM 88340
505-464-5010

Appendix E
Aircraft Noise Analysis and Airspace Operations

APPENDIX E AIRCRAFT NOISE ANALYSIS AND AIRSPACE OPERATIONS

Noise is generally described as unwanted sound. Unwanted sound can be based on objective effects (such as hearing loss or damage to structures) or subjective judgments (community annoyance). Noise analysis thus requires a combination of physical measurement of sound, physical and physiological effects, plus psycho- and socio-acoustic effects.

Section 1.0 of this appendix describes how sound is measured and summarizes noise impact in terms of community acceptability and land use compatibility. Section 2.0 gives detailed descriptions of the effects of noise that lead to the impact guidelines presented in section 1. Section 3.0 provides a description of the specific methods used to predict aircraft noise, including a detailed description of sonic booms.

1.0 NOISE DESCRIPTORS AND IMPACT

Aircraft operating in the military airspace generate two types of sound. One is "subsonic" noise, which is continuous sound generated by the aircraft's engines and also by air flowing over the aircraft itself. The other is sonic booms (where authorized for supersonic), which are transient impulsive sounds generated during supersonic flight. These are quantified in different ways.

Section 1.1 describes the characteristics which are used to describe sound. Section 1.2 describes the specific noise metrics used for noise impact analysis. Section 1.3 describes how environmental impact and land use compatibility are judged in terms of these quantities.

1.1 QUANTIFYING SOUND

Measurement and perception of sound involve two basic physical characteristics: amplitude and frequency. Amplitude is a measure of the strength of the sound and is directly measured in terms of the pressure of a sound wave. Because sound pressure varies in time, various types of pressure averages are usually used. Frequency, commonly perceived as pitch, is the number of times per second the sound causes air molecules to oscillate. Frequency is measured in units of cycles per second, or hertz (Hz).

Amplitude. The loudest sounds the human ear can comfortably hear have acoustic energy one trillion times the acoustic energy of sounds the ear can barely detect. Because of this vast range, attempts to represent sound amplitude by pressure are generally unwieldy. Sound is, therefore, usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as a sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Because of the logarithmic nature of the decibel scale, sounds levels do not add and subtract directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that combination of decibel values consists of first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

The difference in dB between two sounds represents the ratio of the amplitudes of those two sounds. Because human senses tend to be proportional (i.e., detect whether one sound is twice as big as another) rather than absolute (i.e., detect whether one sound is a given number of pressure units bigger than another), the decibel scale correlates well with human response.

Under laboratory conditions, differences in sound level of 1 dB can be detected by the human ear. In the community, the smallest change in average noise level that can be detected is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound *intensity* but only a 50 percent decrease in perceived *loudness* because of the nonlinear response of the human ear (similar to most human senses).

The one exception to the exclusive use of levels, rather than physical pressure units, to quantify sound is in the case of sonic booms. As described in Section 3, sonic booms are coherent waves with specific characteristics. There is a long-standing tradition of describing individual sonic booms by the amplitude of the shock waves, in pounds per square foot (psf). This is particularly relevant when assessing structural effects as opposed to loudness or cumulative community response. In this study, sonic booms are quantified by either dB or psf, as appropriate for the particular impact being assessed.

Frequency. The normal human ear can hear frequencies from about 20 Hz to about 20,000 Hz. It is most sensitive to sounds in the 1,000 to 4,000 Hz range. When measuring community response to noise, it is common to adjust the frequency content of the measured sound to correspond to the frequency sensitivity of the human ear. This adjustment is called A-weighting (American National Standards Institute 1988). Sound levels that have been so adjusted are referred to as A-weighted sound levels.

The audible quality of high thrust engines in modern military combat aircraft can be somewhat different than other aircraft, including (at high throttle settings) the characteristic nonlinear crackle of high thrust engines. The spectral characteristics of various noises are accounted for by A-weighting, which approximates the response of the human ear but does not necessarily account for quality. There are other, more detailed, weighting factors that have been applied to

sounds. In the 1950s and 1960s, when noise from civilian jet aircraft became an issue, substantial research was performed to determine what characteristics of jet noise were a problem. The metrics Perceived Noise Level and Effective Perceived Noise Level were developed. These accounted for nonlinear behavior of hearing and the importance of low frequencies at high levels, and for many years airport/airbase noise contours were presented in terms of Noise Exposure Forecast, which was based on Perceived Noise Level and Effective Perceived Noise Level. In the 1970s, however, it was realized that the primary intrusive aspect of aircraft noise was the high noise level, a factor which is well represented by A-weighted levels and DNL. The refinement of Perceived Noise Level, Effective Perceived Noise Level, and Noise Exposure Forecast was not significant in protecting the public from noise.

There has been continuing research on noise metrics and the importance of sound quality, sponsored by the Department of Defense (DoD) for military aircraft noise and by the Federal Aviation Administration (FAA) for civil aircraft noise. The metric L_{dnmr}, which is described later and accounts for the increased annoyance of rapid onset rate of sound, is a product of this long-term research.

The amplitude of A-weighted sound levels is measured in dB. It is common for some noise analysts to denote the unit of A-weighted sounds by dBA. As long as the use of A-weighting is understood, there is no difference between dB or dBA: it is only important that the use of A-weighting be made clear. In this Environmental Assessment (EA), sound levels are reported in dB.

A-weighting is appropriate for continuous sounds, which are perceived by the ear. Impulsive sounds, such as sonic booms, are perceived by more than just the ear. When experienced indoors, there can be secondary noise from rattling of the building. Vibrations may also be felt. C-weighting (American National Standards Institute 1988) is applied to such sounds. This is a frequency weighting that is flat over the range of human hearing (about 20 Hz to 20,000 Hz) and rolls off above and below that range. In this study, C-weighted sound levels are used for the assessment of sonic booms and other impulsive sounds. As with A-weighting, the unit is dB, but dBC is sometimes used for clarity. In this study, sound levels are reported in dB, and C-weighting is specified as necessary.

Time Averaging. Sound pressure of a continuous sound varies greatly with time, so it is customary to deal with sound levels that represent averages over time. Levels presented as instantaneous (i.e., as might be read from the display of a sound level meter) are based on averages of sound energy over either 1/8 second (fast) or 1 second (slow). The formal definitions of fast and slow levels are somewhat complex, with details that are important to the makers and users of instrumentation. They may, however, be thought of as levels corresponding to the root-mean-square sound pressure measured over the 1/8-second or 1-second periods.

The most common uses of the fast or slow sound level in environmental analysis is in the discussion of the maximum sound level that occurs from the action, and in discussions of typical sound levels. Figure E-1 is a chart of A-weighted sound levels from typical sounds. Some (air conditioner, vacuum cleaner) are continuous sounds whose levels are constant for some time. Some (automobile, heavy truck) are the maximum sound during a vehicle passby. Some (urban daytime, urban nighttime) are averages over some extended period. A variety of noise metrics have been developed to describe noise over different time periods. These are described in section 1.2.

1.2 Noise Metrics

Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by ALM, L_{max}, or L_{Amax}. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleeping, or other common activities. Table E-1 reflects Lmax values for typical aircraft associated with this assessment operating at the indicated flight profiles and power settings.

Table E-1. Representative Maximum Sound Levels (L_{MAX})

	L_{MAX} Values (in dBA) at Varying Distances (in Feet)				
Aircraft/Power Setting	***500***	***1,000***	***2,000***	***5,000***	***10,000***
Takeoff/Departure Operations					
F-117A/96% RPM	116.1	108.5	99.8	85.9	72.5
QF-4/100% RPM	117.3	109.7	101.2	88.5	76.9
T-38A/100% RPM	105.9	98.3	89.8	76.6	64.8
F-22A/100% ETR	119.7	112.4	104.6	93.0	82.9
Landing/Arrival Operations					
F-117A/87% RPM	109.2	101.9	93.9	81.0	68.5
QF-4/87% RPM	106.3	99.1	91.3	79.3	68.7
T-38A/91% RPM	91.4	84.3	76.5	64.4	53.6
F-22A/43% ETR	111.3	103.9	95.9	83.9	73.1

RPM = Revolutions per Minute (For the specific engine considered).
ETR = Engine Temperature Ratio
Sources: NMAP Version 7, 2006 and OMEGA108R

Peak Sound Level

For impulsive sounds, the true instantaneous sound pressure is of interest. For sonic booms, this is the peak pressure of the shock wave, as described in section 3.2 of this appendix. This pressure is usually presented in physical units of pounds per square foot. Sometimes it is

represented on the decibel scale, with symbol L_{pk}. Peak sound levels do not use either A or C weighting.

Sound Exposure Level

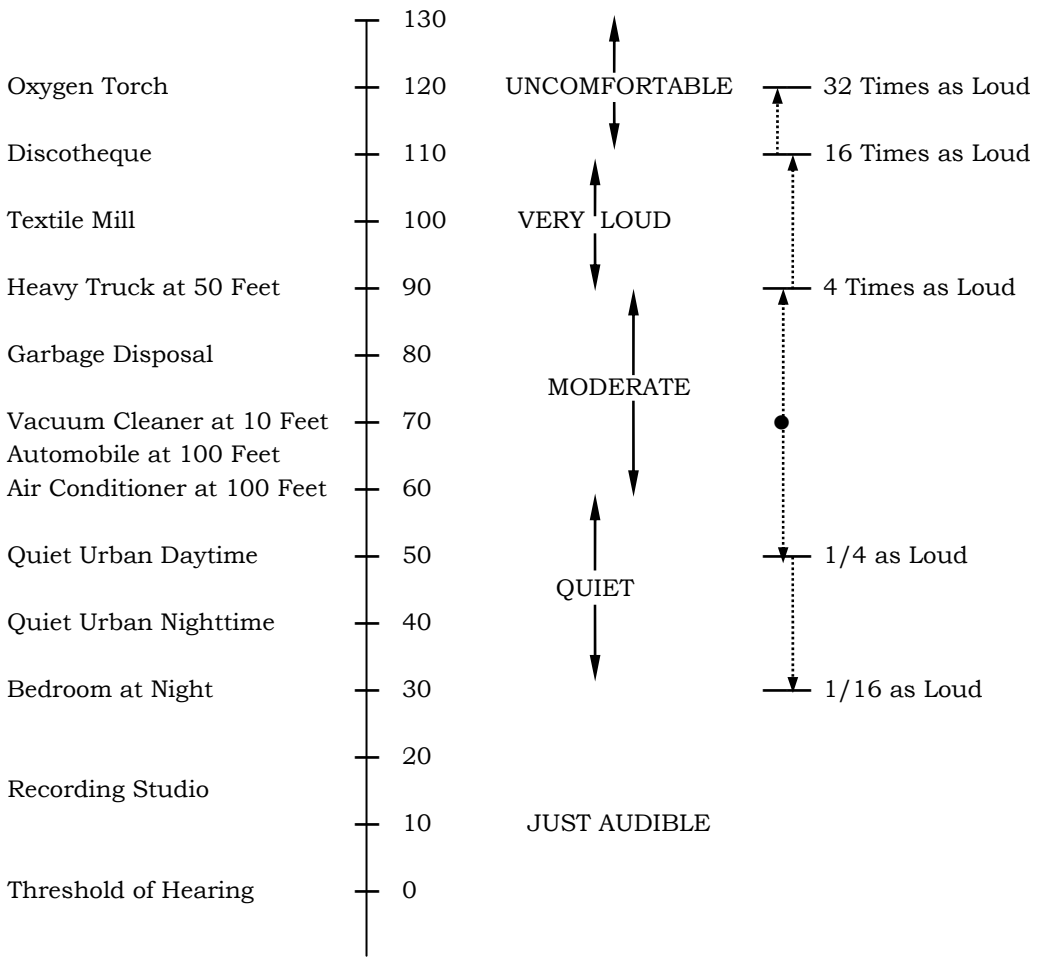
Individual time-varying noise events have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE} for A-weighted sounds) combines both of these characteristics into a single metric.

SEL is a composite metric that represents both the intensity of a sound and its duration. Mathematically, the mean square sound pressure is computed over the duration of the event, then multiplied by the duration in seconds, and the resultant product is turned into a sound level. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that SEL measures this impact much more reliably than just the maximum sound level. Table E-2 shows SEL values corresponding to the aircraft and power settings reflected in Table E-1.

Table E-2. Representative Sound Exposure Levels

	SEL Values (in dBA) at Varying Distances (in Feet)				
Aircraft/Power Setting	***500***	***1,000***	***2,000***	***5,000***	***10,000***
Takeoff/Departure Operations					
F-117A/96% RPM	120.9	115.0	108.1	96.6	85.1
QF-4/100% RPM	124.3	118.4	118.1	101.5	91.6
T-38A/100% RPM	114.0	108.2	101.5	90.7	80.7
F-22A/100% ETR	126.9	121.4	115.4	106.2	97.9
Landing/Arrival Operations					
F-117A/87% RPM	112.4	106.9	100.7	90.1	79.5
QF-4/87% RPM	111.3	105.9	99.9	90.3	81.5
T-38A/91% RPM	96.0	90.7	84.7	75.0	66.0
F-22A/43% ETR	114.9	109.3	103.1	93.5	84.5

RPM = Revolutions per Minute (For the specific engine considered).
ETR = Engine Temperature Ratio
Sources: NMAP Version 7, 2006 and OMEGA108R



Source: *Handbook of Noise Control*, C.M. Harris, Editor, McGraw-Hill Book Co., 1979, and FICON 1992.

FIGURE E-1. TYPICAL A-WEIGHTED SOUND LEVELS OF COMMON SOUNDS

Because the SEL and the maximum sound level are both used to describe single events, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

SEL can be computed for C-weighted levels (appropriate for impulsive sounds), and the results denoted CSEL or L_{CE}. SEL for A-weighted sound is sometimes denoted ASEL. Within this study, SEL is used for A-weighted sounds and CSEL for C-weighted.

Equivalent Sound Level

For longer periods of time, total sound is represented by the equivalent continuous sound pressure level (L_{eq}). L_{eq} is the average sound level over some time period (often an hour or a day, but any explicit time span can be specified), with the averaging being done on the same energy basis as used for SEL. SEL and L_{eq} are closely related, with L_{eq} being SEL over some time period normalized by that time.

Just as SEL has proven to be a good measure of the noise impact of a single event, L_{eq} has been established to be a good measure of the impact of a series of events during a given time period. Also, while L_{eq} is defined as an average, it is effectively a sum over that time period and is, thus, a measure of the cumulative impact of noise.

Day-Night Average Sound Level

Noise tends to be more intrusive at night than during the day. This effect is accounted for by applying a 10 dB penalty to events that occur after 10 pm and before 7 am. If L_{eq} is computed over a 24-hour period with this nighttime penalty applied, the result is the day-night average sound level (DNL). DNL is the community noise metric recommended by the USEPA (United States Environmental Protection Agency [USEPA] 1974) and has been adopted by most federal agencies (Federal Interagency Committee on Noise 1992). It has been well established that DNL correlates well with community response to noise (Schultz 1978; Finegold *et al.* 1994). This correlation is presented in Section 1.3 of this appendix.

While DNL carries the nomenclature "average," it incorporates all of the noise at a given location. For this reason, DNL is often referred to as a "cumulative" metric. It accounts for the total, or cumulative, noise impact.

It was noted earlier that, for impulsive sounds, such as sonic booms, C-weighting is more appropriate than A-weighting. The day-night average sound level can be computed for C-weighted noise and is denoted CDNL or L_{Cdn}. This procedure has been standardized, and impact interpretive criteria similar to those for DNL have been developed (Committee on Hearing, Bioacoustics and Biomechanics 1981).

Onset-Adjusted Monthly Day-Night Average Sound Level

Aircraft operations in military training airspace generate a noise environment somewhat different from other community noise environments. Overflights are sporadic, occurring at random times and varying from day to day and week to week. This situation differs from most community noise environments, in which noise tends to be continuous or patterned. Individual

military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset.

To represent these differences, the conventional DNL metric is adjusted to account for the "surprise" effect of the sudden onset of aircraft noise events on humans (Plotkin *et al.* 1987; Stusnick *et al.* 1992; Stusnick *et al.* 1993). For aircraft exhibiting a rate of increase in sound level (called onset rate) of from 15 to 150 dB per second, an adjustment or penalty ranging from 0 to 11 dB is added to the normal SEL. Onset rates above 150 dB per second require an 11 dB penalty, while onset rates below 15 dB per second require no adjustment. The DNL is then determined in the same manner as for conventional aircraft noise events and is designated as Onset-Rate Adjusted Day-Night Average Sound Level (abbreviated L_{dnmr}). Because of the irregular occurrences of aircraft operations, the number of average daily operations is determined by using the calendar month with the highest number of operations. The monthly average is denoted L_{dnmr}. Noise levels are calculated the same way for both DNL and L_{dnmr}. L_{dnmr} is interpreted by the same criteria as used for DNL.

1.3 Noise Impact

Community Reaction

Studies of community annoyance to numerous types of environmental noise show that DNL correlates well with impact. Schultz (1978) showed a consistent relationship between DNL and annoyance. Shultz's original curve fit (Figure E-2) shows that there is a remarkable consistency in results of attitudinal surveys which relate the percentages of groups of people who express various degrees of annoyance when exposed to different DNL.

A more recent study has reaffirmed this relationship (Fidell *et al.* 1991). Figure E-3 (Federal Interagency Committee on Noise 1992) shows an updated form of the curve fit (Finegold *et al.* 1994) in comparison with the original. The updated fit, which does not differ substantially from the original, is the current preferred form. In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors that influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using DNL.

As noted earlier for SEL, DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure. DNL accounts for the sound level of individual noise events, the duration of those events, and the number of events. Its use is endorsed by the scientific community (American National Standards Institute 1980, 1988; USEPA 1974; Federal Interagency Committee on Urban Noise 1980; Federal Interagency Committee on Noise 1992).

