DELTA MOA

Environmental Assessment, Alaska

Charting of the Delta Military Operations Area Complex Environmental Assessment

Draft

November 2008

ACRONYMS AND ABBREVIATIONS

°	degree
°F	degree Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
11 AF	11th Air Force
3 WG	3rd Wing
AFB	Air Force Base
AFI	Air Force Instruction
AGIA	Alaska Gasline Inducement Act
AGL	above ground level
AK MOA EIS	Alaska Military Operations Area Environmental Impact Statement
ALCAN	Alaska-Canadian
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
ATV	All-terrain Vehicle
AWACS	Airborne Warning and Control System
BRAC	Base Realignment and Closure
BLM	Bureau of Land Management
CAA	Clean Air Act
CAS	Close Air Support
CDNL	C-weighted Day-Night Average Sound Level
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
dB	decibel
Delta T-MOA	Delta Temporary Military Operations Area
DoD	Department of Defense
DZ	drop zone
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FBO	Fixed-Base Operator
FL	Flight Level
FONSI	Finding of No Significant Impact
HMMWV	High Mobility Multipurpose Wheeled Vehicle
IAP	Instrument Approach Procedure
IDO	Initial Defense Operations Capability
IFR	Instrument Flight Rule
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
ILS	Instrument Landing System
IR	Instrument Route
JASSM	Joint Air-to-Surface Standoff Missile
JCS	Joint Chiefs of Staff
JDAM	Joint Direct Attack Munition
JSOW	Joint Standoff Weapon
KIAS	Knots Indicated Airspeed
L_{dn}	Day-Night Average Sound Level
L_{dnmr}	Onset Rate-Adjusted Monthly Day-Night Average Sound Level
LFE	Large Force Exercise
L_{max}	Maximum Sound Level
MEA	Minimum Enroute Altitude
MFE	Major Flying Exercise
MOA	Military Operations Area
MSL	mean sea level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NE	Northern Edge
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NM	nautical mile
NO_2	nitrogen dioxide
NOTAM	Notice to Airmen
NRHP	National Register of Historic Places
NRIS	National Register Information Service
O_3	ozone
P.L.	Public Law
P/CG	Pilot/Controller Glossary
PARC	Pacific Alaska Range Complex
Pb	lead
PM_{10}	particulate matter less than 10 micrometers in diameter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
ppm	parts per million
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
RF-A	Red Flag-Alaska
ROD	Record of Decision
ROI	Region of Influence
S&I	safe & initiation
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SUA	Special Use Airspace
SUAIS	Special Use Airspace Information Service
U.S.	United States
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VFR	Visual Flight Rule
VR	Visual Route

Cover Sheet
DRAFT ENVIRONMENTAL ASSESSMENT FOR CHARTING THE DELTA MOA COMPLEX, EIELSON AFB, ALASKA

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

b. *Proposals and Actions*: This Environmental Assessment (EA) analyzes the potential environmental consequences of a proposal to improve required training for Major Flying Exercises (MFEs) by charting the Delta Military Operations Area (MOA) Complex as part of the Pacific Alaska Range Complex (PARC).

The proposed Delta MOA would connect airspace and allow aircrew to train as they fight. Current MFE training cannot be achieved at the combat mission level with the existing Air Traffic Control Assigned Airspace (ATCAA) and MOA structure connecting the Yukon and Fox/Eielson Special Use Airspaces (SUAs). At present, MFE training aircraft must transition the Delta corridor by either climbing above Flight Level (FL) 180 (18,000 feet mean sea level [MSL]) into the Delta ATCAA or funneling through the low altitude Birch or Buffalo MOAs. The abrupt and segmented changes in altitude artificially constrain realistic threat-avoidance and attack run-in training at exactly the time pilots should be focused on combat conditions. The proposed Delta MOA provides all angle surface attacks, threat reaction tactics, air-to-air combat maneuvering, and joint air-ground operations near ranges R-2202 and R-2205. The Delta MOA would overlie the Birch and Buffalo MOAs, have a ceiling of FL180 at the existing Delta ATCAA, have a floor of 10,000 feet MSL from Eielson Air Force Base (AFB) to the Birch MOA, and a floor 3,000 feet above ground level (AGL) between the Birch and Buffalo MOAs.

The Delta MOA would be activated only for MFEs not to exceed 60 days per year to a maximum of 2.5 hours twice a weekday over a two-week period with 3 hours between two daily usage periods. Civil aviation would be notified at least 30-days in advance and MFEs would not be scheduled in January, February, 27 June to 11 July, or September. Priority would be given to medevac, fire, and other emergency activities during MFEs. Visual Flight Rule (VFR) corridors in the Birch and Buffalo MOAs support VFR traffic. V-444 would not be available for Instrument Flight Rule (IFR) traffic for up to 300 hours, or 3.4 percent of the year. A corridor south of 63 degrees (°) latitude in the Fox 3 ATCAA would support transit of commercial and other civil aircraft. Chaff and defensive flares, as currently used in the Delta ATCAA and the Birch and Buffalo MOAs, would be used in the Delta MOA under existing Alaskan altitude release restrictions. Supersonic activity would continue to occur above FL300 above the Delta MOA. The Delta MOA would support MFE training in accordance with the conditions and mitigations identified for the Delta Temporary MOA (Delta T-MOA) and the Alaska Military Operations Area Environmental Impact Statement (AK MOA EIS) dated 1995.

The No Action Alternative would not chart the proposed Delta MOA on aeronautical charts. The Birch and Buffalo MOAs and the Delta ATCAA would continue to be used for MFE training. This results in continued low-quality MFE training and reduces the realism needed for aircrews to experience combat situations before being deployed to the actual combat theater.

c. *Comments and Inquiries*: Written comments on this document should be directed to Mr. James W. Hostman, 611 CES/CEAO, 10471 20th St., Ste. 302, Elmendorf AFB, AK 99506. Telephone inquiries may be made to 907-552-4151.

d. *Designation*: Draft Environmental Assessment

e. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA). Public and agency comments focused the environmental analysis on airspace management, safety, socioeconomics, biological resources, and land use. Additional environmental resources include noise, air quality, physical resources, cultural resources, and environmental justice. The Delta T-MOA provides substantial information on the potential environmental effects from charting the Delta MOA. VFR traffic would continue to use the established Delta transit corridor. Medevac, fire survey, firefighting, or emergency flights would be given priority. An estimated one to two general aviation IFR flights per MFE training day could be delayed by approximately one hour, primarily at Northway or Fairbanks, if V-444 was not available. Civil aviation traffic would need to communicate through established radio communication systems to obtain MOA status. If no other deconfliction scheduling was possible, one to two commercial flights per MFE day could be re-routed at altitude south of the 63° corridor. Annual average noise levels below the Birch and Buffalo MOAs would be lower and annual average noise levels between the Birch and Buffalo MOAs would noticeably increase from 41.0 to 45.2 Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). The change would not exceed the annual average of 55 Day-Night Average Sound Level (L_{dn}) identified by the United States Environmental Protection Agency (USEPA) as the level to begin assessing the potential for environmental impacts. Experience with the Delta T-MOA demonstrated that scheduling, improved communication, the VFR corridors, and priority for emergency flights successfully addressed the concerns of general aviation pilots and mitigated potential safety impacts. There would be no discernible impacts on air, soils, or water within the Tanana River Valley or the Yukon-Tanana Upland. Extensive studies of chaff particles and defensive flares, as currently used in the Delta ATCAA and Birch and Buffalo MOAs, have found no negative impacts of chaff or flare materials to biological resources. Alaska Native villages at Healy Lake and Dot Lake, under the Buffalo MOA, would experience a discernible reduction in aircraft overflight noise. National Register of Historic Places (NRHP) properties under the Delta ATCAA would experience an increase in average annual noise levels from training above 3,000 feet AGL. There would be no disproportionately high or adverse impacts to minorities or low-income communities and no disproportionate health or safety risks to children. There would be no expected impact to land use. Public scoping concerns questioned socioeconomic effects on regional airports. Expanded radio and radar coverage and adopting the Delta T-MOA mitigations would reduce delays to a minimum and could result in approximately one to two IFR general aviation aircraft being delayed by approximately one hour during an MFE day. Such delays would not be expected to significantly affect transit or refueling of general aviation aircraft at Northway. The availability of VFR corridors, combined with the scheduling of MFE activity to avoid high-use general aviation periods would reduce the potential for any socioeconomic impacts to Northway and other local airports along the Delta corridor. A Fairbanks fixed-base operator (FBO) stated that one cargo service decided to refuel in Anchorage in place of Fairbanks due to the uncertainty regarding the Delta T-MOA. One or two commercial aircraft per day which could not deconflict during a Delta MOA activation period and were required to transit south of the 63° corridor would each incur approximately 500 pounds of fuel and 7 minutes of additional flight time. The proposed Delta MOA would not be expected to significantly impact regional socioeconomics, although specific civil aviation support operations could incur some impacts. No significant cumulative impacts are expected on any environmental resource within the Delta corridor.

DRAFT
FINDING OF NO SIGNIFICANT IMPACT

NAME OF PROPOSED ACTION. Charting the Delta Military Operations Area (MOA) Complex, Eielson Air Force Base (AFB), Alaska

DESCRIPTION OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVES. The United States Air Force (USAF) proposes to improve required training for Major Flying Exercises (MFEs) by charting the Delta MOA Complex. The proposed action would establish connecting airspace to provide a realistic setting for MFEs.

MFEs in Alaskan airspace provide aircrews with realistic simulated combat experience. The expanded capability of aircraft establishes the need for contiguous airspace to meet MFE training objectives. The Delta corridor separates the Yukon MOAs from Ranges R-2202, R-2205, and R-2211, and the Fox and Eielson MOAs. At present, training aircraft must transition the Delta corridor by either climbing above Flight Level (FL) 180 (18,000 feet above mean sea level [MSL]) into the Delta Air Traffic Control Assigned Airspace (ATCAA) or funneling through the low-level Birch or Buffalo MOAs. The abrupt and segmented changes in altitude associated with the current MOA structure introduce pilot concerns about the boundary of the airspace and artificially constrain realistic threat-avoidance and attack run-in training at exactly the time pilots should be focused on combat conditions. The current airspace configuration requires pilots to train using non-optimal tactics in restricted training regimens. This continually reinforces negative habit patterns which can affect pilot survivability in combat. Current MFE training requirements cannot be achieved at the combat mission level with the existing ATCAA and MOA structure connecting the Yukon and Fox/Eielson Special Use Airspaces (SUAs).

Charting the Delta MOA would establish the required north/south training environment to meet current MFE training. The proposed Delta MOA would have a ceiling of FL180 at the existing Delta ATCAA, overlie the Birch and Buffalo MOAs, have a floor of 10,000 feet MSL from Eielson AFB to the Birch MOA, and have a floor of 3,000 feet above ground level (AGL) between the Birch and Buffalo MOAs.

MFEs would activate the MOA in two-week intervals up to a maximum of 60 days per year for a maximum of 2.5 hours twice a weekday. The daily time blocks would have 3 hours between exercises. MFE schedules would be publicized at least 30 days prior to the exercise. MFEs would not be scheduled in January, February, 27 June to 11 July, or September. Chaff and defensive flares are currently used above the Delta corridor in the Delta ATCAA and the Birch and Buffalo MOAs and would be proposed for the Delta MOA.

Visual Flight Rule (VFR) corridors in the Birch and Buffalo MOAs and the floor altitude of the proposed Delta MOA would support VFR traffic. During the up to 300 hours of annual MFE activation (3.4 percent of the year), V-444 would not be available. A corridor south of 63 degrees (°) latitude between Flight Level (FL) 320 and FL350 in the Fox 3 ATCAA would support transit of commercial and other high performance civil aircraft. Life flight, fire, and other emergency activities in the proposed Delta MOA during MFEs would be accommodated by temporarily raising the floor of the MOA or otherwise altering the MFE to meet emergency requirements. The USAF has worked with the Federal Aviation Administration (FAA) to schedule a Delta Temporary MOA (Delta T-MOA) to support MFEs during 2007-2008. The charting of the Delta MOA would be in accordance with the conditions and mitigations identified for the Delta T-MOA and the Pacific Alaska Range Complex (PARC) MOA Environmental Impact Statement (EIS) dated 1995.

The No Action Alternative would not chart the Delta MOA on aeronautical charts used by civil aviation. The Birch and Buffalo MOAs and the Delta ATCAA would continue to be used for MFE training. The USAF would continue to request a Delta T-MOA to support realistic MFE training. MFEs without a Delta MOA result in continued low-quality MFE training and reduce the realism needed for aircrews to experience combat situations before being deployed to the actual combat theater.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES. The Charting of the Delta Military Operations Complex Environmental Assessment (EA) addresses the potential environmental consequences from implementing the Proposed Action and includes the No Action Alternative. Public and agency comments during scoping focused the environmental analysis on airspace management, safety, socioeconomics, biological resources, and land use. Additional environmental resources considered in the EA include noise, air quality, physical resources, cultural resources, environmental justice, and cumulative effects.

The EA demonstrates that the proposed charting of the Delta MOA, including schedule and other mitigations developed through experience with the Delta T-MOA and the 1995 MOA EIS, would not result in significant environmental impacts to any environmental resources area.

Potential environmental consequences may be summarized as follows. The proposed Delta MOA would have minimal effect upon VFR traffic which would continue to use established VFR corridors. Other than communication, there would be no or minimal effect on medevac, fire survey, firefighting, or emergency flights, which would be given priority. An estimated one to two general aviation Instrument Flight Rule (IFR) flights per MFE training day could be delayed primarily at Northway or Fairbanks approximately one hour if IFR circumstances prevailed and V-444 was not available for IFR traffic. Civil aviation traffic operating from improved or unimproved airfields along the Delta corridor between Northway and Fairbanks would need to communicate through established radio systems to obtain MOA status. If no other deconfliction scheduling was possible, one to two commercial flights per MFE day could be re-routed south of the 63° corridor. Annual average noise levels below the Birch and Buffalo MOAs would be lower with the proposed Delta MOA. Noise levels between the Birch and Buffalo MOAs in the proposed Delta MOA are projected to increase from an annual average of 41.0 to 45.2 Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). The noticeable increase in noise levels would not exceed the annual average of 55 Day-Night Average Sound Level (L_{dn}) identified by the United States Environmental Protection Agency (USEPA) as the level to begin assessing the potential for environmental impacts. Supersonic flights would be limited to above FL300 and would not occur in the proposed Delta MOA. Sonic booms are currently experienced and would be expected to continue throughout the PARC.

Experience with the Delta T-MOA has demonstrated that implementation of scheduling, improved communication, priority for medevac, fire, and other emergencies, and continued recognition of the VFR corridors have successfully addressed the concerns of general aviation pilots and mitigated the potential for safety impacts. Defensive flare use would adhere to existing restrictions on flare use in the Alaskan airspace to above 5,000 feet AGL from June to September and above 2,000 feet AGL for the remainder of the year. No impacts to air quality would occur because the proposed Delta MOA altitude floor is above the mixing level for air emissions.

No impacts to the soils or water within the Tanana River Valley or the Yukon-Tanana Upland would occur. Chaff and flares are currently used and residual materials are currently deposited under the Delta ATCAA and Birch and Buffalo MOAs. Extensive studies of chaff particles and defensive flare constituents have found no negative impacts to biological resources. The proposed Delta MOA adopts the Alaska Military Operations Area Environmental Impact Statement (AK MOA EIS) biological mitigations, including the minimum overflight altitude of 3,000 feet AGL above the Delta Caribou Herd calving areas from May 15 to June 15. The change in annual average noise levels associated with MFE training in the proposed Delta MOA would not be at a level or altitude to affect wildlife.

Alaska Native villages at Healy Lake and Dot Lake under the Buffalo MOA are expected to experience a discernible reduction in aircraft overflight noise. There would be no disproportionately high or adverse impacts to minorities or low-income communities, and there would be no disproportionate health or safety risks to children. National Register of Historic Places (NRHP) properties under the Delta ATCAA would experience an increase in annual average noise levels associated with MFE training above 3,000 feet AGL. This training and associated noise level would not be expected to affect historic structures or historic properties. Areas under the proposed Delta MOA between the Buffalo and Birch MOAs would have a discernible change in the average noise level but would not be expected to impact land use under the airspace. Supersonic flights would not occur in the proposed Delta MOA although existing sonic booms from supersonic flights above FL300 would continue. Continued use of chaff and defensive flares could result in a hunter, fisherman, or other individual finding a piece of chaff or flare wrapping material or plastic from a deployed chaff or defensive flare and being annoyed.

Public scoping concerns questioned socioeconomic effects on regional airports, particularly Northway and Fairbanks. Mitigations, including scheduling and publication of MOA activation, could result in approximately one to two general aviation aircraft seeking to fly IFR through the Delta corridor being delayed by approximately one hour during each MFE day. USAF radio and radar expanded coverage in the region would reduce delays to a minimum. The availability of VFR corridors, combined with the scheduling of MFE activity to avoid high-use general aviation periods, would reduce potential for socioeconomic impacts at Northway or other Delta corridor airports. A Fairbanks fixed base operator stated that one IFR cargo service decided to schedule refueling in Anchorage in place of Fairbanks due to the uncertainty regarding the Delta T-MOA.

One to two commercial flights per MFE day, which could not deconflict scheduling and were required to transit south of the 63° corridor, would each incur approximately 500 pounds of additional fuel and 7 minutes of additional flight time. The proposed Delta MOA would not be expected to significantly impact regional socioeconomics, although specific civil aviation operations could incur some impacts. The estimate of one to two general aviation flights delayed by approximately one hour per MFE day includes estimated cumulative effects of increased civil aviation use of the Delta corridor for development activities in the northern parts of Alaska. No significant cumulative impacts are expected on any environmental resource within the Delta corridor.

CONCLUSION. Based on the findings of the EA conducted in accordance with the requirements of the National Environmental Policy Act, the Council on Environmental Quality regulations, and the Air Force Instruction 32-7061, and after careful review of the potential impacts, I conclude that implementation of the Proposed Action would not result in significant impacts to the quality of the human or the natural environment. Therefore, a Finding of No Significant Impact is warranted, and an Environmental Impact Statement is not required for this action.

Name
Title

Date

DRAFT

Charting of the Delta Military Operations Area Complex
Environmental Assessment
Eielson Air Force Base, Alaska

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.

November 2008

TABLE OF CONTENTS

TABLES

FIGURES

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EXECUTIVE SUMMARY

The United States Air Force (USAF) proposes to improve required training for Major Flying Exercises (MFEs), including Red Flag Alaska (RF-A) and Northern Edge (NE) training exercises, by charting the Delta Military Operations Area (MOA) Complex. The Delta MOA would become part of the Pacific Alaska Range Complex (PARC).

The purpose of charting the Delta MOA is to establish connecting airspace which would provide USAF and other military services with a realistic setting for MFEs. The proposed airspace would be in use during two 2.5-hour periods for up to but not exceeding 60 days per year. The airspace would provide the USAF the capability to train aircrews as they fight and ensure that aircrews experience the critical first 10 combat missions in as realistic a setting as possible. The first 10 combat missions have been found to be the most critical for aircrew survival in combat.

This draft Environmental Assessment (EA) and draft Finding of No Significant Impact (FONSI) have been prepared in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations and are issued for a 30-day public and agency review and comment period. Comments on the draft will be incorporated into the completed EA. These comments, in addition to the EA analysis, will be considered in decisionmaking regarding the charting of the Delta MOA.

PURPOSE AND NEED

MFEs in Alaskan airspace are designed to provide aircrews with realistic experience and simulated combat experience without using live munitions. Experience in the War on Terror, and expanded capability of aircraft such as the F-22A and F-35, establish the need for contiguous airspace to meet MFE training objectives. The Delta corridor separates the Yukon MOAs from training ranges and the Fox and Eielson MOAs. At present, training aircraft must transition the Delta corridor by either climbing above Flight Level (FL) 180 (18,000 feet above mean sea level [MSL]) into the Delta ATCAA or being funneled through the low level Birch or Buffalo MOAs. These constraints occur at exactly the time when training aircrew should have the most realistic combat experience.

The abrupt and segmented changes in altitude associated with the current MOA structure introduce pilot concerns about the boundary of the airspace and artificially constrain realistic threat-avoidance and attack run-in training at exactly the time pilots should be focused on combat conditions. The current airspace configuration requires pilots to train using non-optimal tactics in restricted training regimens. This continually reinforces negative habit patterns which can affect pilot survivability in combat. Current MFE training requirements cannot be achieved at the combat mission level with the existing ATCAA and MOA structure connecting the Yukon and Fox/Eielson Special Use Airspaces (SUAs).

The USAF has worked with Federal Aviation Administration (FAA) to schedule a Delta temporary MOA (T-MOA) to support MFEs during 2007 and 2008. The purpose of the proposed charting of the Delta MOA is to establish the Delta MOA airspace to support MFE training in accordance with the conditions and mitigations identified for the Delta T-MOA.

The proposed Delta MOA is designed to meet the MFE training need for all angle realistic surface attacks, threat reaction tactics, air-to-air combat maneuvering at realistic scales, and joint air-ground operations near ranges R-2202, R-2205, and R-2211. The proposed Delta MOA would distribute aircraft throughout the airspace as training aircrews face challenges from advanced aircraft and surface-to-air weapon systems. The proposed action would permit the 11th Air Force (11 AF) to perform realistic MFE training.

PROPOSED ACTION AND ALTERNATIVES

The proposed charting of the Delta MOA establishes the required north/south training environment to meet MFE demands of current aircraft and weapons systems. The proposed Delta MOA has a ceiling of FL180 at the existing Delta Air Traffic Control Assigned Airspace (ATCAA) and would:

- Have a floor of 10,000 feet MSL from Eielson Air Force Base (AFB) to the Birch MOA to support instrument approaches into Fairbanks International Airport and Eielson AFB.
- Overlie the Birch MOA from the top of the Birch MOA with a floor at, but not including, 5,000 feet MSL.
- Have a floor at, but not including, 3,000 feet above ground level (AGL) between the Birch and Buffalo MOAs.
- Overlie the Buffalo MOA above the 7,000 feet MSL top of the Buffalo MOA.
- Be activated up to a maximum of 60 days per year for up to 2.5 hours twice a day. MFEs would occur over a two-week period and not be scheduled on weekends. The daily time blocks would have 3 hours between the exercises to support civil aviation needs.
- Be typically scheduled as one MFE in April-May, two in June-August, and one in October, with year-to-year variations. No exercises would be scheduled in January, February, 27 June to 11 July, or September.
- Include chaff and defensive flare use as currently used in the Delta ATCAA and the Birch and Buffalo MOAs.
- Be scheduled at least 30 days prior to the exercise with accurate times to minimize disruption to civil aviation.
- Continue to have Visual Flight Rule (VFR) corridors in the Birch and Buffalo MOAs to support VFR traffic transiting the Delta corridor.
- Provide a corridor south of 63 degrees (°) latitude between FL320 and FL350 in the Fox 3 ATCAA to support transit of commercial and other civil aircraft in lieu of the current transit on V-444 through the Delta corridor below FL180 during MFE training.
- Prioritize life flight, fire, and other emergency activities in the proposed Delta MOA during MFEs. Such flights would be accommodated through temporarily raising the floor of the MOA or otherwise altering the MFE to meet emergency requirements.
- Adopt all mitigations from the PARC MOA Environmental Impact Statement (EIS) dated 1995 as part of the proposed Delta MOA complex.

The No Action Alternative would not chart the proposed Delta MOA and would not include the Delta MOA airspace in aeronautical charts used by civil aviation. The Birch and Buffalo MOAs and the Delta ATCAA would be used for MFE training. This results in continued low-quality MFE training and reduces the realism needed for aircrews to experience combat situations before being deployed to the actual combat theater. No Action would include continued use of chaff and defensive flares in existing MOA and ATCAA airspace and continued supersonic activity above FL300. The USAF would continue to request a Delta Temporary MOA (Delta T-MOA) to support realistic MFE training.

ENVIRONMENTAL CONSEQUENCES

The public and agency comments focused the environmental analysis on the following environmental resources: airspace management, safety, socioeconomics, biological resources, and land use. Additional environmental resources considered in this environmental assessment include noise, air quality, physical resources, cultural resources, and environmental justice.

AIRSPACE MANAGEMENT

The experience with the Delta T-MOA has provided substantial information on the potential effects upon airspace management associated with charting the Delta MOA. The proposed Delta MOA is expected to have minimal effect upon VFR traffic which would continue to use established VFR corridors to transit the Delta corridor. There would be no or minimal effect beyond communication on medevac, fire survey, firefighting, or emergency flights, which would be given priority if they occurred during the time the proposed Delta MOA was active for an MFE. There would be some delay to Instrument Flight Rule (IFR) traffic under circumstances where IFR conditions prevailed, the proposed Delta MOA was active (3.4 percent of the year), and V-444 was not available for IFR traffic. An estimated one to two general aviation IFR flights per MFE training day could be delayed by approximately one hour, primarily at Northway or Fairbanks. Civil aviation traffic operating from improved or unimproved airfields along the Delta corridor between Northway and Fairbanks would need to communicate through established radio communication systems to obtain status of the proposed Delta MOA activation during scheduled MFE times. If no other deconfliction scheduling were possible, one to two commercial flights per MFE day could be re-routed between FL320 and FL350 south of the 63° corridor.

Charting the proposed Delta MOA with the airspace scheduling mitigations, communication enhancements, and established corridors would not be expected to significantly impact airspace management within the region.

NOISE

Annual average noise levels below the Birch MOA would be slightly but indiscernibly lower and under the Buffalo MOA would be discernibly lower with the proposed Delta MOA. Noise levels between Eielson AFB and the Birch MOA are projected to indiscernibly increase and noise levels between the Birch and Buffalo MOAs in the proposed Delta MOA are projected to discernibly increase from 41.0 Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) to 45.2 L_{dnmr}. The change in noise levels under the proposed Delta MOA outside the Birch or Buffalo MOAs would not exceed the annual average of 55 Day-Night Average Sound Level (L_{dn}) identified by the United States Environmental Protection Agency (USEPA) as the level to begin assessing the potential for environmental impacts. Supersonic flights would continue to be limited to above FL300 and sonic booms would continue to be heard within the Delta corridor although supersonic flight would not occur in the proposed Delta MOA. The proposed Delta MOA would not be expected to result in a substantial impact to noise beneath the airspace.

SAFETY

Experience with the Delta T-MOA has demonstrated that implementation of scheduling, improved communication, and continued recognition of the VFR corridors can address concerns of general aviation pilots and mitigate potential safety impacts. Not scheduling MFEs during weekends, September hunting season, and times of heavy holiday use by general aviation reduces the potential for safety risk. Providing access for emergency aircraft supports life flight, fire, and other emergencies in the region. Chaff and defensive flare use under the proposed Delta MOA would adhere to existing restrictions on flare use in the PARC airspace to above 5,000 feet AGL from June to September and above 2,000 feet AGL for the remainder of the year.

In the unlikely event that a private pilot entered the airspace flying VFR before or during an MFE, was required to change from VFR to IFR due to weather conditions, and had to declare a fuel emergency to continue to traverse the airspace, the USAF and the FAA would work with the pilot to provide safe transit. This could include declaring an emergency situation or suspending MFE activity below a specified altitude to permit the IFR aircraft to safely reach its destination. No significant safety effects are anticipated from charting the proposed Delta MOA.

AIR QUALITY

The mixing level for air emissions is below 3,000 feet AGL. The proposed Delta MOA does not include airspace below 3,000 feet AGL. No emission concentrations or changes to existing air quality attainment would be expected if the proposed Delta MOA were charted.

PHYSICAL RESOURCES

There is no on-the-ground construction associated with the proposed charting of the Delta MOA. Defensive countermeasures consisting of chaff and flares are currently used in the Delta ATCAA and the Birch and Buffalo MOAs. The amount of chaff distributed within the airspace would not substantially change from that currently used during MFE training. Chaff is primarily composed of aluminum and silica, is thinner than a human hair, and breaks down to become indistinguishable from native soils. During deployment of chaff and flares, small plastic or nylon pieces fall to the ground. These plastics pieces and wrappers are inert, widely dispersed, and are not expected to be concentrated in any way that could impact soil or water resources. Charting the proposed Delta MOA would not be expected to discernibly impact the soils or water within the Tanana River Valley or the Yukon-Tanana Upland.

BIOLOGICAL RESOURCES

Biological resources include sensitive species as well as game species. The Alaska Military Operations Area Environmental Impact Statement (AK MOA EIS) included a mitigation to establish a minimum overflight altitude of 3,000 feet AGL above the Delta Caribou Herd calving areas from May 15 to June 15. The proposed Delta MOA is not below 3,000 feet AGL. This means that the proposed Delta MOAs meets the USAF-adopted mitigations to reduce potential impacts upon the Delta Caribou Herd. The floor of the proposed Delta MOA, combined with some change in annual average noise levels associated with MFE training in the proposed Delta MOA, means that the proposed Delta MOA would have essentially the same effect on wildlife as exists under baseline conditions. Chaff and flares are currently used in the Delta ATCAA and Birch and Buffalo MOAs, and residual materials are currently deposited along the Delta corridor. Extensive studies of chaff particles and defensive flares have not documented negative impacts of chaff or flares to biological resources. The proposed Delta MOA would incorporate the existing PARC minimum altitude and seasonal restrictions on defensive flare release. No significant impact to biological resources would be expected as a result of charting the proposed Delta MOA.

CULTURAL RESOURCES

Cultural resources include architectural resources listed on the National Register of Historic Places (NRHP) and cultural properties and villages important to Alaska Natives. Two Alaska Native Villages at Healy Lake and Dot Lake are located under the Buffalo MOA and are expected to experience a discernible reduction in aircraft overflight noise with the charting of the proposed Delta MOA. NRHP properties are currently under the Delta ATCAA and will experience an increase in average annual noise levels associated with MFE training as low as 3,000 feet AGL. This training and associated noise level would not be expected to affect historic structures or historic properties. No change in supersonic activities is expected because supersonic activities are limited to above FL300. No significant impacts to traditional cultural properties or Alaska Native activities are anticipated to result from the proposed charting of the Delta MOA.

LAND USE

Land use under the proposed Delta MOA between the Birch and Buffalo MOAs would experience an annual average subsonic noise increase from L_{dnmr} of 41.0 to 45.2. This noise level change would be discernible but be below the 55 L_{dn} which USEPA has identified as the annual average noise level to begin assessing the potential for noise impact. Supersonic flights would not occur in the proposed Delta MOA. The proposed Delta MOA outside Birch or Buffalo MOAs would have a noticeable change in the average noise level but would not be expected to impact land use under the airspace. Continued use of chaff and defensive flares could result in a hunter, fisherman, or other individual finding a piece of wrapping material or plastic from a deployed chaff or defensive flare and being annoyed. No impact to land use would be expected with the charting of the proposed Delta MOA.

SOCIOECONOMICS

Public scoping concerns questioned socioeconomic effects on regional airports. Of particular concern were the effects upon Northway and Fairbanks. Northway is a location for general aviation aircraft transiting from Canada into Alaska. Such aircraft stop at Northway for customs and other activities. The mitigations integrated into the Delta T-MOA during an MFE, including scheduling and publication of MOA activation could result in approximately one to two general aviation aircraft seeking to fly IFR through the Delta corridor being delayed by approximately one hour during the scheduled MFE.

Communication as a result of USAF radio and radar expanded coverage in the region would reduce delays to a minimum. Such delays would not be expected to significantly affect transit or refueling of general aviation aircraft at Northway. The availability of VFR corridors, combined with the scheduling of MFE activity to avoid high-use general aviation periods, such as the September hunting season, would reduce the potential for any socioeconomic impacts to Northway and other local airports along the Delta corridor.

Accurate communication of the USAF's proposal and scheduling to civil aviation pilots reduces their concern and helps mitigate any potential schedule impacts. Inaccurate communication of the proposed Delta MOA schedule and mitigations can cause civil aviation pilots to re-route and avoid the Delta corridor. For example, erroneous statements, such as "the Delta MOA would effectively close the airspace corridor between Northway and Fairbanks," could result in civil aviation pilots deciding to alter flight routes to Fairbanks or to locations beyond Fairbanks. A Fairbanks fixed-base operator (FBO) stated that one cargo service which had been using the Fairbanks International Airport for refueling decided to refuel in Anchorage in place of Fairbanks due to the uncertainty regarding the Delta T-MOA.

Advanced communication and accurate information regarding the proposed Delta MOA would be expected to result in no significant impact upon airport economics within the region.

Commercial aircraft which could not deconflict during a Delta MOA activation period and were required to fly south of the 63° corridor would incur some economic impacts. These impacts would be approximately 500 pounds of fuel and 7 minutes of additional flight time for each of one to two commercial flights per day. Any additional fuel consumption would be of concern and would be seen as an impact to airline operations. The total economic effect of the proposed Delta MOA would not be expected to significantly impact regional socioeconomics, although specific civil aviation support operations could incur some impacts.

ENVIRONMENTAL JUSTICE

Persons living under the proposed Delta MOA between the Birch and Buffalo MOAs would experience an increase in average annual noise levels. Residents under the Delta corridor are not a disproportionate minority, nor are there a disproportionate number of children or low-income persons when compared with the region of Alaska as a whole. There would be no disproportionately high or adverse impacts to minorities or low-income communities as a result of charting the proposed Delta MOAs. There would be no disproportionate health or safety risks to children.

CUMULATIVE CONSEQUENCES

A variety of projects are proposed for the Delta corridor or for development in Alaska beyond Fairbanks. Changes in aircraft at Eielson AFB or regional airspace could affect the number of training flights outside those estimated for MFEs. The proposed rail extension from Fairbanks to Delta Junction would increase construction and other activities within the region. Increased training at Fort Wainwright would increase construction expenditures and socioeconomic activity in the Delta Junction area. Resource development in the northern parts of Alaska would have the potential to increase civil aviation use of the Delta corridor.

MFE training in the charted Delta MOA would not be expected to affect or be affected by any project on the ground under the proposed MOA. The calculated increase in noise from MFE training between the Birch and Buffalo MOAs would not be expected to have a noticeable cumulative effect with other projects within the region. The estimate of one to two general aviation flights delayed by approximately one hour per MFE day is incorporated into the EA socioeconomic and airspace sections. The Delta T-MOA experience was that an estimated one to two general aviation flights were delayed per 10-day MFE. This means the one to two IFR flights delayed per MFE day would reflect cumulative project flight activity. No significant cumulative impacts are expected on any environmental resource within the Delta corridor.

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION AND ALTERNATIVES

The United States Air Force (USAF) proposes to improve required training opportunities for Major Flying Exercises (MFEs) including Red Flag Alaska (RF-A) and Northern Edge (NE) Training Exercises by charting the Delta Military Operations Area (MOA) complex. The Delta MOA would become part of the Pacific Alaska Range Complex (PARC).

This Environmental Assessment (EA) addresses the environmental consequences on the human and natural environment potentially resulting from implementation of the Delta MOA proposal. The following sections summarize the purpose and need for the charted Delta MOA.

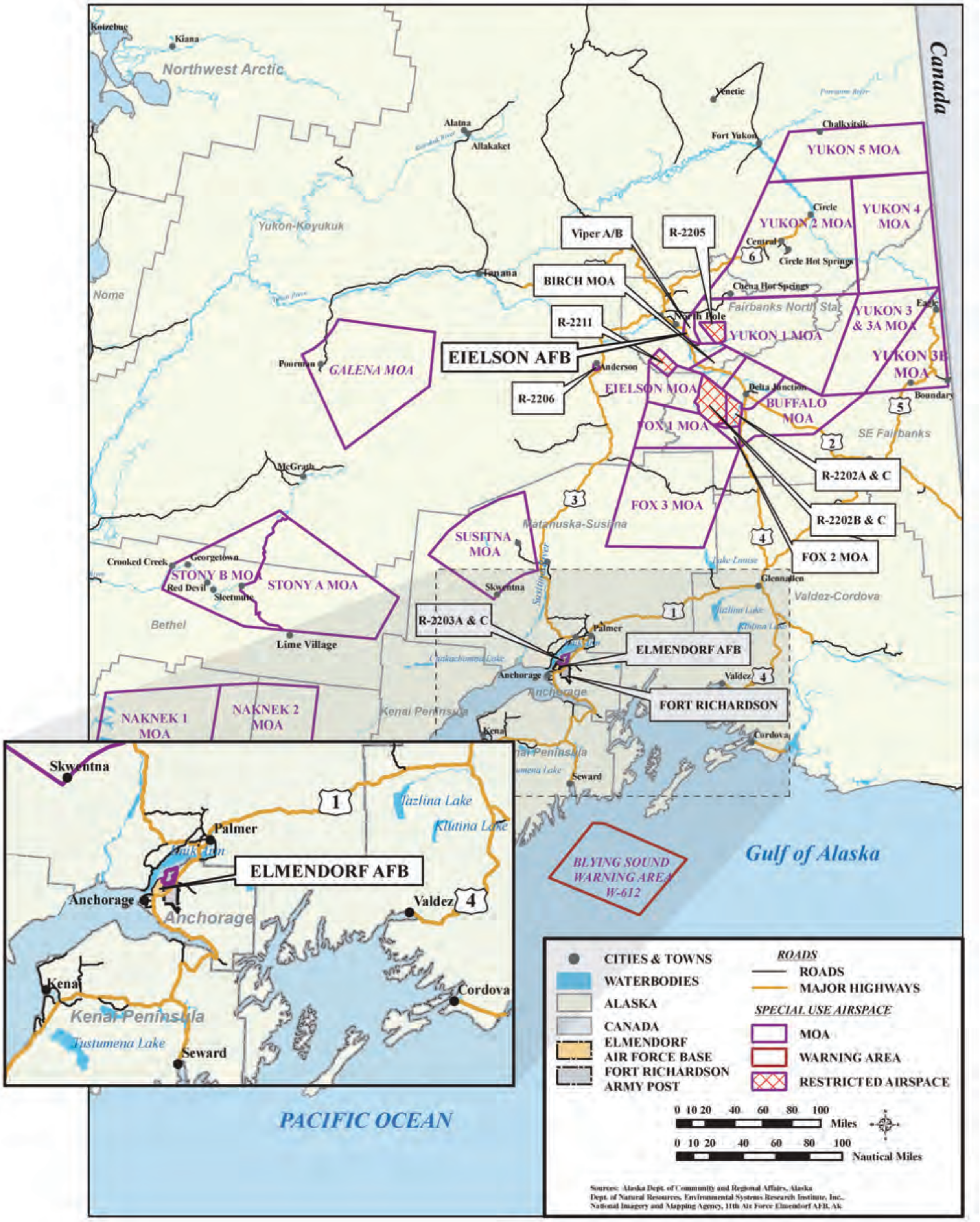
1.1 Purpose and Need for the Proposed Action

F-16 aircraft from the 18th Aggressor Squadron provide realistic training during MFEs. This combat level training allows pilots to practice fighting and maneuvering against the capabilities of enemy aircraft.

The purpose of the proposed action is to establish connecting airspace which would provide USAF and other military services with a realistic setting for MFEs. The proposed airspace would be in use during two 2.5 hour periods for up to, but not exceeding, 60 days a year. This airspace would provide the USAF the capability to train aircrews as they fight and ensure they experience the critical first 10 "combat missions" in a realistic, but controlled setting. The first 10 combat missions have been found to be the most critical for aircrew survival in combat.

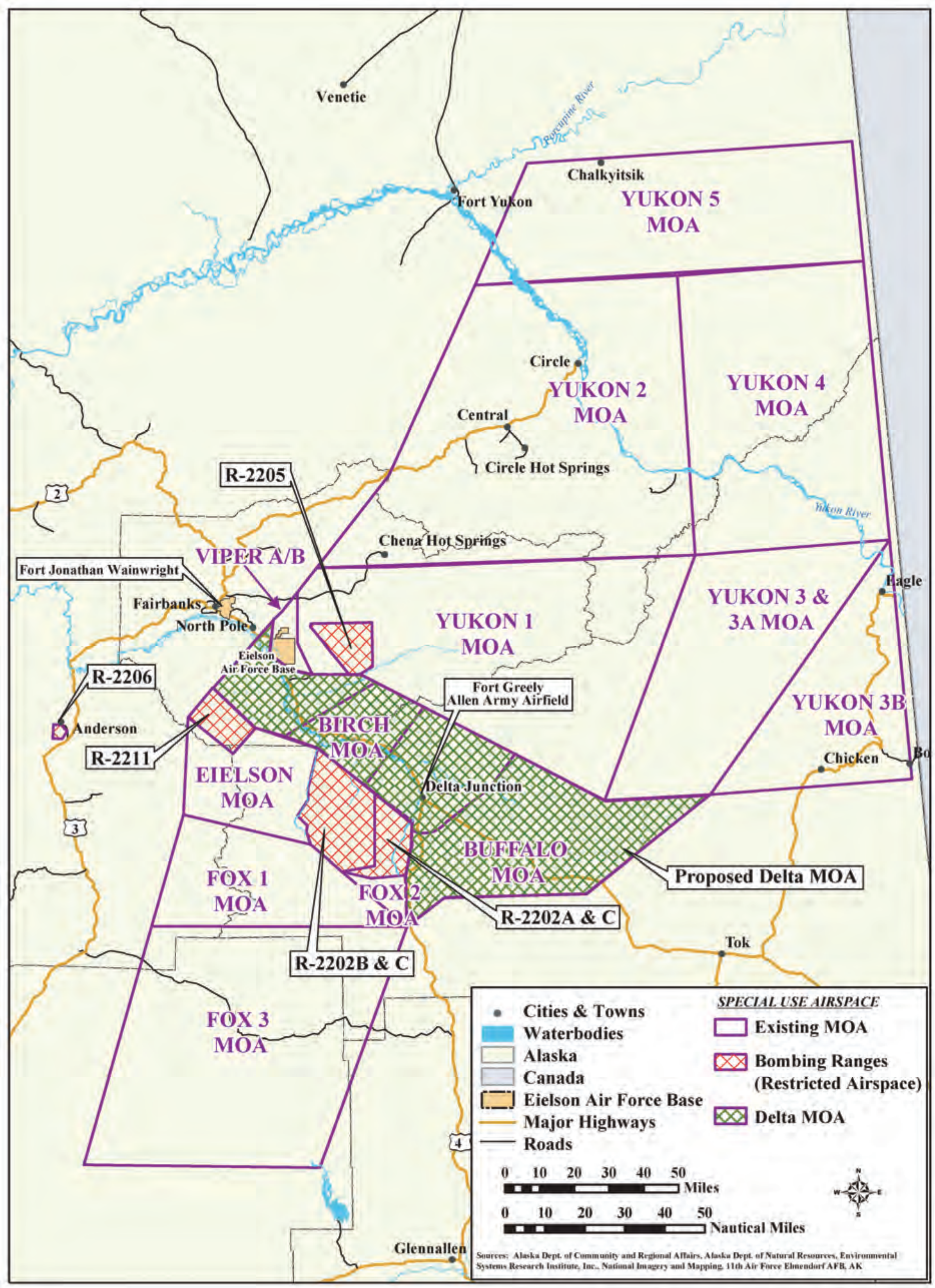
Experiences during recent military activities in the War on Terror have established new or expanded roles for military aircrews. In addition to interdiction missions, the changing threats have created new challenges for close air support (CAS), convoy escort, dynamic targeting, pipeline and infrastructure protection, time-sensitive targeting, and tactical airlift. PARC training must prepare aircrews for these, as well as established air-to-air and air-to-ground combat missions. Training must mirror combat to the greatest extent possible, and PARC training assets need to provide the opportunity for realistic, effective training operations. Aircraft, such as the F-22A and F-35, have expanded capabilities, can acquire targets at distances in excess of 100 miles, and need contiguous airspace to meet MFE training objectives. The current Birch MOA and Buffalo MOA airspaces connect the existing Fox, Eielson, and Yukon airspaces with existing ranges, but do not provide for MFE training to meet these challenges.

MFEs in the PARC are designed to provide aircrews with realistic experience and simulated combat without using live munitions. Pilots are trained the way they will fight and enter combat with the experience and training required to support operational missions, protect their aircraft, and survive real-life threats. RF-A is one MFE conducted in Alaskan military training airspace. Figure 1.1-1, page 1-2, presents the overall training airspace in Alaska, and Figure 1.1-2, page 1-3, focuses on the airspace under consideration in this proposal. Figure 1.1-3, page 1-4, presents a sectional, or side view, of the airspace between the Yukon and Fox/Eielson MOAs. The proposed Delta MOA on Figure 1.1-2, page 1-3, would overlie and connect the Birch and Buffalo MOAs and provide an airspace bridge between the Yukon, Fox, and Eielson MOA complexes.



Sources: Alaska Dept. of Community and Regional Affairs, Alaska Dept. of Natural Resources, Environmental Systems Research Institute, Inc., National Imagery and Mapping Agency, 11th Air Force Elmendorf AFB, Ak.

Figure 1.1-1. Alaskan Airspace Scheduled for USAF Training



Sources: Alaska Dept. of Community and Regional Affairs, Alaska Dept. of Natural Resources, Environmental Systems Research Institute, Inc., National Imagery and Mapping, 11th Air Force Elmendorf AFB, AK

Figure 1.1-2. Proposed Delta MOA Complex Relative to Other Airspace

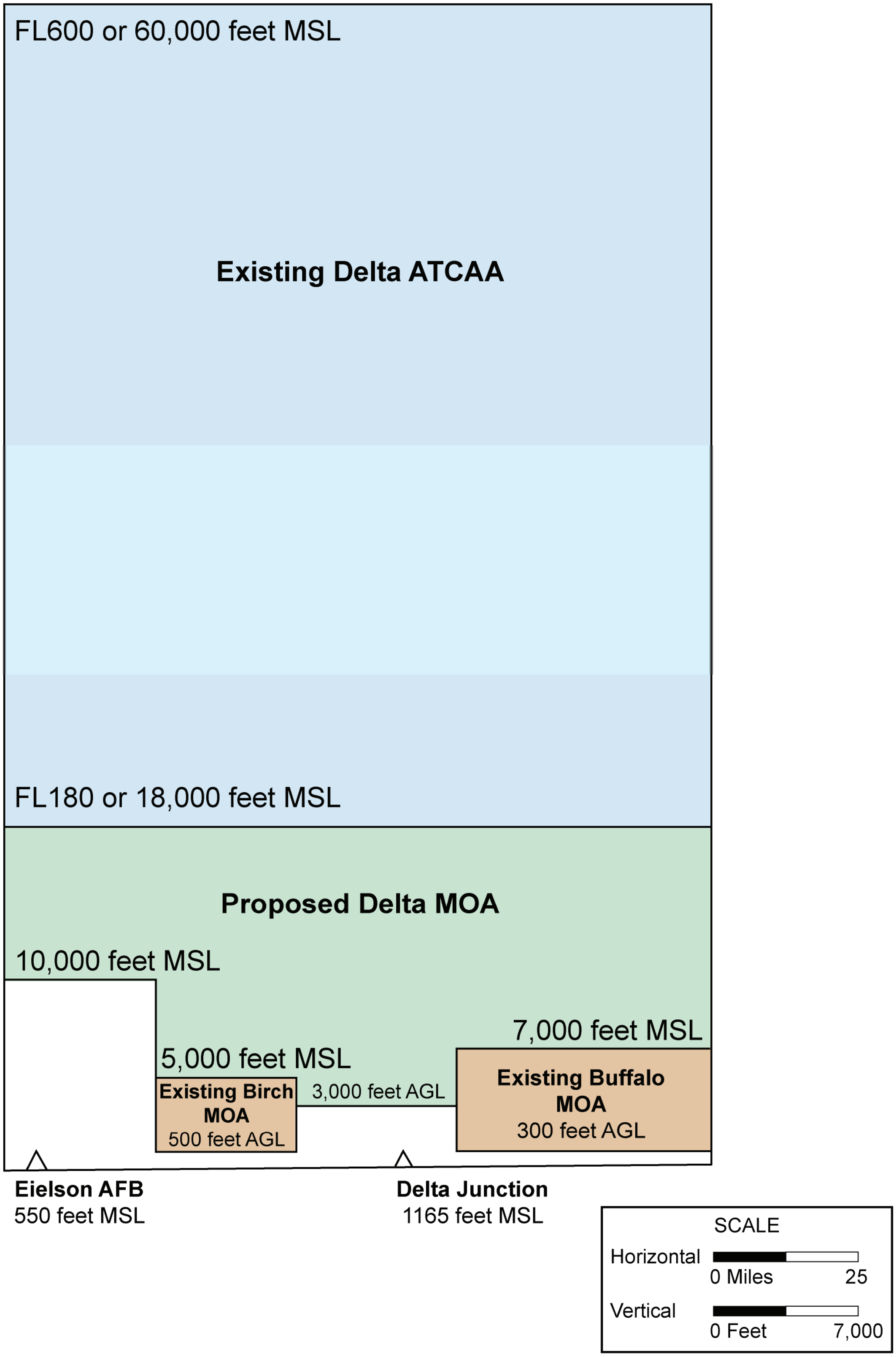


Figure 1.1-3. Cross Section of Proposed Delta MOA

Improved capabilities of next generation combat aircraft have extended distances for target acquisition and engagement. Realistic combat training with current technology requires distances to detect threats and space for multiple combat aircraft to maneuver for attack and defense in an MFE. The PARC is unique in the United States (U.S.) in that it provides such extensive overland airspace. No other overland area in the U.S. provides the extent of the PARC. A review of Figure 1.1-2, page 1-3, demonstrates that this airspace provides the following:

- The Yukon MOAs are ideally situated to permit attacking aircraft to assemble and attack targets on Ranges 2202, 2205, and 2211.
- The Fox and Eielson MOAs are ideally situated to permit defending aircraft (typically, Eielson Air Force Base [AFB]-based F-16 aggressors) to set up in defense of targets.
- The Fox and Eielson MOAs adjoin restricted airspace southwest of Delta Junction with target complexes for air-to-ground training.
- The MOAs and ranges contain sites for threat emitters which simulate ground-based threats of anti-aircraft artillery and surface-to-air missiles.

Aircrews can use either the Fox and Eielson MOAs or Yukon MOAs to train for unit level engagements without the proposed Delta MOA. Realistic MFE training are "graduate experiences" beyond unit engagements. MFEs need capabilities beyond those required for unit training. The Delta MOA would connect Alaskan military training airspace for full scale, realistic combat. Existing airspace limitations do not provide aircrews opportunities to train as they will fight. The proposed Delta MOA improvement substantially increases the ability to perform MFE diversified and realistic training.

Terms Used in This EA

Unit Level Training Mission: Consists of one or more aircraft to multi-ship flights within the training airspace. These training missions would not require use of the proposed Delta MOA.

Large Force Exercise (LFE): Describes a single flying period of 24-48 aircraft for local readiness exercises or extended stays of RF-A participants. These training exercises can be conducted without use of the proposed Delta MOA.

Major Flying Exercise (MFE): Consists of replicating all phases of actual combat over a multi-day exercise. MFEs may involve 75 fighters and/or helicopters plus 25 heavy aircraft such as B-1B bombers and DC-10 tankers. MFEs would propose to activate the proposed Delta MOA during two-week periods for a maximum of 60 days per year.

During 2007 and 2008, RF-A exercises were scheduled in a Delta Temporary MOA (Delta T-MOA) connecting the Fox, Eielson, and Yukon airspaces. This T-MOA permitted aircrews to train in the variety of missions required in current and projected future combat conditions. The experience with the Delta T-MOA demonstrated the training value of the connecting airspace. The appreciation of pilots for this airspace can best be summed up with the quote "How did you ever train for combat without the Delta T-MOA?" The experience with the Delta T-MOA also demonstrated that the proposed Delta MOA can be charted with specified operational scheduling for other users and established priorities to minimize the potential for disruption to commercial and general aviation. This proposal to chart the Delta MOA builds on the experience of the Delta T-MOA for use in RF-A and other MFE training.

Experience with the Delta T-MOA demonstrated that MFE benefits and training realism can be accomplished with minimum effect to civil aviation. Specific aspects incorporated into the Delta T-MOA which the USAF proposes to apply to a charted Delta MOA include:

- The Delta T-MOA was activated for a very specific, limited time to meet flight training periods only.
- Visual Flight Rule (VFR) corridors for civil aviation transit along highways in established flight corridors were always available below 3,500 feet above mean sea level (MSL) (4,000 feet MSL south of Delta Junction).
- The Special Use Airspace Information Service (SUAIS) provides substantially improved radar and radio coverage to help with deconfliction of military and civil aircraft.
- The T-MOA was demonstrated to be a dynamic airspace with no extension of published times and was returned to the Air Traffic Controller as soon as MFE engagements were completed or not needed.
- Priority was given to any medevac, fire fighting, or emergency flights that required access to the T-MOA. This included agreements for minimum delay if return medevac flights were needed.
- The T-MOA did result in a temporary delay in Instrument Flight Rule (IFR) traffic on the Delta corridor when such traffic sought to transit the T-MOA during the limited time it was active.
- The T-MOA did result in re-routing commercial traffic from a flight pattern below 18,000 MSL on the Delta corridor to between Flight Level (FL) 320 and FL350 through the Fox Air Traffic Control Assigned Airspace (ATCAA) south of 63 degrees (°).

1.2 BACKGROUND

Experience from the Vietnam War demonstrated conclusively that the first 10 combat missions are the most critical. During those missions, pilots hone their survival skills and learn to cope with the dynamics of combat. The decision was made at the highest Department of Defense (DoD) levels to recreate those first 10 "combat" missions in a structured training environment where multiple aircraft would "train as they fight" in an MFE. The realistic "10 combat missions" would dramatically improve survival skills in real combat.

The flanker color scheme F-16s fly as the opposing force during MFEs and use enemy tactics, techniques and procedures to give a realistic combat simulation. The existing MOA configuration does not permit realistic training during the critical period when the attacking aircraft are approaching range targets.

In 1975, the USAF instituted the Red Flag experience at Nellis AFB. USAF specially trained aggressor squadrons and ground-based threats created a realistic two-week combat experience so that air and ground crews could be tested by nearly all aspects of real combat. Red Flag exercises have successfully graduated experienced pilots who have met the rigors and requirements of combat.

Changes in aircraft capabilities and recent conflicts have changed training requirements. New aircraft capabilities can identify targets at distances in excess of 100 miles. New low-observability and electronic warfare systems, new missions, and new munitions have placed increasing requirements on the multiple roles of current and future weapon systems. New conflict situations have increased the role of pilots in communication, threat evaluation, close support of ground forces, and precision munitions deployment while avoiding collateral damage. Reactions to unanticipated threats and training to cope with expanded targets of opportunity are needed. In addition to all of these new and expanding roles, pilots must be fully trained to meet increasingly sophisticated air-to-air and surface-to-air threats.

In 1992, Cope Thunder Exercise moved from the Philippines to the PARC. In 2006, the Cope Thunder Exercise was renamed Red Flag Alaska. The USAF has been conducting MFEs in PARC since 1992. A change occurred in 2006 when RF-A was identified as "the military's premier training opportunity" by General Mosely, the USAF Chief of Staff. With the Delta MOA, the PARC would have the contiguous extent of airspace needed to realistically train with improved aircraft capabilities, offers an over land training area which realistically represents current and potential military engagement areas, contains ground-based threats and threat sites to simulate surface-to-air threats, contains target locations which can be used for air-to-surface attacks, and has an aggressor squadron based at Eielson AFB to create near-real combat mission experience. The realistic "10 combat missions" provided by MFE exercises has dramatically improved survival skills as demonstrated by extremely successful campaigns in the last 30 years with minimal combat losses.

1.3 CURRENT TRAINING REQUIREMENTS

The primary MFE area depicted in Figure 1.1-2, page 1-3, includes restricted areas over ranges, the Fox and Eielson MOA complex, the Yukon MOA complex, and overlying ATCAAs which provide for high altitude training. Military Training Routes (MTRs) provide access and traverse the PARC.

The Yukon, Fox, and Eielson MOAs are connected only at ATCAA levels above the Delta area and through the low-level Birch and Buffalo MOA corridors (see Figures 1.1-2, page 1-3, and 1.1-3, page 1-4). At one time, these connections met training needs, but they do not provide for realistic MFE training with current weapon systems.

The abrupt and segmented changes in altitude associated with the current MOA structure introduce pilot concerns about the boundary of the airspace and artificially constrain realistic threat-avoidance and attack run-in training at exactly the time pilots should be focused on combat conditions. The current airspace configuration requires pilots to train using non-optimal tactics in restricted training regimens. This continually reinforces negative habit patterns which can affect pilot survivability in combat. Current MFE training requirements cannot be achieved at the combat mission level with the unconnected airspace.

During MFEs, KC-135R tanker aircraft provide refueling for participating aircraft. Tanker aircraft operate at refueling altitudes, pictured as ovals in Figures 1.3-1 through 1.3-4, outside the main combat area and outside the proposed Delta MOA.

An example of an MFE engagement best depicts the importance of the Delta MOA to realistic MFE training. Figures 1.3-1, page 1-8, through 1.3-5, page 1-10, are representative fight examples for an MFE.

- Figure 1.3-1, page 1-8: Refueling aircraft are established and Airborne Warning and Control System (AWACS) aircraft provide communication and radar coverage for the attack to MFE. Blue aircraft marshall for attack on red threats (depicted as green triangles). Red aircraft marshall across the Delta MOA for defense of their assets. Fight on!

- Figure 1.3-2, page 1-9: Engagement of blue and red aircraft with simulated air-to-air combat. Red aircraft forced back across Delta corridor.
- Figure 1.3-3, page 1-9: Blue attacks across Delta corridor for air-to-ground suppression of enemy air defenses and continued air-to-air engagements. "Destroyed" aircraft (white silhouettes) return to base to be "regenerated."
- Figure 1.3-4, page 1-10: Blue fights across Delta MOA to destroy enemy air defenses and enemy targets under continued air-to-air engagements. Blue aircraft face air and ground threats as they seek to complete mission requirements. Upon successful completion, blue aircraft return to refuel and assess battle success while planning the next engagement.
- Figure 1.3-5, page 1-10: Blue aircraft traverse the Delta corridor to perform convoy, target of opportunity, and other missions.

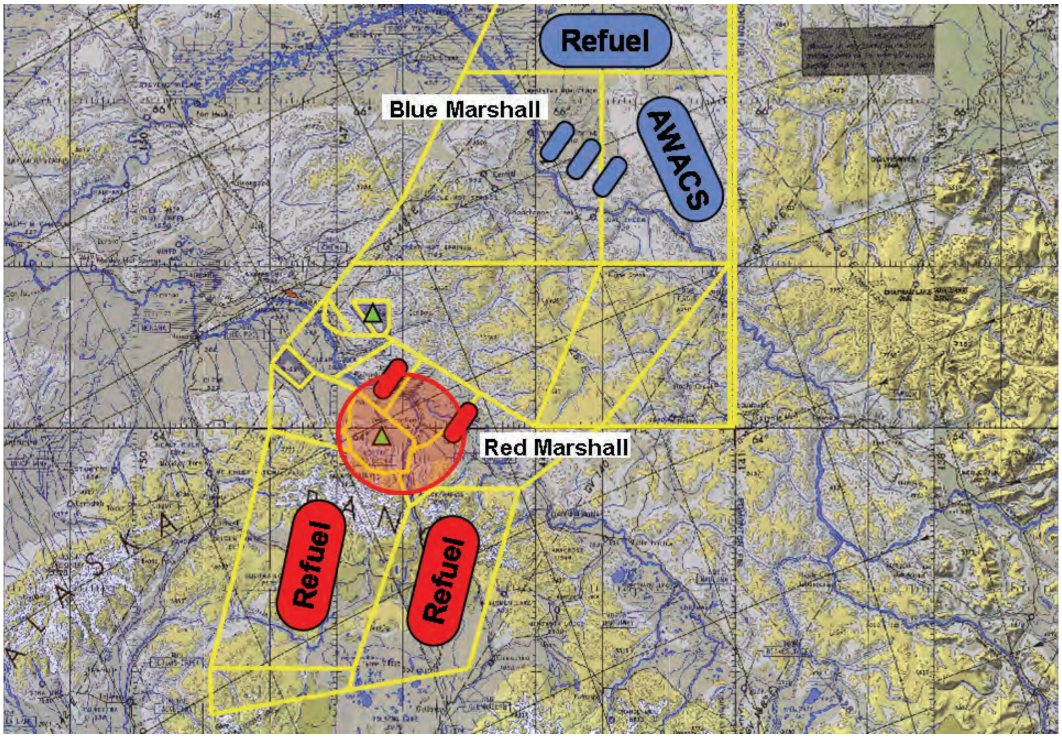


FIGURE 1.3-1. BLUE AIRCRAFT MARSHAL FOR ATTACK ON RED AIRFIELDS AND HIGH VALUE ASSETS

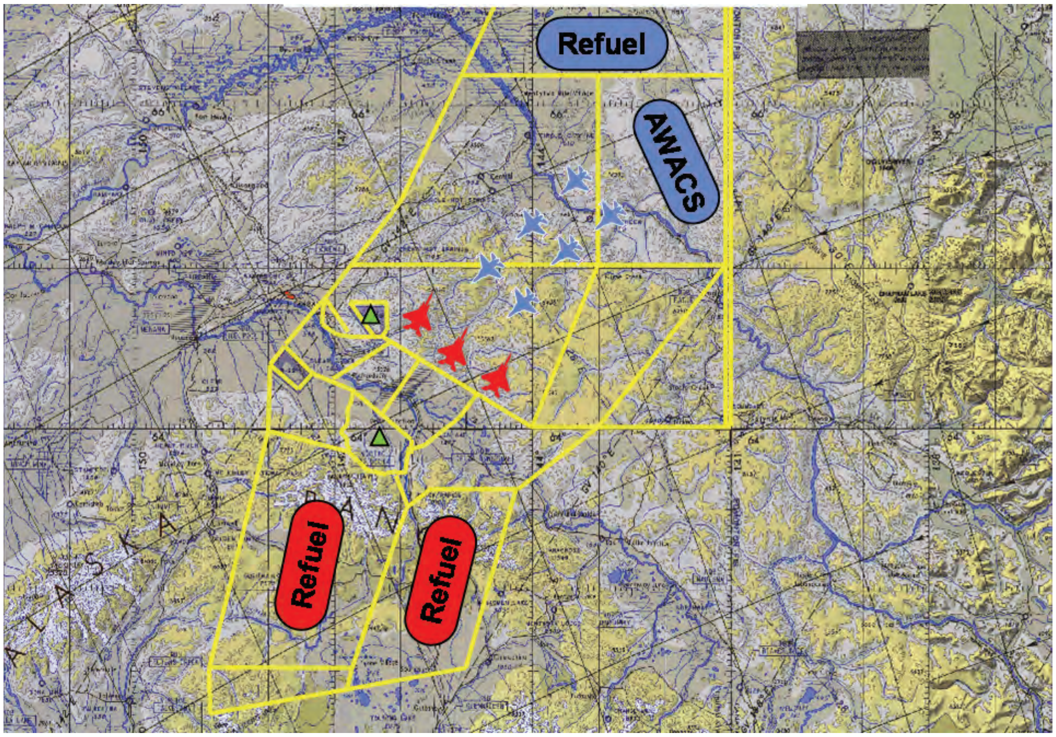


FIGURE 1.3-2. RED AIRCRAFT MOVE ACROSS THE DELTA MOA TO FIGHT BLUE ATTACKING AIRCRAFT IN THE YUKON MOAS

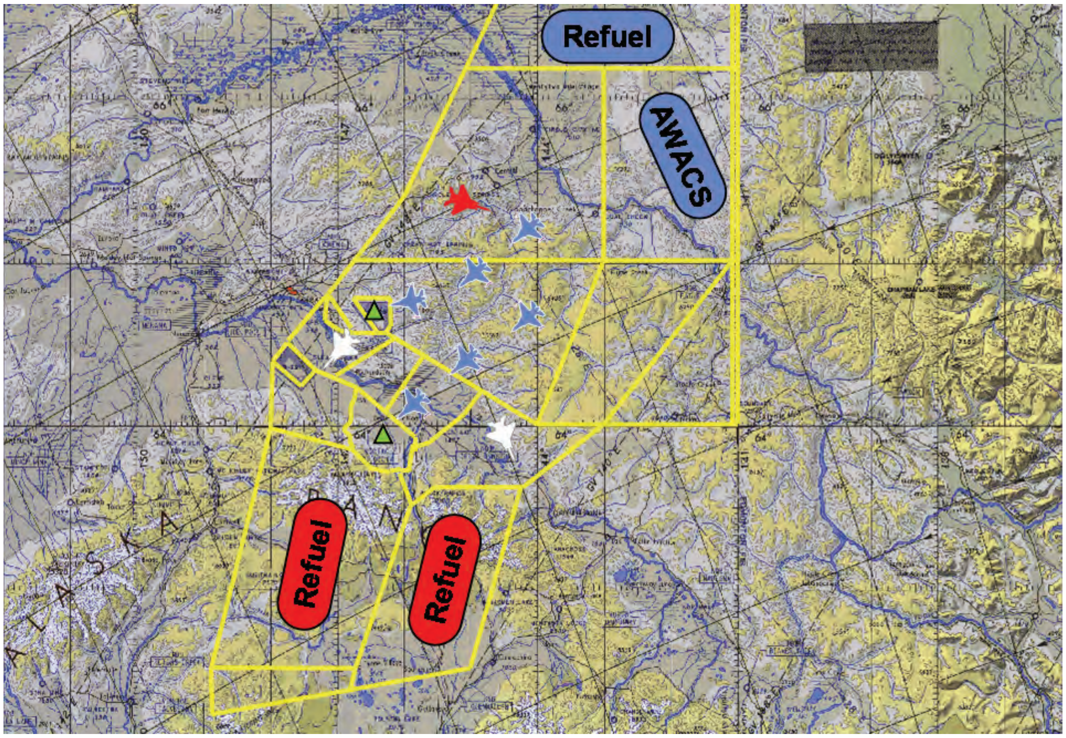


FIGURE 1.3-3. RED AIRCRAFT FORCED BACK ACROSS THE DELTA MOA AND ARE DESTROYED; AIRCRAFT ARE REGENERATED AT BASE. BLUE AIRCRAFT TRANSIT THE DELTA MOA TO ATTACK HIGH VALUE TARGETS

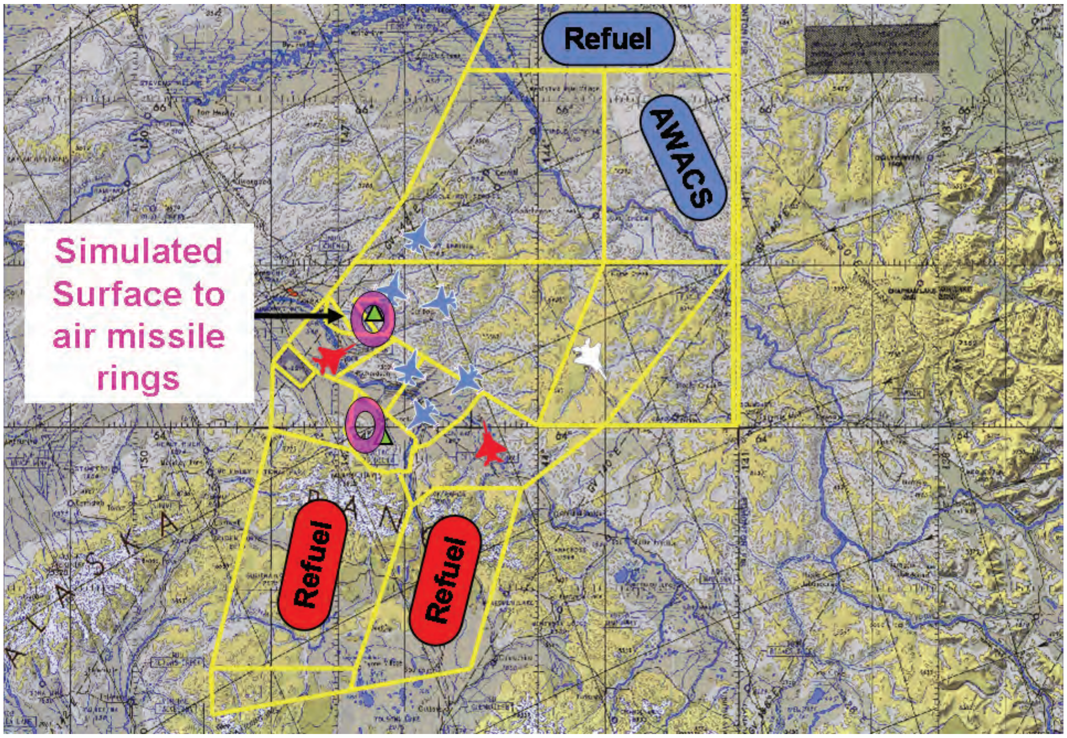


FIGURE 1.3-4. BLUE AIRCRAFT MANEUVER TO AVOID AND SUPPRESS SIMULATED SURFACE-TO-AIR AND AIR-TO-AIR ATTACKS. BLUE AIRCRAFT REFORM TO ASSESS ATTACK RESULTS AND PLAN NEW ATTACKS

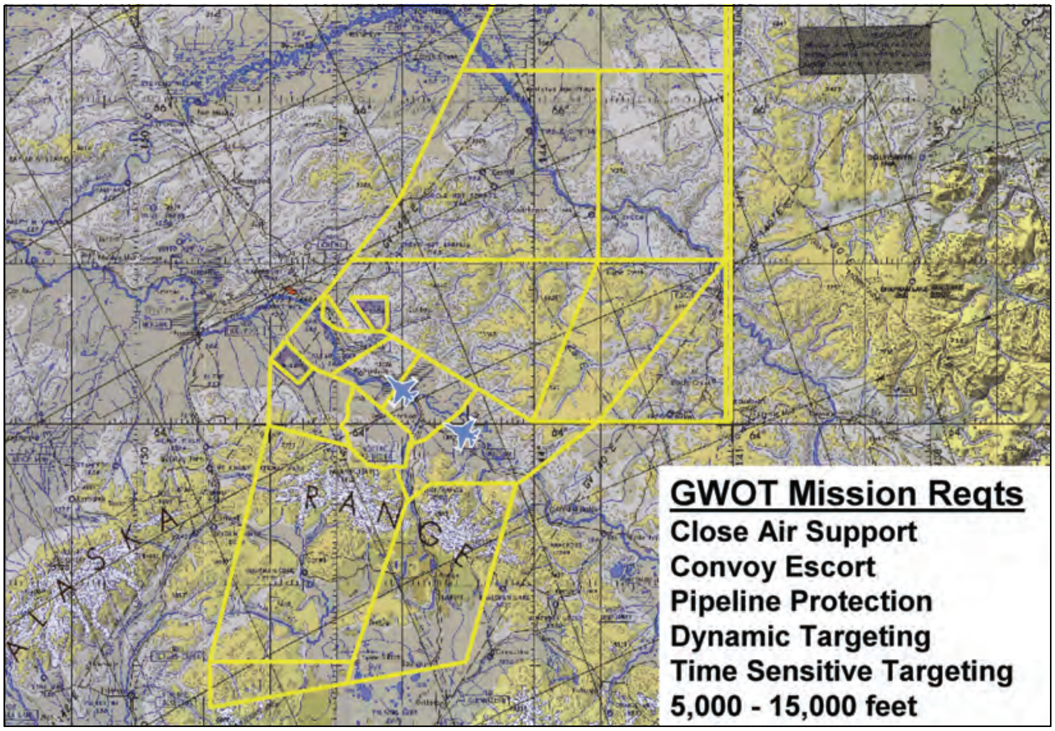


FIGURE 1.3-5. BLUE AIRCRAFT USE DELTA CORRIDOR TO TRAIN FOR MULTIPLE NEW MISSION REQUIREMENTS

Current altitude restrictions below the Delta ATCAA hamper the military's ability to provide realistic training during MFEs. The U.S. military is committed to sharing the Alaskan airspace in order to provide realistic combat training for U.S. forces and minimize disruption to commercial and general aviation.