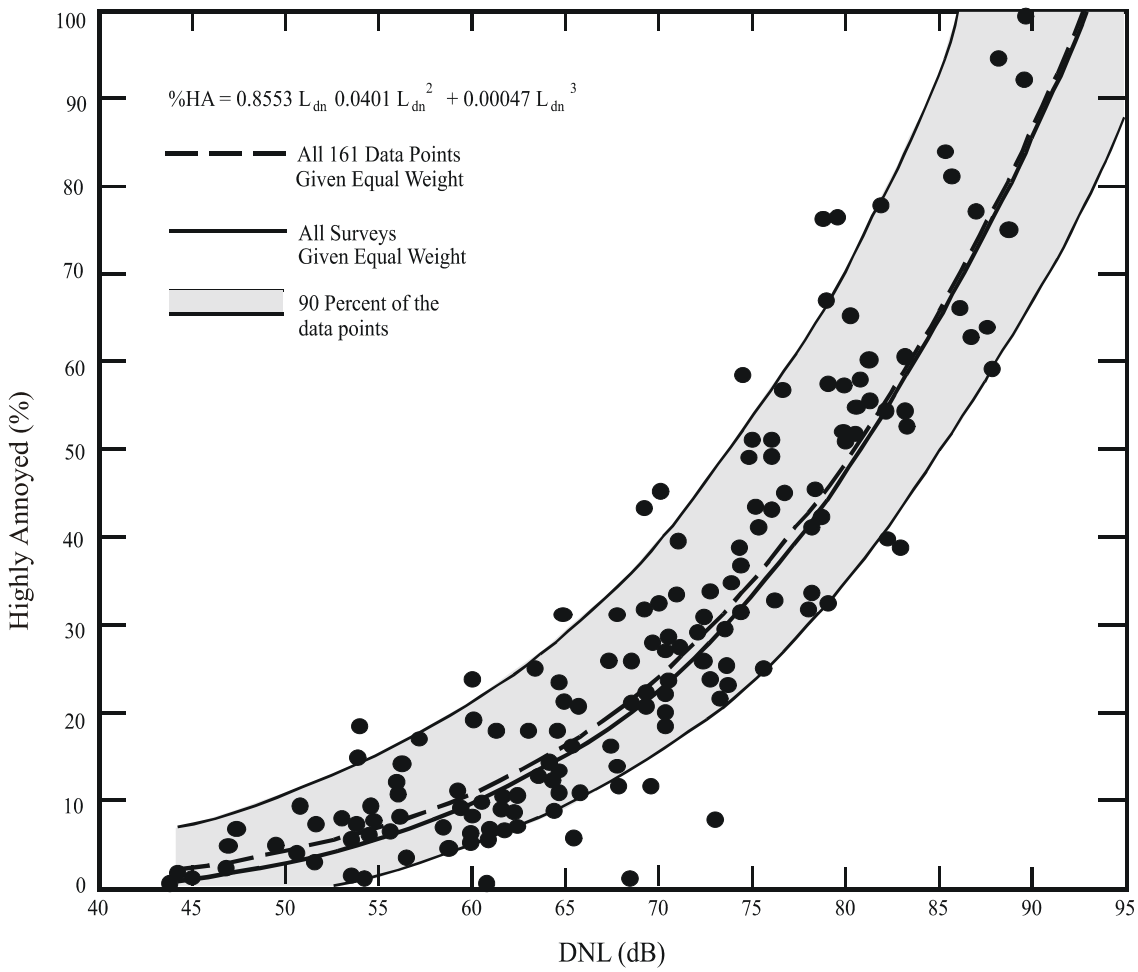


Figure E-2. Community Surveys of Noise Annoyance (Source: Schultz 1978)

While DNL is the best metric for quantitatively assessing cumulative noise impact, it does not lend itself to intuitive interpretation by non-experts. Accordingly, it is common for environmental noise analyses to include other metrics for illustrative purposes. A general indication of the noise environment can be presented by noting the maximum sound levels which can occur and the number of times per day noise events will be loud enough to be heard. Use of other metrics as supplements to DNL has been endorsed by federal agencies (Federal Interagency Committee on Noise 1992).

The Schultz curve is generally applied to annual average DNL. In Section 1.2, L_{dnmr} was described and presented as being appropriate for quantifying noise in military airspace. In the current study, the Schultz curve is used with L_{dnmr} as the noise metric. L_{dnmr} is always equal to or greater than DNL, so impact is generally higher than would have been predicted if the onset rate and busiest-month adjustments were not accounted for.

There are several points of interest in the noise-annoyance relation. The first is DNL of 65 dB. This is a level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like aviation which do cause noise. Areas exposed to DNL above 65 dB are generally not considered suitable for residential use. The second is DNL of 55 dB, which was identified by USEPA as a level "...requisite to protect the public health and welfare with an adequate margin of safety," (USEPA 1974) which is essentially a level below which adverse impact is not expected. The third is DNL of 75 dB. This is the lowest level at which adverse health effects could be credible (USEPA 1974). The very high annoyance levels correlated with DNL of 75 dB make such areas unsuitable for residential land use.

Sonic boom exposure is measured by C-weighting, with the corresponding cumulative metric being CDNL. Correlation between CDNL and annoyance has been established, based on community reaction to impulsive sounds (Committee on Hearing, Bioacoustics and Biomechanics 1981). Values of the C-weighted equivalent to the Schultz curve are different than that of the Schultz curve itself. Table E-3 shows the relation between annoyance, DNL, and CDNL.

Table E-3. Relation Between Annoyance, DNL and CDNL

DNL	*% Highly Annoyed*	*CDNL*
45	0.83	42
50	1.66	46
55	3.31	51
60	6.48	56
65	12.29	60
70	22.10	65

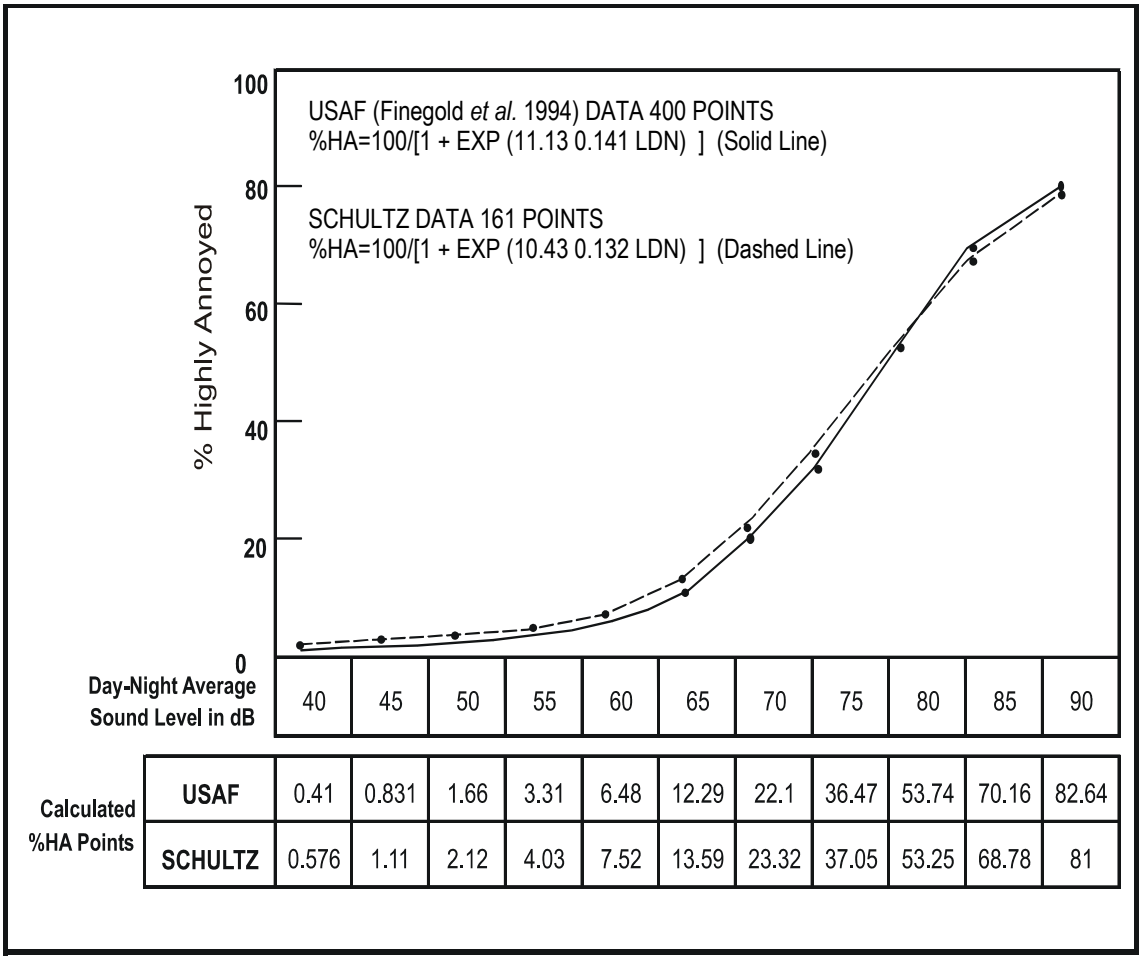


Figure E-3. Response of Communities to Noise; Comparison of Original (Schultz 1978) and Current (Finegold et al. 1994) Curve Fits.

Interpretation of CDNL from impulsive noise is accomplished by using the CDNL versus annoyance values in Table E-1. CDNL can be interpreted in terms of an "equivalent annoyance" DNL. For example, CDNL of 52, 61, and 69 dB are equivalent to DNL of 55, 65, and 75 dB, respectively. If both continuous and impulsive noise occurs in the same area, impacts are assessed separately for each.

Land Use Compatibility

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is the DNL or L_{dnmr} for military overflights. Impulsive noise can be assessed by relating CDNL to an "equivalent annoyance" DNL, as outlined in Section 1.3.1.

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise published guidelines (Federal Interagency Committee on Urban Noise 1980) relating DNL to compatible land uses. This committee was composed of representatives from DoD, Transportation, and Housing and Urban Development; USEPA; and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, DoD and FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee's guidelines in the Federal Aviation Regulations (United States Department of Transportation 1984). These guidelines are reprinted in Table E-4, along with the explanatory notes included in the regulation. Although these guidelines are not mandatory (note the footnote "*" in the table), they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor DNL values above 65 dB, and the extent of land areas and populations exposed to DNL of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions. In some cases a change in noise level, rather than an absolute threshold, may be a more appropriate measure of impact.

2.0 NOISE EFFECTS

The discussion in Section 1.3 presents the global effect of noise on communities. The following sections describe particular noise effects.

Table E-4. Land-Use Compatibility With Yearly Day-Night Average Sound Levels

Land Use	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	**65–70**	**70–75**	**75–80**	**80–85**	**Over 85**
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoria, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

* The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

KEY TO TABLE D-2

Y (YES) = Land Use and related structures compatible without restrictions.
N (No) = Land Use and related structures are not compatible and should be prohibited.
NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35 = Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

NOTES FOR TABLE D-2

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(3) Measures to achieve NLR 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(5) Land-use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25.
(7) Residential buildings require an NLR of 30.
(8) Residential buildings not permitted.

2.1 Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure) suggests a time-average sound level of 70 dB over a 24-hour period (USEPA 1974). Since it is unlikely that airport neighbors will remain outside their homes 24 hours per day for extended periods of time, there is little possibility of hearing loss below a DNL of 75 dB, and this level is extremely conservative.

2.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have not been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on January 22–24, 1990, in Washington, D.C., which states "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day)" (von Gierke 1990; parenthetical wording added for clarification). At the International Congress (1988) on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss; and even above these criteria, results regarding such health effects were ambiguous.

Consequently, it can be concluded that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place.

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two University of California at Los Angeles researchers found a relation between aircraft noise levels under the approach path to Los Angeles International Airport and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Meecham and Shaw 1979). Nevertheless, three other University of California at Los Angeles professors analyzed those same data and found no relation between noise exposure and mortality rates (Frerichs *et al*. 1980).

As a second example, two other University of California at Los Angeles researchers used this same population near Los Angeles International Airport to show a higher rate of birth defects during the period of 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the United States Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport for 1970 to 1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds 1979).

A recent review of health effects, prepared by a Committee of the Health Council of The Netherlands (Committee of the Health Council of the Netherlands 1996), analyzed currently available published information on this topic. The committee concluded that the threshold for possible long-term health effects was a 16-hour (6:00 a.m. to 10:00 p.m.) L_{eq} of 70 dB. Projecting this to 24 hours and applying the 10 dB nighttime penalty used with DNL, this corresponds to DNL of about 75 dB. The study also affirmed the risk threshold for hearing loss, as discussed earlier.

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

2.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the USEPA as any negative subjective reaction on the part of an individual or group (USEPA 1974). As noted in the discussion of DNL above, community annoyance is best measured by that metric.

Because the USEPA Levels Document (USEPA 1974) identified DNL of 55 dB as ". . . requisite to protect public health and welfare with an adequate margin of safety," it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial and technical resources are generally not available to achieve that goal. Most agencies have identified DNL of 65 dB as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis (Federal Interagency Committee on Noise 1992). This corresponds to about 12 percent of the exposed population being highly annoyed.

Although DNL of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit, and it is appropriate to consider other thresholds in particular cases.

In this EA, no specific threshold is used. The noise in the affected environment is evaluated on the basis of the information presented in this appendix and in the body of the EA.

Community annoyance from sonic booms is based on CDNL, as discussed in Section 1.3. These effects are implicitly included in the "equivalent annoyance" CDNL values in Table E-1, since those were developed from actual community noise impact.

2.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities in the home, such as radio or television listening, telephone use, or family conversation, gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that the use of the SEL metric will measure speech interference successfully, and that a SEL exceeding 65 dB will begin to interfere with speech communication.

2.5 Sleep Interference

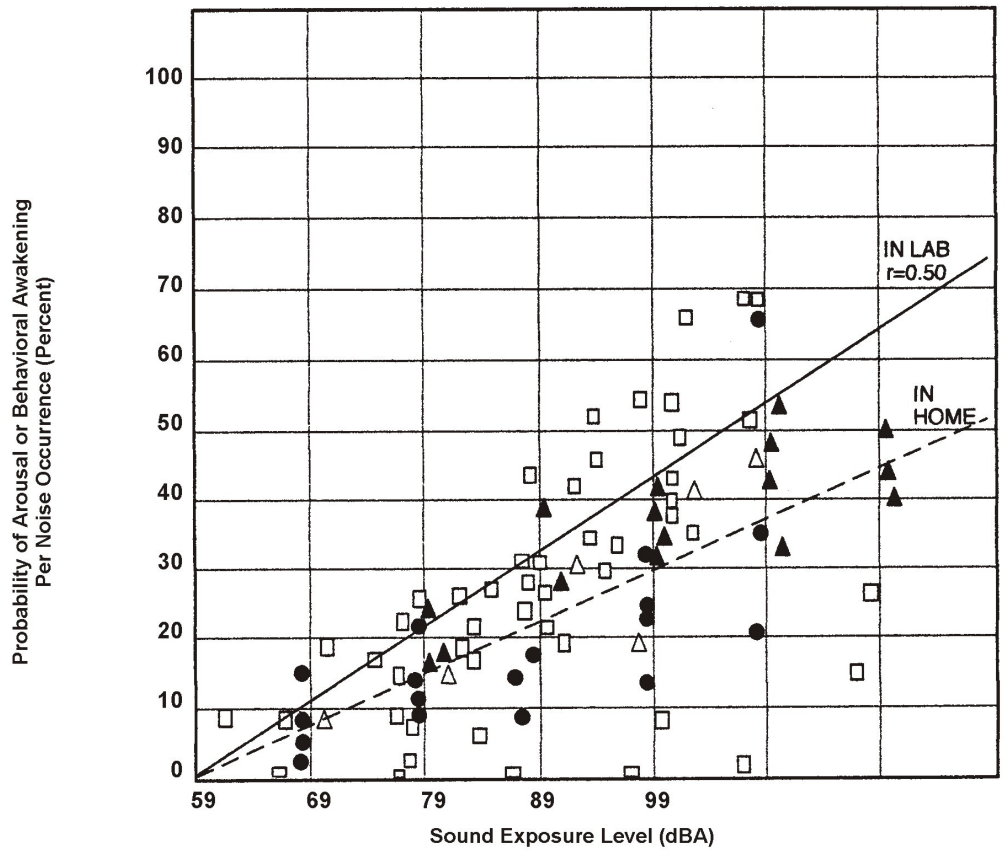
Sleep interference is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat higher noise level than does a change in sleep stage.

An analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons *et al*. 1989). The analysis concluded that a lack of reliable in-home studies, combined with large differences among the results from the various laboratory studies, did not permit development of an acceptably accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced. None of the laboratory studies were of sufficiently long duration to determine any effects of habituation, such as that which would occur under normal community conditions. A recent extensive study of sleep interference in people's own homes (Ollerhead 1992) showed very little disturbance from aircraft noise.

There is some controversy associated with the recent studies, so a conservative approach should be taken in judging sleep interference. Based on older data, the USEPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference (USEPA 1974). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

A 1984 publication reviewed the probability of arousal or behavioral awakening in terms of SEL (Kryter 1984). Figure E-4, extracted from Figure 10.37 of Kryter (1984), indicates that an indoor SEL of 65 dB or lower should awaken less than 5 percent of those exposed. These results do not include any habituation over time by sleeping subjects. Nevertheless, this provides a reasonable guideline for assessing sleep interference and corresponds to similar guidance for speech interference, as noted above.



LEGEND

- □ Laboratory Studies, Variety of Noises, Lukas
- ● Steady State (In Home)
- ▲ Transient (In Home)
- △ Truck Noise, Laboratory Study, Thiesen
  Transformer, Transmission Line, Window Air Conditioner, and Distant Traffic Noise, Horonjeff

Figure E-4. Probability of Arousal or Behavioral Awakening in Terms of Sound Exposure Level

2.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

A review of the effects of noise and sonic boom on livestock and wildlife is presented in Section 4.5 and Appendix G in this EA.

2.7 Noise Effects on Structures

Subsonic Aircraft Noise

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonance. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (National Research Council/National Academy of Sciences 1977).

A study directed specifically at low-altitude, high-speed aircraft showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects within the dwelling, such as hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

Sonic Booms

Sonic booms are commonly associated with structural damage. Most damage claims are for brittle objects, such as glass and plaster. Table E-5 summarizes the threshold of damage that might be expected at various overpressures. There is a large degree of variability in damage experience, and much damage depends on the pre-existing condition of a structure. Breakage data for glass, for example, spans a range of two to three orders of magnitude at a given overpressure. At 1 psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). These damage rates are associated with a combination of boom load and glass condition. At 10 psf, the probability of

breakage is between one in a hundred and one in a thousand. Laboratory tests of glass (White 1972) have shown that properly installed window glass will not break at overpressures below 10 psf, even when subjected to repeated booms, but in the real world glass is not in pristine condition.

Damage to plaster occurs at similar ranges to glass damage. Plaster has a compounding issue in that it will often crack due to shrinkage while curing, or from stresses as a structure settles, even in the absence of outside loads. Sonic boom damage to plaster often occurs when internal stresses are high from these factors.

Some degree of damage to glass and plaster should thus be expected whenever there are sonic booms, but usually at the low rates noted above. In general, structural damage from sonic booms should be expected only for overpressures above 10 psf.

2.8 Noise Effects on Terrain

Subsonic Aircraft Noise

Members of the public often believe that noise from low-flying aircraft can cause avalanches or landslides by disturbing fragile soil or snow structures in mountainous areas. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

Sonic Booms

In contrast to subsonic noise, sonic booms are considered to be a potential trigger for snow avalanches. Avalanches are highly dependent on the physical status of the snow, and do occur spontaneously. They can be triggered by minor disturbances, and there are documented accounts of sonic booms triggering avalanches. Switzerland routinely restricts supersonic flight during avalanche season.

Landslides are not an issue for sonic booms. There was one anecdotal report of a minor landslide from a sonic boom generated by the Space Shuttle during landing, but there is no credible mechanism or consistent pattern of reports.