1.4 SUMMARY OF OPERATIONAL REQUIREMENTS

An Aggressor F-16 with arctic color scheme lands at Eielson AFB. The proposed Delta MOA complex would permit multiple realistic MFE training opportunities for aircrews.

The Delta MOA would be used for MFEs and would achieve a series of beneficial training results. The Delta MOA would:

- Provide functional connection between R-2202, R-2205, R-2211, and the Yukon Complex, and allow for continuous realistic fight scenario across the Yukon, Fox, and Eielson MOA complexes.
- Increase the number of approach options to threats and targets (both air-to-air and air-to-ground).
- Provide for aggressors to recycle more efficiently during MFEs. Aggressors retreat and "regenerate" after being "killed" to increase the number of aggressors. Aggressors need to refuel in air refueling tracks in the Fox and other ATCAAs.
- Expand training with weapons systems/capabilities such as F/A-18, F-22A, F-35, A-10C, Advanced Targeting Pods, Joint Direct Attack Munition (JDAM), Joint Standoff Weapon (JSOW), Joint Air-to-Surface Standoff Missile (JASSM), and other long range standoff weapons. Many of the air-to-surface training events are simulated.
- Enhance training for specific missions such as Air-to-Air, Strike Missions, CAS, Dynamic Targeting, Suppression of Enemy Air Defenses, Pipeline Protection, Convoy Escort, C-17, C-130, V-22, and other aircraft, airlift and tactical airdrops, Combat Search and Rescue, and Target of Opportunity.
- Create a realistic training setting with more realistic boundaries, air-to-air and air-to-ground at realistic standoff distances, and multi-aircraft training formation throughout the duration of an exercise.

1.5 LEAD AND COOPERATING AGENCIES

The USAF is the proponent for the Delta MOA proposal and is the lead agency for the preparation of the EA. The Federal Aviation Administration (FAA) is a cooperating agency. As defined in 40 Code of Federal Regulations (CFR) §1508.5, a cooperating agency…

> means any Federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment.

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. As the agency with jurisdiction by law and special expertise with respect to those portions of the proposal regarding establishment of new Delta MOA airspace, the FAA is participating in this EA as a cooperating agency. As a cooperating agency, FAA participated in the preparation of the EA.

No charted airspace decision has been made or will be made prior to complete environmental review. The Delta T-MOA has been applied for, and approved, to support MFEs in 2007 and 2008 and is proposed for 2009. After receipt of the public and agency comments on the proposed charted Delta MOA, the USAF has prepared this EA. The USAF's decision on the Delta MOA proposal is proposed to be documented in a USAF Finding of No Significant Impact (FONSI). The USAF will submit a final airspace proposal to FAA requesting action on the airspace modifications and establishment of new airspace as recorded in the EA and FONSI. Figure 1.5-1, page 1-13, depicts the FAA Non-Regulatory Special Use Airspace Standard Process. According to FAA environmental policies and procedures (Order 1050.1E Change 1) and in accordance with 40 CFR 1506.3, the Delta MOA EA can be adopted in whole or in part, as an official environmental analysis supporting the airspace proposal. Upon acceptance, the FAA would issue its own determination and provide notification to the United States Environmental Protection Agency (USEPA) of the adoption.

1.6 ORGANIZATION OF THIS EA

This EA is organized into the following chapters: Chapter 1.0 describes MFE training and the purpose and need of the proposal to provide military training airspace that adequately connects the Fox, Eielson, and Yukon MOA complexes for a specified number of MFE training days. Detailed descriptions of the Proposed Action and alternatives, the No-Action Alternative, and proposed USAF actions to reduce any potential for environmental consequences are in Chapter 2.0. Chapter 2.0 also discusses alternatives considered but not carried forward for further analysis. Finally, Chapter 2.0 provides a comparative summary of the effects of the alternatives with respect to the various environmental resources.

Chapter 3.0 describes the existing conditions of environmental resources that could be affected by the Proposed Action or an alternative. Chapter 4.0 addresses the environmental consequences to those resources that could result from implementing the Proposed Action or an alternative. Chapter 5.0 addresses the cumulative effects of recent past, present, and reasonably foreseeable actions that may be implemented in the region of influence (ROI). Chapter 5.0 also presents the relationship between short-term uses and long-term productivity identified for the resources affected, and any irreversible and irretrievable commitment of resources if the Proposed Action or an alternative were selected. Chapter 6.0 contains references cited in the EA and lists the individuals and organizations contacted during the preparation of the EA. A list of the document preparers is included in Chapter 7.0.

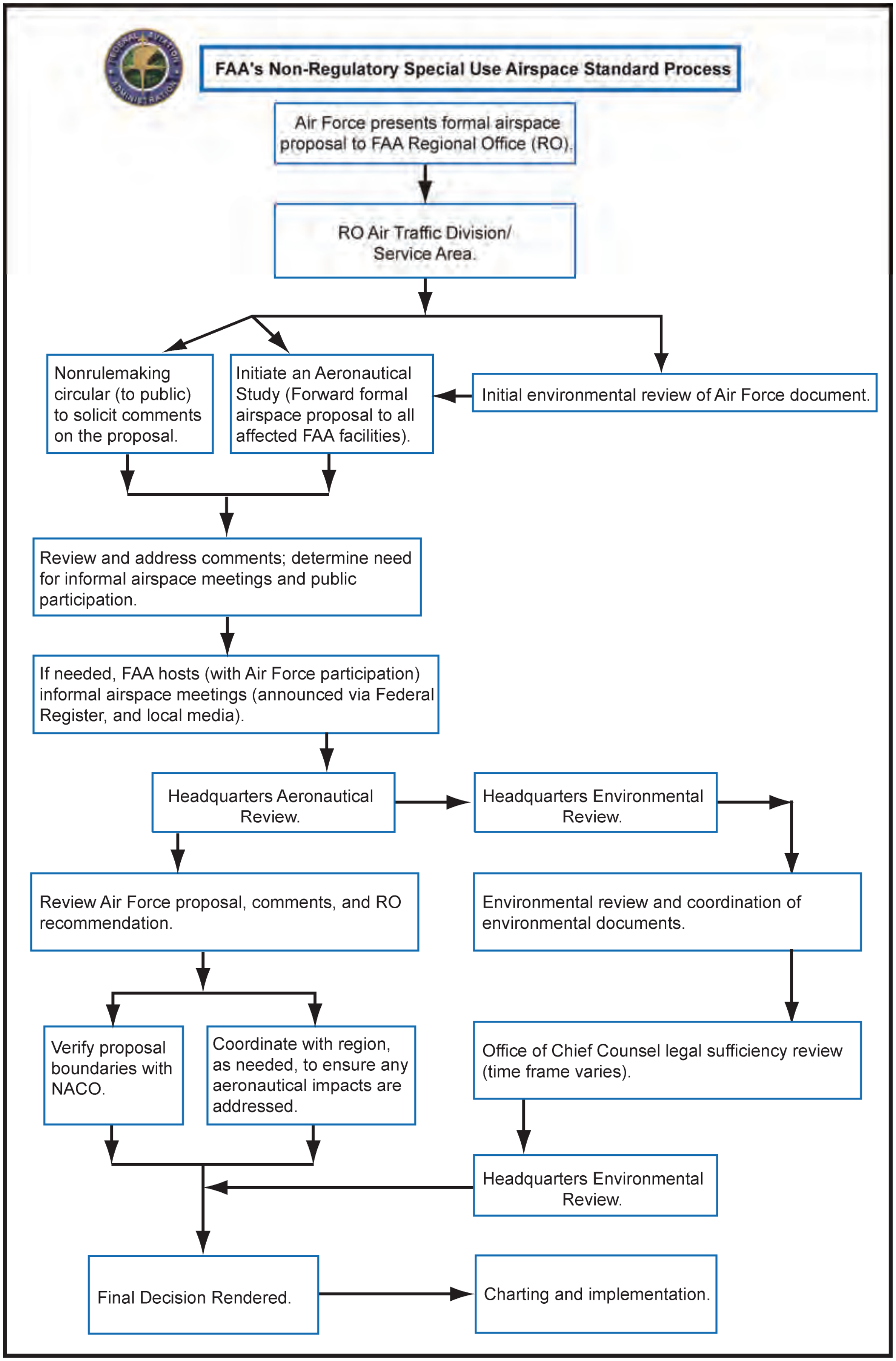


FIGURE 1.5-1. FAA'S NON-REGULATORY SPECIAL USE AIRSPACE STANDARD PROCESS

Delta MOA EA

In addition to the main text, the following appendices are included: Appendix A, Alaska Military Operations Areas Special Use Airspace Information Service Pamphlet; Appendix B, Characteristics of Chaff; Appendix C, Characteristics and Analysis of Flares; Appendix D, Public Involvement and Agency Correspondence; Appendix E, Relevant Statutes, Regulations, and Guidelines; Appendix F, Airspace Management; Appendix G, Aircraft Noise Analysis and Airspace Operations; Appendix H, Review of Effects of Aircraft Noise, Chaff, and Flares on Biological Resources; and Appendix I, Mid-Air Collision Avoidance Pamphlet.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and the No-Action Alternative. The Proposed Action is designed to provide more realistic training during Major Flying Exercises (MFEs) by the 11th Air Force (11 AF). The proposal is to create a Delta Military Operations Area (MOA) beneath the confines of the present Delta Air Traffic Control Assigned Airspace (ATCAA) and schedule use of the Delta MOA for two-week exercises not to exceed 60 days per year. The proposed Delta MOA would support joint and combined military forces training, including the Joint Chiefs of Staff (JCS) Northern Edge (NE) Exercises and the USAF's Red Flag-Alaska (RF-A) Exercises. This Environmental Assessment (EA) assesses the environmental consequences of the proposed charting of the Delta MOA and the No-Action Alternative.

This EA has the benefit of a Delta Temporary MOA (Delta T-MOA) being used for MFE training during different times in 2007 and 2008. Section 2.4 summarizes the proposed charting of the Delta MOA Complex and provides an overview of comments received on the Delta T-MOA. Section 2.4 also presents USAF actions taken to reduce the potential for environmental impacts during use of the Delta T-MOA. These actions to reduce the potential for impacts are proposed to be applied to a Federal Aviation Administration (FAA)-charted Delta MOA.

2.1 INTRODUCTION

The proposed Delta MOA would permit realistic MFEs to train aircrews as they fight in two week scheduled exercises. During MFEs, there would be two 1.5 to 2.5 hour flight periods per day, not to exceed 60 days per year.

MFE is a structured exercise designed to replicate combat missions as described in Section 1.3. The MFE is typically organized around the requirement for interdiction combat missions.

The typical interdiction combat mission follows a general profile which is tailored to the objective and includes tactics to pursue that objective. The general profile includes the following events: 1) transit to the combat area, 2) enter combat area and assemble along with the force package, 3) ingress to target and strike with appropriate weapons, 4) egress target area and rejoin force package, and 5) exit combat area and return to base. Missions can also include tactical airdrops in support of ground operations. Airdrops may be accomplished by platforms other than C-130 and C-17. Enemy ground and air forces defend high-value targets on the ranges.

Section 1.3 depicted typical mission activities during an MFE. In this example, "blue" or friendly aircraft set up in the Yukon MOAs for an attack on range targets. Blue aircraft maneuver to avoid threats and conduct suppression of enemy air and ground targets. Maneuvering can include bursts of supersonic speeds and deployment of defensive chaff and flares to avoid threats. Enemy as "red" aircraft defend the high-value targets. Attack aircraft transit the proposed Delta MOA at different locations and various altitudes to attack high-value targets on the ranges. The attackers re-form following the attack. Enemy and friendly aircraft "destroyed" during the engagement retreat to their respective borders to refuel and re-form to re-enter as "new" fighters.

Altitude restrictions between the Fox, Eielson, and Yukon MOAs, beneath the Delta ATCAA, create discontinuous low altitude airspace (refer to Figure 1.1-3, page 1-4). These altitude restrictions hamper training and impair the military's ability to conduct realistic north/south training during MFEs. Aircraft must leave training altitudes, fly up through either the Delta ATCAA or be funneled through the low-ceiling Birch or Buffalo MOAs and then resume training altitudes in the adjoining ranges and MOAs just as they approach targets. Tactical airdrops, support for special operations on range tactical drop zones (DZs), and target of opportunity are all required for current MFE training. The airspace is not conducive to practical and realistic military training for today's and tomorrow's conflicts.

F-16 aircraft participate in MFEs as both aggressors and as aircraft from throughout the Air Force and other nations. Each MFE is designed to train aircrews for combat situations, often with emphasis on interdiction missions.

Missions have changed or expanded, especially in the past decade. Realistic, integrated training in MFEs ensures that aircrews possess the skills and readiness for combat that: 1) mirror combat events, 2) link a realistic sequence of training activities into a cohesive mission, and 3) hone aircrew teamwork. Each training mission requires realistic, linked, and sequenced activities that equate to combat events. A review of any newspaper today describes the new or expanded missions for which the USAF must train. These missions are typically conducted at altitudes from 8,000 to 20,000 feet above mean sea level (MSL) and include:

- **Close Air Support (CAS).** CAS requires aircraft to coordinate closely with ground troops. With the fast pace and changing positions in these generally small battles, precise, real-time coordination protects against inaccurate targeting and collateral damage. Training involves target identification and precise deployment of munitions on a range.
- **Convoy Escort.** In a traditional convoy escort mission, the aircraft proceeds to observe the area through which a convoy is traveling. The convoy escort may identify and attack a threat in advance of a convoy or provide CAS to defend a convoy under enemy attack. Vehicles on a highway under the Delta MOA could be pickup trucks, vans, High Mobility Multipurpose Wheeled Vehicles (HMMWVs), or flat trailers to simulate a convoy.
- **Pipeline Protection.** Pipeline protection is similar to convoy escort without a moving convoy. The aircrew observes the pipeline, identifies potential threats, and may take action independently or in conjunction with other ground or air assets observing the threat. As with CAS and convoy support, close coordination and communication is required in training and actual combat.
- **Dynamic Targeting.** Normal interdiction has a briefed aircrew depart the operating base and proceed to the predefined combat area point. For dynamic targeting, the aircrew on its assigned mission may be reassigned to address a new high-value target. The aircrew must rapidly change plans, calculate routes to targets, face enemy defenses, and address the new targets.
- **Time Sensitive Targeting.** For time sensitive targeting, an aircraft flies a predetermined alert orbit awaiting target information and attack authorization from command. Many sources may provide target identification and location data to the aircrew. Once authorized, the aircrew delivers ordnance on command-identified coordinates.

- **High-Altitude Resupply Missions.** C-130s, C-17s, V-22s routinely drop supplies to ground forces from high altitudes (12,000 feet to 20,000 feet). These missions successfully resupply troops in remote range DZ locations without exposing the aircraft and crew to low altitude threats.

Any and all of these missions must be executed in combat, and training during MFEs must occur for all. The Delta MOA would permit diverse training to recognize and defeat real-world threats in realistic combat conditions.

The Delta MOA would permit CAS from any heading for "friendly" troops. The Delta MOA would permit convoy escort training during an MFE along the Alaska-Canadian (ALCAN) Highway as aircraft scan the route for potential "threats." The Delta MOA would support Pipeline protection missions where pipelines are readily accessible to "threats," such as at highway crossings. The Delta MOA would support dynamic targeting as aircraft from the north or south could be directed to a "changing" target on a nearby range. The Delta MOA would support time sensitive targets as aircrews identified or were vectored (directed) to a range target where time sensitivity (ongoing "terrorist") activity was occurring. The Delta MOA would also allow airlift aircraft to practice high altitude airdrops on tactical DZs. For example, R-2211 overlies the only USAF air-to-ground range in Alaska. It contains strafe targets, a bomb drop target, and an accuracy range to train the pilots where the bomb or bullet goes after it leaves the aircraft.

The Proposed Action would relax current airspace limitations and associated procedures for MFEs that prohibit optimal military aircraft training and employment. The Delta MOA would permit all angle realistic surface attacks, threat reaction tactics, and air-to-air combat maneuvering at realistic scales, and joint air-ground operations near bombing ranges R-2202, R-2205, and R-2211. During MFEs with the existing airspace configuration, aircrews are often required to prioritize attention to airspace vertical borders rather than training for tactically sound flying techniques. The use of Birch and Buffalo MOAs during a north/south scenario is no longer a practical alternative because it forces aircraft into unrealistically low altitudes and funnels large numbers of aircraft through relatively small airspace blocks. The proposed Delta MOA would distribute aircraft realistically throughout the airspace as aircrews face realistic challenges from advanced aircraft and surface-to-air weapons systems. The Proposed Action would permit the 11 AF to perform MFE training for new aircraft, weapons systems, and tactics.

2.2 ELEMENTS OF PROPOSED ACTION

The Proposed Action has the following basic elements to establish the required north/south training environment under the demands of current aircraft, weapon systems, and exercises while accommodating civilian and commercial aviation:

- Create new airspace to meet training requirements for MFEs, including RF-A and NE.
- Change airspace use to meet training requirements for a maximum of 60 days per year in two-week exercises with weekends not scheduled.
- Delta MOA schedule would be activated for 1.5 hours to a maximum of 2.5 hours twice a day with at least 3 hours between the two daily exercises.
- Typical MFE exercise schedule consists of one exercise in the April-May time period, two exercises in the June-August time period, and one exercise in October, with year-to-year variations.

- There would be no exercises in January, February, 27 June to 11 July, or September.
- Defensive chaff and flare use, which currently occurs in the Delta ATCAA, would be extended to the charted Delta MOA Complex.
- MFE training in the proposed airspace would be scheduled at least 30 days prior with accurate times to minimize disruption to civil aviation.

2.2.1 CREATION OF NEW AIRSPACE

The creation of the Delta MOA Complex would enhance existing training opportunities by charting a new special use airspace (SUA). The proposed Delta MOA would have a ceiling extending to the floor of the existing Delta ATCAA up to, but not including, Flight Level (FL) 180. Figure 2.2-1, page 2-5, depicts the top down view of the proposed Delta MOA airspace outlined in yellow and the Visual Flight Rule (VFR) corridors in red. The Delta MOA would have four segments:

- The western most section, nearest Eielson Air Force Base (AFB) and west of the Birch MOA, would have a floor at 10,000 feet MSL so as to not interfere with the instrument approach into Fairbanks International Airport and Eielson AFB.
- The section overlying the Birch MOA would extend from the top of the Birch MOA with a floor at, but not including, 5,000 feet MSL.
- The section between the Birch and Buffalo MOAs would be from 3,000 feet above ground level (AGL) to the Delta ATCAA.
- The most easterly section overlying the Buffalo MOA would extend from, and including, 7,000 feet MSL upward.

Figure 2.2-1, page 2-5, includes the existing VFR corridors through the Buffalo and Birch MOAs. These corridors, combined with the proposed 3,000 foot AGL floor of the Delta MOA between the Buffalo and Birch MOAs, means that VFR traffic could traverse the Delta corridor at an altitude below 2,500 to 3,000 feet AGL during the MFEs.

Currently, commercial traffic traversing the Delta MOA during an MFE must descend to altitudes below the 18,000 foot MSL floor of the Delta ATCAA. Currently, during an MFE, high altitude traffic descends to 16,000 or 17,000 feet MSL prior to entering the Delta corridor and flies through the Delta corridor at that altitude prior to descending to Fairbanks. High altitude aircraft departing Fairbanks during an MFE are currently required to stay below 18,000 feet until beyond the Delta ATCAA.

Under the proposed Delta MOA, when an MFE was active, commercial and other high-altitude traffic would remain at altitude FL320 to FL350 south of N 63 degrees (°) through the Fox 3 ATCAA and descend into Fairbanks on the west side of the Fox MOAs. The number of commercial or other high altitude flights potentially affected is based upon airline schedules and seasonal variations. Typically one to six commercial airlines could be using the airspace on any given day and, depending upon the schedule, none to three or four could require deconfliction during an MFE. For the purpose of this analysis, one to two commercial aircraft are assumed unable to deconflict during a Delta MOA activation period.

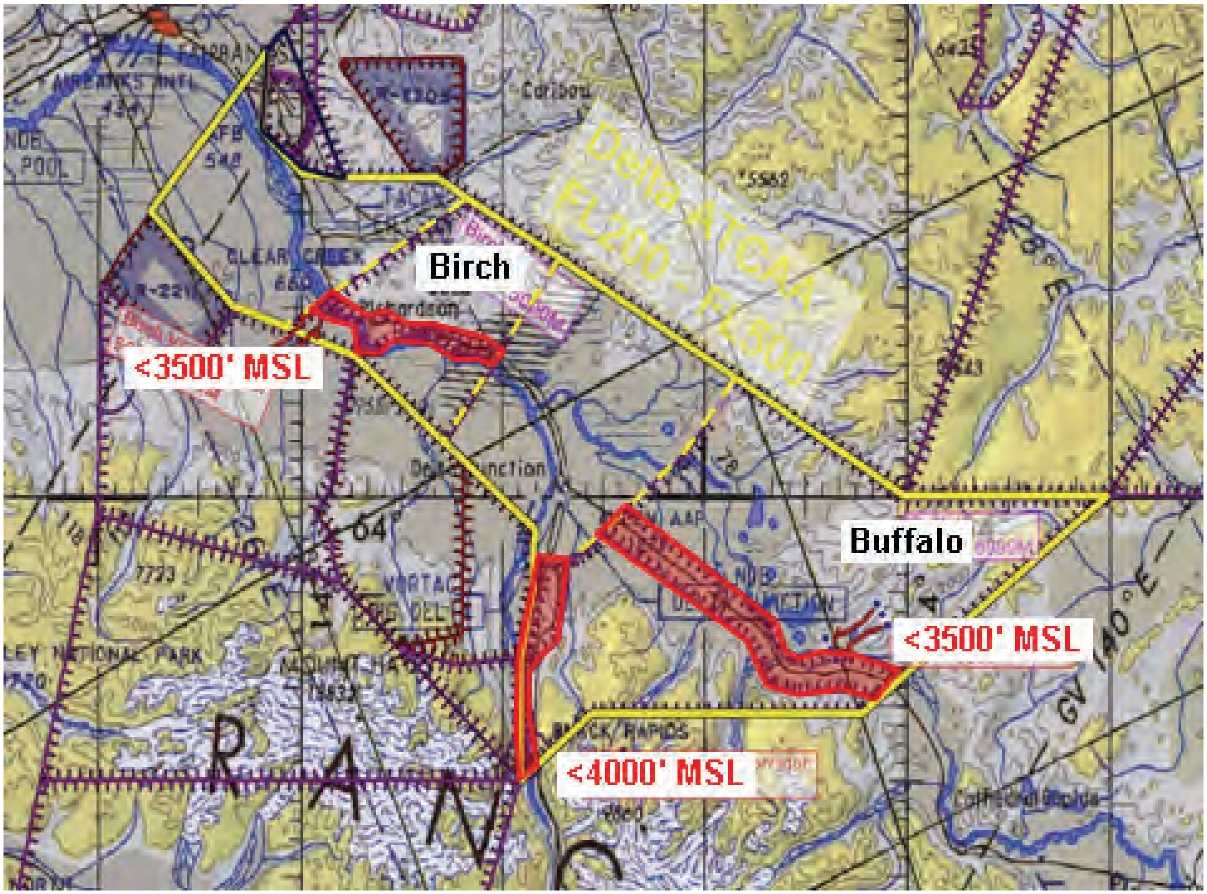


FIGURE 2.2-1. DELTA CORRIDOR INCLUDING VFR CORRIDORS

2.2.2 CHANGES IN AIRSPACE USE

Under Title 49, United States Code (USC) and Public Law (P.L.) 103-272, the United States (U.S.) government has sovereignty over the nation's airspace from the surface to above FL600. The FAA plans, manages, and controls the structure and use of this airspace to make it as useful as possible for all types of aircraft. The USAF, in working with the FAA, recognized that proposed training airspace should limit or reduce the potential for conflicts with the structure and use of the airspace system by civil aviation. Avoidance of conflicts with airports, jet routes, federal airways, and other airspace units represents a priority for the 11 AF/Alaska Command.

The Alaska Pipeline, here crossing the Tanana River, would offer good training for Air Force pipeline protection missions.

The Delta MOA Complex would create a functional "bridge" between Eielson and Fox 2 MOAs to the south and Yukon 1 and 3 MOAs to the north. The virtual wall that currently exists above and between the Birch and Buffalo MOAs limits realistic training opportunities during air-to-air engagements, north/south transits, ground operations support, and ground target ingress and egress.

The 11 AF/Alaska Command would schedule and activate the proposed Delta MOA Complex during MFEs, including RF-A, NE, and other exercises. No modification of the 1997 MOA

Environmental Impact Statement (EIS) Record of Decision's (ROD's) restrictions of 60 MFE days per year would occur under the Proposed Action. Implemented restrictions and mitigations from the MOA EIS ROD will continue to be in place and considered for planning purposes. The 11 AF/Alaska Command will continue to provide appropriate notification through the public affairs channels to the regional local native tribes and the public. MFE schedules would be provided and the airspace would be activated for two 1.5 to a maximum of 2.5 hour blocks daily so that others may also use the airspace.

The USAF will dynamically manage the proposed Delta complex to provide return of the airspace to Air Traffic Control (ATC) as soon as possible. In practice, the USAF would typically be active in the airspace in 1.5 hour blocks twice per weekday during an MFE. The USAF would schedule up to a maximum of 2.5 hour blocks to allow for aircraft launch, marshalling, or other potential short delays. As soon as the USAF exercise was completed for the time block, the airspace would be available for Instrument Flight Rule (IFR) traffic. The airspace would always be available to VFR traffic below 3,000 feet AGL.

The USAF will continue to use the Special Use Airspace Information System (SUAIS) to provide the most recent information available to civil aviation operating in Alaskan airspace (see Appendix A). The MFE schedules will be published a minimum of 30 days in advance to provide for advanced planning. During scoping, several commentors expressed concern with the timeliness of data available on the Notice to Airmen (NOTAM) system. The USAF will take every reasonable step possible to ensure communication to general aviation. This includes publishing MFE schedules a minimum of 30 days in advance on the Eielson AFB and Elmendorf AFB websites and distribution of information through the SUAIS.

Next generation high performance F-22 aircraft, pictured here at Eielson AFB, participate in MFE training. There would be no supersonic flights within the Delta MOA and supersonic flights would continue to be limited to above 30,000 feet MSL.

The proposed Delta MOA will adhere to the Delta T-MOA Memo of Understanding, which addresses medevac, emergency, and forest fire support aircraft. In situations where these aircraft are unable to travel VFR, the USAF will put a floor on the Delta T-MOA to allow emergency IFR traffic through this airspace. This floor would be proposed at 10,000 feet allowing IFR traffic at 8,000 and 9,000, and the floor can be adjusted dynamically with real time communication between Anchorage Center and the Eielson Range Control. This concept is a continuation of Anchorage Center and Eielson Range Control agreements for the Delta T-MOA with medevac, emergency, and forest fire support aircraft in the current MOAs on a 24/7 basis.

As depicted in Section 1.3, representative MFEs result in a north/south battle between Yukon airspace with R-2205 and R-2211, and the Eielson and Fox MOAs with R-2202. Airspace usage of the proposed Delta MOA would be comparable to the usage of the Yukon or Fox MOA complexes during an MFE. The exception would be that some heavy aircraft such as KC-10s, KC-135s, and E-3s would stand off at the periphery of the combat zone and would not likely be present in the proposed Delta MOA during an MFE. Aircraft types that could be expected to participate in an MFE are presented in Table 2.2-1, page 2-7.

TABLE 2.2-1. REPRESENTATIVE MFE USE OF THE PROPOSED DELTA MOA

		PERCENT OF TIME AT TYPICAL ALTITUDE WITHIN DELTA MOA COMPLEX[1]				
Aircraft Type	*Transiting the Delta MOA*	*<-1,000 feet AGL*	*1,000-5,000 feet AGL*	*5,000-10,000 feet AGL*	*10,000 feet AGL - FL180*	*Above FL180*
A-10	Y	33	33	24	10	0
F-15C	Y	0	5	10	25	60
F-15E	Y	5	10	10	25	50
F-16	Y	4	5	5	26	60
F-18	Y	5	5	12	28	50
F-22A	Y	0	0	5	5	90
F-35	Y	4	5	5	26	60
Helicopters	Y	20	55	25	-	-
V-22	Y	10	20	30	40	-
Foreign Fighters	Y	5	5	12	28	50
EA-6B	N	0	0	0	20	80
B-1	Y	2	10	3	20	65
B-2	N	0	0	0	3	97
B-52	O	0	2	3	5	90
C-130	Y	28	30	22	20	-
C-17	Y	10	25	30	23	12
KC-135	N	-	-	-	20	80
KC-10	N	-	-	-	-	100
E-3	N	-	-	-	-	100
E-2	N	-	-	-	-	100
Foreign Heavies	O	5	20	25	25	25

Note: 1. Below 3,000 feet AGL would only occur in the existing Birch or Buffalo MOAs where low level flights are authorized.

Y = Yes, expected to regularly transit airspace during MFE.
N = Not expected to regularly transit airspace
O = Occasionally could transit airspace.

Source: Personal communication, Monberg 2008.

The current supersonic limit is above FL300 in the Delta and other ATCAAs. There is no proposed change to this supersonic altitude limit. There is no proposal to fly supersonic in the Delta MOA. Aircraft flying at supersonic speeds above FL300 could produce sonic booms on the ground. Such supersonic events currently occur in the Pacific Alaska Range Complex (PARC), including in the Delta corridor under the Delta ATCAA.

During a typical MFE, there may be 100 single aircraft sorties (or aircraft flights) by a variety of aircraft during each exercise period twice per day. The distribution of aircraft types in the proposed Delta MOA airspace would be not more than 60 sorties twice per day. Table 2.2-1, page 2-7, includes typical altitude distributions of the representative aircraft as they transit the proposed Delta MOA airspace. Table 2.2-2, page 2-9, summarizes an estimate of the number of operations for the Delta MOA Complex and nearby MOAs during MFE exercises. This analysis uses a full number of 60 days and 300 hours of MFEs. The estimated number of annual operations is distributed by aircraft type and by altitude in Table 2.2-3, page 2-10. Table 2.2-3, page 2-10, assumes 6 minutes in the small Birch MOA, 24 minutes in the Buffalo MOA and 30 minutes in the proposed Delta MOA airspace for each operation. The number of operations is estimated based on the types of aircraft expected to participate during a years worth of MFEs. The basis of the estimated distribution is recent annual experience combined with the projected altitude block distribution and the maximum of 300 hours of MFE use. The annual estimates of proposed use by aircraft, by MOA, and by altitude blocks represent a reasonable estimate of usage. Actual usage could vary depending upon the aircraft participating in an MFE and the specific training objectives of the MFE.

This F-16 is deploying munitions over approved training ranges adjacent to, and outside of, the proposed Delta MOA. The proposed Delta MOA would permit combat-realistic approaches to targets and substantially improve the realism of MFEs.

The number and types of aircraft would depend upon what squadrons of USAF, Navy, Marine, or foreign aircraft participated in a particular MFE. A typical MFE could have approximately 75 fighters and helicopters (EA-6B and above in Table 2.2-1, page 2-7) and 25 heavies (B-1 and below in Table 2.2-1, page 2-7) participating for a two-week exercise. During those two weeks, there would typically be 10 flying days with 100 sorties in two 1.5 to a maximum of 2.5 hour time blocks per day.

During MFE exercises with the Delta MOA, training aircraft would not be unrealistically funneled at low altitudes through the Birch or Buffalo MOAs or pop up over the Delta "speed bump" into the Delta ATCAA before reforming at combat altitudes.

TABLE 2.2-2. EXISTING AND PROPOSED AIRSPACE UTILIZATION FOR PROPOSED DELTA MOA COMPLEX AND ADJACENT MOAS

	EXISTING FY07			PROPOSED (ESTIMATED)		
MOA	*Typical Number of Operations*	*Days Activated*	*Hours Utilized*	*Typical Number of Operations*	*Days Activated*[1]	*Hours Utilized*[2]
Birch	3,455	51	258	4,100	60	300
Buffalo	3,455	51	258	4,100	60	300
Delta	NA	NA	NA	4,100	60	300
Eielson	6,500	231	965	7,650	270	1,100
Fox 1	6,508	231	968	7,650	270	1,100
Fox 2	6,494	231	964	7,650	270	1,100
Viper B	6,105	225	923	7,200	270	1,100
Yukon 1	6,105	225	923	7,200	270	1,100
Yukon 3	3,520	60	263	4,100	60	300

Notes: 1. MFE: Up to 60 days per year
2. MFE: Up to 2.5 hours twice per day

TABLE 2.2-3. ESTIMATED DELTA MOA COMPLEX ANNUAL MFE HOURS AT ALTITUDE BY MOA

Aircraft Type	WITHOUT DELTA MOA						*Aircraft Type*	WITH PROPOSED DELTA MOA								
	ALTITUDE							ALTITUDE								
	<1,000 AGL		***1,000-5,000 AGL***		***5,000-7,000 AGL***	***>FL180***		***<1,000 AGL***		***1,000-5,000 AGL***			***5,000-10,000 AGL***		***10,000-18,000 AGL***	***>FL180***
	Birch	*Buffalo*	*Birch*	*Buffalo*	*Buffalo*	*ATCAA*		*Birch*	*Buffalo*	*Birch*	*Buffalo*	*Delta*	*Buffalo*	*Delta*	*Delta*	*ATCAA*
A-10	18	18	20	20	20	0	A-10	18	18	14	14	7	3	12	10	0
F-15[1]	4	6	30	30	10	220	F-15[1]	4	6	16	16	3	4	31	50	170
F-16/ F-35	12	12	16	16	24	526	F-16/ F-35	12	12	10	10	10	4	22	160	366
F-18E/F[2]	10	10	20	20	20	310	F-18E/F[2]	10	10	9	9	2	4	36	110	200
F-22A	0	0	0	0	4	100	F-22A	0	0	0	0	0	2	2	5	95
V-22[3]	5	5	15	15	10	0	V-22[3]	5	5	11	11	2	4	12	0	0
EA-6B	0	0	0	0	0	100	EA-6B	0	0	0	0	0	0	0	20	80
B-1B	1	1	10	3	2	80	B-1B	1	1	10	2	0	0	3	20	60
C-130[4]	30	30	60	60	20	0	C-130[4]	30	30	30	30	5	5	35	35	0
C-17[5]	5	10	20	20	20	55	C-17[5]	2	10	10	10	15	4	34	30	15
Total	85	92	191	184	130	1391	Total	82	92	110	102	44	30	187	440	986

Notes:
1. Includes F15C
2. Includes foreign fighters
3. Includes all helicopters
4. Includes foreign types
5. Includes other foreign heavies

2.2.3 CHAFF AND FLARE USE IN THE PROPOSED DELTA MOA

Under the Proposed Action, the use of training chaff and flares in the existing Birch, Buffalo, Yukon, and Fox MOAs would be extended into the new and modified airspace established under the Proposed Action. There would not be an increase in the use of chaff and flares within the overall airspace, although there would be a redistribution of chaff and flares within the new and modified airspace. Chaff and flares are used throughout Alaskan training airspace as air combat defensive counter measures to defend against air or ground-based threats. Chaff and flares are currently used in the Delta ATCAA and Birch and Buffalo MOAs. Table 2.2-4 presents the estimated use of chaff and flares in the existing Birch MOA, Buffalo MOA, and Delta ATCAA during a typical MFE and the projected use of chaff and flares in the airspace with the proposed Delta MOA Complex.

TABLE 2.2-4. ESTIMATED CHAFF AND FLARE USE IN THE PROPOSED DELTA MOA COMPLEX DURING ONE TWO-WEEK MFE

Mission MFE	EXISTING (NO-ACTION)			PROPOSED DELTA MOA			
	Birch MOA	*Buffalo MOA*	*Delta ATCAA*	*Birch MOA*	*Buffalo MOA*	*Delta MOA*	*Delta ATCAA*
Chaff Bundles	100	100	800	75	75	350	500
Flares	26	26	200	20	20	40	130

MFE aircraft currently transit the Delta corridor in the Delta ATCAA above FL180 or in the Birch or Buffalo MOAs. These aircraft deploy defensive chaff and flares in response to existing threats. During an MFE, there are an estimated 60 sorties twice per weekday for a two week period. The total number of MFE days can be up to 60 in a calendar year. The Delta corridor represents approximately one-seventh of the PARC Fox to Yukon airspace. During training, aircraft, on average, deploy 3 bundles of chaff and 21 flares. Data collected during 2006-2008 show a typical MFE to use 4-7,000 bundles of chaff and 1-2,000 flares. For the purpose of this EA, a 10-day MFE is estimated to use 7,000 bundles of chaff and 1,800 flares.

Applying these averages to the expected training sorties during an MFE and the volume of airspace represented by the proposed Delta MOA Complex yields the estimated chaff and flare use per MFE in Table 2.2-4. The numbers in the table are representative of MFE training and assume, under existing conditions, all aircraft flying below 10,000 feet MSL traverse the Delta corridor through the Birch or Buffalo MOAs and all aircraft above 10,000 feet MSL climb over the “Delta speed bump” to the Delta ATCAA to traverse the Delta corridor. An MFE using the proposed Delta MOA is assumed to have the aircraft more evenly distributed in the training airspace. Chaff and flare use is estimated to be proportional to the training activity within the Delta MOA Complex. Figure 2.2-2, page 2-12, depicts the life cycle of defensive chaff and flares. Flares are used to attract enemy heat-seeking missiles and lead them away from the targeted aircraft. Effective air combat training requires that pilots instantaneously react to a threat by deploying chaff or flares as defensive counter measures.

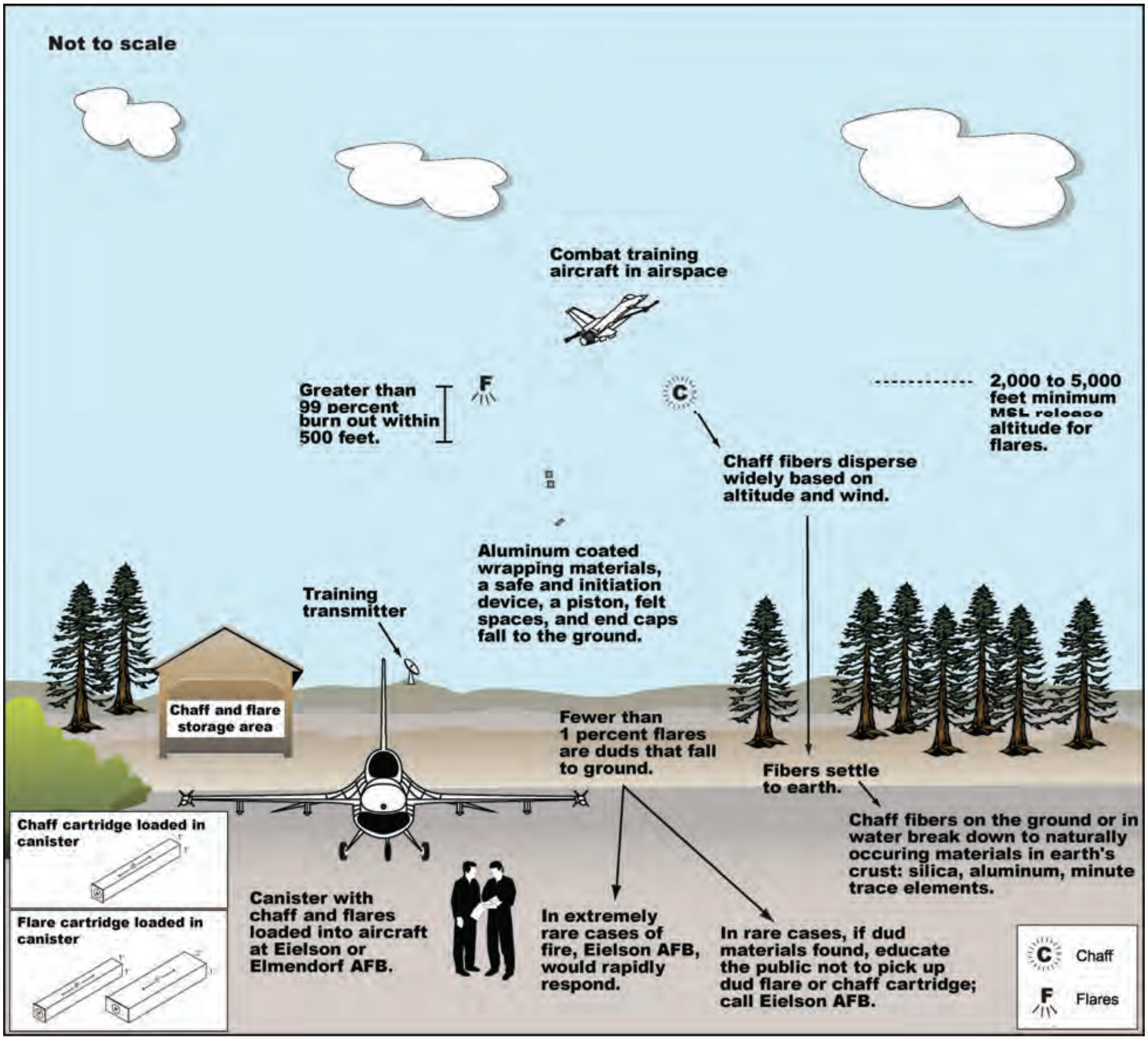


FIGURE 2.2-2. LIFE CYCLE OF TRAINING DEFENSIVE CHAFF AND FLARES

CHAFF

Chaff, bundles of extremely small strands of aluminum-coated silica fibers, is designed to create a brief electronic cloud to confuse opposition radar and permit a pilot to maneuver to avoid the threat. The thinner than human hair chaff fibers and two plastic end caps that are 1/8-inch thick x 1-inch x 1-inch pieces of plastic, and a felt spacer, are ejected with the chaff. On rare occasions, the chaff may not wholly separate and may fall to earth as a clump. A concentration of chaff fibers could be higher if a chaff bundle failed to function. For more detailed information on chaff, please refer to Appendix B.

FLARES

Flares are used to attract enemy heat-seeking missiles and lead them away from the targeted aircraft. Defensive flares are magnesium pellets that, when ignited, burn for a short period (typically 5 seconds) at approximately 2,000 degrees Fahrenheit (°F). Because the burn temperature is hotter than the exhaust of an aircraft engine, the flare attracts and decoys heat-seeking weapons and sensors targeted on the aircraft. Pilots must regularly train with defensive flares under simulated threat conditions to ensure a near-instinctive reaction to deploy flares in extremely high stress conditions.

Restrictions for flare use in Alaskan MOAs are:

- Flares may only be deployed above 5,000 feet AGL from 1 June through 30 September.
- Flares may be deployed above 2,000 feet AGL from 1 October through 31 May.

Flares burn out in approximately 500 feet. The altitude restrictions are designed to result in flare burnout between 1,500 and 4,500 feet AGL.

Typical flares used for defensive training in the Alaskan MOAs include M-206, MJU-7 A/B, and MJU-10/B flares. Table 2.2-5 presents the residual materials deposited on the surface following deployment of each flare type. The MJU-23/B used by the B-1B bomber is also listed as representative of flares from a heavy aircraft. The majority of the residual flare materials that fall have surface area to weight ratios that would not produce an impact when the residual flare material struck the surface. The one item that could fall with enough force to impact an object on the ground is the Safe & Initiation (S&I) device with a weight of 0.7 ounces. The S&I device would strike the earth with approximately the same force as a large hailstone. On extremely rare occasions (approximately 0.01 percent of the flares dispensed), a flare may not ignite and would fall to the earth as a dud flare. For more detailed information on flares, refer to Appendix C.

TABLE 2.2-5. RESIDUAL MATERIAL DEPOSITED ON THE SURFACE FOLLOWING DEPLOYMENT OF ONE FLARE

	FLARE TYPE			
Material	*M-206*	*MJU-7/B*	*MJU-10/B*	*MJU-23/B*
End Cap	One 1 inch x 1 inch x 1/4 inch plastic or nylon	One 2 inch x 1 inch x 1/4 inch plastic or nylon	One 2 inch x 2 inch x 1/4 inch plastic or nylon	One 2 3/4 inch diameter x 1/4 inch thick round plastic disc
Piston	One 1 inch x 1 inch x 1/2 inch plastic or nylon	One 2 inch x 1 inch x 1/2 inch plastic or nylon	One 2 inch x 2 inch x 1/2 inch plastic or nylon	One approximately 2 3/4 inch diameter x 1/2 inch aluminum (or plastic) piston
Spacer	One or two 1 inch x 1 inch felt	One or two 2 inch x 1 inch felt	One or two 2 inch x 2 inch felt	One 1/2 inch thick x 2 3/4 inch diameter rubber shock absorber sealant, two (1/8 inch x 2 3/4 inch diameter) felt discs, up to four 1 inch x 10 inch felt strips
Wrapping	One up to 2 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 3 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 4 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 4 1/2 inch x 20 inch piece of aluminum-coated stiff duct-tape type material
S&I Device	N/A	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device

2.3 NO-ACTION ALTERNATIVE

The No-Action Alternative consists of continuing to use the Birch and Buffalo MOAs and the Delta ATCAA for MFEs. This would result in continued low quality MFE training and reduce the realism needed for aircrews to experience combat situations before being deployed to the actual combat theater. No-Action would include continued use of defensive chaff and flares in existing MOA and ATCAA airspace and continued supersonic activity in the Delta ATCAA. Analysis of the No-Action Alternative is used primarily as a benchmark, allowing for a comparison of the magnitude of environmental effects of the Proposed Action. Section 1502.14(d) of the National Environmental Policy Act (NEPA) requires analysis of the No-Action Alternative in an EA.

2.4 SUMMARY OF PROPOSED ACTION AND ALTERNATIVE

This section summarizes the elements of the proposed charting of the Delta MOA in Section 2.4.1. Section 2.4.2 presents the mitigation measures adopted by the USAF for the Alaska Military Operations Area Environmental Impact Statement (AK MOA EIS) (USAF 1995). Section 2.4.3 summarizes comments received on the Delta T-MOA and the proposed actions to reduce the potential for impact of MFE use of the proposed Delta MOA.

2.4.1 SUMMARY OF THE PROPOSED ACTION AND NO-ACTION ALTERNATIVE

The Proposed Delta MOA would be designed to accomplish the following.

- The Proposed Action creates the Delta MOA Complex as a new training airspace to optimize airspace use by military aircrews and provide more realistic training opportunities.
- The new airspace will have a relatively high floor to support VFR transit of the airspace and is designed to facilitate maneuvering and training between the Fox, Eielson, and Yukon MOA complexes.
- The proposed Delta MOA would be scheduled for two-week long MFEs to a maximum of 60 days each year. Daily flight operations would consist of a maximum of 2.5 hour periods twice per weekday with a 3.0 hour separation between activation time blocks. Outside those time periods, the airspace would be released to ATC. The USAF would minimize the activation times of the Delta MOA and would turn this airspace back to Anchorage Center when all participants have exited.
- The USAF would provide a corridor south of 63° in the Fox 3 ATCAA to support transit of commercial and other high altitude civil aircraft in lieu of the current transit through the Delta corridor below FL180 during MFE training.
- Defensive countermeasure use would occur in the new airspace in the same way chaff and flares are used in other PARC MOAs and ATCAAs, including the Delta ATCAA.
- The Proposed Action would better match airspace structure to advanced aircraft, weapons, and training, and contribute to an improved combat ready U.S. military while harmonizing commercial and general aviation airspace user demands.

Under the No-Action Alternative, a new MOA would not be created. Aircrews would continue to "funnel" through Birch and Buffalo MOAs during north/south MFEs; unrealistic "battlespace" distances would be reinforced during training; and approaches, targeting, and ground support related to bombing ranges R-2202 and R-2205 would continue to be limited.

2.4.2 USAF ADOPTED MITIGATIONS

The mitigation actions identified to reduce the potential for impacts in the AK MOA EIS (USAF 1995) are adopted for the proposed Delta MOA Complex. These actions include the following general mitigations with specifics to the proposed Delta MOA where applicable.

RESOURCE PROTECTION

- Protecting certain "at-risk" wildlife populations by restricting overflights during critical life cycle periods.
- Protecting the Delta Caribou Herd by establishing a minimum overflight altitude of 3,000 feet AGL, over calving areas, in appropriate areas of the Birch and Eielson MOAs from May 15 to June 15.
- Protecting Dall sheep by establishing a minimum overflight altitude of 5,000 feet AGL, over lambing areas and spring mineral licks, in appropriate areas of Yukon 1, 2, 3, and 4, Buffalo, Eielson, and Fox MOAs May 15 to June 15, and rutting areas from November 15 to December 15.
- Reducing potential noise impacts to peregrine falcons and other resources by increasing existing flight avoidance efforts on the Yukon, Charley, and Kandik Rivers, within appropriate areas of Yukon MOAs 1, 2, 3, and 4, and by extending the avoidance period from April 15 through September 15.
- Minimizing potential impacts to subsistence/sport hunting and late season recreational activities by conducting no MFEs during September.
- Minimizing potential impacts to wildlife and recreation activities by ensuring at least two weeks between MFEs.
- Continuously evaluating environmental efforts, identifying where more changes are needed, and providing information to agencies and the public through the public affairs channels with federal, state, and USAF membership.
- Reducing potential impacts to subsistence and other resources by restricting the use of Yukon 5 to MFEs only.

CIVIL AVIATION/SAFETY

- Enhancing safety for civil aviators transiting the MOAs by establishing VFRs in civil aviation corridors in the Buffalo and Birch MOAs along the Richardson and Alaskan Highways.
- Enhancing civil aviation access and safety in adjacent areas by dividing the Yukon 3 MOA into horizontal and vertical sections and reducing hours of scheduled activation.
- Accommodating civil aviation traffic participating in subsistence/hunting and recreation activities by maintaining the year-round minimum altitude of southeast half of Yukon 3 MOA to 2,000 feet AGL.

- Increasing situational awareness of all aviators operating in the interior MOAs by establishing and improving the capabilities of the SUAIS in Eielson, Birch, Buffalo, and Yukon 1, 2, and 3.
- Creating direct dialogue on potential impacts to aviation activities through the Alaska Civil/Military Aviation Council.
- In the very unlikely chance an IFR pilot arrived at the edge of the airspace during an MFE, the pilot would have several choices: one, cancel IFR and proceed VFR; two, turn around and return to Northway; or three, declare "emergency minimum fuel." In situations where aircraft are unable to travel VFR, after having left Northway for Fairbanks, and are required to fly IFR, the USAF will work with the FAA to allow such emergency IFR traffic through the airspace.

NOISE

- Avoiding the creation of aircraft noise around the Gulkana and Delta National Wild and Scenic Rivers, Tangle Lakes area, and Richardson Highway with the Fox MOA eastern boundary.
- Reducing potential noise impacts by maintaining the minimum altitude of the Yukon 5 and Fox MOAs to 5,000 feet AGL.
- Reducing aircraft noise in the Salcha River and Harding Lake areas with the northwest boundary of the Birch MOA.
- Reducing potential noise impacts to recreation activities by conducting no MFEs 27 June to 11 July for the 4th of July holidays.

PUBLIC INFORMATION EXCHANGE

- Assisting the public in planning activities around MFEs by publicizing the annual MFE schedules in publications such as the *Milepost*, visitor and traveler guides, and various newspapers.
- Providing the public information on USAF aviation activities, MFE schedules, and receiving information and/or concerns about USAF activities, by continuing the in-state toll free number for Alaska residents (1-800-538-6647).
- Publishing MFE information a minimum of 30 days prior to each exercise, and provide this information to eh FAA for NOTAMs, giving the IFR pilot ample time to plan ahead.

2.5 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Alternatives were considered to bring the PARC capabilities to the level needed for realistic MFEs. Additional potential alternatives, including concepts raised during scoping, were evaluated but either did not meet the fundamental purpose and need for PARC MFEs or were not reasonable alternatives. The following describes why each of these concepts was not carried forward for detailed analysis in this EA.

2.5.1 EXTEND BIRCH AND BUFFALO MOAS TO THE DELTA ATCAA

Extension of the Birch and Buffalo MOAs from their current floor altitudes to FL180 would expand the connection between the Yukon and Fox MOA complexes. These corridors would continue to unrealistically channel attacking and defending aircraft into predictable attack headings. This channeling of the aircraft combined with serious limitations on the ability to perform convoy escort, dynamic targeting, and restrictions on potential CAS of ground forces means that vertical extension of the Birch and Buffalo MOAs would not achieve the training for required current MFE missions. This alternative was not carried forward because it did not meet MFE mission requirements.

2.5.2 EXPANDED USE OF SIMULATORS IN PLACE OF THE DELTA MOA

Simulators have improved over the years and represent a valuable training aid. However, simulators lack the realism of actual flying. Aircrews do not receive the same physical or training challenges in simulators that occur in actual flight. Simulators cannot replicate the problems and teamwork associated with flying with other aircraft. Using simulators also excludes other parts of the USAF team essential in completing actual missions, including maintenance, supply, and weather analysis. Simulators alone do not produce the type of MFE training proposed with the PARC. Expanding the use of simulators in place of the proposed Delta MOA was not carried forward for further analysis.

2.6 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

This EA for the charting of the Delta MOA Complex has been prepared in accordance with NEPA (42 USC 4321-4347), Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [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.

2.6.1 ENVIRONMENTAL ASSESSMENT PROCESS

The EA process (depicted in Figure 2.6-1), in compliance with NEPA guidance, includes public and agency review of information pertinent to the Proposed Action and provides a full and fair discussion of potential consequences to the natural and human environment. The USAF published newspaper advertisements, posted flyers, sent out press releases, and distributed Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) letters. These announcements solicited public and agency input on the proposal and invited the public and agencies to attend community outreach/scoping meetings on the charting of the Delta MOA Complex.

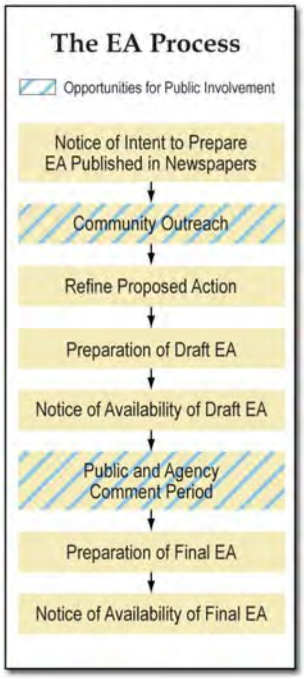


FIGURE 2.6-1. EA PROCESS

Community outreach/scoping meetings were held in Fairbanks, Delta Junction, Tok, and Anchorage, Alaska during the spring of 2008 to involve the public and agencies, to identify possible consequences of the Proposed Action, and to focus analysis on environmental resources potentially affected by the Proposed Action or the No-Action Alternative. Table 2.6-1 presents details on the community outreach events. IICEP letters were sent and responses received in 2008. Community outreach and scoping handouts and IICEP letters included information on the Proposed Action (Appendix D). Additionally, the April-May 2008 edition of *The Transponder* publication dedicated a full-page article on the Charted Delta MOA with information on the public comment timeframe and points of contact.

TABLE 2.6-1. COMMUNITY OUTREACH MEETINGS

Publication	*Meeting Date*	*Meeting Location*
Mukluk News	March 18, 2008	Tok, Alaska
Delta Wind News	March 19, 2008	Delta Junction, Alaska
Fairbanks Daily News-Miner	March 20, 2008	Fairbanks, Alaska
Anchorage Daily News	April 8, 2008	Anchorage, Alaska

2.6.2 SCOPE OF RESOURCE ANALYSIS

The Proposed Action and alternatives have the potential to affect certain environmental resources. These potentially affected resources have been identified through public scoping meetings, communications with state and federal agencies and Alaska Natives, and review of past environmental documentation. Environmental resources with the potential for environmental consequences include airspace management and ATC (including airport traffic), noise, safety, air quality, physical resources (including visual), biological resources, cultural resources, land use, socioeconomics, and environmental justice.

2.6.3 PUBLIC AND AGENCY INPUT

Public and agency inputs were received during the community outreach/scoping meetings. The 10 most frequently voiced concerns and the USAF actions to reduce the potential for environmental consequences are described in Table 2.6-2, page 2-19. Other public and agency inputs are considered in applicable EA sections.

TABLE 2.6-2. PUBLIC CONCERNS AND USAF PROPOSED ACTIONS
(PAGE 1 OF 3)

	Concern	*Action*
1	The 2.5 hour block activation times of the proposed Delta MOA are too long. Activation times should be coordinated more dynamically.	The USAF will minimize the activation times of the proposed Delta MOA and will turn this airspace back to Anchorage Center when all participants have exited. As a result, more than half of the activation times are expected to be 1.5 hour blocks, not 2.5 hour blocks (see Section 2.2.2).
2	The additional civil aviation rerouting miles and time results in longer flights, greater potential for misconnections, increased crew duty time, increased fuel costs, and scheduling impacts.	The USAF would provide a corridor that starts at the 63-00 North Latitude line and extends south through Fox 3 ATCAA and Paxson ATCAA between FL320 and FL350 back to Anchorage Center when the proposed Delta MOA was active.
3	What constraints will a charted MOA place on commercial aircraft traffic?	The charted Delta MOA would have no constraints on civil aviation except when activated during an MFE. Commercial aircraft, which could not be deconflicted through USAF or airline scheduling, would be required to use the routing below MFE airspace described in Concern 2.
4	The proposed Delta MOA would impact the only Victor airway, V-444 that connects Fairbanks and northern Alaska with Canada and the lower 48 states. V-444 also provides IFR access to Allen Army Airfield serving the Delta Junction and Ft. Greely areas. The only alternative route would require a detour of nearly 390 NM, with a Minimum Enroute Altitude (MEA) of 10,000 feet that requires two crossings of the Alaska Range.	The USAF designed a safe VFR corridor which allows 24/7 access and is supported by the SUAIS, normally staffed from 7 a.m. to 5 p.m., Monday through Friday (except federal holidays), and at all times when military flying is in progress in the Interior Alaskan MOAs and Restricted Areas. As described in Section 3.3 of this EA, the USAF installed additional radars and new communication facilities throughout this area. The USAF is working to ensure that Anchorage Center has these important radar and communication capabilities. The VFR corridors which are currently available in the Buffalo and Birch MOA will remain and the floor of the proposed Delta MOA between these two MOAs is 3,000 feet AGL (approximately 4,500 feet MSL) (see Section 2.2.1). See IFR discussions in Concerns 5 and 8.
5	How will the USAF notify civil aviation using V-444 of the activation of the Delta MOA?	The times the proposed Delta MOA will be activated will be published MFE information a minimum of 30 days prior to each exercise and the information provided to the FAA for NOTAMs, giving the IFR pilot ample time to plan ahead. A safe VFR corridor exists (weather permitting) at all times. Together, these efforts will give pilots time and options to safely traverse the area (see Section 2.2.1). The IFR traffic counts along V-444 during the September 2008 hunting season was 2.7 aircraft over a 13 hour window. During an up to five-hour MFE day, the number of aircraft potentially affected is projected to be very small.

TABLE 2.6-2. PUBLIC CONCERNS AND USAF PROPOSED ACTIONS
(PAGE 2 OF 3)

	Concern	*Action*
6	How will ATC open and close this airspace, and will this window be extended to a larger timeframe to allow for schedule delays or weather?	The times the proposed Delta MOA will be activated will be published MFE information a minimum of 30 days prior to each exercise and the information provided to the FAA for NOTAMs, giving the IFR pilot ample time to plan ahead. The airspace will only be opened during the NOTAM'd time by positive communications between Anchorage Center and Eielson Range Control. This airspace will be turned back over to Anchorage Center in real time by Eielson Range Control. The USAF will not extend the proposed Delta MOA activation time past the NOTAM'd time (see Section 2.2.2).
7	Will medevac and emergency flights be available 24/7 and will they be given priority?	Medevac, emergency, fire fighting, and related flights will be given priority as described in Section 2.2.2.
8	Aircraft inbound from Whitehorse will have been airborne for a couple of hours before encountering the airspace. These require very different levels of coordination with Anchorage Center. Some level of discussion needs to take place between the Flight Standards Office, Air Traffic, the USAF, and a few of the operations affected by this MOA, to determine how these cases will be handled before we have assurance that access won't be unjustifiably restricted.	The proposed Delta MOA could affect IFR aircraft inbound from Whitehorse to Fairbanks where pilots had a) not read the NOTAMs and b) happen to be arriving during the limited time period the Delta MOA was active. Actions could include: First, during the coordination for the initial IFR clearance, this airspace conflict should become evident. Second, Anchorage Center will be informed about this IFR traffic approximately 30 minutes prior to reaching the Alaskan border, at this time Anchorage Center would report this airspace conflict. Third, most small aircraft stop at Northway Alaska to clear customs and, therefore, an IFR clearance would not be issued when it was in conflict with the MFE. In the very unlikely chance an IFR pilot could arrive at the edge of the Delta MOA, the pilot would have several choices: one, cancel IFR and proceed VFR; two, turn around and return to Northway; or three, declare "minimum fuel emergency." As part of the proposed Delta MOA, the USAF will adhere to the Delta T-MOA Memo of Understanding to allow Anchorage Center to ask for the floor of the MOA to be raised (similar to medevac and emergency aircraft) for "minimum fuel emergency" aircraft.
9	Real time coordination with FAA ATC could permit IFR traffic in the corridor during an MFE. VFR operations monitored by Eielson Range Control include radio communications, radar coverage, and a single point of contact for military and civil pilots operating in the MOAs. Procedures using similar technology and coordinated with FAA ATC could allow access by civil aviation to IFR route structure in the corridor during MFEs.	The FAA does not allow the simultaneous or "real time" use of airspace between military aircraft and civilian aircraft filed on IFR flight plans. This is the primary reason MOAs are established, to ensure safety and separation of military and IFR traffic. The USAF has implemented procedures to make this airspace as real-time as possible (see Section 2.2.2).

TABLE 2.6-2. PUBLIC CONCERNS AND USAF PROPOSED ACTIONS (PAGE 3 OF 3)

	Concern	*Action*
10	Will the proposed Delta MOA close the IFR airway permanently in the future?	No, the proposed Delta MOA is only for MFEs. The Delta MOA is proposed to be activated for no more than 2.5 hours twice a day not to exceed 60 days per year. The majority of the activation periods would be 1.5 hours and would be returned back to Anchorage Center in real time when all MFE aircraft are clear of the airspace. The USAF has reduced the amount of time this air route would be temporarily unavailable to the smallest amount possible and the airspace would be controlled real time. When the USAF is done using the MOA for the NOTAM'd period, it will immediately be returned to the FAA, regardless of the times it was NOTAM'd out. Civilian aviators would have the scheduled MOA times 30 days in advance and can plan around these two 1.5 hour to 2.5 hour blocks to ensure their flights are uninterrupted. When flying on an IFR flight plan, all aviators, either military or civilian, understand their flights are always subject to delay based on navigational aid availability, weather, traffic, and other factors that affect all users of the National Airspace System.

2.7 REGULATORY COMPLIANCE

This EA has been prepared to satisfy the USAF and FAA requirements of NEPA (P.L. 91-190, 42 USC 4321 *et seq*.) as amended in 1975 by P.L. 94-52 and P.L. 94-83. The intent of NEPA is to protect, restore, and enhance the environment through well-informed federal decisions. In addition, this document was prepared in accordance with Section 102 (2) of NEPA, regulations established by the CEQ (40 CFR 1500-1508), and AFI 32-7061 (i.e., 32 CFR Part 989).

Certain areas of federal legislation, such as the Endangered Species Act (ESA) and National Historic Preservation Act (NHPA), have been given special consideration in this EA. Implementation of the proposed charting of the Delta MOA Complex could require various federal and state reviews (Appendix E).

Implementation of the Proposed Action would involve coordination with several organizations and agencies. Compliance with the ESA requires communication with the U.S. Fish and Wildlife Service (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 proposal area. If any of these species is present, a determination is made of any potential adverse effects on the species. 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 proposal and requesting data regarding applicable protected species (Appendix D).

The preservation of Alaska Native cultural resources is coordinated by the State Historic Preservation Office (SHPO), as mandated by the NHPA and its implementing regulations. Letters were sent to potentially affected Alaska Native communities informing them of the proposal (Appendix D). Further communication is included as part of the Draft EA review process.

2.8 ENVIRONMENTAL COMPARISON OF THE PROPOSED ACTION OPTIONS AND THE NO-ACTION ALTERNATIVE

Table 2.8-1, page 2-23, summarizes the consequences of implementing the Proposed Action and includes the No-Action Alternative. This summary is derived from the detailed analyses presented in Chapter 4.0.