Table E-5. Possible Damage to Structures From Sonic Booms

Sonic Boom Overpressure Nominal (psf)	*Item Affected*	*Type of Damage*
0.5 - 2	Plaster	Fine cracks; extension of existing cracks; more in ceilings; over door frames; between some plaster boards.
	Glass	Rarely shattered; either partial or extension of existing cracks.
	Roof	Slippage of existing loose tiles/slates; sometimes new cracking of old slates at nail hole.
	Damage to outside walls	Existing cracks in stucco extended.
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass, such as large goblets, can fall and break.
	Other	Dust falls in chimneys.
2 - 4	Glass, plaster, roofs, ceilings	For elements nominally in good condition, failures show that would have been difficult to forecast in terms of their existing localized condition.
4 - 10	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic greenhouses.
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster.
	Roofs	High probability rate of failure in slurry wash in nominally good state; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can move bodily.
	Walls (out)	Old, free standing, in fairly good condition can collapse.
	Walls (in)	Internal ("party") walls known to move at 10 psf.
Greater than 10	Glass	Some good window glass will fail when exposed to regular sonic booms from the same direction. Glass with existing faults could shatter and fly. Large window frames move.
	Plaster	Most plaster affected.
	Ceilings	Plaster boards displaced by nail popping.
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gale-end and wall-plate cracks; domestic chimneys dislodged if not in good condition.
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage.
	Bric-a-brac	Some nominally secure items can fall; e.g., large pictures, especially if fixed to party walls.

Source: Haber and Nakaki 1989

2.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Wesler 1977). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning within the building itself.

As noted above for the noise effects of noise-induced vibrations on normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

3.0 NOISE MODELING

3.1 Subsonic Aircraft Noise

An aircraft in subsonic flight generally emits noise from two sources: the engines and flow noise around the airframe. Noise generation mechanisms are complex and, in practical models, the noise sources must be based on measured data. The Air Force has developed a series of computer models and aircraft noise databases for this purpose. The models include NOISEMAP (Moulton 1992) for noise around airbases, and MR_NMAP (Lucas and Calamia 1996) for use in MOAs, ranges, and low-level training routes. These models use the NOISEFILE database developed by the Air Force. NOISEFILE data includes SEL and L_{Amax} as a function of speed and power setting for aircraft in straight flight.

Noise from an individual aircraft is a time-varying continuous sound. It is first audible as the aircraft approaches, increases to a maximum when the aircraft is near its closest point, then diminishes as it departs. The noise depends on the speed and power setting of the aircraft and its trajectory. The models noted above divide the trajectory into segments whose noise can be computed from the data in NOISEFILE. The contributions from these segments are summed.

MR_NMAP was used to compute noise levels in the airspace. The primary noise metric computed by MR_NMAP was L_{dnmr} averaged over each airspace. Supporting routines from NOISEMAP were used to calculate SEL and L_{Amax} for various flight altitudes and lateral offsets from a ground receiver position.

3.2 Sonic Booms

When an aircraft moves through the air, it pushes the air out of its way. At subsonic speeds, the displaced air forms a pressure wave that disperses rapidly. At supersonic speeds, the aircraft is moving too quickly for the wave to disperse, so it remains as a coherent wave. This wave is a sonic boom. When heard at the ground, a sonic boom consists of two shock waves (one associated with the forward part of the aircraft, the other with the rear part) of approximately equal strength and (for fighter aircraft) separated by 100 to 200 milliseconds. When plotted, this pair of shock waves and the expanding flow between them have the appearance of a capital letter "N," so a sonic boom pressure wave is usually called an "N-wave." An N-wave has a characteristic "bang-bang" sound that can be startling. Figure E-5 shows the generation and evolution of a sonic boom N-wave under the aircraft. Figure E-6 shows the sonic boom pattern for an aircraft in steady supersonic flight. The boom forms a cone that is said to sweep out a "carpet" under the flight track.

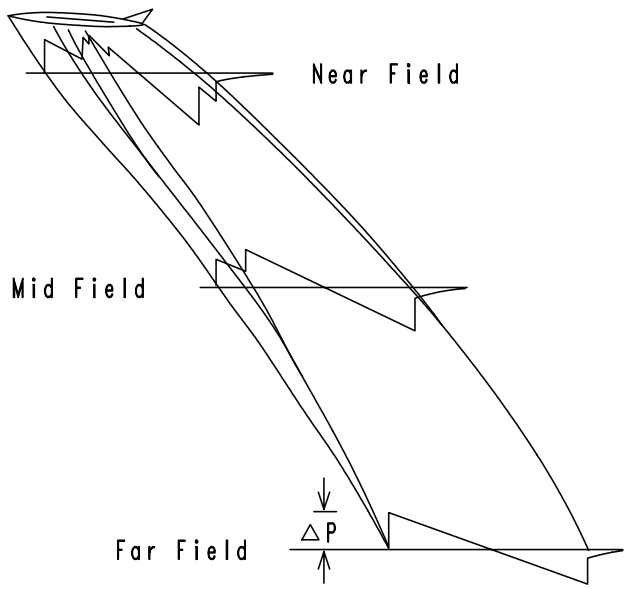


Figure E-5. Sonic Boom Generation, and Evolution to N-wave

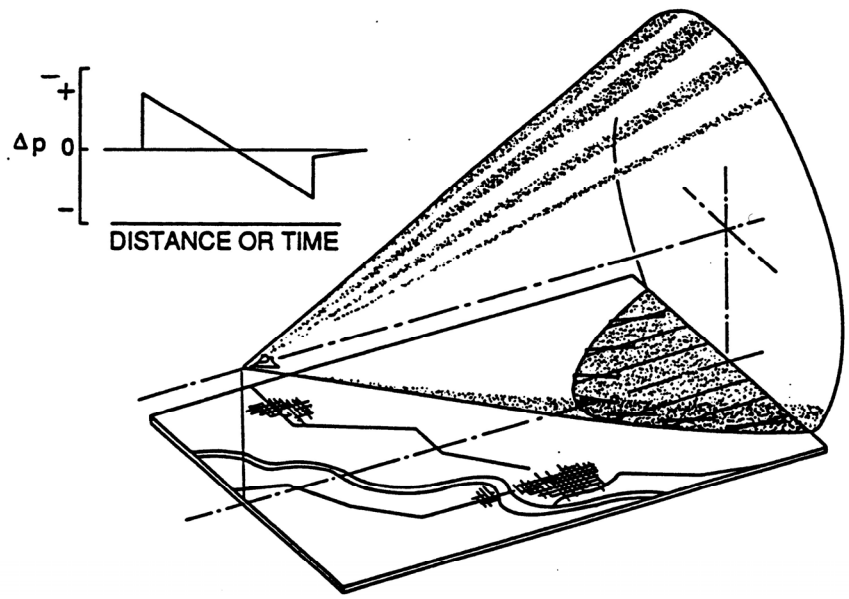


Figure E-6. Sonic Boom Carpet in Steady Flight

The complete ground pattern of a sonic boom depends on the size, shape, speed, and trajectory of the aircraft. Even for a nominally steady mission, the aircraft must accelerate to supersonic speed at the start, decelerate back to subsonic speed at the end, and usually change altitude. Figure E-7 illustrates the complexity of a nominal full mission.

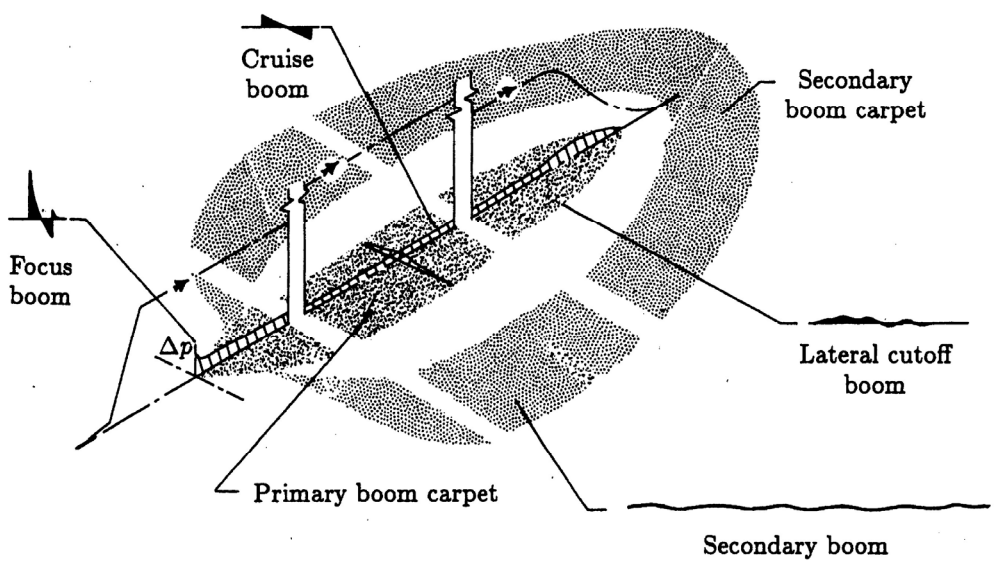


Figure E-7. Complex Sonic Boom Pattern for Full Mission

The Air Force's PCBoom4 computer program (Plotkin and Grandi 2002) can be used to compute the complete sonic boom footprint for a given single event, accounting for details of a particular maneuver.

Supersonic operations for the proposed action and alternatives are, however, associated with air combat training, which cannot be described in the deterministic manner that PCBoom4 requires. Supersonic events occur as aircraft approach an engagement, break at the end, and maneuver for advantage during the engagement. Long time cumulative sonic boom exposure, CDNL, is meaningful for this kind of environment.

Long-term sonic boom measurement projects have been conducted in four supersonic air combat training airspaces: White Sands, New Mexico (Plotkin *et al.* 1989); the eastern portion of the Goldwater Range, Arizona (Plotkin *et al.* 1992); the Elgin MOA at Nellis AFB, Nevada (Frampton *et al.* 1993); and the western portion of the Goldwater Range (Page *et al.* 1994). These studies included analysis of schedule and air combat maneuvering instrumentation data and supported development of the 1992 BOOMAP model (Plotkin *et al.* 1992). The current version of BOOMAP (Frampton *et al.* 1993; Plotkin 1996) incorporates results from all four studies. Because BOOMAP is directly based on long-term measurements, it implicitly accounts for such variables as maneuvers, statistical variations in operations, atmosphere effects, and other factors.

Figure E-8 shows a sample of supersonic flight tracks measured in the air combat training airspace at White Sands (Plotkin *et al.* 1989). The tracks fall into an elliptical pattern aligned with preferred engagement directions in the airspace. Figure E-9 shows the CDNL contours that were fit to six months of measured booms in that airspace. The subsequent measurement programs refined the fit, and demonstrated that the elliptical maneuver area is related to the size and shape of the airspace (Frampton *et al*. 1993). BOOMAP quantifies the size and shape of CDNL contours, and also numbers of booms per day, in air combat training airspaces. That model was used for prediction of cumulative sonic boom exposure in the study area.

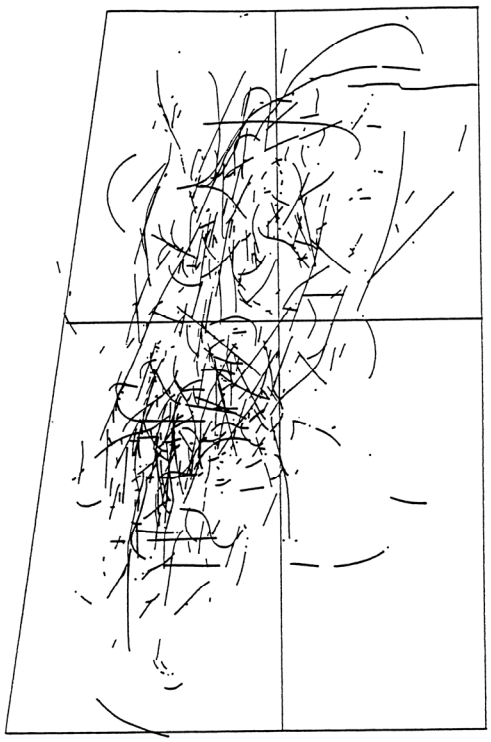


Figure E-8. Supersonic Flight Tracks in Supersonic Air Combat Training Airspace

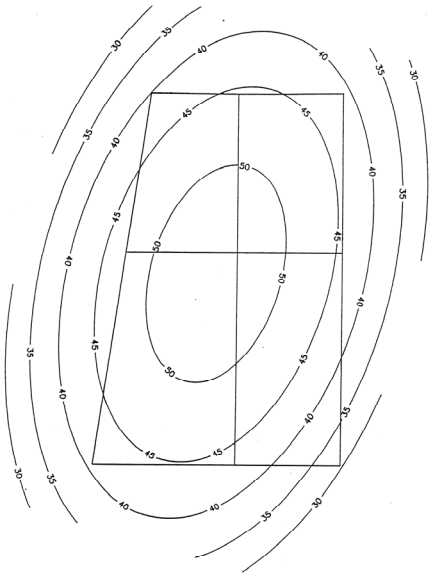


Figure E-9. Elliptical CDNL Contours in Supersonic Air Combat Training Airspace

REFERENCES

American National Standards Institute. 1980. Sound Level Descriptors for Determination of Compatible Land Use. American National Standards Institute Standard ANSI S3.23-1980.

. 1988. Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1. American National Standards Institute Standard ANSI S12.9-1988.

Committee on Hearing, Bioacoustics and Biomechanics. 1981. Assessment of Community Noise Response to High-Energy Impulsive Sounds. Report of Working Group 84, Committee on Hearing, Bioacoustics and Biomechanics, Assembly of Behavioral and Social Sciences. National Research Council, National Academy of Sciences. Washington, DC.

Committee of the Health Council of the Netherlands. 1996. Effects of Noise on Health. Noise/News International 4. September.

Edmonds, L.D., P.M. Layde, and J.D. Erickson. 1979. *Airport Noise and Teratogenesis*. Archives of Environmental Health, 243-247. July/August.

Federal Interagency Committee on Noise. 1992. Federal Agency Review of Selected Airport Noise Analysis Issues. Federal Interagency Committee on Noise. August.

Federal Interagency Committee on Urban Noise. 1980. Guidelines for Considering Noise in Land-Use Planning and Control. Federal Interagency Committee on Urban Noise. June.

Fidell, S., D.S. Barger, and T.J. Schultz. 1991. Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise. *J. Acoust. Soc. Am.*, 89, 221-233. January.

Finegold, L.S., C.S. Harris, and H.E. von Gierke. 1994. Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People. In *Noise Control Engineering Journal*, Volume 42, Number 1. pp. 25-30. January-February.

Frampton, K.D., M.J. Lucas, and B. Cook. 1993. Modeling the Sonic Boom Noise Environment in Military Operating Areas. AIAA Paper 93-4432.

Frerichs, R.R., B.L. Beeman, and A.H. Coulson. 1980. Los Angeles Airport Noise and Mortality: Faulty Analysis and Public Policy. *Am. J. Public Health*, 357-362. April.

Haber, J. and D. Nakaki. 1989. Sonic Boom Damage to Conventional Structures. HSD-TR-89-001. April.

Harris, C.M. (editor). 1979. *Handbook of Noise Control*. McGraw-Hill.

Hershey, R.L. and T.H. Higgins. 1976, "Statistical Model of Sonic Boom Structural Damage," FAA-RD-76-87, July 1976

Jones, F.N. and J. Tauscher. 1978. Residence Under an Airport Landing Pattern as a Factor in Teratism. *Archives of Environmental Health*, 10-12. January/February.

Kryter, K.D. 1984. Physiological, Psychological, and Social Effects of Noise. *NASA Reference Publication* 1115, 446. July.

Lucas, M.J. and P.T. Calamia. 1996. Military Operations Area and Range Noise Model: NRNMAP User's Manual. Final. Wright-Patterson AFB, Ohio: AAMRL. A1/OE-MN-1996-0001.

Lucas, M.J. and K. Plotkin. 1988. ROUTEMAP Model for Predicting Noise Exposure From Aircraft Operations on Military Training Routes. Final, Wright-Patterson AFB, Ohio. AAMRL. AAMRL-TR-88-060.

Meecham, W.C. and N. Shaw. 1979. Effects of Jet Noise on Mortality Rates. *British J. Audiology*, 77-80. August.

Moulton, C.L. 1992. Air Force Procedure for Predicting Noise Around Airbases: Noise Exposure Model (NOISEMAP). Technical Report AL-TR-1992-59.

National Research Council/National Academy of Sciences. 1977. Guidelines for Preparing Environmental Impact Statements on Noise. Committee on Hearing, Bioacoustics, and Biomechanics.

Ollerhead, J.B., C.J. Jones, R.E. Cadoux, A. Woodley, B.J. Atkinson, J.A. Horne, F. Pankhurst, L. Reyner, K.I. Hume, F. Van, A. Watson, I.D. Diamond, P. Egger, D. Holmes, and J. McKean. 1992. Report of a Field Study of Aircraft Noise and Sleep Disturbance. The Department of Transport, Department of Safety Environment and Engineering. Civil Aviation Authority, London. December.

Page, J.A., B.D. Schantz, R. Brown, K.J. Plotkin, and C.L. Moulton. 1994. "Measurements of Sonic Booms Due to ACM Training in R2301 W of the Barry Goldwater Air Force Range," Wyle Research Report WR 94-11.

Pearsons, K.S., D.S. Barber, and B.G. Tabachick. 1989. Analyses of the Predictability of Noise-Induced Sleep Disturbance. USAF Report HSD-TR-89-029. October.

Plotkin, K.J., V.R. Desai, C.L. Moulton, M.J. Lucas, and R. Brown. 1989. "Measurements of Sonic Booms due to ACM Training at White Sands Missile Range," Wyle Research Report WR 89-18.

Plotkin, K.J., C.L. Moulton, V.R. Desai, and M.J. Lucas. 1992. "Sonic Boom Environment under a Supersonic Military Operations Area," Journal of Aircraft 29(6): 1069-1072.

Plotkin, K.J., 1996. PCBoom3 Sonic Boom Prediction Model: Version 1.0c. Wyle Research Report WR 95-22C. May.

Plotkin, K.J. and F. Grandi, 2002. "Computer Models for Sonic Boom Analysis: PCBoom4, CABoom, BooMap, CORBoom," Wyle Research Report WR 02-11, June 2002.

Plotkin, K.J., L.C. Sutherland, and J.A. Molino. 1987. Environmental Noise Assessment for Military Aircraft Training Routes, Volume II: Recommended Noise Metric. Wyle Research Report WR 86-21. January.

Schultz, T.J. 1978. Synthesis of Social Surveys on Noise Annoyance. *J. Acoust. Soc. Am.*, 64, 377-405. August.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 2: Rented Own-Home Experiment. Wyle Laboratories Research Report WR 92-3. March.

Stusnick, E., K.A. Bradley, M.A. Bossi, and D.G. Rickert. 1993. The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 3: Hybrid Own-Home Experiment. Wyle Laboratories Research Report WR 93-22. December.

Sutherland, L. 1989. Assessment of Potential Structural Damage from Low Altitude Subsonic Aircraft. Wyle Laboratories Research Report WR 89-16. El Segundo, CA.

Sutherland, L.C. 1990. "Effects of Sonic Boom on Structures," Lecture 3 of *Sonic Boom: Prediction and Effects*, AIAA Short Course, October 1990.