TABLE 2.8-1. SUMMARY OF IMPACTS BY RESOURCE FOR TRAINING SUA

(PAGE 1 OF 5)

	Proposed Action	*No-Action*
Airspace Management and Air Traffic Control	Minimal effect upon VFR traffic because established VFR corridors would remain open during MFEs. No effect except communication for medevac, fire survey, firefighting, or declared emergency flights, which would be given priority during an MFE. Civil aviation traffic could not fly IFR on V-444 for a not-to-exceed 300 hours annually, or 3.4 percent of the year. An estimated one to two general aviation IFR flights per MFE training day could be delayed by approximately one hour at Northway or Fairbanks. If no other deconfliction scheduling were possible, one to two commercial or other high-altitude jet flights per MFE day could be re-routed south of the 63° corridor and be required to turn north to Fairbanks. This would result in approximately 500 pounds of fuel and 7 minutes of flight time per re-routed commercial flight.	VFR and IFR traffic would continue to use the Delta corridor as they have been during an MFE. Commercial or other high-altitude jet aircraft would continue to be required to fly below FL180 on the Delta corridor during an MFE.
Noise	Annual average noise levels under the Birch and Buffalo MOAs would be lower than existing MFE conditions with the proposed Delta MOA. Annual average noise levels between the Birch and Buffalo MOAs under the proposed Delta MOA are projected to increase from 41.0 Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) to 45.2 L_{dnmr}. This increase in noise levels would be noticeable but would not exceed the annual average of 55 Day-Night Average Sound Level (L_{dn}) identified by the United States Environmental Protection Agency (USEPA) as the level to begin assessing the potential for environmental impact. Dispersed training results in noise level reductions to L_{dnmr} of 56.7 and 51.6 dB under the Birch and Buffalo MOAs, respectively. Supersonic flights would not occur in the proposed Delta MOA, but would continue in ATCAA airspace above FL300.	Annual average noise levels would continue with L_{dnmr} 58.7 to 60.1 dB noise levels under the Birch and Buffalo MOAs. Supersonic flights would continue to occur above FL300. Sonic booms would continue to be detected in areas under the ATCAAs.

TABLE 2.8-1. SUMMARY OF IMPACTS BY RESOURCE FOR TRAINING SUA (PAGE 2 OF 5)

	Proposed Action	*No-Action*
Safety	Emergency aircraft to support medevac, fire, and other emergencies would be given priority. General aviation pilots would continue to have access to VFR corridors. MFEs would not be scheduled during weekends or specific times of heavy use by general aviation to reduce the potential for safety risks. The potential for Class A mishaps is not expected to change with the proposed Delta MOA. Chaff and defensive flare use within the proposed Delta MOA would adhere to existing restrictions on flare use in the Alaskan airspace to above 5,000 feet AGL from June to September and above 2,000 feet AGL for the remainder of the year. If an aircraft declared an emergency condition, the USAF would work with the FAA to suspend MFE activity below a specific altitude to permit IFR aircraft to reach its destination safely. Re-routing commercial and other high performance aircraft flights south of the 63° corridor between FL320 and FL350, if no other deconfliction scheduling were possible, would ensure safe transit of the area during an MFE.	Civil aircraft, including emergency aircraft, would continue to operate as they have during MFEs. Chaff and flare use would continue in the Birch and Buffalo MOAs and in the Delta ATCAA. Existing Class A potential accident risk would continue.
Air Quality	The mixing level for air emissions is below 3,000 feet AGL. The proposed Delta MOA does not include airspace below 3,000 feet AGL. No emission concentrations or changes to existing air quality attainment would be expected.	The area under the Delta MOA is in air quality attainment.
Physical Resources	No on-the-ground construction is proposed. Chaff and flare distribution within the airspace would not substantially change from that currently used during MFE training. Chaff and flare small plastic or nylon pieces and wrappers that represent residual material after deployment of defensive countermeasures would be widely dispersed and not expected to be concentrated in any way that could impact soil or water resources.	No change from existing conditions, which include deployment of defensive countermeasure in the Birch and Buffalo MOAs and the Delta ATCAA.

TABLE 2.8-1. SUMMARY OF IMPACTS BY RESOURCE FOR TRAINING SUA
(PAGE 3 OF 5)

	Proposed Action	*No-Action*
Biological Resources	The proposed Delta MOA meets USAF-adopted mitigations to reduce potential impacts upon the Delta Caribou Herd. Chaff and flares are currently used in the Delta ATCAA and Birch and Buffalo MOAs, and residual materials are currently deposited along the Delta corridor. Minimum altitude and seasonal restrictions on defensive flares would continue. Chaff particles become indistinguishable from dirt and have no documented negative impacts upon biological resources. Reduced annual average noise under the Birch and Buffalo MOAs and increased annual average noise west of the Birch MOA and between the Birch and Buffalo MOAs would not be of a level which could affect biological resources.	No change from existing conditions, including continued deployment of defensive countermeasures above the Delta corridor and current average annual noise levels.
Cultural Resources	No projected effect on National Register of Historic Places (NRHP) properties under the proposed Delta MOA. Some noticeable increased noise levels will occur in the Delta Junction area and noticeable reduced noise levels will occur under the Buffalo MOA. Training and noise levels not expected to affect NRHP properties. No change in supersonic activities because supersonic flight is limited to above FL300. Some reduced noise to Alaska Native villages at Healy Lake and Dot Lake under the Buffalo MOA.	Continued existing conditions with slightly higher noise levels above Healy Lake and Dot Lake and discernibly lower noise levels above Delta Junction when compared with the proposed action.
Land Use/Transportation/ Recreation	Subsonic noise increase from L_{dnmr} 41.0 to 45.2, discernible under the proposed Delta MOA between the Birch and Buffalo MOAs, is below the 55 L_{dn} which USEPA identified as the annual average noise level to begin assessing for potential noise impact. Continued use of chaff and defensive flares could result in a hunter, fisherman, or other individual being annoyed by finding a piece of wrapping material or plastic from a deployed chaff or defensive flare. Land use under the airspace not expected to be impacted.	No change from existing conditions. Continued use of chaff and defensive flares above Delta corridor. No change in average annual noise levels.

TABLE 2.8-1. SUMMARY OF IMPACTS BY RESOURCE FOR TRAINING SUA
(PAGE 4 OF 5)

	Proposed Action	*No-Action*
Socioeconomics	VFR aircraft able to transit the MOAs on established corridors. V-444 would be unavailable for IFR traffic up to 300 hours, or 3.4 percent of a year. This could require one to two general aviation aircraft per MFE day seeking to fly IFR through the Delta corridor being delayed by approximately one hour at Northway or Fairbanks. Accurate communication of USAF scheduling and improved radio and radar coverage should facilitate use of VFR corridors and minimize effect on IFR traffic. Commercial aircraft which could not deconflict during a Delta MOA activation period and were required to fly south of the 63° corridor would each incur an estimated additional consumption of approximately 500 pounds of fuel and 7 minutes of additional flight time. If scheduling deconfliction were not possible, an estimated one to two commercial flights per MFE day could be affected. Not scheduling MFEs in January, February, 27 June to 11 July, or September, reduces potential effects on general aviation, recreational, and hunting activities. Specific aviation support operations at Fairbanks could incur some impacts. No significant impact to regional socioeconomics would be expected.	V-444 would continue to be open the up to 300 hours proposed for MFE activity. No change in commercial airline use of the Delta corridor below FL180 during an MFE.
Environmental Justice	Residents under the Delta corridor are not disproportionately minority children or low income when compared with the region. Reduced average annual noise levels under the Buffalo MOA would have noticeable effect upon Alaska Native villages. The proposed action would have no disproportionately high adverse impacts to minorities or low income communities and no disproportionate health or safety risks to children.	No change from existing conditions. No change in effects upon individuals along the Delta corridor.

TABLE 2.8-1. SUMMARY OF IMPACTS BY RESOURCE FOR TRAINING SUA (PAGE 5 OF 5)

	Proposed Action	*No-Action*
Cumulative Environmental Consequences	Past, present, and reasonably foreseeable projects in the Delta corridor include a rail extension from Fairbanks to Delta Junction, increased training at Fort Wainwright, changes in Eielson aircraft and airspace usage, and natural resource development in Alaska. These projects could cumulatively increase civil aviation use of the Delta corridor. MFEs in 2007 and 2008 typically delayed one to two general aviation aircraft per two-week MFE. This EA analyzes one to two general aviation aircraft being delayed approximately one hour per MFE day. One to two delays per day as compared to one to two in a two-week period includes the cumulative effects of increased general aviation activity along the Delta corridor. The proposed action has no ground disturbance and is above air quality mixing levels. No significant cumulative effects are anticipated.	Cumulative effects along the Delta corridor would not be noticeably changed by implementing or not implementing the proposed Delta MOA.

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3.0 TRAINING SPECIAL USE AIRSPACE AFFECTED ENVIRONMENT

Chapter 1.0 of this Environmental Assessment (EA) describes the purpose and need for the Delta Military Operations Area (MOA) Complex and Chapter 2.0 details the configuration and operations of the proposed Delta MOA Complex. This chapter describes the environment potentially affected by the Proposed Delta MOA Complex and the No-Action Alternative within the training Special Use Airspace (SUA) associated with charting of the Delta MOA Complex. The National Environmental Policy Act (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 *Affected Environment* discussion of each relevant environmental resource gives the public and agency decision-makers a meaningful point from which they can compare potential future environmental, social, and economic effects. The environment potentially affected is assumed to be the conditions prevailing under the sixty days per year agreed-to total MFE usage from the 1995 Alaska MOA Environmental Impact Statement (EIS) (United States Air Force [USAF] 1995). Following this Chapter 3.0 affected environment presentation, Chapter 4.0, *Environmental Consequences*, overlays the project elements from Chapter 2.0 upon Chapter 3.0 environmental conditions to project potential environmental consequences. Potential cumulative effects are discussed in Chapter 5.0.

Each resource discussion begins with a *definition* including resource attributes and any applicable regulations. The expected geographic scope of potential impacts is also identified as the region of influence (ROI). The ROI is defined as the estimated boundary of potential environmental consequences. For most resources in this chapter, the ROI is defined as the lands underlying the MOAs and Restricted Areas. However, for some resources (such as Airspace Management, Air Quality, and Socioeconomics), the ROI extends over a larger jurisdiction unique to the resource.

3.1 AIRSPACE MANAGEMENT

3.1.1 DEFINITION

Military training airspace in Alaska is designated the PARC. PARC is part of the navigable airspace administered by the Federal Aviation Administration (FAA). FAA has charted and published SUA for military and other governmental activities. Management of SUA considers how airspace is designated, used, and administered to best accommodate the individual and common needs of commercial aviation, general aviation, the military, resource management agencies, and others. The FAA considers multiple and sometimes competing demands for aviation airspace in relation to airport operations, Federal Airways, Jet Routes, military flight training activities, and other special needs to determine how the National Airspace System can best be structured to address all user requirements.

The FAA has designated four types of airspace within the United States (U.S.): Controlled, Special Use, Other, and Uncontrolled airspace. Controlled airspace 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 (Pilot/Controller Glossary [P/CG] 2004). Controlled airspace is categorized into five separate classes: Classes A through E. These classes identify airspace that is controlled, airspace supporting airport operations, and designated airways affording en route transit from place-to-place. The classes also dictate pilot qualification requirements, rules of flight that must be followed, and the type of equipment necessary to operate within that airspace class. Military aircrews fly under FAA rules when not training in SUA. These airspaces are shown graphically in Appendix F.

SUA is designated airspace within which flight activities are conducted that require confinement of participating aircraft or place operating limitations on non-participating aircraft. The Fox, Eielson, and Yukon MOAs are examples of SUA. The R-2202, R-2205, and R-2211 Restricted Areas are also examples of SUA.

Other airspace consists of advisory areas, areas that have specific flight limitations or designated prohibitions, areas designated for parachute jump operations, Military Training Routes (MTRs), and Aerial Refueling Tracks. This category also includes the Delta and other Air Traffic Control Assigned Airspaces (ATCAAs). When not required for other needs, an ATCAA is airspace authorized for military use by the managing Air Route Traffic Control Center (ARTCC). ATCAAs can extend from Flight Level (FL) 180 to FL600 or higher.

Uncontrolled airspace is designated Class G airspace and has no specific prohibitions associated with its use.

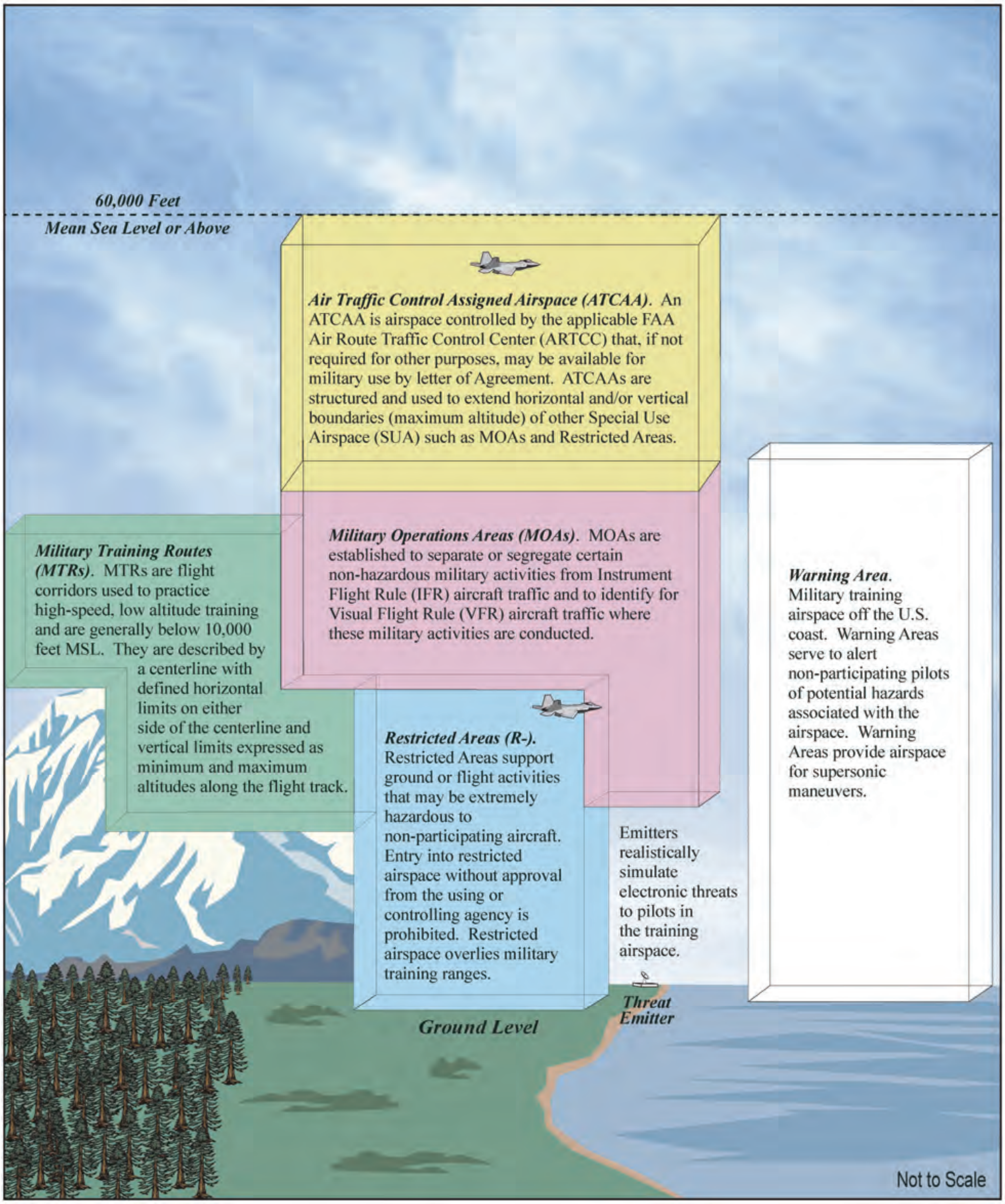
Military training airspace currently used by Elmendorf Air Force Base (AFB), Eielson AFB, and Major Flying Exercise (MFE) aircrews includes MOAs, ATCAAs, MTRs, and Restricted Areas. MOAs, MTRs, and Restricted Areas are normally scheduled by the using agency under the overall management of the applicable ARTCC. Alaskan SUA is managed by the 11th Air Force (11 AF) Commander.

3.1.2 EXISTING CONDITIONS

This section discusses the existing SUA that supports the USAF and MFE training activity in the PARC. Figure 3.1-1, page 3-3, depicts the types of airspace used for training in Alaska. The ROI for the proposed Delta MOA includes the airspace within the proposed MOA, adjacent SUA airspace, and civilian airspace from Fairbanks to the Alaskan-Canadian border.

3.1.2.1 MILITARY OPERATIONS AREAS

The PARC includes MOAs. The Proposed Action would chart a new Delta MOA. A MOA is airspace of defined vertical and lateral limits 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. Class A airspace extends from FL180 up to and including FL600 (P/CG 2004). When activated for military training, MOAs can have military aircraft operating at high speeds and performing sudden maneuvers and rapid changes in altitude and speed. 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 are required to remain clear of an active MOA unless approved by the responsible ARTCC. Table 3.1-1, page 3-4, describes the existing MOAs used by USAF and other Alaskan military users for flight training in the vicinity of the proposed Delta MOA Complex. These MOAs are mapped on Figure 3.1-2, page 3-5.



Air Traffic Control Assigned Airspace (ATCAA). An ATCAA is airspace controlled by the applicable FAA Air Route Traffic Control Center (ARTCC) that, if not required for other purposes, may be available for military use by letter of Agreement. ATCAAs are structured and used to extend horizontal and/or vertical boundaries (maximum altitude) of other Special Use Airspace (SUA) such as MOAs and Restricted Areas.

Military Operations Areas (MOAs). MOAs are established to separate or segregate certain non-hazardous military activities from Instrument Flight Rule (IFR) aircraft traffic and to identify for Visual Flight Rule (VFR) aircraft traffic where these military activities are conducted.

Military Training Routes (MTRs). MTRs are flight corridors used to practice high-speed, low altitude training and are generally below 10,000 feet MSL. They are described by a centerline with defined horizontal limits on either side of the centerline and vertical limits expressed as minimum and maximum altitudes along the flight track.

Restricted Areas (R-). Restricted Areas support ground or flight activities that may be extremely hazardous to non-participating aircraft. Entry into restricted airspace without approval from the using or controlling agency is prohibited. Restricted airspace overlies military training ranges.

Emitters realistically simulate electronic threats to pilots in the training airspace.

Warning Area. Military training airspace off the U.S. coast. Warning Areas serve to alert non-participating pilots of potential hazards associated with the airspace. Warning Areas provide airspace for supersonic maneuvers.

FIGURE 3.1-1. TYPES OF ALASKAN TRAINING AIRSPACE

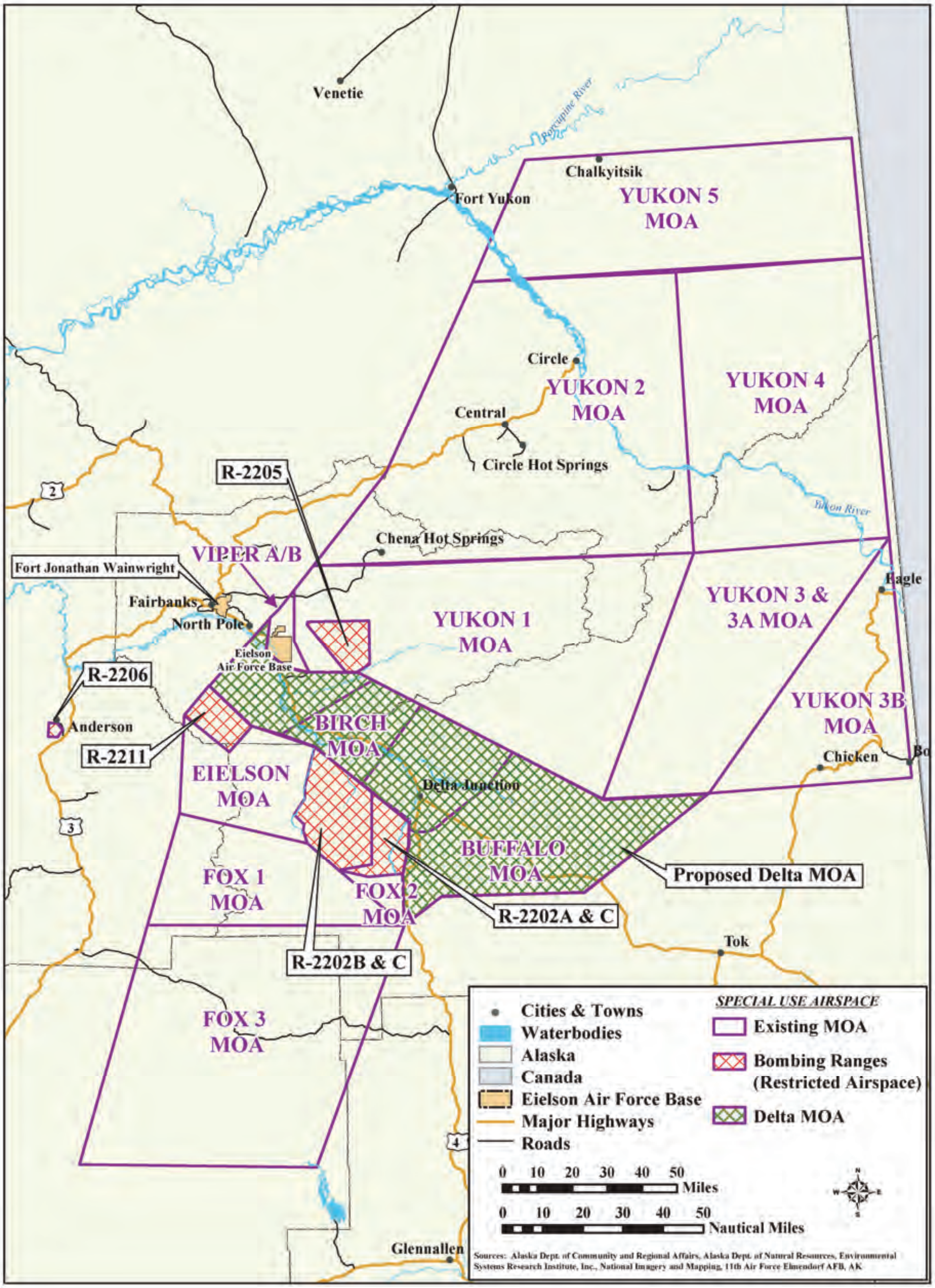
TABLE 3.1-1. DESCRIPTION OF MOAS IN THE VICINITY OF THE PROPOSED DELTA MOA COMPLEX

	ALTITUDES		HOURS OF USE [1]		*Controlling ARTCC*
MOA	*Minimum*	*Maximum*[2]	*From*	*To*	
Birch	500 AGL	Up to and including 5,000 MSL	8:00 a.m.	6:00 p.m.	Anchorage
Buffalo	300 AGL	Up to but not including 7,000 MSL	8:00 a.m.	6:00 p.m.	Anchorage
Eielson	100 AGL	FL180[3]	8:00 a.m.	6:00 p.m.	Anchorage
Fox 1	5,000 AGL	Up to but not including FL180	8:00 a.m.	6:00 p.m.	Anchorage
Fox 2	7,000 MSL	Up to but not including FL180	8:00 a.m.	6:00 p.m.	Anchorage
Fox 3	5,000 AGL	Up to but not including FL180	8:00 a.m.	6:00 p.m.	Anchorage
Yukon 1	100 AGL	Up to but not including FL180	8:00 a.m.	6:00 p.m.	Anchorage
Yukon 2	100 AGL	Up to but not including FL180	8:00 a.m.	6:00 p.m.	Anchorage
Yukon 3 High	10,000 MSL	Up to but not including FL180	10:00 a.m. – 3:00 p.m. Mon – Fri, for other times between 7:00 a.m. – 10:00 p.m. contact USAF SUAIS or any FSS		Anchorage
Yukon 3A Low	Up to but not including 100 AGL	10,000 MSL	10:00 a.m. 1:30 p.m.	11:30 a.m. 3:00 p.m.	Anchorage
Yukon 3B	2,000 AGL	Up to but not including FL180	Only During Major Flying Exercise		Anchorage
Yukon 4	100 AGL	Up to but not including FL180	10:00 a.m.	3:00 p.m.	Anchorage
Yukon 5	5,000 AGL	Up to but not including FL180	Only During Major Flying Exercise		Anchorage
Viper[4]	500 AGL	Up to but not including FL180	7:00 a.m. - 10:00 p.m. Intermittent		Anchorage

Notes:
1. Days of use are Monday through Friday. All times are local times as normally scheduled.
2. Maximum is up to, but not including unless otherwise noted.
3. Described in terms of hundreds of feet MSL using a standard altimeter setting. Thus, FL180 is approximately 18,000 feet MSL.
4. Viper A/B are divided at 10,000 feet MSL.

AGL = above ground level
MSL = mean sea level
FL = Flight Level

Source: FAA 2000



Sources: Alaska Dept. of Community and Regional Affairs, Alaska Dept. of Natural Resources, Environmental Systems Research Institute, Inc., National Imagery and Mapping, 11th Air Force Elmendorf AFB, AK

FIGURE 3.1-2. PROPOSED DELTA MOA COMPLEX RELATIVE TO OTHER SPECIAL USE AIRSPACE

Flight in an active MOA by both participating military 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 Code of Federal Regulations (CFR) Part 91" (P/CG 2004). The "see-and-avoid" procedures mean that if a MOA were active under weather conditions which obscured visibility, a pilot flying VFR could not safely access the MOA airspace. Pilots would not normally fly VFR under obscured visibility conditions. The responsible ARTCC provides separation service for aircraft operating under IFR and MOA participants. Route V-444 is the IFR in the Delta corridor.

3.1.2.2 AIR TRAFFIC CONTROL ASSIGNED AIRSPACE

PARC ATCAAs are airspaces of defined vertical and lateral limits assigned by 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). ATCAA airspace, if not required for other purposes, may be made available for military use. ATCAAs are normally structured and used to extend the horizontal and/or vertical boundaries of SUA such as MOAs and Restricted Areas.

With the exception of the Buffalo MOA and the Birch MOA, all of the Alaskan MOAs currently used for MFE training have associated ATCAAs. The Delta ATCAA, with a floor of FL180, connects the Yukon and Fox ATCAAs. Through letters of agreement with the FAA, ATCAAs may extend up to and above FL600. Several of the ATCAAs used by military aircrews are "capped" at lower altitudes by the managing ARTCC to allow unimpeded transit by civil and commercial aircraft traffic. There is no proposed change in PARC ATCAAs to support a charted Delta MOA.

3.1.2.3 MILITARY TRAINING ROUTES

MTRs are flight corridors developed and used as part of PARC 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 (Department of Defense [DoD] 2004). They are described by a centerline, 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 (VRs) or Instrument Routes (IRs). No changes to Alaskan MTRs are proposed as part of the charting of the Delta MOA.

3.1.2.4 RESTRICTED AREAS

A Restricted Area is designated airspace that supports ground or flight activities that may be extremely hazardous to non-participating aircraft. A Restricted Area is designated under 14 CFR Part 73, within which the flight of non-participating 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. The restricted airspaces, R-2202, R-2203, and R-2205, are Army ranges and airspace used by the USAF as part of the PARC. R-2206 is not a flying range. R-2211 is USAF-owned and managed airspace to support training activities. According to FAA Order 7400.8M, R-2202C is from 10,000 MSL to and including FL310 and R-2202D is above

FL310 to unlimited. These airspace elements are described in Table 3.1-2 and mapped on Figure 1.1-2, page 1-3. The Delta MOA proposal does not include changes to any restricted airspace.

TABLE 3.1-2. DESCRIPTION OF RESTRICTED AIRSPACE

Restricted Area	ALTITUDES		HOURS OF USE [1]		*Controlling ARTCC*
	Minimum	*Maximum*	*From*	*To*	
R-2202A	Surface	Up to but not including 10,000 MSL	7:00 a.m. – 6:00 p.m., other times by NOTAM		Anchorage
R-2202B	Surface	Up to but not including 10,000 MSL	7:00 a.m. – 6:00 p.m., other times by NOTAM		Anchorage
R-2202C	10,000 MSL	FL310	Intermittent by NOTAM		Anchorage
R-2205	Surface	FL200	7:00 a.m. – 7:00 p.m., other times by NOTAM		Fairbanks Approach
R-2206[2]	Surface	8,800 MSL	Continuous	Continuous	Anchorage
R-2211	Surface	FL310	8:00 a.m.	6:00 p.m.	Anchorage

Notes: 1. Days of use are Monday through Friday. All times are local times as normally scheduled.
2. Not used for training.
MSL = mean sea level
Source: USAF 2005.

Range management involves the development and implementation of those processes and procedures required by Air Force Instruction (AFI) 13-212, Volumes 1, 2, and 3, to ensure that USAF 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. Specific direction on different range activities is contained in AFI 13-212, Volume 1, *Range Planning and Operations*, Volume 2, *Range Construction and Maintenance*, and Volume 3, *SAFE-RANGE Program Methodology* (USAF 2001a, 2001b, 2001c). The focus of range management is on ensuring the safe, effective, and efficient operation of USAF ranges. 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 (USAF 2001a, 2001b, 2001c).

3.1.2.5 EXISTING USE OF MOAS AND ATCAAS

The USAF currently conducts MFEs within the MOAs and ATCAAs depicted in Figure 3.1-2, page 3-5. During an MFE, attacking or Blue aircraft may assemble for attack in the Yukon MOAs and ATCAAs, and defending, or Red aircraft, may assemble in the Fox and Eielson MOAs and ATCAAs and the Delta ATCAA to protect targets in the Restricted Areas. Refueling aircraft are located in ATCAAs such as Fox 3 and Yukon 4 or 5. During each battle sequence, the attacking aircraft are currently required to funnel from the Yukon MOAs through the low level Birch and Buffalo MOAs to attack targets in the Restricted Areas. Realistic training designed to teach aircrews to avoid threats as they address targets cannot be conducted during the final run in to the targets. See Sections 1.1 and 1.3 for additional explanation of how an MFE is conducted.

3.1.2.6 EXISTING CIVIL AVIATION USE OF THE DELTA CORRIDOR

The USAF does not propose to schedule any MFEs during September to avoid the heavier general aviation traffic associated with moose, caribou, duck, and Dall Sheep hunting season. FAA, the cooperating agency on this EA, prepared Table 3.1-3 to identify how much general aviation activity occurs along the Delta corridor. September was used by FAA to depict a representative heavy use time. Table 3.1-3 presents the aviation traffic on V-444, the instrument route affected by the proposed Delta MOA. Interestingly, the traffic reflects the expected hunting season activities, especially the surge on 21-22 September as hunting season draws to a close. The civilian traffic in the 13-hour window averages 2.7 aircraft per day. The maximum 5-hour MFE daily use is projected to have resulted in an estimated 1 to 2 civilian aircraft being delayed if an MFE had been scheduled during a comparable high civilian use period. The FAA data are useful to demonstrate the potential for 1 to 2 general aviation delays per day during an MFE. The USAF will not activate the proposed Delta MOA during September to avoid general aviation usage during hunting season.

TABLE 3.1-3. FLIGHTS ON V-444 FROM 10 SEPTEMBER TO 23 SEPTEMBER 2008

Date	*Total Civilian Flights*	*Civilian between hours of 9 a.m. and 10 p.m. (1800Z-0700Z)*[1]
10 September	6	3
11 September	4	2
12 September	4	1
13 September	3	2
14 September	5	2
15 September	4	1
16 September	5	3
17 September	5	5
18 September	5	3
19 September	3	2
20 September	4	1
21 September	8	4
22 September	11	7
23 September	5	2
Totals	72	38
Average Per Day	5.1	2.7

NOTE: NORMAL HOURS MFE CONDUCTED.

3.2 NOISE

3.2.1 DEFINITION

Within PARC, subsonic training is dispersed and often occurs randomly or, due to either airspace configuration or training scenarios, training may be concentrated or channeled into specific areas or corridors. Supersonic flight in the PARC is limited to ATCAAs above FL300. The ROI for noise is the area under the Delta corridor.

The USAF has developed the MR_NMAP (MOA-Range NOISEMAP) computer program (Lucas and Calamia 1996) to calculate subsonic aircraft noise in these areas. These computer programs calculate projected noise based on aircraft type, flight characteristics, meteorological conditions, and training activities. The models are based upon data collected under military airspace and represent the best data available for environmental evaluation. MR_NMAP can calculate noise for both random operations and operations channeled into corridors. The model results are supported by measurements in several military airspaces (Lucas *et al.* 1995). The affected airspace for the proposed Delta MOA Complex includes the Birch and Buffalo MOAs and the overlying Delta ATCAA in which training aircraft operate during an MFE.

The primary noise metric calculated by MR_NMAP for this assessment is the Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). This is an extension of the Day-Night Average Sound Level (L_{dn}, also denoted DNL), and accounts for the additional annoyance due to the rapid onset rate of noise from low-altitude high-speed aircraft. This quantity has been computed for each of the primary airspace units potentially affected by the Proposed Action and No-Action Alternative. As discussed in Appendix G, this cumulative metric represents the most widely accepted method of quantifying noise impact. L_{dnmr} is the monthly average of the L_{dn}. Noise levels are interpreted the same way for both L_{dn} and L_{dnmr}. The annual sortie-operations for a MOA is divided by 12 to define monthly average sortie-operations. For this Draft EA, training airspace noise levels for 60 days of MFEs were calculated using L_{dnmr}.

L_{dnmr} provides a total noise exposure, but may not provide an intuitive description of the noise environment. People often desire to know what the loudness of an individual aircraft will be; MR_NMAP and its supporting programs can provide the maximum sound level (L_{max}) and sound exposure level (SEL) that accounts for both the duration and intensity of a noise event for individual aircraft at various distances and altitudes. Table 3.2-1, page 3-10, presents L_{max} for aircraft typically participating in an MFE. Table 3.2-2, page 3-10, presents SEL values for representation aircraft at various altitudes. The L_{max} indicates the maximum noise level that would be heard by an individual as the aircraft flies overhead. SELs reflect the complete noise exposure as an aircraft flies by, accounting for both the level and duration of the sound. Both measures are described in Appendix G. These two tables demonstrate that, at comparable speeds, the F-15C and F-22A produce similar L_{max} and SEL noise levels.