U.S. Department of Transportation. 1984. Airport Noise Compatibility Planning; Development of Submission of Airport Operator's Noise Exposure Map and Noise Compatibility Program; Final Rule and Request for Comments. 14 CFR Parts 11 and 150, Federal Register 49(244): 18 December.

United States Environmental Protection Agency (USEPA). 1974. Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare With an Adequate Margin of Safety. U.S. Environmental Protection Agency Report 550/9-74-004. March.

von Gierke, H.R. 1990. The Noise-Induced Hearing Loss Problem. NIH Consensus Development Conference on Noise and Hearing Loss. Washington, D.C. 22-24 January.

Wesler, J.E. 1977. Concorde Operations At Dulles International Airport. NOISEXPO '77, Chicago, IL. March.

White, R. 1972. Effects of Repetitive Sonic Booms on Glass Breakage. FAA Report FAA-RD-72-43. April.

Appendix F
Holloman AFB and Regional Historical Context

APPENDIX F HOLLOMAN AFB AND REGIONAL HISTORICAL CONTEXT

Historical Background

Humans have inhabited the area near Holloman AFB for at least 12,000 years. The climate of the American Southwest was once cooler and moister supporting megafauna such as mammoth, musk ox, giant beaver, mastodon, and sloth. The first inhabitants of the area, termed Paleo Indians, were big game hunters that relied on megafauna until their extinction approximately 10,000 years before the present (BP). They are best known through the artifacts left behind, principally projectile points (e.g., Clovis and Folsom spear points).

Later, during the Archaic Period (approximately 8,000 to 2,800 years BP), the climate gradually became warmer and drier, forests gave way to desert scrub and grassland. By the middle of the period, vegetation in the area largely resembled the conditions of today. Populations continued to rely on hunting but developed diverse technologies and used a greater variety of plant resources, as evidenced by an increased variety of flaked and ground stone tools.

After the Archaic Period and until about 1,000 years ago, groups became increasingly less mobile and dramatically increased their reliance on agriculture, particularly maize production. People of this time developed sophisticated irrigation technologies, fine and elaborately decorated ceramics, long distance trade, solar calendars, and social and political systems to manage the higher population densities that are possible with a successful, agriculture-based economy. Large multi-room pueblos were constructed, perhaps housing as many as a thousand people (Fagan 1991). Toward the end of the 13th century A.D., a major drought occurred throughout the Southwest. When agriculture failed and populations naturally reduced through attrition, groups relocated to environments that could support them (Holloman AFB 2005).

Spanish explorers entered the region beginning in the mid-1500s, encountering Apache resistance. Apache occupation continued until the mid-1700s, when the Comanche entered the region and engaged in raids against eastern Pueblo and Spanish settlements that led to military campaigns by the Spanish.

In 1810, a treaty between the Spanish and the Mescalero Apache established a reservation for the Mescalero. The treaty was renewed by the Mexican government in 1832. In the following decades, Mescalero encounters with the American military led to additional short-term treaty and reservation arrangements. After a period of instability following the American Civil War, a new reservation was established in 1873 for the Mescalero and Chiricahua Apache at its present location near the Sacramento Mountains northeast of Holloman AFB.

After the war between the U.S. and Mexico in 1846, most of New Mexico and Arizona was ceded to the U.S. The Texas/New Mexico borders were established in 1850. American military forts were established by the early 1860s to defend routes of travel through the region. Most settlement occurred after 1882 and the arrival of the Southern Pacific Railroad. Ranching, which began in the late 1800s, continued to be important into the 1900s. Mining began in the nearby San Andres, Oscura, Mockingbird, and Jicarilla mountains during the 1870s, spurring local settlement and the development of water control systems (Holloman AFB 2005). Travel and development throughout the region relied on supply routes and trails, most of which followed

previously established Native American trails. Several of these trails are now recognized as National historic Trails.

A modern military presence was established in the area during World War II. Alamogordo Army Air Field (later renamed Holloman AFB) was created in 1942 in New Mexico's Tularosa Basin between the San Andreas and Sacramento mountain ranges. The base occupies 59,639 acres of land, 90 miles north of El Paso, Texas, and 70 miles east of Las Cruces, New Mexico (Holloman AFB 2005). Originally the base was to serve as a center for the British Overseas Training Program where aircrews would train over the uninhabited expanses of New Mexico. Due to events in Europe, Britain decided not to pursue its overseas training program with the December 7, 1941 attack on Pearl Harbor. The U.S. elected to establish a base at the same location to train its own growing military. For the remainder of WWII, the base served as the training grounds for B-17, B-24, and B-29 bomber crews. Crews commonly trained for approximately six months before being deployed to the Pacific or European Theaters (Holloman AFB 2005).

After WWII, the base was renamed Holloman Air Force Base and, along with the adjacent White Sands Proving Ground (WSPG), became the primary testing area for pilotless aircraft, guided missiles, and other research programs (Holloman AFB 2005). WSPG was assembled from existing firing ranges, the Alamogordo Bombing Range, and large tracts of both private and public lands. WSPG was separated from the Alamogordo Bombing and Gunnery Range, and assumed control of huge tracts of private and public land. WSPG was renamed White Sands Missile Range (WSMR) in 1958. Work at the range included V-2 rocket firings and developmental testing of such missiles as Nike, Viking, Corporal, Lance and Multiple Launch Rocket System. The National Park Service designated the V-2 complex a National Historic Landmark in 1985. It is still active today and is known as Launch Complex 33.

Through the 1950s and 1960s, the Air Force Missile Development Center at Holloman AFB was the location of numerous developments in aerospace and aeromedical technology. In 1952, two Philippine monkeys rode an Aerobee rocket to an altitude of 36 miles, reaching a speed of 2,000 mph. The primates were recovered unharmed and provided significant data later applied to manned space missions (Air Force Museum of Space and Flight 2004). In 1954, Lt Col John Stapp rode a rocket sled to a speed of 632 mph, setting a land speed record. In 1960, in an attempt to evaluate techniques for high altitude bail out, Capt Joseph Kittinger jumped from a balloon at a height of more than 102,000 feet. During the 13 minute free fall, he reached a speed of 614 mph and broke four world records. In 1961 a chimpanzee trained at Holloman was the first specimen successfully launched into orbit (Holloman AFB 2005).

In 1968, Holloman AFB became the home of the 49th Tactical Fighter Wing (TFW) employing the F-4 Phantom. In 1971, Holloman AFB became part of the Tactical Air Command (TAC), and shifted from missile testing to fighter pilot training. In 1972, the 49 TFW transitioned to the F-15 Eagle, the Air Force's top air to air weapon (Global Security 2006). In 1992, the base became part of Air Combat Command (ACC) as the 49 TFW transitioned aircraft once again. The base is now home to arguably the most advanced fighter aircraft ever produced, the F-117A Nighthawk, or Stealth Fighter (Holloman AFB 2005). The most recent development at Holloman AFB is the establishment of the German Air Force Tactical Training Center (TTC). Currently, more than 300 German Air Force members are assigned to the base in the only program of its kind in the country.

Today Holloman AFB supports approximately 21,000 active duty, guard, reserves, retirees, DoD civilians and their family members. Personnel from Holloman AFB have participated in Operation Desert Shield/Desert Storm, Operation Allied Forces, Operation Southern Watch, Operation Northern Watch, Operation Enduring Freedom and many more. Holloman personnel also assist the WSMR in maintaining the White Sands Space Harbor, an alternative runway for Space Shuttle missions (Holloman AFB 2005).

References

Air Force Museum of Space and Flight. 2004. Aerojet "aerobe" research rocket. http://www.wpafb.af.mil/museum/space_flights/sf16.htm

Fagan, Brian M. 1991. Ancient North America, the Archaeology of a Continent. Thames and Hudson, London.

Global Security. 2006. Holloman AFB. http://www.globalsecurity.org/military/facility/holloman.htm

Holloman AFB. 2005. Holloman Air Force Base Integrated Cultural Resources Management Plan. 49 CES/CEVA.

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix G
Biological Resources – Supplemental Information

APPENDIX G BIOLOGICAL RESOURCES – SUPPLEMENTAL INFORMATION

1.0 Definition of Resource and Region of Influence (ROI)

Holloman Air Force Base. Biological resources consist of native or naturalized plants and animals, along with their habitats, including wetlands. Although the existence and preservation of biological resources are both intrinsically valuable, these resources also provide essential aesthetic, recreational, and socioeconomic benefits to society. This section focuses on plant and animal species and vegetation types that are important to the functioning of local ecosystems, are of special societal importance, or are protected under federal or state law or statute. The ROI for this resource is Holloman AFB.

Area Under Airspace. As treated in Section 4.6, biological resources include vegetation and habitat, wetlands, fish and wildlife, and special-status species (on lands under training airspace). Section 3.6.1 explains these resources in more detail. In addition, because of concerns expressed during scoping, domestic animals are included in the discussion of environmental consequences to biological resources. The ROI encompasses all lands under the proposed F-22A training airspace in southern New Mexico. The ROI spans several landownership classifications; Bureau of Land Management (BLM), U.S. Forest Service, Department of Defense, National Park Service, U.S. Fish and Wildlife Service (USFWS), and tribal, state and private lands all occur under the proposed F-22A training airspace.

2.0 Regulatory Setting

National Environmental Policy Act (NEPA)

NEPA requires federal agencies to take into consideration the potential environmental consequences of proposed actions in their decision-making process. The intent of NEPA is to protect, restore, and enhance the environment through well-informed federal decisions. The CEQ was established under NEPA to implement and oversee federal policy in this process. The CEQ subsequently issued the Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR Sections 1500–1508) . These requirements specify that an EA be prepared to:

- Briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a FONSI;
- Aid in an agency's compliance with NEPA when an EIS is not necessary; and
- Facilitate preparation of an EIS when one is necessary.

The activities addressed within this document constitute a federal action and therefore must be assessed in accordance with NEPA. To comply with NEPA, as well as other pertinent environmental requirements, the decision-making process for the Proposed Action includes the development of this EA to address the environmental issues related to the proposed activities. The Air Force implementing procedures for NEPA are contained in 32 CFR Part 989 *et seq.*, *Environmental Impact Analysis Process.*

Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 USC §§ 1531–1544, as amended) established measures for the protection of plant and animal species that are federally listed as threatened and endangered, and for the conservation of habitats that are critical to the continued existence of those species. Federal agencies must evaluate the effects of their proposed actions through a set of defined procedures, which can include the preparation of a Biological Assessment and can require formal consultation with the United States Fish and Wildlife Service (USFWS) under Section 7 of the Act.

Implementation of an alternative will involve coordination with several organizations and agencies. Compliance with the ESA requires communication with the USFWS in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this consultation is to request a determination of whether any of these species occur in the region of influence. If any of these species are present, a determination of the potentially adverse effects on the species is made. Should no species protected by the ESA be affected by the Proposed Action, no additional action is required. No adverse effects are anticipated. Letters were sent to the appropriate USFWS offices as well as state agencies, informing them of the Proposed Action and alternatives and requesting data regarding applicable protected species. Appendix A includes copies of relevant coordination letters sent by the Air Force.

Clean Water Act (CWA)

The Clean Water Act (CWA) of 1977 (33 USC § 1251 *et seq.*) and the EPA Storm Water General Permit regulate pollutant discharges that could affect aquatic life forms or human health and safety. Section 404 of the CWA and EO 11990, *Protection of Wetlands*, regulate development activities in or near streams or wetlands. Section 404 regulates development in streams and wetlands and requires a permit from the United States Army Corps of Engineers (USACE) for dredging and filling in wetlands. EO 11988, *Floodplain Management*, requires federal agencies to take action to reduce the risk of flood damage; minimize the impacts of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains. Federal agencies are directed to consider the proximity of their actions to or within floodplains. There are no wetlands in any of the proposed construction areas at Holloman Air Force Base.

Migratory Bird Treaty Act (16 U.S.C. 703 et seq.) and Executive Order 13186

The Migratory Bird Treaty Act (MBTA) governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. The take of all migratory birds is governed by the MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent overuse. The MBTA also prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase or barter, any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit (50 CFR 21.11).

Many birds in the region are protected by the Migratory Bird Treaty Act (MBTA). Under the MBTA the intentional taking of these species requires a depredation permit. However, if a migratory bird species is involved in a bird-aircraft strike it would be considered an incidental taking not an intentional taking. Such incidental taking during military training is exempt from

any permitting requirement by Section 315 of the FY 03 National Defense Authorization Act, signed 2 December 2003, which authorized the USFWS (Service) to allow DoD (Military Services) unintentional take of migratory birds during military readiness activities. The Service in cooperation with the Military Services is developing implementing regulations related to the migratory bird exemption.

Executive Order (EO) 13186 (effective January 10, 2001), outlines the responsibilities of Federal agencies to protect migratory birds, in accordance with the MBTA, the Bald and Golden Eagle Protection Acts, the Fish and Wildlife Coordination Act, ESA, and NEPA. This order specifies the following:

- The USFWS as the lead for coordinating and implementing EO 13186;
- Requires Federal agencies to incorporate migratory bird protection measures into their activities; and
- Requires Federal agencies to obtain permits from USFWS before any "take" occurs, even when the agency intent is not to kill or injure migratory birds.
- EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (2001) recognizes the ecological and economic importance of migratory birds to this and other countries requires federal agencies to evaluate the effects of their actions and plans on migratory birds (with an emphasis on species of concern) in their NEPA documents. Listing among the federal Birds of Conservation Concern confers no legal protection independent of protection that is afforded under the Migratory Bird Treaty Act or other legislation.

3.0 Additional Data

Categories of endangered, threatened, and sensitive species used in this document.

Federally Listed Threatened and Endangered Species. The ESA of 1973 provides protection to species federally listed as endangered or threatened. Endangered species are those species that are at risk of extinction in all or a significant portion of their range. Threatened species are those that could be listed as endangered in the near future.

State Listed Wildlife and Plants. The State of New Mexico maintains its own list of state endangered, threatened, and sensitive wildlife species.

Other Sensitive Species. Taxa under this heading receive no legal protection under the ESA. They include federally proposed endangered species, proposed threatened species, and species of concern. Federally proposed endangered and threatened species are those proposed to be listed as endangered and threatened under the ESA, respectively (formal ruling in progress). Federal species of concern (formerly labeled as candidate species) are those for which the USFWS has on file sufficient information on biological vulnerability and threats to support proposals to list them as endangered or threatened, but issuance of proposed rules for these species is precluded by higher priority listing actions.

Other sensitive species at the federal level also include birds of conservation concern, defined as those migratory, nongame avian species in greatest need of conservation action at different geographic scales.

Other sensitive species also include those identified by the New Mexico Natural Heritage Program as species critically imperiled globally or at the state level, irrespective of whether they are listed under any of the federal designations described above.

Many of the species listed in Table 1 are habitat specific, meaning that they are almost exclusively found in their associated habitats and tend not to stray from their associated landscapes. In addition, some species in Table 1 are seasonal or accidental occurrences that have been documented on the Holloman AFB in the past.

4.0 Review of effects of aircraft noise, chaff, and flares on biological resources

4.1 Introduction

This biological resources appendix addresses the effects of aircraft noise, including sonic booms, on wildlife and domestic animals. This appendix also considers the effects of training chaff and flares on biological resources under the training airspaces currently used by Holloman Air Force Base and the proposed use by F-22A.

4.2 Aircraft Noise

The review of the noise effects literature shows that the documented reaction of animals newly or infrequently exposed to low-altitude aircraft and sonic booms ranges from no reaction to an alert posture or a "startle effect." Although an observer's interpretation of the startle effect is behavioral (e.g., the animal runs in response to the sound or flinches and remains in place), it does have a physiological basis. The startle effect is a reflex; it is an autonomic reaction to loud, sudden noise (Westman and Walters 1981, Harrington and Veitch 1991). Increased heart rate and muscle flexion are the typical physiological responses.

The literature indicates that the type of noise that can stimulate the startle reflex is highly varied among animal species (Manci *et al.* 1988). In general, studies have indicated that close, loud, and sudden noises that are combined with a visual stimulus produce the most intense reactions. Rotary wing aircraft (helicopters) generally induce the startle effect more frequently than fixed wing aircraft (Gladwin *et al.* 1988, Ward *et al.* 1999). Similarly, the clap of a nearby sonic boom has a higher potential to startle an animal compared to the thunder-like sound from a distant sonic boom. External physical variables, such as landscape structure and wind, can also lessen the animal's perception of and response to aircraft noise (Ward *et al.* 1999).

Animals can habituate to fixed wing aircraft noise as demonstrated under controlled conditions (e.g., Conomy *et al.* 1998, Krausman *et al.* 1998) and by observations reported by biologists working in parks and wildlife refuges (Gladwin *et al.* 1988). Brown *et al.* (1999) defined habituation as "… an active learning process that permits individuals to discard a response to a recurring stimulus for which constant response is biologically inappropriate without impairment of their ability to respond to other stimuli." However, species can differ in their ability to habituate to aircraft noise, particularly the sporadic noise associated with military aircraft training (e.g., Conomy *et al.* 1998).

Table 1. Threatened, Endangered, and Sensitive Species on or in the Vicinity of Holloman AFB (Page 1 of 3)

Common Name	*Scientific Name*	*Status*[1]	*Potential for occurrence*
Mammals			
Western small-footed myotis bat	*Myotis ciliolabrum melanorhinus*	SS, FSC	Present on Holloman Air Force Base (AFB); very unlikely to occur in combined project construction area based on habitat associations
Spotted bat	*Euderma maculatum*	ST, FSC	Present on Holloman AFB; very unlikely to occur in project construction area based on habitat associations
Townsend's big-eared bat	*Plecotus townsendii*	SS, FSC	Present on Holloman AFB; very unlikely to occur in project construction area based on habitat associations
Big free-tailed bat	*Nyctinomops macrotis*	SS, FSC	Possibly present on Holloman AFB; very unlikely to occur in project construction area based on habitat associations
Rock squirrel	*Spermophilus ariegates tularosae*	SS	Present on Holloman AFB
Black-tailed prairie dog	*Cynomys ludovicianus*	SS	Unlikely to be present on Holloman AFB; not recorded in project construction area
Botta's pocket gopher	*Thomomys bottae tularosae*	SS	Possibly present on Holloman AFB
Desert pocket gopher	*Geomys arenarius*	SS, FSC	Possibly present on Holloman AFB
Plains pocket mouse	*Perognathus flavescens gypsi*	SS	Present on Holloman AFB
Ringtail	*Bassariscus astutus*	SS	Present on Holloman AFB
Western spotted skunk	*Spilogale gracilis*	SS	Possibly present on Holloman AFB
Common hog-nosed skunk	*Conepatus mesoleucus*	SS	Possibly present on Holloman AFB
Birds			
Brown pelican	*Pelecanus occidentalis*	SE, FE	Accidental occurrence on Holloman AFB (only one record)
Neotropic cormorant	*Phalacrocorax brasilianus*	ST	Present on Holloman AFB
White-faced ibis	*Plegadis chihi*	SS	Present on Holloman AFB
Northern harrier	*Circus cyaneus*	FBCC	Present on Holloman AFB
Northern gray hawk	*Asturina nitida maximus*	SS, FSC	Present on Holloman AFB

Table 1. Threatened and Endangered Species on or in the Vicinity of Holloman AFB (Page 2 of 3)

Common Name	*Scientific Name*	*Status*[1]	*Potential for occurrence*
Ferruginous hawk	*Buteo regalis*	FSC, FBCC	Documented only once on Holloman AFB, in gypgrass-four winged saltbush habitat; very unlikely to occur in project construction area based on habitat associations and level of human disturbance
Common black hawk	*Buteogallus anthracinus*	ST	Unlikely to be present on Holloman AFB, as this species prefers riparian gallery forests, a habitat type not present locally
Bald eagle	*Haliaeetus leucocephalus*	ST, FT	Present on Holloman AFB; very unlikely in project construction area due to the absence of river, lake, or very tall tree. Potential visitor to Lake Holloman.
American peregrine falcon	*Falco peregrinus anatum*	ST	Present on Holloman AFB (documented at Lake Holloman); occurrence in project construction area is possible.
Northern aplomado falcon	*Falco femoralis septentrionalis*	SE, FE	Present on Holloman AFB; occurrence in project construction area as a transient is possible but unlikely (has been documented about 3-5 miles to the north)
Snowy plover	*Charadrius alexandrinus*	FBCC	Present on Holloman AFB; occurrence in project construction area is unlikely
Mountain plover	*Charadrius montanus*	SS	Present on Holloman AFB
Long-billed curlew	*Numenius americanus*	FBCC	Present on Holloman AFB
Interior least tern	*Sterna antillarum athalassos*	SE, FE	Present on Holloman AFB
Black tern	*Chlidonias niger*	FSC	Present on Holloman AFB
Western burrowing owl	*Athene cunicularia hypugaea*	FSC, FBCC	Present on Holloman AFB, where nesting has been documented in the past; not documented and unlikely in project construction area
Costa's hummingbird	*Calypte costae*	ST	Present on Holloman AFB
Crissal thrasher	*Toxostoma crissale*	FBCC	Present on Holloman AFB
Southwestern willow flycatcher	*Empidonax traillii extimus*	SE, FE	Unlikely to be present on Holloman AFB due to lack of suitable habitat
Loggerhead shrike	*Lanius ludovicianus*	FSC, FBCC	Present on Holloman AFB

Table 1. Threatened and Endangered Species on or in the Vicinity of Holloman AFB (Page 3 of 3)

Common Name	*Scientific Name*	*Status*[1]	*Potential for occurrence*
Bell's vireo	*Vireo bellii*	ST, FBCC	Unlikely to be present on Holloman AFB
Gray vireo	*Vireo vicinior*	ST, FBCC	Possibly present on Holloman AFB
Sprague's pipit	*Anthus spragueii*	FBCC	Present on Holloman AFB
Cassin's sparrow	*Aimophila cassinii*	FBCC	Present on Holloman AFB
Sage sparrow	*Amphispiza belli*	FBCC	Present on Holloman AFB
Lark bunting	*Calamospiza melanocorys*	FBCC	Present on Holloman AFB
Baird's sparrow	*Ammodramus bairdii*	ST, SSC, FBCC	Present on Holloman AFB
McCown's longspur	*Calcarius mccownii*	FBCC	Present on Holloman AFB
Chestnut-collared longspur	*Calcarius ornatus*	FBCC	Present on Holloman AFB
Reptiles			
Little white whiptail	*Cnemidophorus gypsi*	SS	Likely present on Holloman AFB
Bleached earless lizard	*Holbrookia maculate ruthveni*	SS	Likely present on Holloman AFB
Texas horned lizard	*Phrynosoma cornutum*	FSC	Present on Holloman AFB; occasional in project construction area
White Sands prairie lizard	*Sceloporus undulates cowlesi*	SS	Likely present on Holloman AFB
Fish			
White Sands pupfish	*Cyprinodon tularosa*	ST	Present on Holloman AFB but not in project construction area
Plants and Lichen			
Sacramento prickly poppy	*Argemone pleiacantha pinnatisecta*	SE, FE	Possibly present on Holloman AFB
Kuenzler's hedgehog cactus	*Echinocereus fendleri kuenzleri*	TE, SE	Unlikely to be present on Holloman AFB
Villard pincushion cactus	*Escobaria villardii*	SE, FSC	Possibly present on Holloman AFB
Night-blooming cereus	*Peniocereus greggii*	SE, FSC	Possibly present on Holloman AFB
Paperspine fishhook cactus	*Sclerocactus papyracanthus*	SS, FSC	Present on Holloman AFB
Alamo beardtongue	*Penstemon alamosensis*	SS, FSC	Possibly present on Holloman AFB
Gypsophyllous lichen	*Acarospora clauzadeana*	GI/SI	Present on Holloman AFB

Notes: 1. Status: FBCC = Federal Birds of Conservation Concern; FE = Federal Endangered; FSC = Federal Species of Concern; FT = Federal Threatened; GI/SI = Critically imperiled globally/In-state because of extreme rarity; SE = State Endangered; SS = State Sensitive; ST = State Threatened. See text for information on Federal Birds of Conservation Concern.
Source: Holloman AFB 1998a

Table 2. Federally-listed Threatened, Endangered, and Candidate Species Associated with Counties Intersecting with the Proposed F-22A Training Airspace in New Mexico (Page 1 of 7)

				Associated F22 Airspace						
Common Name	*Scientific Name*	*Status*	*Likely Occurrence*	*Beak*	*Talon (East & West)*	*McGregor*	*Existing & Expanded WSMR*	*5111A*	*Cowboy/ Expanded Cowboy*	*Valmont ATCAA*
Chiricahua leopard frog	*Rana chiricahuensis*	Threatened	Not likely- Primary NM distribution is west of Rio Grande River				X	X	X	
Sand dune lizard	*Sceloporus arenicolus*	Candidate	Not Likely- Primary NM distribution is east of Pecos River		X				X	X
Noel's amphipod	*Gammarus desperatus*	Endangered	Not Likely- limited to springs around Roswell, NM		X				X	X
Socorro isopod	*Thermosphaeroma thermophilus*	Endangered	Not likely- found in spring west of Socorro				X	X	X	
Alamosa springsnail	*Psuedotryonia alamosae*	Endangered	Not likely- found at the head waters of the Alamosa River				X	X	X	

Table 2. Federally-listed Threatened, Endangered, and Candidate Species Associated with Counties Intersecting with the Proposed F-22A Training Airspace in New Mexico (Page 2 of 7)

Common Name	*Scientific Name*	*Status*	*Likely Occurrence*	Associated F22 Airspace						
				Beak	*Talon (East & West)*	*McGregor*	*Existing & Expanded WSMR*	*5111A*	*Cowboy/ Expanded Cowboy*	*Valmont ATCAA*
Chupadera springsnail	*Pyrgulopsis chupaderae*	Candidate	May Occur-found in the Chupadera Mtns.				X	X	X	
Koster's springsnail	*Juturnia kosteri*	Endangered	Not Likely-limited to springs around Roswell, NM		X				X	X
Pecos assiminea snail	*Assiminea pecos*	Endangered	Not likely-only found around Bitter Lake NWR		X				X	X
Roswell springsnail	*Pyrgulopsis roswellensis*	Endangered	Not Likely-limited to springs around Roswell, NM		X				X	X
Socorro springsnail	*Pyrgulopsis neomexicana*	Endangered	Not likely-found west of San Antonio, NM				X	X	X	
Texas hornshell (mussel)	*Popenaias popei*	Candidate	May occur-on Pecos River near Carlsbad		X				X	X

Table 2. Federally-listed Threatened, Endangered, and Candidate Species Associated with Counties Intersecting with the Proposed F-22A Training Airspace in New Mexico (Page 3 of 7)

Common Name	*Scientific Name*	*Status*	*Likely Occurrence*	Associated F22 Airspace						
				Beak	*Talon (East & West)*	*McGregor*	*Existing & Expanded WSMR*	*5111A*	*Cowboy/ Expanded Cowboy*	*Valmont ATCAA*
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Winter roosts occur on Lincoln NF under the Beak MOA/Cowboy ATCAA	X	X	X	X	X	X	X
Least Tern (Interior Population)	*Sterna antillarum*	Endangered	Not Likely- due to lack of suitable wetland habitat	X	X	X	X	X	X	X
Lesser prairie chicken	*Tympanuchus pallidicinctus*	Candidate	Not likely- primarily occurs east of US-285		X				X	X
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	Designated Critical Habitat present in Lincoln NF under the Beak MOA/Cowboy ATCAA and McGregor Airspace.	X	X	X	X	X	X	X

Table 2. Federally-listed Threatened, Endangered, and Candidate Species Associated with Counties Intersecting with the Proposed F-22A Training Airspace in New Mexico (Page 4 of 7)

				Associated F22 Airspace						
Common Name	*Scientific Name*	*Status*	*Likely Occurrence*	*Beak*	*Talon (East & West)*	*McGregor*	*Existing & Expanded WSMR*	*5111A*	*Cowboy/ Expanded Cowboy*	*Valmont ATCAA*
Northern aplomado falcon	*Falco femoralis septentrionalis*	Endangered	May Occur-suitable habitat is present according to BLM 2005 and Young et al. 2005	X	X	X	X	X	X	X
Piping plover	*Charadrius melodus*	Threatened	Not likely other than rare migratory occurrence				X	X	X	
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	Not Likely-duce to lack of riparian habitat	X	X	X	X	X	X	X
Gila trout	*Oncorhynchus gilae*	Endangered	Not likely-occurs west of Rio Grande				X	X		
Pecos bluntnose shiner	*Notropis simus pecosensis*	Threatened	May occur of Pecos south of Fort Sumner, NM		X				X	X

Table 2. Federally-listed Threatened, Endangered, and Candidate Species Associated with Counties Intersecting with the Proposed F-22A Training Airspace in New Mexico (Page 5 of 7)

				Associated F22 Airspace						
Common Name	*Scientific Name*	*Status*	*Likely Occurrence*	*Beak*	*Talon (East & West)*	*McGregor*	*Existing & Expanded WSMR*	*5111A*	*Cowboy/ Expanded Cowboy*	*Valmont ATCAA*
Pecos gambusia	*Gambusia nobilis*	Endangered	Not likely-occurs on Bitter Lake NWR		X				X	X
Rio Grande silvery minnow	*Hybognathus amarus*	Endangered	Not Likely-existing population limited to the middle Rio Grande				X	X	X	
Black-footed ferret	*Mustela nigripes*	Endangered	No-extirpated from NM	X	X	X	X	X	X	X
Gypsum wild-buckwheat	*Eriogonum gypsophilum*	Threatened	May occur-restricted to gypsum soils		X					
Kuenzler hedgehog cactus	*Echinocereus fendleri var. kuenzleri*	Endangered	May occur-found oak-conifer woodlands	X	X	X	X		X	X
Lee pincushion cactus	*Coryphantha sneedii var. leei*	Threatened	May occur-found in desert scrub		X					
Pecos sunflower	*Helianthus paradoxus*	Threatened	Not likely-due to lack of wetlands		X		X	X	X	X

Table 2. Federally-listed Threatened, Endangered, and Candidate Species Associated with Counties Intersecting with the Proposed F-22A Training Airspace in New Mexico (Page 6 of 7)

Common Name	*Scientific Name*	*Status*	*Likely Occurrence*	Associated F22 Airspace						
				Beak	*Talon (East & West)*	*McGregor*	*Existing & Expanded WSMR*	*5111A*	*Cowboy/ Expanded Cowboy*	*Valmont ATCAA*
Sacramento Mountains thistle	*Cirsium vinaceum*	Threatened	May occur-found in canyons of Sacramento Mnts.	X	X	X	X		X	X
Sacramento prickly poppy	*Argemone pleiacantha spp. pinnatisecta*	Endangered	May occur-found in canyons of Sacramento Mnts.	X	X	X	X		X	X
Sneed pincushion cactus	*Coryphantha sneedii var. sneedii*	Endangered	May occur-found in desert scrub		X		X	X		

Table 2. Federally-listed Threatened, Endangered, and Candidate Species Associated with Counties Intersecting with the Proposed F-22A Training Airspace in New Mexico (Page 7 of 7)

Common Name	*Scientific Name*	*Status*	*Likely Occurrence*	Associated F22 Airspace						
				Beak	*Talon (East & West)*	*McGregor*	*Existing & Expanded WSMR*	*5111A*	*Cowboy/ Expanded Cowboy*	*Valmont ATCAA*
Todsen's pennyroyal	*Hedeoma todsenii*	Endangered	Documented on WSMR in the San Andres Mountains where two 1 km^2 areas of Critical Habitat have been designated in Sierra County. Documented occurrences are within Yonder Impact Area (WSMR) near the northern edge of the safety perimeter outside the live fire area.	X	X	X	X	X	X	X

Sources: NMRPTC 2002, NMDGF 2004

Table 3. Common Wildlife Species and Vegetation Community Association for Lands under the Proposed F-22A Training Airspace in New Mexico (Page 1 of 3)

Species		Community Association		
Scientific Name	*Common Name*	*Plains, Great Basin, and Desert Grassland*	*Shrubland*	*Forest*
Buteo swainsoni	Swainson's hawk	X		X
Buteo jamaicensis	Red-tailed hawk	X		X
Falco mexicanus	Prairie falcon	X		
Athene cunicularia	Burrowing owl	X		
Ammodramus savannarum	Grasshopper sparrow	X		
Calamospiza melancorys	Lark bunting	X		
Peucedramus taeniatus	Olive warbler	X		
Eremophila alpestris	Horned lark	X		
Sturnella neglecta	Western meadowlark	X		
Geococcyx californianus	Greater roadrunner	X		
Campylorhynchus brunneicapillus	Cactus wren		X	
Amphispiza bilineata	Black-throated sparrow		X	
Toxostoma curvirostre	Curve-bill thrasher		X	
Amphispiza belli	Sage sparrow		X	
Oreoscoptes montanus	Sage thrasher		X	
Toxostoma crissale	Crissal thrasher		X	
Pipilo spp.	Towhee		X	
Emipidonax spp.	Empidonax Flycatchers			X
Contopus spp.	Contopus Flycatchers			X
Vireo spp.	Vireo species			X
Junco spp.	Junco species			X
Piranga spp.	Tanager species			X

Table 3. Common Wildlife Species and Vegetation Community Association for Lands under the Proposed F-22A Training Airspace in New Mexico (Page 2 of 3)

Species		Community Association		
Scientific Name	*Common Name*	*Plains, Great Basin, and Desert Grassland*	*Shrubland*	*Forest*
Crotalus atrox	Western diamondback rattlesnake	X	X	X
Holbrookia maculate	Earless lizard	X		
Sceloporus spp.	Fence lizard species	X	X	X
Phrynosoma cornutum	Texas horned lizard	X		
Phrynosoma douglassii	Short-horned lizard	X		
Sceloporus magister	Desert spiny lizard	X		
Scaphiopus bombifrons	Spadefoot toad	X	X	
Masticophis bilineatus	Coachwhip snake	X		
Lampropeltis spp.	Milk snake species	X		
Eumeces spp.	Skink species			X
Ambystoma spp. and *Plethodon* spp.	Salamander species			X
Lampropeltis spp.	Kingsnake species			X
Thamnophis spp.	Garter snake species			X
Arizona elegans	Glossy snake		X	
Leptotyphlops humilis	Western blind snake		X	
Cnemidophorus spp.	Whiptail lizard species		X	
Crotaphytus spp.	Collared lizard species		X	
Uta stansburiana	Side-blotched lizard		X	
Antilocapra americana	Pronghorn antelope	X	X	
Dicotyles tajacu	Javelina	X		
Lepus townsendii	Jackrabbit	X		
Odocoileus hemionus	Mule deer	X	X	X
Cervus elaphus	Elk			X

Table 3. Common Wildlife Species and Vegetation Community Association for Lands under the Proposed F-22A Training Airspace

in New Mexico
(Page 3 of 3)

Species		Community Association		
Scientific Name	*Common Name*	*Plains, Great Basin, and Desert Grassland*	*Shrubland*	*Forest*
Peromyscus eremicus	Deer mice			X
Sciurus spp.	Squirrel species			X
Ovis canadensis	Bighorn sheep		X	
Thomomys spp	Pocket gopher species		X	
Lepus californicus	Blacktail jackrabbit		X	
Dipodomys spp.	Kangaroo rat species		X	

Sources: Dick-Peddie 1993, Bailey 1995.

Ungulates

Wild ungulates appear to vary in sensitivity to aircraft noise. Responses reported in the literature varied from no effect and habituation to panic reactions followed by stampeding (Weisenberger *et al.* 1996; see reviews in Manci *et al.* 1988). Novel or new noises tend to result in a response by an animal, as opposed to regular, predictable noises. Similarly, loud and close aircraft typically result in a more severe response (MacArthur *et al.* 1979, Stockwell *et al.* 1991). Aircraft noise also has the potential to be most detrimental during periods of stress, especially winter, gestation, and calving (DeForge 1981).

Weisenberger *et al.* (1996) measured the heart rate responses of captive bighorn sheep (*Ovis canadensis*) and mule deer (*Odocoileus hemionus*) to simulated aircraft noise ranging from 92 to 112 decibels (dB). For both species, heart rates increased following the simulated aircraft noise, but returned to normal levels within 60–180 seconds. Behavioral responses were relatively rare, and the animals returned to normal behavior within 253 seconds. Furthermore, the animals exhibited decreased responses to increased exposure, suggesting habituation. Similarly, Krausman *et al.* (1998) studied the response of bighorn sheep in a 790-acre enclosure to actual and frequent F-16 overflights at 395 feet AGL. Heart rate increased above preflight level during 7 percent of the overflights but returned to normal within 120 seconds. No behavioral response by the bighorn sheep was observed during the overflights. Luz and Smith (1976) observed that pronghorn antelope (*Antilocapra americana*) did not run until a helicopter was within 150 feet AGL.

Although few studies have been conducted on the response of wild ungulates to sonic booms, they appear to have little to no adverse reactions. Workman *et al.* (1992) studied the physiological and behavioral responses of pronghorn, elk (*Cervus elaphus*), and bighorn sheep to sonic booms. All three species exhibited an increase in heart rate lasting from 30 seconds to 1 ½ minutes in response to their first exposure to a sonic boom. Behaviorally, the animals responded to their first exposure to a sonic boom by running a short distance (less than 30 feet reported for elk). After successive sonic booms, the heart-rate response decreased greatly and the animals remained alert, but did not run. The authors suggested the animals were habituated with successive exposure.

Small Mammals

A few researchers have studied the potential effects of aircraft noise on small mammals. Chesser *et al.* (1975) found that house mice (*Mus musculus*) trapped near an airport runway had larger adrenal glands than those trapped 2 kilometers from the airport. In the lab, naïve mice subjected to simulated aircraft noise also developed larger adrenal glands than a control group. However, the implications of enlarged adrenals for small mammals with a relatively short life span are undetermined. The burrows of some small mammals may reduce their exposure to aircraft noise. Francine *et al.* (1995) found that kit foxes (*Vulpes macrotis*) with twisting tunnels leading to deeper burrows experienced less noise than kangaroo rats (*Dipodomys merriami*) with shallow burrows. McClenaghan and Bowles (1995) studied the effects of aircraft overflights on small mammals and were unable to distinguish potential long-term effects due to aircraft noise compared to other environmental factors.