TABLE 3.2-1. REPRESENTATIVE A-WEIGHTED INSTANTANEOUS MAXIMUM (LMAX) IN DECIBELS UNDER THE FLIGHT TRACK FOR AIRCRAFT AT VARIOUS ALTITUDES IN THE PRIMARY AIRSPACE[1]

Aircraft Type	*Airspeed*	*Power Setting*[2]	*300 AGL*	*500 AGL*	*1,000 AGL*	*2,000 AGL*	*5,000 AGL*	*10,000 AGL*	*20,000 AGL*
F-15C	520	81% NC	119	114	107	99	86	74	57
F-22A[3]	520	70% ETR	120	116	108	99	85	71	54
F-16A	450	87% NC	112	108	101	93	80	67	50
F-18A	500	92% NC	120	116	108	99	85	71	54
B-1B	550	101% RPM	117	112	106	98	86	75	61
C-17	230	3	94	87	78	68	54	43	32
C-130	180	2	90	84	77	69	58	49	39

Notes: 1. Level flight, steady, high-speed conditions.
2. Engine power setting while in a MOA. The type of engine and aircraft determines the power setting: RPM = rotations per minute, NC = percent core RPM, and ETR = engine throttle ratio.
3. Projected based on F-22A composite aircraft.
AGL = above ground level
Sources: USAF 2006a, 2006b; Tetra Tech, Inc. 2004

TABLE 3.2-2. SOUND EXPOSURE LEVEL (SEL) IN DECIBELS UNDER THE FLIGHT TRACK FOR AIRCRAFT AT VARIOUS ALTITUDES IN THE PRIMARY AIRSPACE[1]

Aircraft Type	*Airspeed*	*300 AGL*	*500 AGL*	*1,000 AGL*	*2,000 AGL*	*5,000 AGL*	*10,000 AGL*	*20,000 AGL*
F-15C	520	116	112	107	101	91	80	65
F-22A[2]	520	118	114	108	101	89	77	62
F-16A	450	110	107	101	95	85	74	59
F-18A	500	118	114	108	101	89	77	62
B-1B	550	116	112	107	101	92	82	70
C-17	230	102	97	88	82	72	62	52
C-130	180	99	95	90	84	76	68	55

Note: 1. Level flight, steady, high-speed conditions.
2. Projected based on F-22A composite aircraft.
AGL = above ground level
Sources: USAF 2006a, 2006b, 2007

3.2.2 EXISTING CONDITIONS

3.2.2.1 SUBSONIC FLIGHT

Table 3.2-3 shows the baseline and projected noise levels under the Delta corridor currently used for MFE training. The table presents noise levels from 60 days of MFE activity without and with the proposed Delta MOA. Existing noise levels in all airspace units are 60.1 L_{dnmr} or less. Aircraft noise effects can be described according to two categories: annoyance and human health considerations. Annoyance, which is based on perception, represents the primary effect associated with aircraft noise. Far less potential exists for effects on human health.

TABLE 3.2-3. BASELINE AND PROJECTED NOISE LEVELS FROM 60 DAYS OF MFE TRAINING

MOA/ATCAA[1]	*Baseline without Delta MOA*	*Projected with Delta MOA*
Delta (from Eielson to Birch)[2]	41.0	43.4
Birch[3]	58.7	56.7
Delta (from Birch to Buffalo)[2]	41.0	45.2
Buffalo[3]	60.1	51.6

Notes: 1. Supersonic approved in ATCAA above FL300.
2. Baseline: Delta ATCAA; Projected: Delta MOA/ATCAA.
3. Delta ATCAA above for Baseline; Delta ATCAA and MOA above for Projected.

Studies of community annoyance to numerous types of environmental noise show that L_{dn}/L_{dnmr} correlates well with effects, and Schultz (1978) showed a consistent relationship between noise levels and annoyance. A more recent study reaffirmed and updated this relationship (Fidell *et al.* 1991). The updated relationship, which does not differ substantially from the original, is the current preferred form (see Appendix G).

3.2.2.2 SUPERSONIC FLIGHT

Supersonic flight is primarily associated with air combat training. Supersonic activity is authorized in the PARC above FL300. Supersonic flight produces an air pressure wave that may reach the ground as a sonic boom. The amplitude of an individual sonic boom is measured by its peak overpressure, in pounds per square foot (psf) and depends on an aircraft's size, weight, geometry, Mach number, and flight altitude. Table 3.2-4, page 3-12, shows sonic boom overpressures for F-15C, F-22A, and F-16 aircraft in level flight at various altitudes. The biggest single condition affecting overpressure is altitude. Maneuvers can also affect boom peak overpressures, increasing or decreasing overpressures from those shown in Table 3.2-4, page 3-12 (also see Appendix G).

TABLE 3.2-4. SONIC BOOM PEAK OVERPRESSURES (PSF) FOR AIRCRAFT AT MACH 1.2 LEVEL FLIGHT (IN POUNDS PER SQUARE FOOT)

	ALTITUDE (FEET)			
Aircraft	*10,000*	*20,000*	*30,000*	*40,000*
F-15C	5.40	2.87	1.90	1.46
F-16	4.4	2.3	1.5	1.2
F-18	5.0	2.7	1.7	1.3
F-22A	5.68	3.00	1.97	1.50

Source: USAF 2006a

In general, there is a high correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in L_{dn} or L_{dnmr}. The correlation is lower for the annoyance of individuals. This is not surprising considering the varying personal factors that influence the manner in which individuals react to noise. The inherent variability between individuals makes it impossible to predict accurately how any specific individual will react to a given noise event. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using L_{dn}. During community meetings, low level C-17 flights over Delta Junction were identified as an annoyance by meeting participants.

Relation Between Annoyance and Aircraft Noise

L_{dn}/L_{dnmr}	*CDNL*	*% Population Highly Annoyed*
40	40	0.4
45	44	0.8
50	48	1.7
55	52	3.3
60	57	6.5

Community effects from sonic booms, in the form of annoyance, correlates well with the C-weighted Day-Night Average Sound Level (CDNL). CDNL is similar to L_{dn}, but uses C-weighting to account for the low frequency impulsive nature of sonic booms. Interpretation of CDNL uses a slightly different relation than interpretation of L_{dn}, with a given numeric value of CDNL generally representing more annoyance than the same numeric value of L_{dn}.

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 change, causing booms to be turned upward as they travel toward the ground.

Depending on the altitude of the aircraft and the Mach number, many sonic booms are bent upward sufficiently that they never reach the ground. This same phenomenon, referred to as “cutoff,” also acts to limit the width (area covered) of the sonic booms that reach the ground (Plotkin *et al*. 1989).

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. The area under the Delta ATCAA, which is over both the Birch and Buffalo MOAs, is projected to experience to an estimated 12.2 booms per month (USAF 2006b). 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. Aircraft will set up at positions in excess of 100 NM apart before proceeding toward each other for an engagement. The airspace used tends to be aligned, connecting the setup points in an elliptical shape. Aircraft will fly 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.

A variety of aircraft conducting training perform flight activities that include supersonic events. For most aircraft, these events occur during air-to-air combat, often at high altitudes. 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 Arizona (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) 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.

Individual sonic boom footprints could affect areas from about 10 square miles to 100 square miles. During an MFE conducted 7-18 April 2008, throughout the PARC training airspace, sonic boom reports from the public were reported to Eielson AFB. Approximately 50 noise reports were traced to supersonic events during the MFE. The public reports of sonic booms were spread over an area of approximately 300 square miles. Two of the noise complaints were identified as coming from residents under the proposed Delta MOA airspace.

3.3 SAFETY

3.3.1 DEFINITION

Safety is the conduct of flight training within the Alaskan airspace in a manner that protects other users of the area, as well as military pilots. The ROI for safety is the same as for airspace management. Communication is an important part of safety within the airspace. Elmendorf AFB and Eielson AFB have existing programs and guidance to support safe operations and reduce risks associated with training in Alaskan airspace (USAF 1995; Elmendorf AFB 2003; 3rd Wing [3 WG] 2004). Appendix I contains an example of a communication pamphlet to help civil aviation with safe transit of MOAs during military training. This section addresses communication, flight, ground, explosive, and other safety issues associated with 11 AF and MFE aircrew training within the airspace.

3.3.2 EXISTING CONDITIONS

3.3.2.1 COMMUNICATION WITHIN THE AIRSPACE

Communication within the ATCAAs and MOAs is an important part of safe airspace management. As part of the overall PARC communication system, the USAF has initiated projects to expand communication within the airspace used for all training, including MFEs. These communication enhancements expand both radio and radar coverage in the airspace potentially affected by the proposed Delta MOA Complex. Figure 3.3-1, page 3-14, presents the past radio coverage for communication with military and civil aviation in the airspace. The dark purple includes areas where radio communication exists from 1,000 feet above ground level (AGL) and above. Certain areas of the Buffalo MOA did not have adequate radio coverage. Figure 3.3-2, page 3-15, depicts the enhanced radio coverage resulting when the three additional relay systems are fully operational. The USAF is working with the FAA to provide ATC with the enhanced radio coverage. This radio coverage in the future would benefit airspace management and military and civil aviation throughout the Fox, Eielson, and Yukon MOAs, as well as outside the MOAs in airspace not used for military training. The enhancements also benefit aircraft in the Delta corridor.

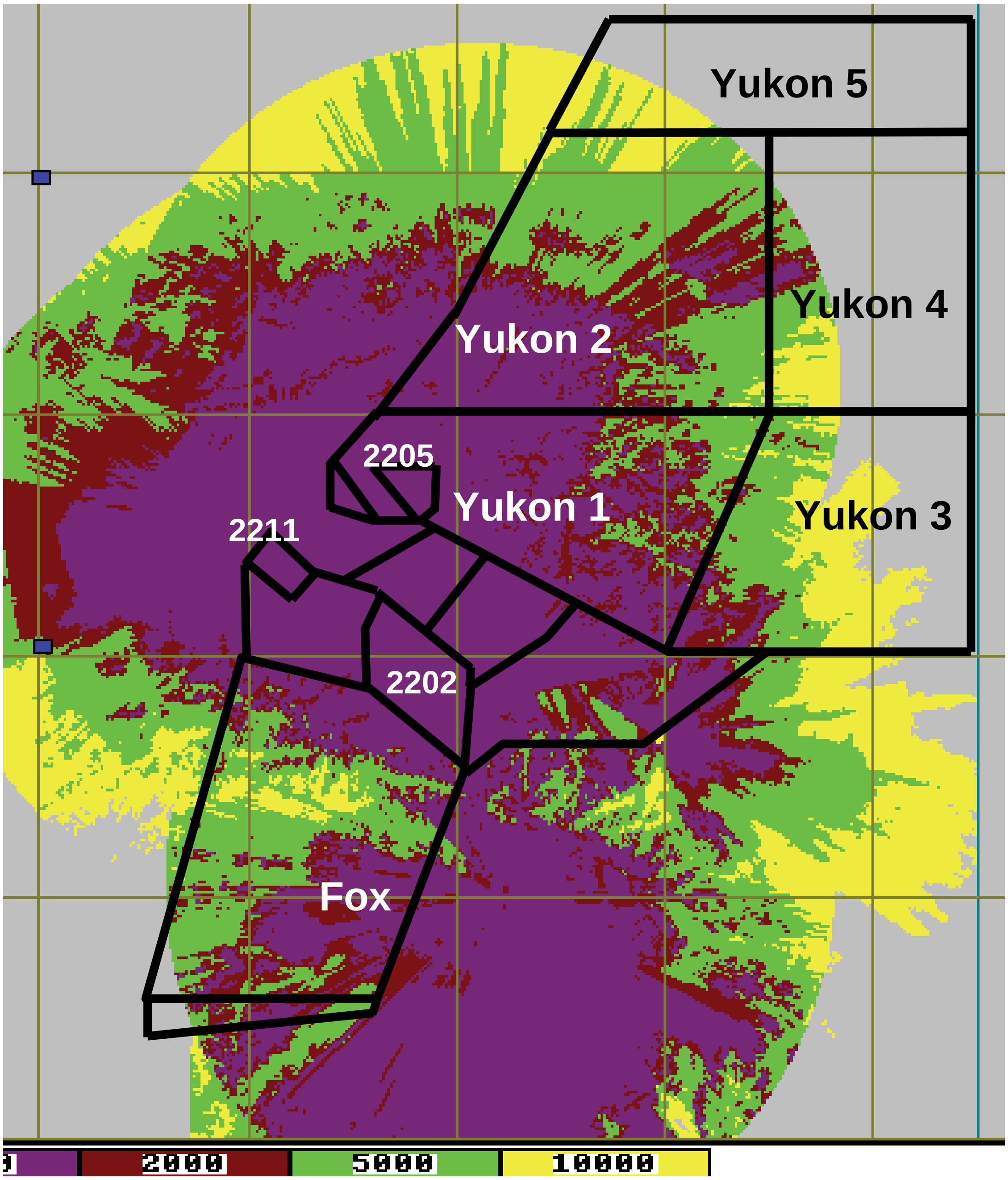


FIGURE 3.3-1. PAST RADIO COVERAGE

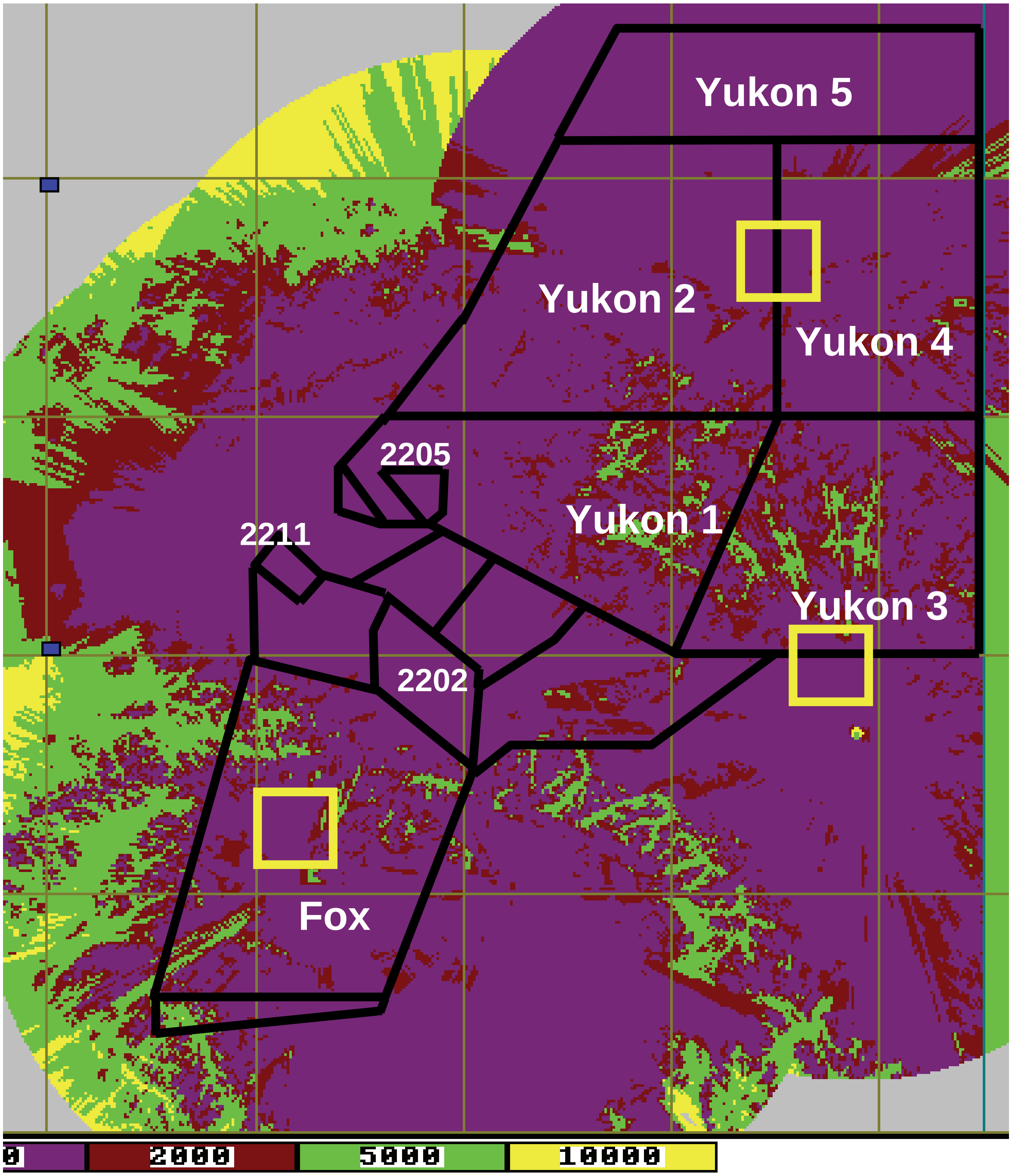


FIGURE 3.3-2. ENHANCED RADIO COVERAGE

Radar coverage is important to safe airspace management because it permits ATC to determine the location of aircraft which have location transmitters. Figure 3.3-3 depicts the past radar coverage accessible to ATC. Substantial areas of the Fox and Buffalo MOAs did not have radar coverage below 5,000 to 10,000 feet MSL. Enhancements depicted in Figure 3.3-4, page 3-17, demonstrate that ATC certifiable radar coverage is below 2,000 feet MSL in nearly all areas of the proposed Delta corridor. The enhanced radar coverage provides information to Eielson Range Control of aircraft activity within the airspace.

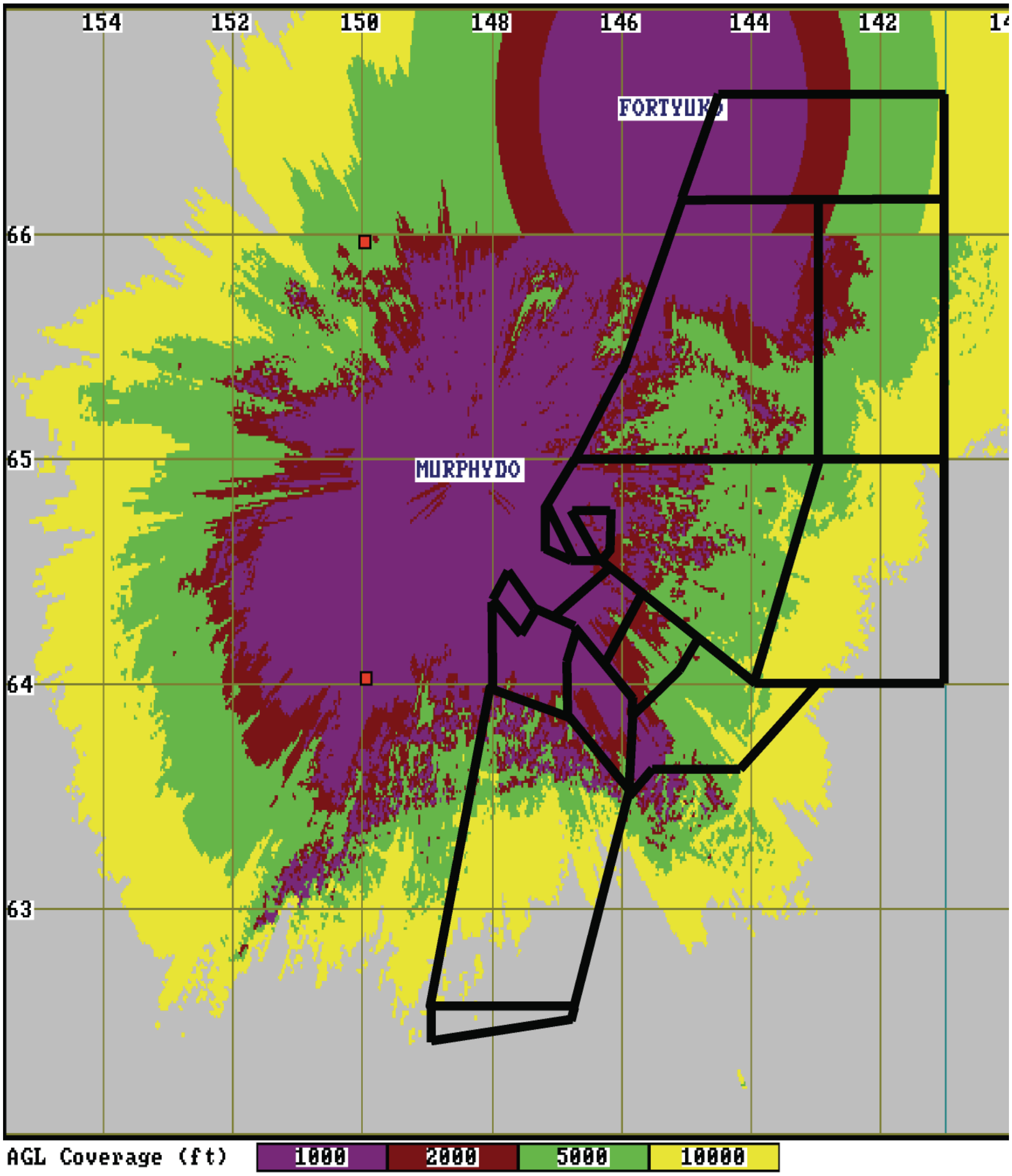


FIGURE 3.3-3. PAST RADAR COVERAGE

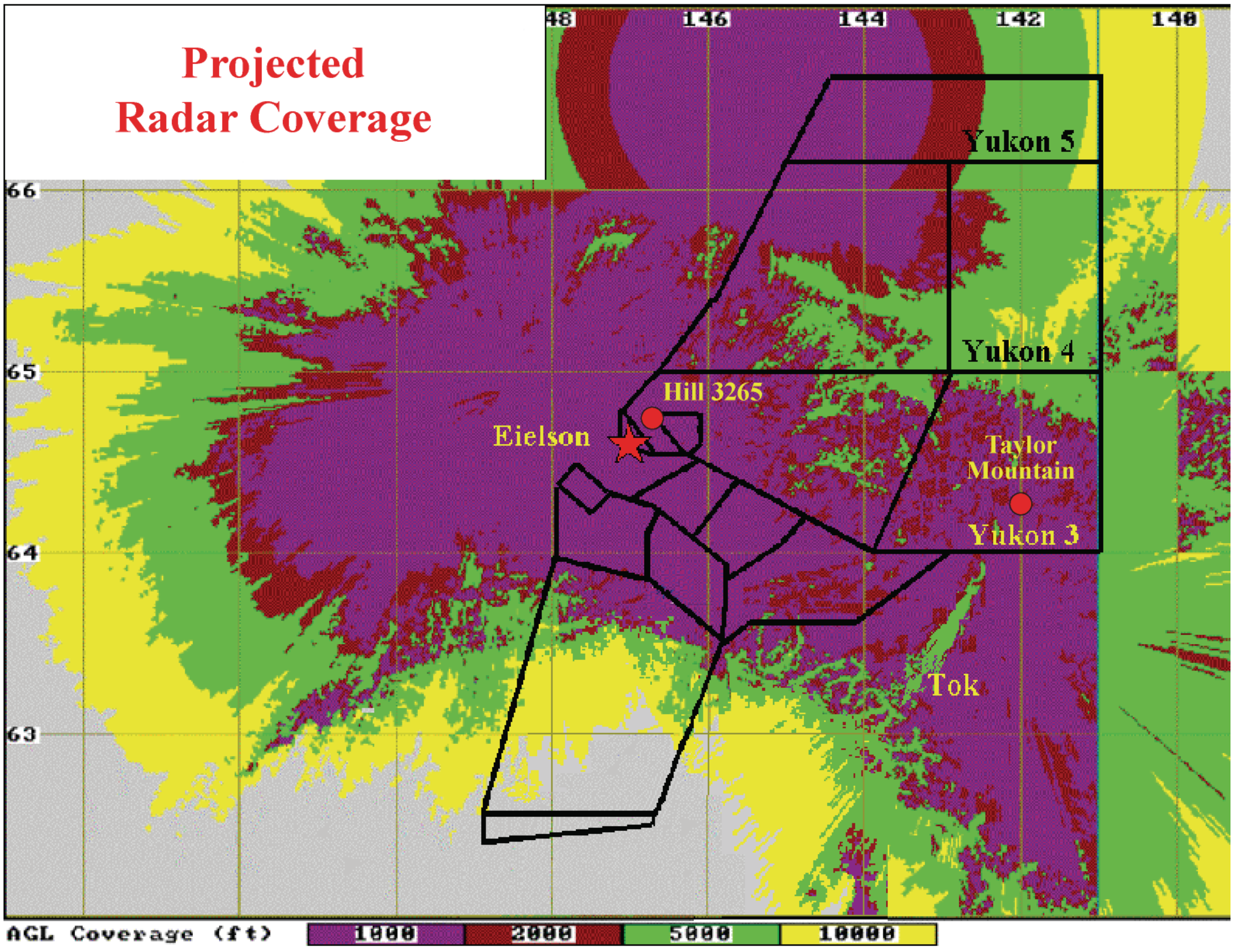


FIGURE 3.3-4. EXPANDED RADAR COVERAGE

The combined effect of enhanced radio and radar coverage provides information for improved safety in airspace management. These improvements include improved ability to communicate airspace activity, better information of aircraft locations, and ability to update routing and altitude information. Although all general aviation aircraft in Alaska do not possess location transponders, the airspace improvements to communication and radar coverage improve safety, efficiency, and emergency coverage of the area.

3.3.2.2 FLIGHT SAFETY

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. These mishap rates do not consider combat losses due to enemy action. Class A mishaps tend to occur more frequently around airfields and in low-altitude flight regimes. Major considerations in any accident are loss of life and damage to property. The aircrew's ability to exit from a malfunctioning aircraft is dependent on the type of malfunction encountered. The probability of an aircraft crashing into a populated area is extremely low, but it cannot be totally discounted. Several factors are relevant in the ROI: the immediate surrounding areas have relatively low population densities; pilots of aircraft are instructed to avoid direct overflight of population centers at very low altitudes; and the limited amount of time the aircraft is over any specific geographic area limits the probability that impact of a disabled aircraft in a populated area would occur.

Secondary effects of an aircraft crash include the potential for fire or environmental contamination. Again, because the extent of these secondary effects is situationally dependent, they are difficult to quantify. The terrain overflown in the ROI is diverse. For example, should a mishap occur in highly vegetated areas during a hot, dry summer, such a mishap would have a higher risk of extensive fires than would a mishap in more barren and rocky areas during the winter. When an aircraft crashes, it may release hydrocarbons. Those petroleums, oils, and lubricants not consumed in a fire could contaminate soil and water. The potential for contamination is dependent on several factors. For example, the porosity of the surface soils will determine how rapidly contaminants are absorbed, while the specific geologic structure in the region will determine the extent and direction of the contamination plume. The locations and characteristics of surface and groundwater in the area will also affect the extent of contamination to those resources.

In the case of MOAs, for each specific aircraft using the airspace an estimated average sortie duration may be used to estimate annual flight hours in the airspace. Then, the Class A mishap rate per 100,000 flying hours can be used to compute a statistical projection of anticipated time between Class A mishaps in each applicable element of airspace. In evaluating this information, it should be emphasized that those data presented are only statistically predictive. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft.

Table 3.3-1 presents estimated Class A mishap rates for an estimated annual maximum of 60 days of MFE flight operations conducted in the Delta ATCAA and Birch and Buffalo MOAs. Shown for the airspace is the mishap rate for the aircraft, the estimated number of annual operations for those aircraft, the levels of use, and the statistically predicted time between Class A mishaps considering the mishap rates and levels of use. The proposed Delta MOA would result in a redistribution of aircraft by altitude in the Delta corridor. The number of aircraft operating within the Delta ATCAA and available MOAs is projected to be approximately the same with existing conditions or with the proposed Delta MOA.

TABLE 3.3-1. CLASS A MISHAPS FOR CURRENT AND PROJECTED MFE OPERATIONS IN THE PROPOSED DELTA MOA COMPLEX

Airspace	*Aircraft Type*	*Mishap Rate*	*MFE Annual Operations (Estimated)*	*MFE Hours*[1] *(Estimated)*	*Years Between Projected Mishap*[2]
Delta ATCAA and Proposed Delta MOA Complex Including Birch and Buffalo MOAs	A-10	2.36	150	75	564
	F-15	2.46	600	300	135
	F-16	3.98	1100	550	45
	F-18[3]	3.34	780	390	76
	F-22A[4]	2.46	320	160	254
	B-1B	4.51	190	95	233
	C-130[5]	0.91	660	330	333

Notes:
1. Assumes maximum number of 60 MFE days per year
2. Years between mishap = 1.0/[(mishap rate/100,000)*MFE hours]
3. Foreign and other fighter aircraft assumed comparable to F-18
4. F-22A, F-35, and V-22 have not flown requisite hours for a meaningful Class A rate; F-15 operational rate assumed
5. Includes C-17 and other heavies

Source: Air Force Safety Center 2006

The military maintains detailed emergency and mishap response plans to react to an aircraft accident, should one occur. These plans assign agency responsibilities and prescribe functional activities necessary to react to major mishaps, whether on or off base. Response would normally occur in two phases. The initial response focuses on rescue, evacuation, fire suppression, safety, elimination of explosive devices, ensuring security of the area, and other actions immediately necessary to prevent loss of life or further property damage. The second phase investigates the accident to determine the cause.

First response to a crash scene is often provided by local emergency services nearest the scene. At the same time, the USAF rapidly mobilizes a response team. The initial response element consists of those personnel and agencies primarily responsible to initiate the initial phase. This element will include the Fire Chief, who will normally be the first On-Scene Commander, fire-fighting and crash rescue personnel, medical personnel, security police, and crash recovery personnel. A subsequent response team is comprised of an array of organizations whose participation will be governed by the circumstances associated with the mishap and actions required to be performed.

After all required actions on the site are complete, the aircraft will be removed and the site cleaned up. Depending on the extent of damage resulting from a Class A mishap, only the largest damaged parts may be located and removed from a crash site.

During community meetings held in conjunction with preparation of this EA, private pilots expressed concern about flight safety as it relates to interaction between military and civil aviation. A variety of existing actions have been implemented by the 11 AF to reduce the potential for interaction between military and civilian aircraft (see Table 2.6-2, page 2-19). The USAF reduces training and does not schedule MFEs during September hunting season or heavy holiday usage of the airspace by private pilots. Discussions during scoping with pilots, hunters, fishermen, and recreationists flying to use the land under the MOAs revealed that, although they occasionally sighted a military aircraft, they generally flew at lower altitudes than the military aircraft and both pilots practiced see-and-avoid measures. A VFR corridor has been designated between Tok and Fairbanks through the Birch and Buffalo MOAs. This VFR corridor is kept open for civil aviation during USAF regular training and MFEs. Improved communication and radar coverage have been installed and is operated by the USAF to improve tracking of and communication with civil aviation within the ROI airspace. These actions and other ongoing communication methods have been implemented by the USAF to support safe training while being joint users of Alaskan airspace.

3.3.2.3 GROUND AND EXPLOSIVE SAFETY

Aircrews in Alaskan Airspace train on air-to-ground ranges under the Restricted Airspace. USAF safety standards require safeguards on weapons systems and ordnance to ensure against inadvertent releases. All munitions mounted on an aircraft, as well as the guns, are equipped with mechanisms that preclude release or firing without activation of an electronic arming circuit. Detailed operating procedures published by the air-to-ground ranges that support 11 AF training ensure that all safety standards are met for the type of ordnance delivered and the delivery profile associated with that ordnance delivery.

3.3.2.4 CHAFF AND FLARE USE

Chaff and defensive flares are managed as ordnance. Chaff and flares are authorized for use by 11 AF crews in existing MOAs and ATCAAs. Use is governed by detailed operating procedures to ensure safety. USAF altitude restrictions for flare use in Alaskan airspace are above 5,000 feet AGL from June through September and above 2,000 feet AGL for the rest of the year. These altitude restrictions substantially reduce any risk of a fire from training with defensive flares.

Chaff, which is ejected from an aircraft to reflect radar signals, consists of fibers of aluminum-coated silica thinner than human hair packed into approximately 4-ounce bundles. When ejected, chaff forms a brief electronic “cloud” that temporarily masks the aircraft from radar detection. Although the chaff may be ejected from the aircraft using a small pyrotechnic charge, the chaff itself is not explosive (USAF 1997). Depending on the chaff used, plastic or nylon pieces, a felt piece, and parchment paper 2-inch by 3-inch squares can fall to the ground with each released chaff bundle. Appendix B provides an expanded discussion of chaff.

Each defensive flare consists of small pellets of highly flammable material that burn rapidly at extremely high temperature. Flares provide a heat source, other than the aircraft’s engine exhaust, to mislead heat-sensitive or heat-seeking targeting systems and decoy them away from the aircraft. The flare ignites upon ejection from the aircraft and burns completely within approximately 3.5 to 5 seconds, or approximately 400 to 500 feet from its release point (USAF 1997).

The existing use of flares as defensive countermeasures results in small plastic, nylon, and aluminum-coated Mylar pieces falling to the ground. As discussed in Appendix C, Characteristics of Flares and Appendix H, Review of Effects of Aircraft Noise, Chaff, and Flares on Biological Resources, flare residual materials are generally light with a high surface to weight ratio. This results in essentially no likelihood of a flare end cap, piston, or wrapper causing injury in the highly unlikely event residual material from a flare struck a person or an animal.

The only exception could be the flare safe & initiation (S&I) device which falls with the force of a medium-sized hailstone. Calculations of the likelihood of an S&I device striking an individual take into consideration the population density under the airspace, the number of flares deployed, and the amount of time the population was outside and unprotected even by a hat. If, for example, a population has an average density of 0.5 persons per square mile and is exposed 50 percent of the time under an airspace the size of the proposed Delta MOA, and if 2,000 flares were deployed annually in the airspace, the expected strikes of a hailstone-sized S&I device to a person would be 1 in 16,000 years. In other words, it is extremely unlikely that anyone would be struck with the force of a medium-sized hailstone as a result of existing or proposed USAF training with flares in the airspace.

3.4 AIR QUALITY

3.4.1 DEFINITION

This section discusses air quality considerations and conditions in the area under the proposed Delta MOA. It addresses air quality standards and describes current air quality conditions in the region. The potential influence of emissions on regional air quality would typically be confined to the air basin in which the emissions occur.

Federal and State Air Quality Standards. Air quality is determined by the type and concentration of pollutants in the atmosphere, the size and topography of the air basin, and local and regional meteorological influences. 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. Under the authority of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (USEPA) 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 and were developed for seven "criteria" pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$), ozone (O_3), 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 generally 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.