Raptors

Most studies have found few negative effects of aircraft noise on raptors. Ellis *et al.* (1991) examined behavioral and reproductive responses of several raptor species to low-level flights.

No incidents of reproductive failure were observed and site re-occupancy rates were high (95 percent) the following year. Several researchers found that ground-based activities, such as operating chainsaws or an intruding human, were more disturbing than aircraft (White and Thurow 1985, Grubb and King 1991, Delaney *et al.* 1997). Red-tailed hawks (*Buteo jamaicensis*) and osprey (*Pandion haliaetus*) appeared to readily habituate to regular aircraft overflights (Andersen *et al.* 1989, Trimper *et al.* 1998). Mexican spotted owls (*Strix occidentalis lucida*) did not flush from a nest or perch unless a helicopter was as close as 330 feet (Delaney *et al.* 1997). In Alaska, Palmer *et al.* (2003) found small differences in nest attendance and time-activity budgets between undisturbed nesting peregrine falcons (*Falco peregrinus*) and those that were overflown by military aircraft within 500 feet; however, the differences were not correlated with specific overflights nor did it affect reproductive success. Furthermore, they did not observe a difference in nest-provisioning rates between disturbed and undisturbed nests. On the other hand, Andersen *et al.* (1990) observed a shift in home ranges of four raptor species away from new military helicopter activity, which supports other reports that wild species are more sensitive to rotary wing aircraft than fixed-wing aircraft.

The effects of aircraft noise on the bald eagle (*Haliaetus leucocephalus*) have been studied relatively well, compared to most wildlife species. Overall, there have been no reports of reduced reproductive success or physiological risks to bald eagles exposed to aircraft overflights or other types of military noise (Fraser *et al.* 1985, Stalmaster and Kaiser 1997, Brown *et al.* 1999; see review in Buehler 2000). Most researchers have documented that pedestrians and helicopters were more disturbing to bald eagles than fixed-wing aircraft, including military jets (Fraser *et al.* 1985, Grubb and King 1991, Grubb and Bowerman 1997). Recorded responses to a total of 2849 events involving closely-approaching aircraft (jets, light planes, and helicopters) at median distances of 550 m, ranged from no response (67%), an alert posture (29%), taking flight (3%) or temporarily departing the immediate area (1%). There was considerably more reaction to helicopters than to jets or light planes (Grubb and King 1991). No specific studies were located on the effects of jet aircraft noise on wintering bald eagles.

Waterfowl and Other Waterbirds

In their review, Manci *et al.* (1988) noted that aircraft can be particularly disturbing to waterfowl. Conomy *et al.* (1998) suggested, though, that responses were species-specific. They found that black ducks (*Anas rubripes*) were able to habituate to aircraft noise, while wood ducks (*Aix sponsa*) did not. Black ducks exhibited a significant decrease in startle response to actual and simulated jet aircraft noise over a 17-day period, but wood duck response did not decrease uniformly following initial exposure. Some bird species appear to be more sensitive to aircraft noise at different times of the year. Snow geese (*Chen caerulescens*) were more easily disturbed by aircraft prior to fall migration than at the beginning of the nesting season (Belanger and Bedard 1989). On an autumn staging ground in Alaska (i.e., prior to fall migration), 75 percent of brant (*Branta bernicla*) and only 9 percent of Canada geese (*Branta canadensis*) flew in response to aircraft overflights (Ward *et al.* 1999). There tended to be a greater response to aircraft at 1,000 to 2,500 feet AGL than at lower or higher altitudes. In contrast, Kushlan (1979) did not observe any negative effects to wading bird colonies (i.e., rookeries) when fixed-wing aircraft conducted surveys within 200 feet AGL; 90 percent of the observations indicated no reactions from the birds. Nesting California least terns (*Sterna albifrons browni*) did not respond negatively to a nearby missile launch (Henningson, Durham, and Richardson 1981).

Previous research also shows varied responses of waterbirds to sonic booms. Burger (1981) found that herring gulls (*Larus argentatus*) responded intensively to sonic booms and many eggs were broken as adults flushed from nests. One study discussed by Manci *et al.* (1988) described the reproductive failure of a colony of sooty terns (*Sterna fuscata*) on the Dry Tortugas reportedly due to sonic booms. However, based on laboratory and numerical models, Ting *et al.* (2002) concluded that sonic boom overpressures from military operations of existing aircraft are unlikely to damage avian eggs.

Domestic Animals

As with wildlife, the startle reflex is the most commonly documented effect on domestic animals. Results of the startle reflex are typically minor (e.g., increase in heart rate or nervousness) and do not result in injury. Espmark *et al.* (1974) did not observe any adverse effects due to minor behavioral reactions to low-altitude flights with noise levels of 95 to 101 A-weighted decibels (dBA). They noted only minimal reactions of cattle and sheep to sonic booms, such as muscle and tail twitching and walking or running short distances (up to 65 feet). More severe reactions may occur when animals are crowded in small enclosures, where loud, sudden noise may cause a widespread panic reaction (Air Force 1993). Such negative impacts were typically only observed when aircraft were less than 330 feet AGL (United States Forest Service 1992). Several studies have found little direct evidence of decreased milk production, weight loss, or lower reproductive success in response to aircraft noise or sonic booms. For example, Head *et al.* (1993) did not find any reductions in milk yields with aircraft Sound Exposure Levels (SEL) levels of 105 to 112 dBA. Many studies documented that domestic animals habituate to aircraft noise (see reviews in Manci *et al.* 1998; Head *et al.* 1993).

There is little direct evidence that aircraft noise or sonic booms can cause domestic chicken eggs to crack or result in lower hatching rates. Stadelman (1958) did not observe a decrease in hatchability when domestic chicken eggs were exposed to loud noises measured at 96 dB inside incubators and 120 dB outside. Bowles and Seddon (1994) found no difference in the hatch rate of four groups of chicken eggs exposed to 1) no sonic booms (control group), 2) sonic booms of 3 pounds per square foot (psf), 3) sonic booms of 20 psf, and 4) sonic booms of 30 psf. No eggs were cracked by the sonic booms and all chicks hatched were normal.

Espmark *et al.* (1974) noted only minimal reactions of domestic cattle and sheep to sonic booms, such as muscle and tail twitching and walking or running short distances (up to 65 feet). More severe reactions may occur when domestic animals are crowded within small enclosures where loud, sudden noise may cause a panic reaction. An animal, such as a high strung racehorse, in the footprint of a sonic boom may react to the sharp clap from an aircraft directly overhead, which is different than the rumble they may hear on a regular basis from more distant sonic booms or thunder.

4.3 Training Chaff and Flares

Specific issues and potential impacts of training chaff and flares on biological resources are discussed below. These issues have been identified by Department of Defense (DoD) research (Air Force 1997, Cook 2001), General Accounting Office review (United States General Accounting Office 1998), independent review (Spargo 1999), resource agency instruction, and public concern and perception. No reports to date have documented negative impacts of training chaff and flares to biological resources. These studies are reviewed below.

Concerns for biological resources are related to the residual materials of training chaff and flares that fall to the ground or dud flares. Residual materials include several flare components, such as plastic end caps, felt spacers, aluminum-coated wrapping material, mylar wrapping, plastic retaining devices, and plastic pistons. Specific concerns are the potential for (1) ingestion of chaff fibers or flare residual materials; (2) inhalation of chaff fibers; (3) physical external effects from chaff fibers, such as skin irritation; (4) effects on water quality and forage quality; (5) increased fire risk; and (6) probability of for being struck by large flare debris (the plastic Safe and Initiation [S&I] device of the MJU-7 A/B flare).

Because of the low rate of application and dispersal of training chaff fibers and flare residues during defensive training, wildlife and domestic animals would have little opportunity to ingest, inhale, or otherwise come in contact with these residual materials. Although some chemical components of chaff are toxic at high levels, such levels could only be reached through the ingestion of many chaff bundles or billions of chaff fibers. Barrett and MacKay (1972) documented that cattle avoided consuming clumps of chaff in their feed. When calves were fed chaff thoroughly mixed with molasses in their feed, no adverse physiological effects were observed pre- or post-mortem.

Chaff fibers are too large for inhalation, although chaff particles can degrade to small pieces. However, the number of degraded or fragmented particles is insufficient to result in disease (Spargo 1999). Chaff is similar in form and softness to very fine human hair, and is unlikely to cause negative reactions if animals were to inadvertently come in contact with it.

Chaff fibers could accumulate on the ground or in water bodies. Studies have shown that chaff breaks down quickly in humid environments and acidic soil conditions (Air Force 1997). In water, only under very high or low pH could the aluminum in chaff become soluble and toxic (Air Force 1997). Few organisms would be present in water bodies with such extreme pH levels. Given the small amount of diffuse or aggregate chaff material that could possibly reach water bodies, water chemistry would not be expected to be affected. Similarly, the magnesium in flares can be toxic at extremely high levels, a situation that could occur only under repeated and concentrated use in localized areas. Flare ash would disperse over wide areas; thus, no impact is expected from the magnesium in flare ash. The probability of an intact dud flare leaving an aircraft during training and falling to the ground outside of a military base is estimated to be 0.01 percent (Air Force 2001). Since toxic levels would require several dud flares to fall in one confined water body, no effect of flares on water quality would be expected. Furthermore, uptake by plants would not be expected to occur.

The expected frequency of an S&I device from an MJU-7 A/B flare striking an exposed animal depends on the number of flares used and the size and population density of the exposed animals. Calculations of potential strikes to a human-sized animal with a density of 50 animals per square mile, where 8,000 flares were used annually, was one strike in 200 years. An animal 1/100th the size of a human with a density of 500 animals per square mile exposed 100 percent of the time (i.e., animals not protected by burrows or dense vegetation) would also have an expected strike rate of one in 200 years. The S&I device strikes with the force of a medium-sized hailstone. Such a strike to a bird, small mammal, or reptile could produce a mortality. The very small likelihood of such a strike, especially when compared with more immediate threats such as highways, would not be expected to have any effect on populations of small species. Strikes to larger species, such as wild ungulates or farm animals could produce a bruise and a startle

reaction. Such a strike from an S&I device would not be expected to seriously injure or otherwise significantly affect natural or domestic species.

Flare debris also includes aluminum-coated mylar wrapping and plastic parts (see Appendix C). The plastic parts, such as end caps, are inert and are not expected to be used by or consumed by any species. Mylar degrades when exposed to sunlight and is not expected to be consumed or otherwise used by native or domestic species. The mylar wrapping on chaff is a new innovation that has not yet had extensive observation in the natural environment. The aluminum coated wrapping on flares, as it degrades, could produce fibrous materials similar to naturally occurring nesting materials. Human observers on an active range observed that the residual flare wrappings had the appearance of a twisted root. There is no known case of such materials being used in nest construction. In a study of pack rats (*Neotoma* spp.), a notorious collector of odd materials, no chaff or flare materials were found in nests on military ranges subject to decades of dispensing chaff and flares (Air Force 1997). Although lighter flare debris could be used by species under the airspace, such use would be expected to be infrequent and incidental.

Public commentors have asked whether a piece of chaff or flare residual material could cause bovine hardware disease in domestic feed lot or dairy cattle. Hardware disease, or traumatic reticuloperitonitis, is a relatively common disease in cattle. The disease results when a cow ingests a foreign object, typically a nail, piece of wire, or other metallic object. The object can become lodged in the wall of the stomach and can penetrate into the diaphragm and heart, resulting in pain and infection; in severe cases animals can die without treatment. Treatment consists of antibiotics and/or surgery. Statistics are not readily available, but one study documented that 55-75 percent of cattle slaughtered in the eastern United States (U.S.) had metallic objects in their stomachs, but the objects did not result in damage (Moseley 2003). Dairy cattle are typically more vulnerable to hardware disease due to the confined nature of diary operations. Many livestock managers rely on magnets inserted into the cow's stomach to prevent and treat hardware disease. The magnet attracts metallic objects, thereby preventing them from traveling to the stomach wall.

The culprit of bovine hardware disease is often a nail or piece of wire greater than 1 inch in length, such as that used to bale hay (Cavedo et al. 2004). If livestock ingested residual materials of the MJU-10/B flare or chaff, the plastic materials of the end cap and slider and the flexible aluminum wrapping do not have pointed edges nor the penetration capability of a nail or piece of wire. Residual chaff or flare materials would be less likely to result in injury than a metallic object.

Flares used for training by F-22A aircraft are designed to burn out within approximately 400 feet of the release altitude. Given the minimum allowable release altitudes for flares, this leaves an extensive safety margin to prevent any burning materials from reaching the ground (Air Force 2001). In the training airspace, flares must be released above 2,000 feet AGL to reduce any potential of a flare-caused fire. When very high or extreme fire conditions exist, Holloman AFB would discontinue flare use. Plastic and aluminum coated wrapping materials from flares that do reach the ground would be inert. The percentage of flares that malfunction is small (<1 percent probability for all categories of malfunction; Air Force 2001). Dud flares (i.e., those that do not ignite at release and fall intact to the ground) contain magnesium, which is thermally stable. Self-ignition is highly unlikely under natural conditions. If a dud flare were located, it should be left alone and its location provided to safety authorities.

5.0 References

Andersen, D.E., O.J. Rongstad, and W.R. Mytton. 1989. Response of Nesting Red-tailed Hawks to Helicopter Overflights. Condor 91:296-299.

_____ . 1990. Home-Range Changes in Raptors Exposed to Increased Human Activity Levels in Southeastern Colorado. Wildlife Society Bulletin 18(2):134-142.

Barrett, B.B., and R.R. MacKay. 1972. The Ingestion of Fiberglass Chaff by Cattle. Animal Diseases Research Institute, Canada Department of Agriculture/Health of Animals Branch.

Beckstead, D. 2004. The Effects of Military Jet Overflights on Dall's Sheep in Interior Alaska. Available at http://www.nps.gov/yuch/Expanded/key_resources/sheep/2004_sheep_report/toc.htm. Accessed December 29, 2005.

Belanger, L. and J. Bedard. 1989. Responses of Staging Greater Snow Geese to Human Disturbance. Journal of Wildlife Management 53(3):713-719.

Bowles, A. E., and M. D. Seddon. 1994. Effects of Simulated Sonic Booms on the Hatchability of White Leghorn Chicken Eggs. Armstrong Laboratory, Air Force Materiel Command, Brooks Air Force Base, TX. AL/OE-TR-0179.

Bowles, A. E., S. Eckert, L. Starke, E. Berg, L. Wolski, and J. Matesic, Jr. 1999. Effects of Flight Noise from Jet Aircraft and Sonic Booms on Hearing, Behavior, Heart Rate, and Oxygen Consumption of Desert Tortoises (*Gopherus agassizii*). United States Air Force Research Laboratory AFRL-HE-WP-TR-1999-0170, Human Effectiveness Division, Wright-Patterson Air Force Base, Ohio.

Brown, B.T., G.S. Mills, C. Powels, W.A. Russell, G.D. Therres, and J.J. Pottie. 1999. The Influence of Weapons-Testing Noise on Bald Eagle Behavior. Journal of Raptor Research 33(3):227-232.

Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In The Birds of North America, No. 506 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Burger, J. 1981. Behavioral Responses of Herring Gulls *Larus argentatus* to Aircraft Noise. Environmental Pollution (Series A):177-184.

Cavedo, A. M., K. S. Latimer, H. L. Tarpley, and P. J. Bain. 2004. Traumatic Reticulopertonitis (Hardware Disease) in Cattle. Class of 2004 and Department of Pathology, College of Veterinary Medicine, University of Georgia, Athens, GA. Available at http://www.vet.uga.edu/vpp/clerk/cavedo. Accessed 6/23/2005.

Chesser, R.K., R.S. Caldwell, and M.J. Harvey. 1975. Effects of Noise on Feral Populations of *Mus musculus*. Physiological Zoology 48(4):323-325.

Conomy, J.T., J.A. Dubovsky, J.A. Collazo, and W.J. Fleming. 1998. Do Black Ducks and Wood Ducks Habituate to Aircraft Disturbance? Journal of Wildlife Management 62(3):1135-1142.

Cook, B.C. 2001. Investigation of Abrasion, Fragmentation and Re-suspension of Chaff. Master's Thesis. Christopher Newport University.

DeForge, J.R. 1981. Stress: Changing Environments and the Effects on Desert Bighorn Sheep. Desert Bighorn Council 1981 Transactions.

Delaney, D.K., T.G. Grubb, and L.L. Pater. 1997. Effects of Helicopter Noise on Nesting Mexican Spotted Owls. Project Order No. DE P.O. 95-4, U.S. Air Force, Holloman Air Force Base, New Mexico.

Delaney, D. K.; Grubb, T. G.; Beier, P.; Pater, L. L.; Reiser, M. H. 1999. Effects of helicopter noise on nesting Mexican spotted owls. Journal of Wildlife Management. 63: 60–76.

Ellis, D.H., C.H. Ellis, and D.P. Mindell. 1991. Raptor Responses to Low-Level Jet Aircraft and Sonic Booms. Environmental Pollution 74:53-83.

Espmark, Y., L. Falt, and B. Falt. 1974. Behavioral Responses in Cattle and Sheep Exposed to Sonic Booms and Low-altitude Subsonic Flight Noise. The Veterinary Record 94:106-113.

Francine, J.K., J.S. Yaeger, and A.E. Bowles. 1995. Sound from Low-Altitude Jet Overflights in Burrows of the Merriam's Kangaroo Rat, *Dipodomys merriami*, and the Kit Fox, *Vulpes macrotis*. *In* R. J. Bernhard and J. S. Bolton. Proceedings of Inter-Noise 95: The 1995 International Congress on Noise Control Engineering. Volume II. Pages 991-994.

Fraser, J.D., L.D. Frenzel, and J.E. Mathisen. 1985. The Impact of Human Activity on Breeding Bald Eagles in North-Central Minnesota. Journal of Wildlife Management 49(3):585-592.

Gladwin, D.N., D.A. Asherin, and K.M. Manci. 1988. Effects of Aircraft Noise and Sonic Booms on Fish and Wildlife. Results of a Survey of U.S. Fish and Wildlife Service Endangered Species and Ecological Services Field Offices, Refuges, Hatcheries, and Research Centers. U.S. Fish and Wildlife Service, National Ecology Research Center, Fort Collins, Colorado.

Grubb, T.G. and R.M. King. 1991. Assessing Human Disturbance of Breeding Bald Eagles with Classification Tree Models. Journal of Wildlife Management 55(3):500-511.

Grubb, T.G. and W.W. Bowerman. 1997. Variations in Breeding Bald Eagle Responses to Jets, Light Planes and Helicopters. Journal of Raptor Research 31(3):213-222.

Harrington, F.H., and A.M. Veitch. 1991. Short-term Impacts of Low-level Jet Fighter Training on Caribou in Labrador. Arctic 44(4):318-327.