Prevention of Significant Deterioration. Section 162 of the Clean Air Act (CAA) established the goal of Prevention of Significant Deterioration (PSD) of air quality in all international parks; national parks which exceeded 6,000 acres; and national wilderness areas and memorial parks which 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, the federal government, states, or tribal nations have the authority to redesignate certain areas, such as a national park or national wilderness areas greater than 10,000 acres established after August 7, 1977, as (non-mandatory) PSD Class I areas. PSD Class I areas are areas 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 pre-construction permitting system.

3.4.2 EXISTING CONDITIONS

Based on measured ambient criteria pollutant data, the USEPA designates areas of the U.S. as having air quality equal to or better than the NAAQS (attainment) or worse than the NAAQS (nonattainment). Upon achieving attainment, areas previously in nonattainment are considered to be in maintenance status for a period of 10 or more years. Areas are designated as unclassifiable for a pollutant when there is insufficient ambient air quality data for the USEPA to form a basis of attainment status. For the purpose of applying air quality regulations, unclassifiable areas are treated similar to areas that are in attainment of the NAAQS.

Air quality in the Delta corridor is in attainment and has air quality equal to or better than the NAAQS. The Delta corridor has winds funneling through nearby mountain passes which break up inversions by mixing the air. This Delta corridor condition is substantially different from the geographic setting of Fairbanks which is situated within a three-sided basin and protected from winds. This basin produces one of the lowest wind conditions in the world and can produce very stable inversion conditions around Fairbanks. In Alaska, alternative forms of transportation and energy generation are a necessity given the isolated nature of many towns and villages. All-terrain vehicles (ATVs or 4-wheelers) often replace the automobile in the warmer weather months and snowmobiles take their place as soon as the snow falls. These vehicle engines, as well as diesel generators used to produce electricity, contribute to the air emissions of the region.

The rural areas under the proposed Delta MOA are classified as attainment areas for emissions. No ground construction is proposed as part of the Delta MOA Complex.

The likelihood for air quality impacts associated with airspace use was evaluated based on the floor height of the primary MOAs relative to the mixing height for pollutants. Mixing height for the area under the proposed Delta MOA Complex is 2,000 feet AGL. The proposed floor of the Delta MOA would be 3,000 feet AGL (Figure 1.1-3, page 1-4). MFE training in the proposed Delta MOA would not include aircraft flying below the average mixing height of 2,000 feet.

MFE training in the proposed Delta MOA would not be at altitudes that could contribute to deterioration of air quality within the Delta corridor.

3.5 PHYSICAL RESOURCES

3.5.1 DEFINITION

Physical resources are defined as the earth and water resources beneath the proposed Delta MOA Complex. This ROI is an area of diverse geologic and hydrologic features and is classified as part of the Interior of Alaska.

3.5.2 EXISTING CONDITIONS

The area primarily traverses the Tanana River valley between the Alaska Range to the south and Mertie Mountains to the north. The physiography of much of the area consists of fluvial, glaciofluvial, and wind-borne sediments overlying granitic and sedimentary bedrock. River bottoms are level to slightly sloping up to the east and feature fine to course quaternary sediments, gravel, and cobble. Much of the central portion of the environment beneath the proposed airspace is dominated by the broad and highly-braided floodplains of the Tanana and Delta Rivers. Beyond this, the landscape is punctuated by prominent bedrock exposures (primary to the northern and southern reaches of the proposed airspace, but occasionally adding interest and topographic relief to the highway corridor), steep alluvial fans and moraines. Nearly all low-lying areas are classified as wetlands.

The Alaska interior around Fairbanks is represented by low population density, forested uplands, wetlands, and river systems.

Portions of the existing Birch, Buffalo, and Eielson MOAs overlie the Yukon-Tanana Upland (USAF 1995). Earth resources beneath the proposed training airspace extend from the Alaska Range on the south and generally follows the course of the Tanana River. The area is generally characterized by low ridges with gentle slopes and summits 1,500 to 2,500 feet high with a few 3,500-foot peaks. Valley floors are broad and irregular, with many imperceptible divides. The flat floodplains are rolling silt and gravel-covered marginal terraces having sharp escarpments 150 to 600 feet high which rise above the flats and slope gradually up to altitudes of about 1,500 feet at the base of surrounding uplands and mountains (U.S. Geological Survey [USGS] 2000).

The Yukon-Tanana Upland is characterized by rounded even-topped ridges. In the western part, these rounded ridges trend northwestward to eastward and have altitudes of 1,500 to 3,000 feet. The ridges are surmounted by compact rugged mountains 4,000 to 5,000 feet in altitude. Ridges in the eastern part are 3,000 to 5,000 feet in altitude and rise 1,500 to 3,000 feet above adjacent valleys. Valleys in the western part are generally flat, alluvium floored, and 0.25-0.50 mile wide to within a few miles of headwaters. No glaciers are in the region, but the entire section is underlain by discontinuous permafrost (USGS 2000). The Birch, Buffalo, and Eielson MOAs also overlie the Tanana-Kuskokwim Lowland and the Northern Hills. The lowland is a broad depression north of the foothills of the Alaska Range. The Tanana and Delta rivers, rising in the Alaska Range, flow north across the lowland at intervals of 5 to 20 miles. Thaw lakes and sinks are abundant in the lowlands. The Northern Foothills of the Alaska Range are flat-topped east-trending ridges 2,000 to 4,500 feet in elevation, 3 to 7 miles wide, and 5 to 20 miles long, and separated by rolling lowlands 700 to 1,500 feet high and 2 to 10 miles wide (USAF 1995).

South of the proposed Delta MOA Complex, beneath the Fox MOAs, the region is bounded on the east by the St. Elias and Chugach mountains, which are breached only by the Copper River Valley. The Aleutian Range along the western boundary of the Fox MOAs is characterized by extreme relief with lowlands near sea level and mountains rising up to 10,000 to 20,320 feet. The Fox MOAs overlie the central part of the Alaska Range in the north, the Clearwater Mountains in the center, the foothills of the Talkeetna Mountains in the southwest, and the Gulkana Upland and Copper River Lowland in the southeast. The central part of the Alaska Range contains ridges 6,000 to 9,000 feet high, surmounted by peaks over 9,500 feet in elevation, including Mount Deborah (12,329 feet), Mount Moffit (13,020 feet), and Mount Hayes (13,832 feet). The range rises abruptly from lower country on either side (USAF 1995).

3.6 BIOLOGICAL RESOURCES

3.6.1 DEFINITION

Biological resources on lands under SUA include vegetation and habitat, wetlands, fish and wildlife, and special-status species. Table 3.6-1, page 3-24, identifies the relationship between special-status species and the Alaskan training airspace used for MFEs. The ROI for training airspace in Alaska consists of lands under the proposed Delta MOA Complex.

Vegetation in the area is primarily “riparian forest” consisting of variable mixed stands of balsam poplar, alder, and black and white spruce. Early secessional river bars are dominated by mixed willow and other shrubs. Most areas are underlain by permafrost at a depth of 50 to 75 centimeters (Magoun and Dean 2000). The upper tree line is approximately 900 feet MSL (Bonanza Creek Long Term Ecological Research 2007).

The physiography and vegetation create a highly varied setting for wildlife. Rich avian habitat is provided for migrating breeding birds in both river bottoms and forests. Furbearers and large mammals find habitats rich in resources (Magoun and Dean 2000).

3.6.2 EXISTING CONDITIONS

Existing PARC training airspace occurs primarily in MOAs and ATCAAs, some of which overlie the Delta corridor. Training is authorized at different altitudes depending upon the MOA. Chaff and flare use is authorized in existing airspace over the Delta corridor. ATCAAs, including the Delta ATCAA, have supersonic flight authorized above FL300.

TABLE 3.6-1. THE RELATIONSHIP OF SPECIAL-STATUS SPECIES TO THE PROPOSED DELTA AIRSPACE COMPLEX

Common Name	*Scientific Name*	*Status*	*Occurrence under Training Airspace*
Aleutian shield fern	*Polystichum aleuticum*	FE	No
Chinook salmon (Fall stock from Snake River)	*Oncorhynchus tshawytscha*	AK SSC	No
Short-tailed albatross	*Phoebastria albatrus*	FE, AKE	No
Kittlitz's murrelet	*Brachyramphus brevirostris*	FC	No
Eskimo curlew	*Numenius borealis*	FE, AKE	Unlikely; species is considered extinct
Spectacled eider	*Somateria fisheri*	FT, AK SSC	No
Stellar's eider (AK breeding population)	*Polysticta stelleri*	FT, AK SSC	No
Aleutian Canada goose	*Branta canadensis leucopareia*	AK SSC	No
Peregrine falcon	*Falco peregrinus*	AK SSC	Yes
Northern goshawk (southeast AK population)	*Accipiter gentilis laingi*	AK SSC	No
Olive-sided flycatcher	*Contopus cooperi*	AK SSC	Yes
Gray-cheeked thrush	*Catharus minimus*	AK SSC	Yes
Townsend's warbler	*Dendroica townsendi*	AK SSC	Yes
Blackpoll warbler	*Dendroica striata*	AK SSC	Yes

FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; AKE = State of Alaska Endangered; AK SSC = State of Alaska Species of Special Concern.

Sources: Alaska Department of Fish and Game 2005a and 2005b, United States Fish and Wildlife Service (USFWS) 2005.

Vegetation. The existing training airspace overlies the Upland Tundra and Boreal Forest ecoregions (Bailey 1995). Predominant land cover types are forests (60 percent), fields (17 percent), and tundra (15 percent) (USAF 2001d). Forest types are largely evergreen and mixed conifer/deciduous. Rivers and wetlands are interspersed with the forests. Wetland types under the airspace are largely deciduous, evergreen, and mixed forest wetlands.

Fish and Wildlife. Common fish and wildlife species within the existing Delta corridor include regionally important game species such as moose, caribou (*Rangifer tarandus*), Dall's sheep (*Ovis dalli*), bears, and various species of waterfowl. Moose, caribou, and Dall's sheep have critical lambing/calving, wintering, and rutting areas underneath portions of training airspace. The USAF has existing airspace restrictions that prevent potential overflight effects on these and other wildlife species. These mitigations are summarized in Section 2.4.2. These mitigations include protecting certain "at risk" wildlife populations by restricting overflights during critical life cycle periods. For example, the minimum overflight altitude is 3,000 feet over the Delta caribou herd calving areas from May 15 to June 15 (USAF 1995).

The Delta Junction State Bison Range is comprised of plains bison introduced in 1928 into an area formerly occupied by wood bison southeast of Delta Junction. The Bison Range starts about 12 miles southeast of Delta Junction on the Richardson Highway and is primarily under the Buffalo MOA. MFE use of the Buffalo MOA would be reduced with establishment of the proposed Delta MOA. Neither the existing MFE use of the Buffalo MOA nor the proposed MFE training in a new Delta MOA and the existing Buffalo MOA would be expected to impact the Bison Range.

Special-Status Species. Special-status species include species designated as threatened, endangered, or candidate species by state or federal agencies. There are no federally listed threatened or endangered species that occur under lands of the proposed training airspace (Table 3.6-1, page 3-24). Five Alaska species of special concern likely occur in the ROI. These are peregrine falcon, olive-sided flycatcher, gray-cheeked thrush, blackpoll warbler, and Townsend's warbler.

3.7 CULTURAL RESOURCES

3.7.1 DEFINITION

Cultural resources are any Alaskan Native, historic or prehistoric district, site, building, structure, or object considered important to a culture or community for scientific, traditional, religious or other purposes. The ROI for cultural resources is the area beneath the proposed Delta MOA Complex.

3.7.2 EXISTING CONDITIONS

Alaskan Native and archaeological sites under training airspace include native burial grounds, village and settlement sites, and historic mining sites (USAF 1991a). Architectural resources under the proposed MOAs include structures relating to gold mining, trapping, the Alaska-Canadian (ALCAN) Highway, and the railroad (USAF 1991). Architectural resources under the proposed Delta MOA Complex, which are listed on the National Register of Historic Places (NRHP), are as follows:

- Big Delta Historic District (Also known as Big Delta State Historical Park), Delta Junction.
- John Haines Homestead (Also known as Richardson Homestead), Delta.
- Rapids Roadhouse (Also known as Black Rapids Roadhouse), Delta.
- Rika's Landing Roadhouse (Also known as Rika's Landing Site), Big Delta.
- Sullivan Roadhouse (Also known as "T-3000"), Delta Junction.

National Register of Historic Places (NRHP)-listed resources underlie the Birch, Buffalo, Eielson, and Viper MOAs (National Register Information Service [NRIS] 2006). The Regional Native Corporation for the area is Doyon. The Alaska Native villages of Healy Lake and Dot Lake are located under the existing Buffalo MOA as depicted on Figure 3.7-1, page 3-26. Sixty days of MFE training without the Delta MOA results in L_{dnmr} 60.1 db noise levels under the Buffalo MOA. These noise levels without the Delta MOA are above the 55 dB level identified by the USEPA as the level to begin assessing the potential for environmental impacts.

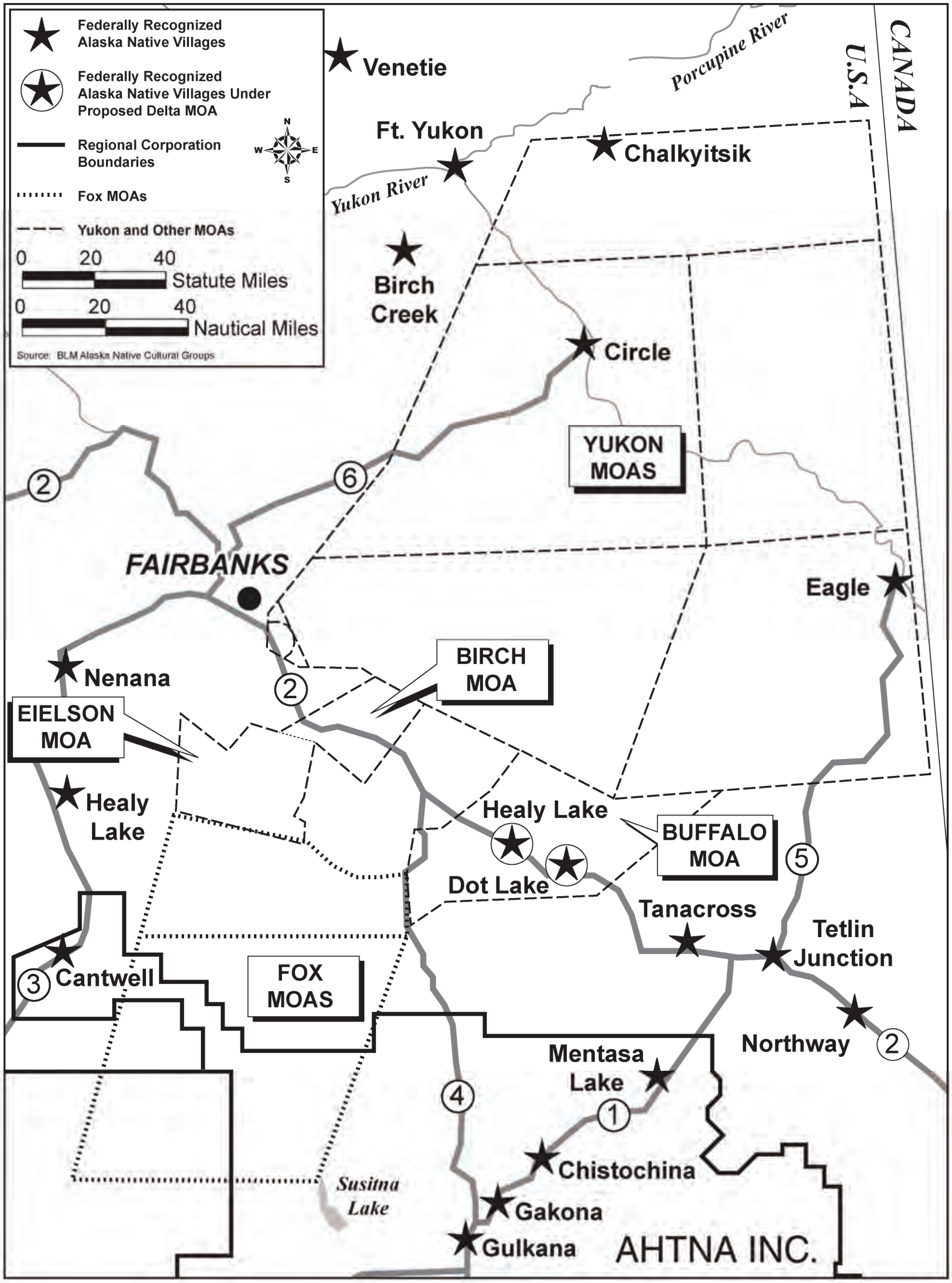


FIGURE 3.7-1. FEDERALLY RECOGNIZED ALASKA NATIVE VILLAGES

The Alaska Military Operations Area Environmental Impact Statement (AK MOA EIS) adopted mitigations to reduce potential effects to Native Alaskan subsistence hunting and guiding. These mitigations include restricting use of the adjacent Yukon 5 MOA to MFEs only, maintaining 2,000 feet AGL as the minimum altitude of the southeast half of the Yukon 3 MOA, and not scheduling MFEs during September (USAF 1995).

3.8 LAND USE AND RECREATION

3.8.1 DEFINITION

Land use addresses general land use patterns, land ownership, land management plans, and special use areas under the proposed Delta MOA Complex. General land use patterns characterize the types of uses within a particular area such as forests, residential, military, and recreational. Land ownership is a categorization of land according to type of owner. The major land ownership categories include state, federal, Alaska Native corporations, and other private landowners. Federal lands are described by the managing agency, which may include the USFWS, the U.S. Forest Service, Bureau of Land Management (BLM), or DoD. State of Alaska land under the study area is typically managed by the Departments of Fish and Game or Natural Resources. The land management plans include those documents prepared by agencies to establish appropriate goals for future use and development. As part of this process, sensitive land use areas are often identified by agencies as being worthy of more rigorous management. FAA administers all navigable airspace above public and private lands.

Recreation resources consider outdoor recreational activities that take place away from the residences of participants. This includes natural resources and man-made facilities that are designated or available for public recreational use in remote areas. As part of the mitigations identified for the AK MOA EIS Record of Decision (ROD), the USAF participates with public affairs channels to work with agencies, Alaska Natives, and others in the identification and mitigation of potential consequences to environmental resources (USAF 1995).

The ROI for land use and recreation consists of all the lands under the proposed Delta MOA airspace.

3.8.2 EXISTING CONDITIONS

The general land use patterns underlying this airspace may be characterized as very rural with scattered communities and other human uses extending throughout the Richardson and Alaskan Highway corridor beneath the proposed Delta MOA. Communities include Big Horn, Bluff, Moose Creek, Salcha, Richardson, Big Delta, Delta Junction, and Dot Lake. There are large public land areas as well as some agricultural forested areas. Remote areas are accessible only by waterways or small planes. Within populated communities, a variety of land use types occur, including residential, commercial, industrial, and public lands.

The Richardson Highway, designated Alaska Route 2 from Fairbanks to Delta Junction, is the all season highway under the proposed Delta MOA.

Methods used to identify land uses under the proposed Delta MOA Complex involved collection and review of available published information, and a reconnaissance of the human and natural environments under the proposed airspace to refine information and record site-specific conditions. The results are presented using a segment system consisting of five segments established for the Richardson and Alaskan Highway system from Eielson AFB to south of Donnelly Dome and Delta Junction to Dot Lake.

The approximately 165 mile Richardson and Alaskan Highway corridor has been divided into five segments to make the presentation of data and analysis manageable and consistent. The five segments are:

- **Segment 1**: Richardson Highway from east of North Pole to near Silver Fox Lodge.
- **Segment 2**: Richardson Highway from Silver Fox Lodge to Shaw Creek Flats.
- **Segment 3**: Richardson Highway from Shaw Creek Flats to Delta Junction.
- **Segment 4**: Alaskan Highway from terminus at Delta Junction to Dot Lake.
- **Segment 5, Delta 3 and 4 MOA**: Richardson Highway from south of Delta Junction to south of Donnelly Dome area.

SEGMENT 1

Segment 1 begins where the western margin of the proposed Delta MOA crosses the Richardson Highway east of North Pole. This area is closest to Fairbanks and supports the highest levels of human activity. Within a setting dominated by late stage black spruce forest and wetlands, numerous sloughs and small lakes intermix with small residential communities and other human land uses. A small community called Big Horn is followed by another called Bluff. As the southeast trending highway reaches Moose Creek Village, it turns more southward to parallel the airfield of Eielson AFB (milepost 334). With the end of Eielson AFB property begins rather dispersed community of Salcha. Originally an Alaskan Native community, Salcha was slowly transformed during the early part of the 20th century as European immigrants lived along side and then replaced the shrinking Alaskan Native population. Salcha Elementary School is located at milepost 325.3. Segment 1 becomes more remote and scenic as the highway converges on the Tanana River. Lodges and recreational areas abound. These include Salcha River State Recreation Area (milepost 324.3), Harding Lake State Recreation Area (milepost 321.6), and Silver Fox Lodge. An avian flyway is evidenced on power lines crossing the Salcha River (milepost 322).

SEGMENT 2

Segment 2 begins at a hill to the east of Silver Fox Lodge. It then continues on to the Birch Lake Military Recreation Area (milepost 305.2). All-season recreational uses are evidenced. Cabins dot the margin of the lake.

The Salcha community ends at the Banner Creek Bridge near the community of Richardson. Beyond Richardson, the highway briefly traverses upland habitats with more variable relief, with more rugged landscapes lying to the north. The highway crosses Shaw Creek and resumes its river-following course at the Shaw Creek Lodge (milepost 286.4). Segment 2 ends with a broad area of marshy bottom land (Shaw Creek Flats).

SEGMENT 3

From the Shaw Creek Flats, the highway continues through the communities of Big Delta and Delta Junction. These are the larges communities under the proposed Delta MOA Complex. The Quartz Lake State Recreation Area is located at milepost 278. Throughout the length of this segment, the highway lies in close association with the Tanana and Delta Rivers moving through willow, poplar, and spruce habitats. Although mostly level, at the confluence of the Tanana and Delta Rivers, the highway traverses a bedrock exposure of some relief. At the Tanana River crossing, an Alaskan Pipeline river crossing parallels the highway. A state historical park is located in Big Delta (milepost 275). Delta Junction is an active community that marks the northern terminus of the ALCAN Highway.

SEGMENT 4

Segment 4 follows the ALCAN Highway to Dot Lake. For most of its length, this segment is straight and level as it moves through black spruce forest. Agricultural land uses are north of the highway. At ALCAN milepost 1410, Near Dot Lake, the highway enters Tanana Valley State Forest and the Tok Management Area as it converges once more with the Tanana River. An airstrip is located just west of Dot Lake.

SEGMENT 5

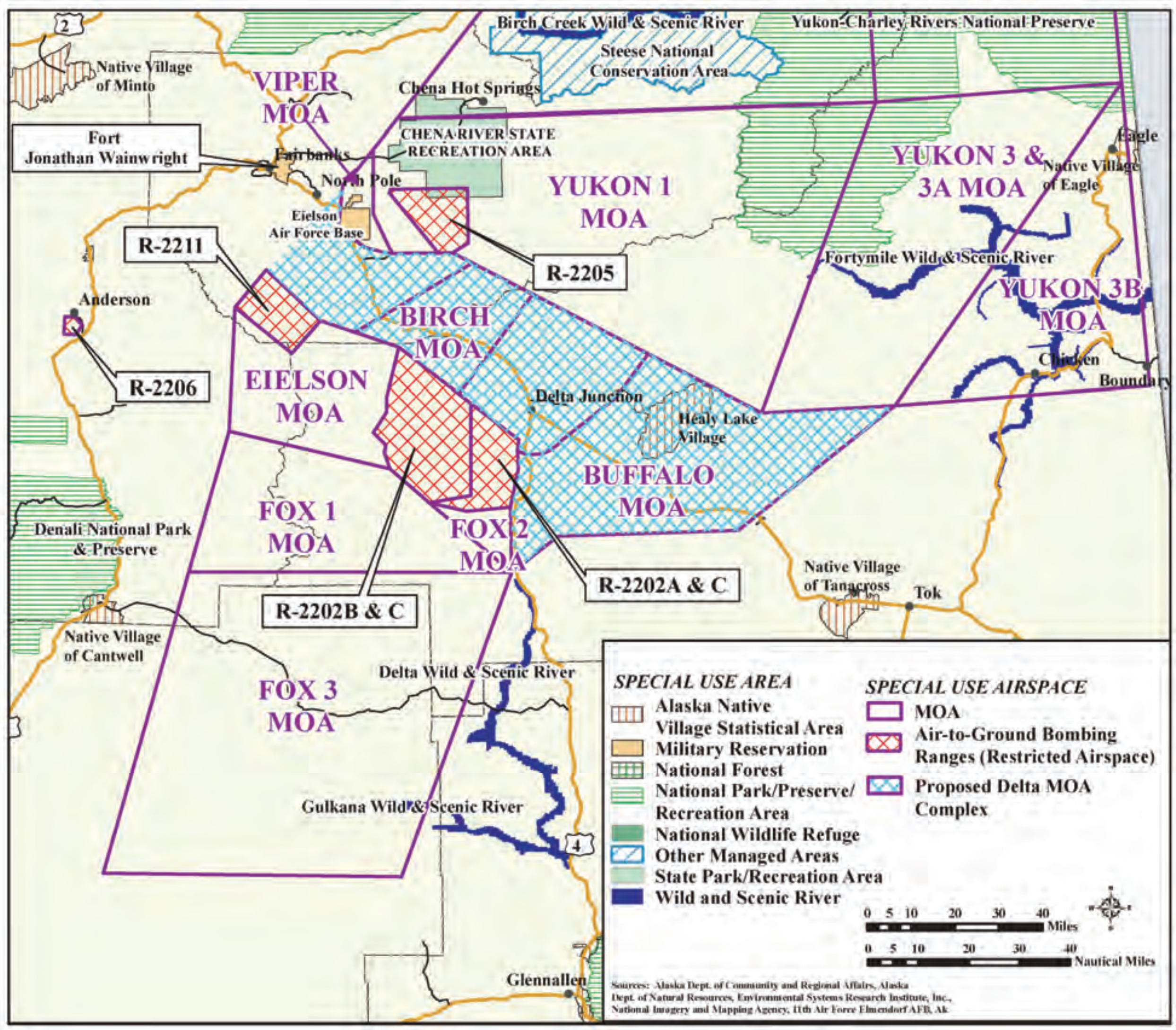
Segment 5 moves south from Delta Junction and follows the Richardson Highway through Fort Greely. The Richardson Highway parallels the trans-Alaska pipeline route.

The highway grades upward on its approach to Donnelly Dome and the foothills of the Alaska Range. As Route 4 transitions above the tree line, it enters an area of willow-dominated shrubs where moose find rich forage and cover. The highway travels south along the border of the existing Buffalo MOA and the Fox 2 MOA and exits the proposed Delta MOA Complex.

Special use areas provide recreational activities (trails and parks), hunting, fishing, and/or solitude or wilderness experience (parks, forests, and wilderness areas). Table 3.8-1 identifies the total area under the airspace units. Figure 3.8-1, page 3-30, presents these special use areas under or near training airspace. For the purpose of this EA, Alaska Native regional corporation private lands and village statistical areas are included with recreational areas. This broad grouping of special use areas includes large public land areas such as state or national parks, forests, and reserves which may include individual campgrounds, trails, and visitor centers. This broad definition of special use areas also includes large private land areas under the airspace.

TABLE 3.8-1. LAND AREA UNDER PROPOSED DELTA MOA COMPLEX

Airspace	*Total Area under Airspace (Acres)*	*Primary Land Use under Airspace*
Proposed Delta MOA West of Birch MOA	534,295	Western portion settled; most natural resources and recreation
Birch MOA	475,900	Natural resources and recreation
Proposed Delta MOA between Birch and Buffalo MOAs	708,552	Settled along highway and at Delta Junction; some military; most natural resources and recreation
Buffalo MOA	1,861,643	Settled along highway and at Healy Lake; most natural resources and recreation



Sources: Alaska Dept. of Community and Regional Affairs, Alaska Dept. of Natural Resources, Environmental Systems Research Institute, Inc., National Imagery and Mapping Agency, 11th Air Force Elmendorf AFB, Ak

FIGURE 3.8-1. LAND USES WITHIN THE REGION

3.9 SOCIOECONOMICS

Socioeconomic factors are defined as the basic attributes and resources associated with the human environment, including population and economic activity. Data for the socioeconomic analysis in this EA were obtained from the U.S. Bureau of the Census, the Alaska Departments of Commerce and Labor, and communication with potentially affected airfields.

3.9.1 DEFINITION

The ROI for socioeconomic resources includes geographic areas under or proximate to the proposed training airspace. The geographic area considered is the Southeast Fairbanks Census Area, located partially under the existing Birch and Buffalo MOAs and the proposed Delta MOA Complex. The population center of Fairbanks is included although it is outside the airspace because scoping comments questioned potential effects from airspace changes. Other communities potentially affected include Delta Junction, Tok, and Northway.

3.9.2 EXISTING CONDITIONS

POPULATION AND HOUSING

The Southeast Fairbanks Census Area includes lands under training airspace which are very rural in nature with scattered populations. Population density in the region is 0.2 persons or fewer per square mile (see Table 3.9-1). The 34.9 percent housing vacancy rate reflects seasonal housing. Average household size in the area under the proposed airspace is approximately 2.8 persons per household. Information on specific communities within the region is included in the Aviation Facilities section below.

TABLE 3.9-1. DEMOGRAPHIC CHARACTERISTICS OF AFFECTED REGIONS (2000)

	Total Population	*Percent Rural*	*Population Density*	*Average Household Size*	*Housing Vacancy Rate*
State of Alaska	626,932	34.4	1.1	2.74	15.1
Fairbanks North Star Borough	82,840	30.4	11.2	2.68	10.6
Southeast Fairbanks Census Area	6,174	100.0	0.2	2.80	34.9

Source: U.S. Bureau of the Census 2000.

ECONOMIC ACTIVITY

Economic activity in the region away from population centers revolves primarily around Alaska's natural resources. Government and government enterprises provide many jobs in these regions and provide a measure of stability through year-round employment. Seasonal employment that includes guided hunting and fishing, recreation, and related industries are an important source of income. Population in many of these areas fluctuates throughout the year in response to seasonal activity. Resource-based tourism, mining, and oil/gas employment also contribute to regional economic activity. For many

General aviation is an important part of transportation in the interior of Alaska in nearly all weather conditions.

residents, subsistence fishing and hunting are important and contribute substantially to people's diets and supplementary income.

Fairbanks is a regional hub at the heart of the Alaskan Interior and provides a concentration of economic resources including intellectual capital, the natural resources industry, transportation infrastructure, the University of Alaska Fairbanks, and cold climate testing facilities (Fairbanks Economic Development Council 2006). Expanding on its traditional economic base, Fairbanks is moving to a more diverse economy while continuing to support development of the state's rich natural resources.

Seasonal unemployment rates vary widely in response to fluctuations in resource-based employment. Average annual unemployment rates in the rural areas are approximately 9.5 percent, in comparison to the state's average unemployment rate of 6.1 percent (see Table 3.9-2). Median household income and per capita personal income vary considerably. With nearly 50 percent of the state's population in the city of Anchorage and its environs, the household and personal income of Anchorage dominate state statistics. Most rural regions experience income levels lower than Anchorage or Anchorage-driven average state levels.

TABLE 3.9-2. ECONOMIC CHARACTERISTICS OF REGIONS (2000)

	Total Employment	*Percent Unemployment*	*Median Household Income*	*Per Capita Personal Income*
State of Alaska	281,532	6.1	$51,571	$22,660
Fairbanks North Star Borough	35,258	5.8	$49,076	$21,553
Southeast Fairbanks Census Area	1,932	9.5	$38,776	$16,679

Source: U.S. Bureau of the Census 2000.

The Fairbanks region includes a strong military presence. Eielson AFB and Fort Wainwright contribute substantially to economic activity, with an estimated annual economic impact of $800 million (Fairbanks Economic Development Council 2006). Eielson AFB hosts two-week MFEs which typically involve foreign participant expenditures of $24 million per MFE (personal communication, Eielson AFB Public Affairs 2008). Military expenditures generate economic activity in the region through housing, lodging, restaurants, and other miscellaneous participant spending. Military personnel and contracts complete the estimated $800 million annual military contribution to the Fairbanks region. Military-civilian collaborations on cold-weather testing and other high-tech developments generate indirect economic effects and diversify Alaska's resource-based economy.

AVIATION ACTIVITY

General aviation in Alaska has many unique features and unique challenges. The spectrum of general aviation activities ranges from the individual with an aircraft parked in his yard that uses the highway as a runway to take-off or land to the corporate jet aircraft supporting resource exploration throughout the state. It is not unusual to see grocery stores in Fairbanks advertising air delivery of groceries to remote areas. Hunters, fishermen, sightseers, and recreationists all have an important part in general aviation activities within the region. The aircraft plays an important role in game management through tracking and documenting game resources. Fixed base operators at the airports derive much of their income from transient users. The distances in Alaska necessitate the use of aircraft for emergency, safety, fire reconnaissance, firefighting, and other needs.

General aviation contributes to travel, safety, firefighting, recreation, mining, oil and gas development, and supplies. Airfields either located within the ROI or otherwise potentially affected by the Delta MOA Complex include Fairbanks, Delta Junction, Tanacross, Tok Junction, and Northway. General aviation also uses landing strips and lakes throughout the area under the proposed Delta MOA Complex.

Operational information were collected for each of the five public airports underlying or potentially effected by permanent charting of the Delta MOA airspace (see Table 3.9-3, page 3-34). Figure 3.9-1, page 3-35, displays the proposed Delta MOA airspace and the location of relevant public airports.

Of the five airports identified, Fairbanks International is the only facility with a control tower, an Instrument Landing System (ILS) installed, and a broad spectrum of services and fixed-base operators (FBOs). Delta Junction Airport, owned by the City of Delta Junction and situated under the proposed Delta MOA airspace, serves VFR transient general aviation. The facility itself is unattended with no on-site services. Tanacross Airport is currently owned by the BLM, however, it is in the process of being conveyed to the State of Alaska. Use at this unattended, uncontrolled facility is entirely transient general aviation. Tok Junction and Northway Airports both provide Instrument Approach Procedures (IAP) and serve a variety of operational uses including air taxi, local and general aviation, and some military. The Northway Airport is a location for general aviation aircraft transiting from Canada into Alaska and emergency flight services. Such aircraft stop at Northway for customs and other activities.