Head, H. H., R. C. Kull, Jr., M. S. Campos, K. C. Bachman, C. J. Wilcox, L. L. Cline, and M. J. Hayen. 1993. Milk Yield, Milk Composition, and Behavior of Holstein Cows in Response to Jet Aircraft Noise before Milking. Journal of Dairy Science 76:1558-1567.

Henningson, Durham and Richardson. 1981. Effects of Minuteman Launch on California Least Tern Nesting Activity, Vandenberg AFB, California. Prepared for U.S. Air Force, Ballistic Missile Office, Norton Air Force Base, California.

Johnson, C. L. and R. T. Reynolds. 2002. Responses of Mexican Spotted Owls to Low-flying Military Jet Aircraft. USDA Forest Service Rocky Mountain Research Station Research Note RMRS-RN-12. 4 pages. January 2002

Krausman, P.R., M.C. Wallace, K.L. Hayes, and D.W. DeYoung. 1998. Effects of Jet Aircraft on Mountain Sheep. Journal of Wildlife Management 62(4):1246-1254.

Kushlan, J. A. 1979. Effects of Helicopter Censuses on Wading Bird Colonies. Journal of Wildlife Management 43(3):756-760.

Lawler, J. P., A. J. Magoun, C. T. Seaton, C. L. Gardner, R. D. Bobertje, J. M. Ver Hoef, and P. A. Del Vecchio. 2005. Short-term Impacts of Military Overflights on Caribou during Calving Season. Journal of Wildlife Management 69(3):1133-1146.

Luz, G. A., and J. B. Smith. 1976. Reactions of Pronghorn Antelope to Helicopter Overflight. Journal of the Acoustical Society of America 59(6):1514-1515.

Maier, J. A. K., S. M. Murphy, R. G. White, and M. D. Smith. 1998. Responses of Caribou to Overflights by Low-Altitude Jet Aircraft. Journal of Wildlife Management 62(2):752-766.

Manci, K.M., D.N. Gladwin, R. Villella, and M. Cavendish. 1988. Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: a Literature Synthesis. U.S. Fish and Wildlife Service National Ecology Research Center, Ft. Collins, CO. NERC-88/29.

McArthur, R. A., R. H. Johnson, and V. Geist. 1979. Factors Influencing Heart Rate in Free-Ranging Bighorn Sheep: A Physiological Approach to the Study of Wildlife Harassment. Canadian Journal of Zoology 57:2010-2021.

McClenaghan, L, and A.E. Bowles. 1995. Effects of Low-Altitude Overflights on Populations of Small Mammals on the Barry M. Goldwater Range. *In* R. J. Bernhard and J. S. Bolton. Proceedings of Inter-Noise 95: The 1995 International Congress on Noise Control Engineering. Volume II. Pages 985-990.

Moseley, B. L. 2003. Hardware Disease in Cattle. University of Missouri, MU Extension. Available at http://muextension.missouri.edu/explore/agguides/pests/g07700.htm. Accessed 7/26/2005.

Palmer, A.G., D.L. Nordmeyer, and D.D. Roby. 2003. Effects of Jet Aircraft Overflights on Parental Care of Peregrine Falcons. Wildlife Society Bulletin 31(2):499-509.

Spargo, B.J. 1999. Environmental Effects of RF Chaff: a Select Panel Report to the Undersecretary of Defense for Environmental Security. NRL/PU/6100—99-389, Washington, D.C.

Stadelman, W.J. 1958. The Effect of Sounds of Varying Intensity on Hatchability of Chicken Eggs. Poultry Sciences 37:166-169.

Stalmaster, M.V. and J.L. Kaiser. 1997. Flushing Responses of Wintering Bald Eagles to Military Activity. Journal of Wildlife Management 61(4):1307-1313.

Stockwell, C. A., G. C. Bateman, and J. Berger. 1991. Conflicts in National Parks: A Case Study of Helicopters and Bighorn Sheep Time Budgets at the Grand Canyon. Biological Conservation 56:317-328.

Ting, C., J. Garrelick, and A. Bowles. 2002. An Analysis of the Response of Sooty Tern Eggs to Sonic Boom Overpressures. The Journal of the Acoustical Society of America 111(1):562-568.

Trimper, P.G., N.M. Standen, L.M. Lye, D. Lemon, T.E. Chubbs, and G.W. Humphries. 1998. Effects of Low-level Jet Aircraft Noise on the Behaviour of Nesting Osprey. Journal of Applied Ecology 35:122-130.

United States Air Force (Air Force). 1993. The Impact of Low Altitude Flights on Livestock and Poultry. AF Handbook #-#, Volume 8.

United States Air Force (Air Force). 1997. Environmental Effects of Self Protection Chaff and Flares. Final Report. August.

_____ . 2001. Final Environmental Assessment for the Defensive Training Initiative, Cannon Air Force Base, New Mexico. Prepared for Air Combat Command, Langley Air Force Base, Virginia.

United States Forest Service. 1992. Report to Congress: Potential Impacts of Aircraft Overflights of National Forest System Wilderness. Prepared pursuant to Public Law 100-91, The National Parks Overflights Act of 1987.

United States General Accounting Office. 1998. DoD Management Issues Related to Chaff: Report to the Honorable Harry Reid, U.S. Senate.

Ward, D.H., R.A. Stehn, W.P. Erickson, and D.V. Derksen. 1999. Response of Fall-Staging Brant and Canada Geese to Aircraft Overflights in Southwestern Alaska. Journal of Wildlife Management 63(1):373-381.

Weisenberger, M.E., P.R. Krausman, M.C. Wallace, and D.W. De Young, and O.E. Maughan. 1996. Effects of Simulated Jet Aircraft Noise on Heart Rate and Behavior of Desert Ungulates. Journal of Wildlife Management 60(1):52-61.

Westman, J.C., and J.R. Walters. 1981. Noise and Stress: a Comprehensive Approach. Environmental Health Perspectives 41:291-309.

White, C.M., and T.L. Thurow. 1985. Reproduction of Ferruginous Hawks Exposed to Controlled Disturbance. Condor 87:14-22.

Workman, G.W., T.D. Bunch, L.S. Neilson, E.M. Rawlings, J.W. Call, R.C. Evans, N.R. Lundberg, W.T. Maughan, and J.E. Braithwaite. 1992. Sonic Boom/Animal Disturbance Studies on Pronghorn Antelope, Rocky Mountain Elk, and Bighorn Sheep. Utah State University. Contract number F42650-87-0349. Submitted to U.S. Air Force, Hill Air Force Base, Utah.

Appendix H
Airspace Management

APPENDIX H AIRSPACE MANAGEMENT

Controlled Airspace is defined in Federal Aviation Administration (FAA) Order 7400.2. It is airspace of defined dimensions within which Air Traffic Control (ATC) service is provided to Instrument Flight Rule (IFR) flights and to Visual Flight Rule (VFR) flights in accordance with the airspace classification. For IFR operations in controlled airspace, a pilot must file an IFR flight plan and receive an appropriate ATC clearance.

Controlled airspace in the United States is designated as Class A, B, C, D, and E. Each Class B, C, and D airspace designated for an airport contains at least one primary airport around which the airspace is designated.

Class A airspace, generally, is that airspace from 18,000 feet above mean sea level (MSL) up to and including Flight Level (FL) 600. Flight levels are altitudes MSL based on the use of a directed barometric altimeter setting, and are expressed in hundreds-of-feet. Therefore, FL 600 is equal to approximately 60,000 feet MSL. Class A airspace includes the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous States and Alaska (DOT 2001).

Class B airspace, generally, is that airspace from the surface to 10,000 feet MSL around the nation's busiest airports. The actual configuration of Class B airspace is individually tailored and consists of a surface area and two or more layers, and is designed to contain all published instrument procedures (DOT 2001).

Class C airspace, generally, is that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control (RAPCON), and that have a certain number of IFR operations or passenger enplanements. Although the actual configuration of Class C airspace is individually tailored, it usually consists of a surface area with a 5 NM radius, and an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation (DOT 2001).

Class D airspace, generally, is that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be designated as Class D or Class E airspace (DOT 2001).

Class E airspace is controlled airspace that is not Class A, B, C, or D. There are seven types of Class E airspace, as described below.

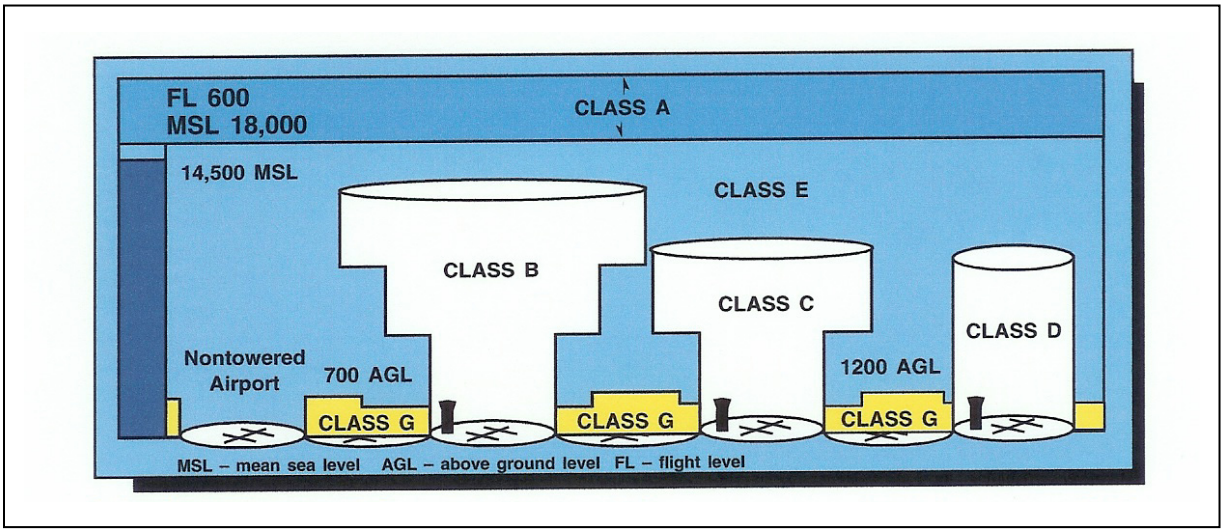
- **Surface Area Designated For An Airport.** When so designated, the airspace will be configured to contain all instrument procedures.
- **Extension To A Surface Area.** There are Class E airspace areas that serve as extensions to Class B, C, and D surface areas designated for an airport. This airspace provides controlled airspace to contain standard instrument approach procedures without imposing a communications requirement on pilots operating under VFR.

- **Airspace Used For Transition.** There are Class E airspace areas beginning at either 700 or 1,200 feet above ground level (AGL) used to transition to/from the terminal or en route environment.
- **En Route Domestic Airspace Areas.** These areas are Class E airspace areas that extend upward from a specified altitude to provide controlled airspace where there is a requirement for IFR en route ATC services, but where the Federal airway system is inadequate.
- **Federal Airways.** Federal Airways (Victor Routes) are Class E airspace areas, and, unless otherwise specified, extend upward from 1,200 feet to, but not including, 18,000 feet MSL.
- **Other.** Unless designated at a lower altitude, Class E airspace begins at 14,500 feet MSL to, but not including 18,000 feet MSL overlying: a) the 48 contiguous States, including the waters within 12 miles from the coast of the 48 contiguous States; b) the District of Columbia; c) Alaska, including the waters within 12 miles from the coast of Alaska, and that airspace above FL 600; d) excluding the Alaska peninsula west of 160°00′00″ west longitude, and the airspace below 1,500 feet above the surface of the earth unless specifically so designated.
- **Offshore/Control Airspace Areas.** This includes airspace areas beyond 12 NM from the coast of the United States, wherein ATC services are provided (DOT 2001).

Airspace that has not been designated as Class A, B, C, D, or E airspace is **Uncontrolled Airspace (Class G)** (DOT 2001).

These airspaces are shown graphically in Figure 1.

Figure 1. Controlled / Uncontrolled Airspace



Source: DOT 2003

Airspace for Special Use (ASU) is used to collectively identify non-SUA assets. It is of defined dimensions wherein activities must be confined because of their nature, and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. ASU includes Military Training Routes (MTRs) (Instrument Routes [IR]/Visual Routes [VR]), Air Traffic Control Assigned Airspace (ATCAA), aerial refueling track/anchors (AR), slow routes (SR), and low-altitude tactical navigation areas.

Military Operations Area (MOA) is airspace of defined vertical and lateral limits established outside Class A airspace to separate and segregate certain non-hazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted (P/CG 2004). Class A airspace covers the continental U.S. and limited parts of Alaska, including the airspace overlying the water within 12 nautical miles (NM) of the U.S. coast. It extends from 18,000 feet above mean sea level (MSL) up to and including 60,000 feet MSL (P/CG 2004). MOAs are considered "joint use" airspace. Non-participating aircraft operating under VFR are permitted to enter a MOA, even when the MOA is active for military use. Aircraft operating under IFR must remain clear of an active MOA unless approved by the responsible ARTCC. Flight by both participating and VFR non-participating aircraft is conducted under the "see-and-avoid" concept, which stipulates that "when weather conditions permit, pilots operating IFR or VFR are required to observe and maneuver to avoid other aircraft. Right-of-way rules are contained in CFR Part 91" (P/CG 2004). The responsible ARTCC provides separation service for aircraft operating under IFR and MOA participants. The "see-and-avoid" procedures mean that if a MOA were active during inclement weather, the general aviation pilot could not safely access the MOA airspace.

Air Traffic Control Assigned Airspace (ATCAA) is airspace of defined vertical and lateral limits, assigned by Air Traffic Control (ATC), for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic (P/CG 2004). This airspace, if not required for other purposes, may be made available for military use. ATCAAs are frequently structured and used to extend the horizontal and/or vertical boundaries of MOAs.

Restricted Area is designated airspace that supports ground or flight activities that could be hazardous to non-participating aircraft. A Restricted Area is airspace designated under 14 Code of Federal Regulations (CFR) Part 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated "joint-use" and IFR/VFR operations in the area may be authorized by the controlling ATC facility when it is not being utilized by the using agency (P/CG 2004).

Military Training Routes (MTRs) are flight corridors developed and used by the DoD to practice high-speed, low-altitude flight, generally below 10,000 feet MSL. Specifically, MTRs are airspace of defined vertical and lateral dimensions established for the conduct of military flight training at airspeeds in excess of 250 knots indicated airspeed (KIAS) (P/CG 2004). MTRs are developed in accordance with criteria specified in FAA Order 7610.4 (DoD 2004). They are described by a centerline (often with defined horizontal limits on either side of the centerline) and vertical limits expressed as minimum and maximum altitudes along the flight track. MTRs are identified as Visual Routes (VR) or Instrument Routes (IR).

VRs and IRs are used by DoD and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training. VRs are under VFR conditions (usually below 10,000 feet MSL) at airspeeds in excess of 250 KIAS (P/CG 2004). IRs are used by DoD,

including associated Reserve and Air Guard units, for the purpose of conducting low-altitude navigation and tactical training in both IFR and VFR weather conditions usually below 10,000 feet MSL at airspeeds in excess of 250 KIAS (P/CG 2004).

Special Use Airspace (SUA) is airspace of defined dimensions identified by an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not part of those activities. Types of SUA include Alert Areas, Controlled Firing Areas, MOAs, Prohibited Areas, Restricted Areas, and Warning Areas.

References

U.S. Department of Transportation (DOT), Federal Aviation Administration (FAA). 2006. Aeronautical Information Manual, February 16, 2006. Headquarters Air Combat Command (ACC) Page 12, Supplement 1 to Air Force Instruction 13-201, Air Force Airspace Management, 24 June 1999.

U.S. Department of Transportation (DOT), Federal Aviation Administration (FAA). 2003. FAA-H-8083-25, Pilot's Handbook of Aeronautical Knowledge.

U.S. Department of Transportation (DOT), Federal Aviation Administration (FAA). 2001. FAA Order 7400.2E, Procedures For Handling Airspace Matters. June 4.

Appendix I
Air Quality

APPENDIX I AIR QUALITY

Construction Emissions. Emissions during the construction period were quantified to determine the potential impacts on regional air quality. Calculations of volatile organic compounds (VOCs), nitrogen oxides (NO_x), CO, and PM_{10} emissions from construction, grading, and paving activities were performed using USEPA emission factors compiled in the *California Environmental Quality Air Quality Handbook* (South Coast Air Quality Management District 1993), *Calculations Methods for Criteria Air Pollution Emission Inventories* (Jagielski and O'Brien 1994), and *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations* (O'Brien and Wade 2002). The emission factors for building construction include contributions from engine exhaust emissions (i.e., construction equipment, material handling, and workers' travel) and fugitive dust emissions (e.g., from grading activities). Demolition emissions (from removal of old pavement) include fugitive dust and transport of demolition debris offsite. Site preparation and grading emissions include fugitive dust from ground disturbance, plus combustive emissions from heavy equipment operating during the construction period. Paving emissions include combustive emissions from bulldozers, rollers, and paving equipment, plus emissions from a dump truck hauling pavement materials to the site.

Identifying the ROI for air quality requires knowledge of the types of pollutants being emitted, pollutant emission rates, topography, and meteorological conditions. The ROI for inert pollutants (pollutants other than O_3 and its precursors) is generally limited to a few miles downwind from a source. The ROI for photochemical pollutants, such as O_3, can extend much farther downwind than for inert pollutants. Ozone is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors. Ozone precursors are mainly VOCs and NO_x. In the presence of solar radiation, the maximum effect of VOCs and NO_x emissions on O_3 levels usually occurs several hours after they are emitted and many miles from the source. Federal regulations at 40 CFR 81 have defined certain air quality control regions (AQCR), which were originally designated based on population and topographic criteria closely approximating each air basin. The potential effects on air quality would typically be confined to the air basin in which the emissions occur.

Federal Air Quality Standards. Under the authority of the Clean Air Act (CAA), the EPA has established nationwide air quality standards to protect public health and welfare, with an adequate margin of safety.

These federal standards, known as the National Ambient Air Quality Standards (NAAQS), represent the maximum allowable atmospheric concentrations of seven "criteria pollutants": O_3, CO, PM_{10}, particulate matter less than 2.5 µm in diameter ($PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb). The NAAQS are defined in terms of concentration (e.g., parts per million [ppm] or micrograms per cubic meter [$\mu g/m^3$]) determined over various periods of time (averaging periods). Short-term standards (1-hour, 8-hour, or 24-hour periods) were established for pollutants with acute health effects and may not be exceeded more than once a year. Long-term standards (annual periods) were established for pollutants with chronic health effects and may never be exceeded.

Based on measured ambient criteria pollutant data, the EPA designates areas of the U.S. as having air quality equal to or better than the NAAQS (attainment) or worse than the NAAQS

(nonattainment). Nonattainment regions, upon achieving attainment, are considered to be maintenance areas for a period of 10 or more years. Areas are designated as unclassifiable for a pollutant when there is insufficient local ambient air quality data for the EPA to form a basis for an attainment designation. For the purpose of applying air quality regulations, unclassifiable areas are treated similar to areas that are in attainment of the NAAQS.

State Air Quality Standards. Under the CAA, state and local agencies may establish Ambient Air Quality Standards (AAQS) and regulations of their own, provided these are at least as stringent as the federal requirements. For selected criteria pollutants, the State of New Mexico has established its AAQS (NMAC 2006). New Mexico standards are equivalent to the NAAQS for PM_{10}, O_3, and Pb. New Mexico AAQS are more restrictive than federal standards for CO, NO_2, and SO_2. In addition, New Mexico regulates emissions of total suspended particulates (TSP), hydrogen sulfide (H_2S), and total reduced sulfur, three pollutants for which there are no federal standards. The New Mexico AAQS are not intended to provide a sharp dividing line between satisfactory and unsatisfactory air quality. They are, however, numbers that represent objectives that will preserve the state's air resources (ACC 2004).

State Implementation Plan. For nonattainment regions, individual states are required to develop a State Implementation Plan (SIP) designed to eliminate or reduce the severity and number of NAAQS violations, with an underlying goal to bring state air quality conditions into (and maintain) compliance with the NAAQS by specific deadlines. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS in each state.

Prevention of Significant Deterioration. Section 162 of the CAA further established the goal of prevention of significant deterioration (PSD) of air quality in all international parks; national parks that exceeded 6,000 acres; and national wilderness areas and memorial parks that exceeded 5,000 acres if these areas were in existence on August 7, 1977. These areas were defined as mandatory Class I areas, while all other attainment or unclassifiable areas were defined as Class II areas. Under CAA Section 164, states, tribal nations, and the federal government have the authority to redesignate certain areas as (nonmandatory) Class I areas (e.g., a National Park or wilderness area established after August 7, 1977). Class I areas (mandatory and nonmandatory) are those where any appreciable deterioration of air quality is considered significant. Class II areas are those where moderate, well-controlled growth could be permitted. Class III areas are those designated by the governor of a state as requiring less protection than Class II areas. No Class III areas have yet been so designated. The PSD requirements affect construction of new major stationary sources in the PSD Class I, II, and III areas and are a preconstruction permitting system.

Visibility. CAA Section 169A established the additional goal of prevention of further visibility impairment in PSD Class I areas. Visibility impairment is defined as atmospheric discoloration and a reduction in the visual range. Determination of the significance of an activity on visibility in a PSD Class I area is typically associated with evaluation of stationary source contributions. The EPA is implementing a Regional Haze rule for PSD Class I areas that will address contributions from mobile sources and pollution transported from other states or regions. Emission levels are used to qualitatively assess potential impairment to visibility in PSD Class I areas. Decreased visibility may potentially result from elevated concentrations of PM_{10} and SO_2 in the lower atmosphere.

General Conformity. CAA Section 176(c), General Conformity, established certain statutory requirements for federal agencies with proposed federal activities to demonstrate conformity of the proposed activities with each SIP for attainment of the NAAQS. In 1993, EPA issued the final rules for determining air quality conformity. Federal activities must not:

- Cause or contribute to any new violation;
- Increase the frequency or severity of any existing violation; or
- Delay timely attainment of any standard, interim emission reductions, or milestones in conformity to a SIP's purpose of eliminating or reducing the severity and number of NAAQS violations or achieving attainment of NAAQS.

General conformity applies only to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual thresholds identified in the rule, a conformity determination is required of that action. The thresholds become more restrictive as the severity of the nonattainment status of the region increases. The State of New Mexico Environmental Improvement Board has implemented the federal general conformity regulations in Title 20, Chapter 2, Part 98 of the state's Air Quality Regulations.

Stationary Source Operating Permits. In New Mexico, the New Mexico Air Quality Bureau (NMAQB) Permitting Section processes permit applications for industries that emit pollutants into the air. The Permitting Section consists of two groups: (1) New Source Review (NSR); and (2) Title V. The NSR is responsible for issuing construction permits, technical and administrative revisions or modifications to existing permits, Notices of Intent for smaller industrial operations, and No Permit Required determinations. Construction Permits (under NSR) are required for all sources with the potential emission rate greater than 10 pounds per hour or 25 tons per year of criteria pollutants (e.g., NO_2 and CO). Air quality permits must be obtained for new or modified sources. Title V of the CAA Amendments of 1990 requires states to issue Federal Operating Permits for major stationary sources. A major stationary source in an attainment or maintenance area is a facility (e.g., plant, base) or an activity that emits more than 100 tons per year of any one criteria air pollutant; 10 tons per year of a hazardous air pollutant; or 25 tons per year of any combination of hazardous air pollutants. The purpose of the permitting rule is to establish regulatory control over large, industrial activities and to monitor their impact upon air quality (NMAQB 2006).

References

ACC. 2004. Air Combat Command. 2004. Environmental Assessment Inactivation of the 20th Fighter Squadron (German Air Force) at Holloman Air Force Base, New Mexico. U.S. Air Force, Air Combat Command. Langley Air Force Base, VA. September.

Jagielski and O'Brien 1994) and *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources* (USEPA 1992).

New Mexico Administrative Code. 2006. Ambient Air Quality Standards. New Mexico Administrative Code, Title 20, Chapter 2, Part 3. Effective 10/31/2002. http://www.nmenv.state.nm.us/aqb/regs/20_2_03nmac_103102.pdf, last updated January 26, 2006.

New Mexico Air Quality Bureau. 2006. Air Quality Bureau Permitting Section. http://www.nmenv.state.nm.us/aqb/permit/index.html, last updated April 12, 2006.

O'Brien, R.J. and M.D. Wade. 2002. Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations. Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis. IERA-RS-BR-SR-2001-0010. Brooks Air Force Base, Texas. January.

South Coast Air Quality Management District. 1993. CEQA Air Quality Handbook.

U.S. Environmental Protection Agency. 2006. National Emissions Inventories for the U.S. http://www.epa.gov/ttn/chief/net/, last updated on March 7, 2006.

Appendix J
Physical Resources

APPENDIX J PHYSICAL RESOURCES

The Tularosa Basin is a massive, 30 by 60 mile, graven valley between the San Andres Mountains (up to 8,965 feet MSL) on the west and the Sacramento Mountains (up to 9,695 feet MSL) on the east. The majority of the basin floor is between 3,900 feet and 4,100 feet MSL. It is filled with very deep alluvial deposits primarily derived from weathered limestones of the surrounding mountains. This fill has high levels of calcium and lesser levels of sulfur that have combined and absorbed water to produce 250 square miles of gypsum (hydrous calcium sulfate) flats and dunes.

Typical of areas with low precipitation, basin soils have little horizon development, high pH, and are susceptible to wind and water erosion. The soil temperature regime is thermic, having a mean annual temperature between 59 degrees Fahrenheit (°F) and 72°F; the soil moisture regime is aridic (dry) (SCS 1980).

Within the project area (see Figure 1.1-1), the predominant soil map unit is Holloman-Gypsum land-Yesum complex. This complex is composed of soils that are shallow, intermingled with deep, well-drained soils and areas of exposed gypsum, all underlain by a soft bedrock of completely calcified soils (caliche). In general, soil permeability is moderate, the available water-holding capacity is low, and the soils are very susceptible to wind erosion where the surface is bare. Because vegetation is not productive on these soils, blowing dust from bare soil is common. These soils provide poor quality roadfill material and have moderate to severe limitations for construction of buildings due to low soil strength and the shallow depth to bedrock, although the rock is soft enough to be rippable. For these sites, there is a high risk of corrosion of buried, uncoated steel, and concrete (SCS 1981).

Ground Water. The terrain at Holloman AFB is nearly level, with only a very slight overall slope to the southwest by sheet wash channels and arroyos that typically carry flow only after summer thunder storms. The base is crossed by several arroyos that flow intermittently, primarily with storm water runoff. This storm runoff generally sinks into the permeable soils before the water reaches the intermittent lakes (playas) on the west and southwest sides of the base. These runoff events recharge ground water that typically is less than 20 feet below the surface of Holloman AFB.

Holloman AFB relies on off-base sources of groundwater and mountain surface water to provide potable water to base personnel. Groundwater is obtained from five wellfields: the Boles, Escondido, San Andreas, Frenchy, and Douglas wellfields. The surface water is carried in 90 miles of pipline, from Bonito Lake in the White Mountains north of Ruidoso to Holloman AFB. A total of 15 groundwater wells draw water from the Bolson Aquifer located in the Tularosa Basin and are the primary source of potable water year-round (Holloman AFB 2003). There are two ground level storage tanks with a total storage capacity of 0.9 million gallons (MG) associated with the well fields. These two tanks feed the Boles Field Pumping Station.

The primary aquifer is increasingly saline with distance into the basin, variably saline with depth below surface, and classified non-potable. The only source of potable groundwater is perched plumes below the mouths of mountain canyons and the near-to-mountain margins of the major basin aquifer. Despite these quality problems, Tularosa Basin water has been extensively developed to provide water for drinking and irrigation (NMWQCC 2002). Because

of the water quality problems, the US Bureau of Reclamation has established a National Desalination Experiment Station in the Tularosa Basin near Holloman AFB.

Surface Water. Holloman AFB is located on the east side of the Tularosa Basin and on the west foot slope of the Sacramento Mountains escarpment. The Tularosa Basin is a closed basin, fed by ephemeral drainages. The Base is crossed by several arroyos that flow intermittently, primarily with storm water runoff. These arroyos include Lost River, Dillard Draw, Malone Draw, and several smaller tributaries. The arroyos generally drain in the southwest direction. Lost River is supplied by surface water flows, seeps, and springs (Holloman AFB 2001). Flows in many of the surface water drainages sink into the permeable soils before water reaches their outlets.

Surface water from Bonito Lake and springs in Fresnal Canyon and La Luz Canyon is transported through the pipelines to reservoirs at the city of Alamogordo's La Luz water treatment plant. At the La Luz plant, the water is filtered and chlorinated, and potable water for use by Holloman AFB is pumped through the city and Prather water lines to the Boles Field Pumping Station. Potable water is fed to the base from the Boles Field Pumping Station through two separate pipelines for storage, chlorination, and distribution within the base system. Average daily water demand is approximately 2.1 MGD with 8 percent (0.168 MGD) used by the golf course for irrigation (49 FW 2004).

Potable water storage on-base is provided by three tanks (Eagle Tower with 0.3 MG; Challenger Tank with 0.4 MG; North Area Tower with 0.25 MG) having a total capacity of 0.95 MG.

Stormwater, typically generated in the arid climate of New Mexico during the months of June through October, is conveyed through drainage channels, underground piping (storm sewer), and, in a few areas, by sheet flow on Holloman AFB. Base topography slopes slightly to the south-southwest and, correspondingly, storm water flows in a southerly direction across the base. Pollutants in storm water discharges from specified industrial areas are managed in compliance with NPDES requirements under a program administered by the USEPA to address industrial activities. Holloman AFB has an approved Stormwater Pollution Prevention Plan (SWPPP) that meets the requirements of the base-wide NPDES Multi-Sector General Permit for Industrial Activities (Holloman AFB 2001). Fourteen drainage areas, synonymous with outfall tributary areas or outfall areas, have been delineated for the areas of the base containing industrial activities. Eleven of these drainage areas have been identified as contributing to distinct discharges from the Holloman AFB to Waters of the U.S. (e.g., wetlands and flowing, and intermittently flowing, rivers, creeks, or streams). Two of the remaining drainage areas discharge to depressions in the ground (located on base) where storm water evaporates or percolates into the ground. A fourteenth drainage area drains mainly by sheet flow towards Waters of the U.S. (Holloman AFB 2001).

Waters of the U.S. that receive discharges from the identified drainage areas include Lake Holloman, Dillard Draw, Lost River, Ritas Draw, and three unnamed wetlands. Land development/construction sites disturbing one acre or more require an NPDES Stormwater General Permit for Small Construction. Each site must be covered by a site-specific SWPPP that addresses BMPs to reduce introduction of sediment and pollutant into the storm water.

Small construction activity that disturbs an area of one acre or larger must comply with the USEPA Phase II Stormwater General Permit for Small Construction. Compliance with the permit is intended to improve or maintain water quality by minimizing pollutants in storm

water runoff that is discharged into the drainage system. It requires issuance of a Notice of Intent, development and implementation of a site-specific SWPPP and an erosion and sediment control plan, and maintenance of control measures. The SWPPP and erosion and sediment control plan includes temporary and permanent stabilization of disturbed areas and the installation and maintenance of BMPs. The Stormwater General Permit for Small Construction requirement may be waived during periods of low rainfall (generally September through June at Holloman AFB) by calculating the Rainfall Erosivity Factor to determine whether the potential for polluted discharge is low enough to justify a waiver (USEPA 2001).

During development of the SWPPP, site evaluations of facilities were conducted to ensure that materials handling and pollution prevention procedures are adequate to ensure that there will be no contamination of surface water or groundwater due to activities on the base. BMPs are described in the SWPPP to provide guidance to minimize adverse effects on water quality. Annual monitoring and assessment of potential storm water pollution sources is required under the Stormwater General Permit for Small Construction.

Floodplains/Wetlands. Typically, issues relevant to water resources include the quality and quantity of downstream water bodies that could be affected and hazards associated with 100-year floodplains delineated in accordance with EO 11988, *Floodplain Management.* There are no designated 100-year floodplains in the area to be affected by the projects described in this EA. Any potential modifications to wetlands are addressed in accordance with EO 11990, *Protection of Wetlands*, which regulates development activities in or near streams.

There are approximately 780 acres of delineated wetlands on Holloman AFB. While there are no perennial streams on Holloman AFB, there are Waters of the U.S. that receive storm water discharges from the base including Lake Holloman, Dillard Draw, Ritas Draw, and Lost River (Holloman AFB 2001). Ritas Draw flows into Lost River, which sinks into the sand dunes of White Sands National Monument. Flows that reach Dillard Draw and Lake Holloman either infiltrate the soil or evaporate.

The existing airspace covers three Major Land Resource Areas as defined by the NRCS; the characteristics of each are discussed in Table J-1.

Table J-1. Major Land Resource Areas covered by proposed airspace (Page 1 of 2)

Major Land Resource Area	*% of ROI*	*Brief Description of Characteristics*
42: Southern Desertic Basins, Plains, and Mountains	46	About 1/3 federally owned (mainly in New Mexico), with most of the rangeland at low carrying capacity. Mean seal level elevations range from 2,625 feet (800 meters) to 8,530 feet (2,600 m) in the mountains. Broad desert basins and valleys are bordered by gently sloping to strongly sloping fans and terraces. Average annual precipitation ranges from approximately 8 inches (200 millimeters) to 13 inches (325 millimeters), most occurring from midspring to midautumn. With scarce surface water and low precipitation, the Rio Grande, Pecos River, and a few larger tributaries are the only perennial streams. Groundwater in deep valley fill provides most water for domestic, municipal, and livestock use. Most soils are well drained and medium textured, formed mainly in locally transported sediments on the smoothly sloping sites. Shallow soils occur on steep and broken hill slopes. This area supports desert grass-shrub vegetation with variations of plant communities, depending on landscape position, soils, and topography. Major physiographic features of the ROI in this MLRA include Jordana del Muerto, the Tularosa Basin with its lava flow, Gypsum Flats and Dunes, and Chupadera Mesa.
70: Pecos-Canadian Plains and Valleys	40	Located in Colorado and New Mexico, mostly in farms, ranches, or other private holdings. Some of the northern and eastern slopes of the high mesas in the north are covered by forest vegetation, but the total forested area is small. Elevation ranges from 3,940 feet (1,200 meters) to almost 7,900 feet (2,400 meters), increasing gradually from southeast to northwest. Most of these dissected high plains are gently sloping to rolling, but bands of steep slopes and rough broken land border the stream valleys. Average annual precipitation ranges from approximately 12 inches (300 millimeters) to 16 inches (400 millimeters), fluctuating widely from year to year. Water is scarce throughout the area because of low and erratic precipitation and few perennial streams. Groundwater in deep sand and gravel in the north and from limestone in the south provides water for domestic and agricultural purposes, but is scarce in areas where shale and sandstone are near the surface. Most soils are well drained and moderately fine to moderately coarse textured with mixed mineralogy. Vegetation is predominantly short and mid-height grasses, dominated by blue grama, western wheatgrass, and lesser amounts of black grama, galleta, New Mexico feathergrass, and a variety of shrubs, half shrubs, and forbs in the southern part. Scattered juniper and piñon with an understory of sideoats grama, bottlebrush squirreltail, and western wheatgrass grow on shallow soils and in escarpments. Major physiographic features of the ROI in this MLRA include the East slopes of the Capitan, White, Sacramento Mountains and Guadalupe Mountains.

Table J-1. Major Land Resource Areas covered by proposed airspace (Page 2 of 2)

Major Land Resource Area	*% of ROI*	*Brief Description of Characteristics*
39: Arizona and New Mexico Mountains	14	Located in parts of Arizona, Colorado, New Mexico, and Utah. Mostly covered with timber and woodlands. Most of this area is very hilly and mountainous, with an upland plateau dissected by deep canyons. Elevations can range from 4,590 feet (1400 meters) to 12,470 feet (3800 meters). Average annual precipitation is higher than MLRA 42, increasing with elevation, with larger streams and tributaries maintaining perennial flow. Groundwater is limited and usually occurs at great depth. At lower elevations, soils overlie mostly sedimentary rocks and old alluvium. Vegetation at lower elevations grade to chaparral and grassland. Major physiographic features of the ROI in this MLRA include the highlands of the Organ, San Andres, Oscura, Capitan, White, Sacramento and Guadalupe Mountains

Source: NRCS 1998

References

49 FW. 2004. 49th Fighter Wing. 2004. General Plan Update. U.S. Air Force, Holloman Air Force Base. Alamogordo, New Mexico. July.

Holloman AFB. 2001. Holloman Air Force Base. 2001. Final Storm Water Pollution Prevention Plan for Holloman Air Force Base, New Mexico. 49 CES. January 25.

Holloman AFB. 2003. Holloman Air Force Base. 2003. Potable Water Vulnerability and Risk Assessment. Holloman Air Force Base, NM. Part I. Sanitary Survey and Contingency Response. Alamogordo, NM. September

NMWQCC. 2002. NMWQCC 2002. Water Quality And Water Pollution Control In New Mexico, 2002. A State Report Required By The U.S. Congress Under §305(b) of the Clean Water Act. New Mexico Water Quality Control Commission. New Mexico Environment Department. Santa Fe, NM. February.

NRCS. 1998. National Resources Conservation Service. Soil Information for Environmental Modeling and Ecosystem Management, Western Range and Irrigated Region (D). http://www.soilinfo.psu.edu/soil_lrr/. Accessed May 3

SCS. 1980. Soil Conservation Service. 1980. Major Land Resource and Subresource Areas, New Mexico. Map and subresource area descriptions. U.S. Department of Agriculture. June.

SCS. 1981. Soil Conservation Service. 1981. Soil Survey of Otero Area, New Mexico: Parts of Otero, Eddy, and Chaves Counties. U.S. Department of Agriculture with U.S. Forest Service in cooperation with the New Mexico State University Agricultural Experiment Station.