During scoping, public concerns were expressed regarding the potential effects upon both commercial and civil aviation, including flights through active MOAs, flights during inclement weather, operational delays and increased fuel costs due to re-routing, and effects on emergency flights. Managers of the general aviation facilities serving VFR traffic, alone, expressed the opinion that proposed scheduling, communications, and airspace boundaries associated with the Delta MOA were generally adequate to support continued VFR operations (Morris 2008). Fairbanks International Airport and commercial operators expressed concern that commercial aircraft, and other IFR traffic, could not deconflict during a Delta MOA activation period and would be required to fly south of the 63° corridor, incurring operational delays and increased fuel costs.

Because the airplane plays such a crucial role in Alaskan transportation, any potential restrictions on airspace are given substantial attention. The importance of general aviation and commercial aviation to Alaska was taken into consideration by the USAF and the FAA in development mitigations implemented in conjunction with the Delta T-MOA. These mitigations, described in Section 1.1, are designed to minimize social and economic effects upon general aviation if the Delta MOA proposal is implemented.

Airport managers in the region stressed that accurate, advance communication from the USAF regarding activation and use of the MOA is vital to minimizing issues and concerns (Fehrenbacher 2008, Morris 2008).

TABLE 3.9-3. AIRPORT FACILITY, AIRCRAFT, AND OPERATIONS INFORMATION

Airport Information	*Facility & Services*	*Aircraft*	*Operations*
Fairbanks International FAI (State of Alaska) Jesse Vanderzanden 907-474-2500	Control tower. Continuous attendance. IAP (ILS). Four runways: 11,800 feet asphalt, 6,500 feet asphalt, 2,900 feet gravel, 5,400 feet water. Terminal building, hangars, fuel, major airframe service, major powerplant service. Service providers include Alaska Aerofuel, ACE Fuels, Northland Aviation Services, and several lodging/hospitality facilities.	514 based aircraft: 437 single-engine, 77 multi-engine.	133,267 annual operations. 35 percent local general, 33 percent transient general, 18 percent air taxi, 13 percent commercial, 2 percent military.
Delta Junction Airport D66 (City of Delta Junction) Jack Morris 907-895-4656	No control tower. Unattended. No IAP. Two runways: 2,500 feet gravel, 1,600 feet dirt. Tiedowns. No services.	16 based aircraft: 15 single-engine, 1 multi-engine.	No published operations data. Estimated 2,000 annual operations. 100 percent transient general.
Tok Junction Airport 6K8 (State of Alaska) Jim Fehrenbacher 907-451-2200	No control tower. Unattended. IAP (RNAV). One runway: 2,509 feet asphalt. Fuel, tiedowns. Service providers include 40-Mile Air.	22 based aircraft: 20 single-engine, 1 multi-engine, 1 helicopter.	2,700 annual operations. 56 percent air taxi, 37 percent local general aviation, 7 percent transient general aviation.
Northway Airport ORT (State of Alaska) Jim Fehrenbacher 907-451-2200	No control tower. Continuous attendance. IAP (RNAV). One runway: 5,100 feet gravel. Fuel, hangars, minor airframe service, minor powerplant service. Service providers include Northway Airport Services.	8 based aircraft: 7 single-engine, 1 multi-engine.	15,800 annual operations. 51 percent transient general aviation, 25 percent air taxi, 22 percent local general aviation, 2 percent military.
Tanacross Airport TSG (BLM) Shelly Jacobson 907-474-2200	No control tower. Unattended. No IAP. Two runways: 5,100 feet asphalt, 5,000 feet asphalt. No fuel, major airframe service, minor powerplant service. No other services.	None.	800 annual operations. 100 percent transient general aviation.

Source: Airport IQ5010 2008, AirNav.com 2008.

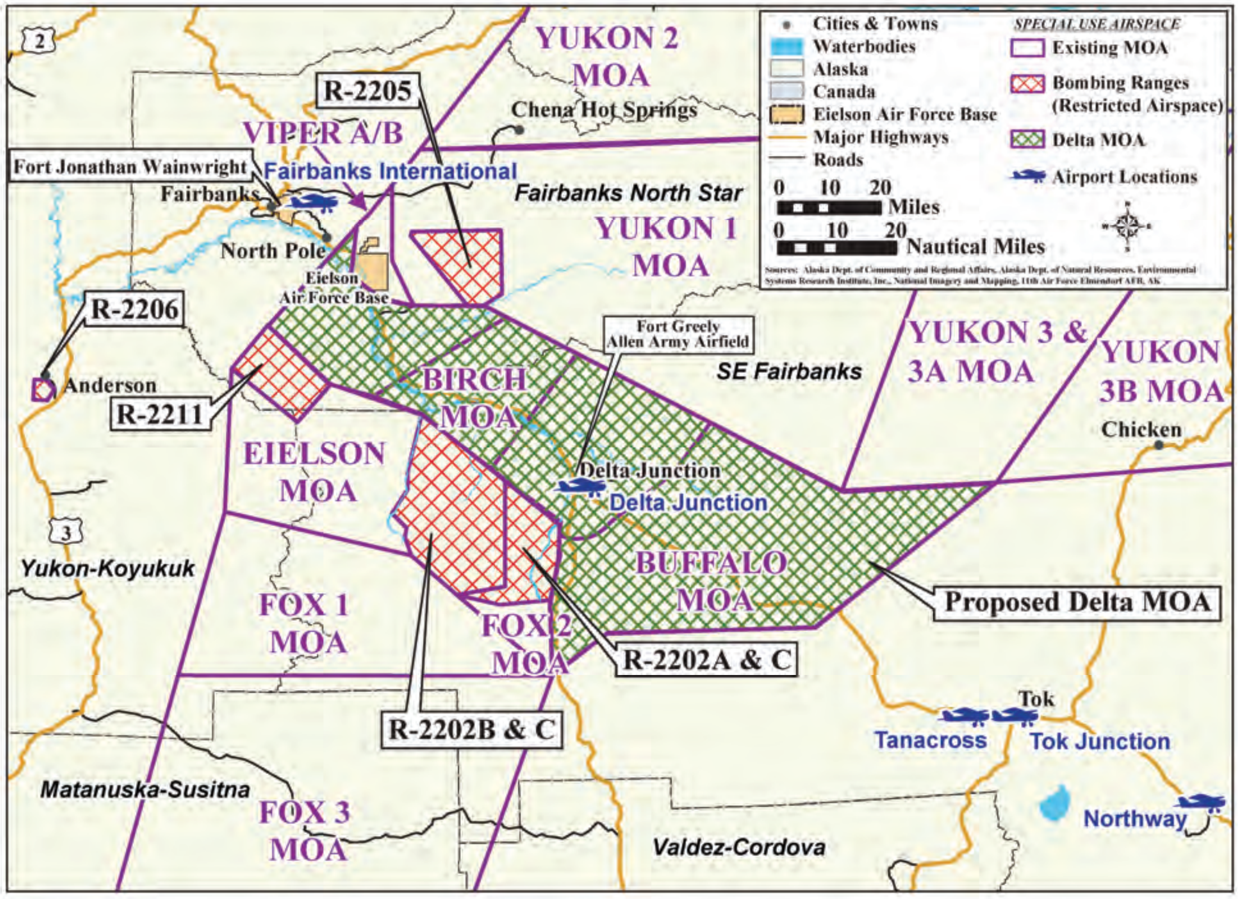


Figure 3.9-1. Airports in Delta MOA Region

3.10 ENVIRONMENTAL JUSTICE

Executive Order (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. In addition to environmental justice concerns are those pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which 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*: Alaska Natives, persons of Hispanic origin of any race, Blacks, American Indians, Asians, or Pacific Islanders.
- *Low-Income Population*: Persons living below the poverty level.
- *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. These data were used to estimate minority populations potentially affected by implementation of the Proposed Action. Low-income and youth population figures also were drawn from the Census 2000 Profile of General Demographic Characteristics.

3.10.1 DEFINITION

The ROI for environmental justice is the Southeast Fairbanks Census Area geographic area under the affected airspace and the Fairbanks North Star Borough.

3.10.2 EXISTING CONDITIONS

Alaska Natives live on many land areas under existing SUA. Baseline data on minority, low-income, and youth populations in the ROI are presented in Table 3.10-1. Minority persons represent between 22.6 percent and 24 percent of the regions' population. The percent minority and the percent Alaskan Native populations under and near the proposed Delta MOA Complex are below the percent minority population of the State of Alaska. The regional percent low-income is above the corresponding percent low-income in the State of Alaska and reflects the region's seasonal employment.

TABLE 3.10-1. MINORITY AND LOW-INCOME POPULATIONS BY AREA (2000)

	Total Population	*Percent Low-Income*	*Percent Minority*	*Percent Alaska Native*	*Percent Youth*
State of Alaska	626,932	9.4	32.4	15.4	30.4
Anchorage Municipality	260,283	7.3	30.1	7.0	29.1
Bethel Census Area	16,006	20.6	87.8	81.6	39.8
Dillingham Census Area	4,922	21.4	79.1	69.4	38.1
Fairbanks North Star Borough	82,840	7.8	24.0	6.8	30.1
Lake and Peninsula Borough	1,823	18.9	81.2	73.0	37.8
Matanuska-Susitna Borough	59,322	11.0	13.7	5.3	32.2
Southeast Fairbanks Census Area	6,174	18.9	22.6	12.6	32.8
Valdez-Cordova Census Area	10,195	9.8	25.3	13.0	29.6
Yukon-Koyukuk Census Area	6,551	23.8	76.0	70.4	35.0

Source: U.S. Bureau of the Census 2000a, 2005.

Doyon Ltd. is the Regional Native Corporation whose boundaries include the proposed Delta MOA airspace. Two federally-recognized Alaska Native villages, Healy Lake and Dot Lake, are currently under the Buffalo MOA. These villages are on Alaska Route 2, the ALCAN Highway (see Figure 3.7-1, page 3-26).

Annual average noise levels under the Buffalo MOA, without the Delta MOA, and assuming a 60 day per year MFE schedule, are calculated to be L_{dnmr} 60.1 dB. This without Delta MOA noise level exceeds the annual average of L_{dn} 55 dB identified by the USEPA as the level to begin assessing the potential for environmental impacts. Average indoor noise levels are reduced by construction methods that are designed to cope with extreme weather conditions in the interior of Alaska.

The site at Healy Lake has been occupied by Alaska Natives for more than 10,000 years. Newton's trading post was established at the mouth of the Healy River, and the community developed at Healy Lake in the late nineteenth century. In the early 1900s, the community became permanent, with trade localized to Healy Lake and neighboring Tanacross (Cook 1989).

In 2000, there were 37 residents of Healy Lake comprised of 13 households. The population is 73 percent Alaska Native or Alaska Native descent. The median income for a household was $51,250, and the median income for a family was $53,750 (U.S. Bureau of the Census 2000).

Dot Lake is a traditional Upper Tanana Athabascan village in which about three of every four residents is Alaska Native or part Native and subsistence activities are important to the economy. A separate, non-Native community is located near Dot Lake Lodge. The lodge, motel, grocery store, and gas station comprise the community of Dot Lake. The Natives in Dot Lake Village have limited local employment opportunities in the village council, Tanana Chiefs Conference, and the school. Parkas, moccasins, beadwork, and other handicrafts are sold by local residents. In the summer, the BLM hires firefighting crews. In 2000, Dot Lake had 19 residents comprised of 10 households. The census listed the median income for a household as $13,750 and the median income for families as $62,500 (U.S. Bureau of the Census 2000).

Based on 2000 Census data, the incidence of persons and families in the Southern Fairbanks Census Area with incomes below the poverty level generally exceeded state levels (see Table 3.10-1, page 3-36). Poverty rates in the affected rural regions under the training airspace are approximately 18.9 percent. Poverty rates in Fairbanks are below the state average of approximately 7.8 percent. This poverty rate reflects the seasonal employment in the rural Southeast Fairbanks Census Area. Table 3.10-1, page 3-36, demonstrates the difference in income levels between the urban areas of Anchorage, Fairbanks, and Valdez-Cordova and the rural areas including the Southeast Fairbanks Census Area.

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter overlays the project description from Chapter 2.0 upon the potentially affected environment from Chapter 3.0 to identify potential environmental consequences associated with charting the Delta Military Operations Area (MOA). For the purposes of evaluating potential environmental consequences, the Delta MOA Major Flying Exercise (MFE) is assumed to be activated twice daily for up to two blocks of 2.5 hours each for up to 60 days per year. Sixty days per year is the agreed-to total MFE usage from the 1995 Alaska Military Operations Area Environmental Impact Statement (AK MOA EIS) (United States Air Force [USAF] 1995).

Table 2.6-2, page 2-19, identifies public concerns and USAF actions and commitments incorporated into the proposal to chart the Delta MOA Complex. These actions are designed to reduce the potential for environmental impacts. Cumulative effects are discussed in Chapter 5.0.

4.1 AIRSPACE MANAGEMENT

4.1.1 PROPOSED ACTION

Table 2.2-4, page 2-11, describes the existing and projected MOA usage associated with the proposed charting of the Delta MOA. The Delta MOA is proposed for use during MFEs. The charted Delta MOA is proposed to be the same as the Delta temporary MOA (T-MOA) used for MFE training during 2007 and 2008. Charting the Delta MOA and using the airspace for MFE training are not expected to affect regional airspace management. MFE training within the Delta MOA could change the use of the airspace by civil aviation during the hours of MFE activities. The Air Force would work with commercial airlines to schedule the proposed Delta MOA activation times (within operational, weather, and financial constraints) to deconflict MFE training from scheduled flights.

The management of a charted Delta MOA would be the same as under the Delta T-MOA. The remaining PARC airspace would not change. Use of the Delta MOA for any specific MFE would distribute aircraft training activities throughout a larger airspace, as depicted in Figure 1.1-3, page 1-4. Air-to-ground training in the PARC is performed by flying attack profiles and practicing the release of munitions. The Delta MOA would substantially enhance realistic air-to-ground training by providing airspace to support simulated releases of munitions over approved ranges within restricted airspace. Practice munitions would be deployed only in the restricted areas and ranges, several of which are adjacent to the proposed Delta MOA. The delivery of practice munitions would occur at altitudes designed to train aircrews in the handling and characteristics of an aircraft under deployed conditions.

As noted in Section 1.1, the effects and conditions associated with the Delta T-MOA are representative of the effects from a charted Delta MOA. The effects include:

- No or minimum communication effect upon Visual Flight Rule (VFR) traffic, which would continue to use established VFR corridors to transit the Delta corridor.
- No or minimum communication effect upon medevac, fire survey, firefighting, or emergency flights which would be given priority if they occurred during the time the proposed Delta MOA was active for an MFE.

- Some effect upon Instrument Flight Rule (IFR) traffic, which could be delayed under a circumstance where IFR conditions prevail and the Delta MOA was active for MFE training. V-444, which traverses the Delta corridor, could not be used for IFR traffic up to 300 hours per year when the Delta MOA was activated for MFEs. This time period would represent 3.4 percent of the year. Based upon the data from September 2008, experience with the Delta T-MOA, and scoping meeting comments about increased flights for resource development, as many as one to two general aviation IFR flights per MFE training day could be delayed by approximately one hour, primarily at Northway or Fairbanks.
- Some effect upon re-routed commercial flights, which could add an estimated seven minutes to the flight and approximately 500 pounds of fuel consumption to one to two commercial flights per MFE day. If no other deconfliction scheduling were possible, these commercial flights would be re-routed south of the 63 degree (°) corridor between Flight Level (FL) 320 and FL350.
- Some potential effects could occur to civil aviation traffic operating from improved or unimproved airfields along the Delta corridor between Northway and Fairbanks. Such aircraft would need to communicate to learn the MOA status. Section 3.3 describes radio and radar communication enhancements which improve information on the scheduling and status of regional MOAs.

All mitigations in the 1995 AK MOA EIS Record of Decision (ROD) and mitigations to the Delta T-MOA would apply to the charted Delta MOA. These mitigations are described in Section 2.4.2 and Table 2.6-2, page 2-19. Dissemination of flight information was identified as an important element during community information meetings for the Delta MOA Environmental Assessment (EA). The Special Use Airspace Information Service (SUAIS) would continue to provide information to both civil and military pilots and aircrews. The enhanced radio and radar coverage within the airspace, which is being established to improve communications, would support the SUAIS.

The Fairbanks International Airport supports international, national, and regional commercial carriers as well as general aviation. During an MFE day, an estimated one to two commercial flights flying into Fairbanks could be re-routed south of the 63° corridor into Fairbanks if no other scheduling options were available.

Airfields such as the Delta Junction Airport and private airfields within the Delta MOA Complex would not be substantially affected by the proposed Delta MOA. The proposed altitude above Delta Junction would be 3,000 feet above ground level (AGL), and the existing VFR corridors through the Buffalo and Birch MOAs would continue to be available for civil aircraft. Aircraft entering or departing from Delta Junction airspace could operate VFR within the 3,000 foot AGL floor when the proposed Delta MOA was activated for MFE training. Aircraft operating from fields under the Birch or Buffalo MOAs would be able to take-off and land as they currently do when the Birch MOA or Buffalo MOA is activated.

No MOA, Air Traffic Control Assigned Airspace (ATCAA), or Military Training Route (MTR) other than the Delta MOA and ATCAA airspace and the corridor south of 63° would be affected by the proposed charting of the Delta MOA.

Charting the Delta MOA would not impact airspace management within the region. Airspace scheduling mitigations and communication enhancements are being developed and agreed to so that general aviation would be minimally affected by the charting of the Delta MOA. Commercial aviation would be required to avoid IFR transit of an active MOA. There would be approximately 500 pounds of fuel and seven minute flight time impact to each of one to two commercial flights per MFE day.

4.1.2 NO ACTION

Existing airspace usage would continue under the No Action Alternative. The Delta T-MOA would continue to be used on a case-by-case basis through coordination with the Federal Aviation Administration (FAA). The FAA has expressed the position that, if a Delta T-MOA were scheduled on a regular basis for multiple years, a charted Delta MOA for the same airspace as the Delta T-MOA under the same conditions would provide for consistency of information on the sectional aeronautical chart. If No Action were to result in no Delta T-MOA use for MFEs, training quality would be compromised.

4.2 NOISE

4.2.1 PROPOSED ACTION

MFE training within the proposed Delta MOA would have some effect upon noise conditions under the proposed Delta MOA. As described in Section 3.2, Table 3.2-3, page 3-12, the primary change in noise would be under the Delta MOA between the Birch and Buffalo MOAs and under the Buffalo MOA. The Delta ATCAA overlies the Delta MOA Complex, including the Birch and Buffalo MOAs. Noise levels between the Birch and Buffalo MOAs are projected to increase from 41.0 Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) up to 45.2 L_{dnmr}. The United States Environmental Protection Agency (USEPA) has identified an annual average of 55 Day-Night Average Sound Level (L_{dn}) as a level to begin assessing the potential for environmental impacts. The change in noise levels under the Delta MOA would be noticeable but would not exceed any level of impact identified by USAF and USEPA agreements. Noise experienced at ground level are greater from military aircraft at low levels. The proposed Delta MOA floor of 3,000 feet AGL would not be expected to result in high noise or startle effects at ground level. No noticeable change would be expected on lands under the adjacent Yukon, Fox, or other airspaces as a result of MFE activity with a charted Delta MOA.

With the Delta MOA, annual average noise levels under the Birch MOA would experience a minimal reduction from L_{dnmr} 58.7 dB to 56.7 dB. This noise level reduction is the result of aircraft being dispersed in realistic training throughout the Delta MOA Complex. The affect of fewer low-level aircraft would be definitely noticeable under the Buffalo MOA where annual average noise levels would decline from L_{dnmr} 60.1 dB to 51.6 dB.

Annual average noise levels under the proposed Delta MOA west of the Birch MOA would minimally increase from L_{dnmr} 41.0 to Ldnmr 43.4. This small change is primarily due to the proposed Delta MOA 10,000 above mean sea level (MSL) floor over this area.

Supersonic activity would continue to be limited to above FL300. Supersonic activity currently occurs in the Delta ATCAA, as well as in ATCAAs overlying MOAs adjacent to the proposed Delta ATCAA. Advanced aircraft capabilities, such as those with the F-22A, increase the possibility of supersonic events within the PARC (USAF 2006b). As noted in Section 3.2.3.2, existing MFE training results in some annoyance and noise complaints over a large area, including the Delta corridor.

No change in supersonic events would be expected as a result of charting the Delta MOA. Aircraft using the proposed Delta MOA would not fly at supersonic speeds.

The charted Delta MOA would be expected to result in increased L_{dnmr} noise levels within the Delta corridor between the Birch and Buffalo MOAs. This projected increase from 41.0 L_{dnmr} to 45.2 L_{dnmr} is not expected to result in a significant impact to activities beneath the proposed Delta MOA.

4.2.2 NO ACTION

No Action means that the charting of the Delta MOA would not occur. Noise conditions under the Delta T-MOA would continue as long as the Delta T-MOA were authorized by FAA on a year-by-year basis. Noise conditions under the Delta ATCAA within the areas outside the Birch or Buffalo MOAs would continue as existing. This means that, from Table 3.2-3, page 3-12, the area under the Delta ATCAA would continue to experience an estimated 12 supersonic events per month and the baseline L_{dnmr} of 40.3. Noise levels in all other areas would be expected to remain the same as described in Table 3.2-3, page 3-12.

4.3 SAFETY

4.3.1 PROPOSED ACTION

Community meetings held during the preparation of this Delta EA identified concerns of private pilots with flight safety in a charted Delta MOA. These concerns include the ability to fly VFR, the ability to fly IFR, and the accessibility of the airspace under emergency conditions.

Experience with the Delta T-MOA has demonstrated that pre-planning and communication successfully addressed the concerns of civil aviation pilots and mitigated the potential for safety impacts. A variety of actions were identified during both the original AK MOA EIS and the Delta T-MOA to reduce the potential for interaction between military and civil aviation. General aviation support includes not scheduling MFEs during January, February, 27 June to 11 July, September hunting season, or weekends. Another support action is to maintain VFR corridors through the Birch and Buffalo MOAs for use during regular USAF training and during MFEs. The proposed charted Delta MOA 3,000-foot AGL floor between Birch and Buffalo MOAs would continue in the area through which pilots could fly VFR.

Providing priority access for emergency aircraft, including life flight, fire monitoring, fire attack, and other emergencies are part of the USAF-FAA Delta T-MOA agreement and would continue to be part of the proposed Delta MOA Complex. In the unlikely event that a private pilot entered the airspace before or during an MFE, was required to change from VFR to IFR, and only had sufficient fuel to continue to traverse the airspace, the pilot could declare a fuel emergency and the USAF and the FAA would work with the pilot to provide safe transit. This could include declaring an emergency situation or suspending MFE activity below a specified altitude, such as 10,000 feet MSL, to permit the aircraft to safely reach its destination.

Section 3.3.2 describes communication improvements which have been funded and constructed in the airspace adjacent to and including the Delta corridor. These communication improvements address some of the concerns expressed by pilots. A comparison of Figures 3.3-2, page 3-16, and 3.3-4, page 3-18, with Figures 1.1-2, page 1-3, and 1.1-3, page 1-4, demonstrates that these communication systems provide both radio and radar coverage at the altitudes covered by the proposed Delta MOA.

The potential for bird aircraft strikes is not expected to change with the charting of the proposed Delta MOA. The Delta MOA floor presented in Figure 1.1-3, page 1-4, at 3,000 feet AGL at its lowest point is expected to be above most migrating species along the Delta corridor.

The number and types of military aircraft traversing the Delta corridor would not be expected to substantially change with a charted Delta MOA. Aircraft participating in MFEs would have more airspace within which to operate and would not be constrained to fly in either the Delta ATCAA or low-level Birch or Buffalo MOAs. The ability to fly through the entire airspace as part of an MFE would not be expected to substantively change any risk of Class A mishaps from those presented in Table 3.3-1, page 3-19. The 63° corridor in the Fox ATCAA for commercial aircraft or other high performance aircraft would ensure safe separation of commercial aircraft from military training aircraft during the time when the proposed Delta MOA would be activated for MFEs.

Chaff and flare usage under the proposed Delta MOA would not be expected to substantively change from that currently used in the Delta ATCAA plus the Birch and Buffalo MOAs. USAF restrictions on flare use would continue to apply within the proposed Delta MOA Complex. These conditions include restrictions on flare use in the PARC airspace to above 5,000 feet AGL from June to September and above 2,000 feet AGL for the remainder of the year. Since flares burn out within approximately 3.5 to 5 seconds and fall an estimated 400 to 500 feet from their release point, no fire impacts from defensive flare use would be anticipated. Chaff consists of extremely small fibers of aluminum-coated silica as described in Appendix B. Chaff is currently used above the Delta corridor and is not expected to have any discernible effects upon physical or biological resources under the airspace.

Currently during deployment of defensive chaff and flares, residual plastic pieces and aluminum-coated Mylar, similar in appearance to dry duct tape, fall to the ground. These residual materials are described in Section 2.2.3. Approximately the same number of residual pieces would be deposited within the Delta corridor under existing conditions or the Proposed Action. As described in Appendices B and C, this residual debris is not of a concentration which could substantively affect physical or biological resources. If a hiker, hunter, or other individual found a one-inch by two-inch by 1/8-inch piece of plastic or some other plastic or Mylar piece and identified it as coming from a deployed flare, that individual could be annoyed.

An estimated 0.01 percent of deployed flares do not ignite and fall to earth as a dud flare. In the extremely unlikely case that an individual found a dud flare approximately one-inch by two-inches wide and eight inches long, the individual should mark the location and notify Eielson Air Force Base (AFB) Public Affairs. As described in Appendix C, a very high temperature (near 2,000 degrees Fahrenheit [°F]) or friction, such as could be caused by a bullet, could ignite a dud flare. Handling or striking a dud flare could result in injury or death.

Improved communication and radar coverage, priority to emergency conditions, no MFEs scheduled during high general aviation use, and no discernible change in chaff, flares, or flight safety are expected to result in no significant safety impacts.

4.3.2 NO ACTION

MFE training within PARC would continue. The expected Class A mishap rate described in Table 3.3-1, page 3-19, would continue. Use of chaff and flares and deposition of chaff and flare residual materials on the surface would continue as currently exists. During an MFE, civil aviation would continue to be able to fly IFR through the Delta corridor below 18,000 feet MSL. The existing conditions for aircraft flight safety, mishap rates, and chaff and flare residuals would be essentially unchanged with the proposed charting of the Delta MOA or the No Action alternative.

4.4 AIR QUALITY

4.4.1 PROPOSED ACTION

The mixing level for emissions is below 3,000 feet AGL. The proposed Delta MOA does not include airspace below 3,000 feet AGL (see Figure 1.1-3, page 1-4). Aircraft activities in the existing Birch MOA and existing Buffalo MOA, which do operate below 3,000 feet AGL, are expected to be reduced as a result of the expanded training aircraft maneuvering room in the proposed Delta MOA. No emission concentrations or changes to existing air quality attainment would be expected if the proposed Delta MOA were charted.

No increased particulate matter or visibility impacts would be expected to affect any air quality resources. The rural areas under the proposed Delta MOA are classified as attainment areas for emission.

The proposed Delta MOA would not change the attainment classification. There are no on-the-ground construction aspects associated with the charting of the Delta MOA. Emissions from flare usage do not discernibly affect air quality. Vehicular usage of highways or other roads during MFE training would be incidental and consistent with existing highway usage. No effects on air quality are expected as a result of charting the Delta MOA.

4.4.2 NO ACTION

Emissions from military aircraft would not change under No Action. The existing number of low-level flights in the Birch and Buffalo MOAs would continue and would not be distributed at higher altitudes within a Delta MOA. Existing air quality attainment would continue.

4.5 PHYSICAL RESOURCES

4.5.1 PROPOSED ACTION

The Tanana River drains much of the area under the proposed Delta MOA. Charting the MOA would not impact physical resources

No on-the-ground construction is proposed with the charting of the Delta MOA. The proposed Delta MOA Complex would not substantially change airspace use or training above the physical resources described in Section 3.5. Aircraft would continue to train with defensive countermeasures in airspace over the Delta corridor. These defensive countermeasures consist of chaff and flares and result in residual materials falling to the earth. As described in Section 2.2.3 and Appendix B, chaff consists of fine segments (thinner than a human hair) of aluminum-coated silica cut to lengths of 1-1/2 to 2 or more inches to reflect radar signals threatening aircraft. With the proposed Delta MOA, the amount of chaff distributed within the airspace would not substantially change from that currently used during MFE training in the Delta ATCAA and Birch and Buffalo MOAs. Chaff rapidly breaks up to become indistinguishable from native soil. Chaff would not be discerned in the environment and would not produce an effect on water or soils under the airspace.

During deployment, chaff or flares release small plastic or nylon pieces, which fall to the ground. Appendix B describes the chaff residual material, and Appendix C describes the flare residual materials. These plastics parts and wrappers are inert and not expected to be concentrated in any way that could impact soil or water resources. The number of flares proposed to be used during MFE training is comparable to the current MFE usage.

Charting the Delta MOA would not significantly impact the soils or water within the Tanana River Valley or the Yukon-Tanana Upland.

4.5.2 NO ACTION

No Action would not change use of the training airspace nor change the use of defensive countermeasure within the airspace. As with the Proposed Action, no impacts to physical resources are expected.

4.6 BIOLOGICAL RESOURCES

4.6.1 PROPOSED ACTION

There would be no construction or ground-disturbing activities associated with charting the Delta MOA. No construction impacts to vegetation or wildlife would occur under the proposed airspace.

During community information meetings, the public expressed concern for noise impacts on those species that are hunted in Alaska. Moose, caribou, and Dall's sheep are important game species in Alaska, and critical calving grounds are located under the training airspace. Several studies have documented the reaction and effects to ungulates exposed to military aircraft overflights. Responses ranged from no reaction and habituation to panic reaction from overflights below 500 feet AGL followed by stampeding (Weisenberger *et al.* 1996; see reviews in Manci *et al*. 1988). Although few studies have evaluated the effect of military overflights on moose, several have studied the effect on caribou. A recent study in Alaska documented only mild short-term reactions of caribou to military overflights in the Yukon MOAs (Lawler *et al*. 2005). A large portion of the Fortymile Caribou Herd calves underneath the Yukon MOAs. Lawler *et al*. (2005) concluded that military overflights did not cause any calf death, nor did cow-calf pairs exhibit increased movement in response to the overflights.

Maier *et al*. (1998) found that cow-calf pairs of the Delta Caribou Herd within a range that includes the Delta corridor exposed to low-altitude overflights in existing MOAs moved about 2.5 kilometers more per day than those not exposed (Maier *et al*.1998). The authors stated that this distance was of low energetic cost. Harrington and Veitch (1991) expressed concern for survival and health of woodland caribou calves in Labrador, Eastern Canada, where military training flights occur as low as 100 feet AGL. Low-level transit of the Birch and Buffalo MOAs would be minimally reduced as aircraft were dispersed throughout the proposed Delta MOA airspace. The Delta MOA lowest altitude is 3,000 feet AGL (Figure 1.1-3, page 1-4). One of the adopted mitigations from the AK MOA EIS (USAF 1995) included establishing a minimum overflight altitude of 3,000 feet AGL over the Delta Caribou Herd calving areas from May 15 to

June 15. This means the proposed Delta MOA meets the USAF-adopted mitigation in the AK MOA EIS to reduce potential impacts upon the Delta Caribou Herd (USAF 1995).

Beckstead (2004) reported on a study of the effects of military jet overflights on Dall's sheep under the Yukon 1 and 2 MOAs in Alaska. The study could find no difference in population trends, productivity, survival rates, behavior, or habitat use between areas mitigated and not mitigated for low-level military aircraft by the AK MOA EIS (USAF 1995). In the mitigated area of the Yukon MOAs, flights are restricted to above 5,000 feet AGL during the lambing season.

Noise effects to other wildlife species are reviewed in Appendix H. Based on previous research, current flight restrictions over calving/lambing grounds (USAF 1995), and the relatively small changes in noise levels associated with MFE training in the proposed Delta MOA, charting the Delta MOA would have essentially the same effects on wildlife as exist under baseline conditions.

Some animals may startle in response to a sonic boom. However, most animals under the training airspace have been previously exposed to sonic booms from F-15s, F-16s, and other training aircraft flying above FL300 and are likely habituated to the sound (see Appendix H). Supersonic flights would not occur within the Delta MOA and sonic boom activity is not projected to change with the charting of the Delta MOA (see Section 3.2).

Training with chaff and defensive flares is proposed in a charted Delta MOA. Chaff and flare use over the Delta corridor is projected to remain approximately the same as under current conditions in the Birch and Buffalo MOAs and the Delta ATCAA. There would be no change in the minimum altitude or seasonal restrictions on defensive flare release. The potential environmental consequences and characteristic of chaff and flares are reviewed in Appendices B and C.

Specific issues raised during the scoping period for this EA include 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 potential; and (6) potential for being struck by medium hailstone-sized flare debris.

The review in Appendix B demonstrates that no reports or studies to date have documented negative impacts of training chaff or flares to biological resources.

1. Chaff fibers break down and have the same composition as current soils. Ingestion would not normally occur, or if it occurred, the results would be comparable to ingesting soil particles during feeding (Appendix B).
2. Chaff fibers eventually break down and a small portion of the fibers become particulate matter less than 10 micrometers in diameter (PM_{10}) or smaller particles. During scoping, concern was expressed that bison could inhale chaff fibers. Once deployed, chaff rapidly disperses and is not concentrated in any location. The material composition of chaff particles would produce no different effect than inhaling dust. Under an electron microscope, chaff particles are indistinguishable from ambient soil particles except in the rare case where both aluminum and silica are present in the sample undergoing analysis (Appendix B). Aluminum and silica are the two most common elements in the earth's crust.

3. Chaff fibers and particles have no characteristics which distinguish them from naturally occurring materials. No skin irritation would be expected.
4. Studies on soils and sediment subjected to decades of concentrated chaff deployment have not been able to distinguish chaff from naturally occurring materials. Studies of fresh water organisms have found no significant change in mortality when organisms are exposed to 10 or 100 times the expected chaff concentration under training airspace (Appendix B).
5. Mitigations in place to restrict altitude deployment of flares in Alaska have successfully avoided fire impacts from MFE training with defensive flares.
6. The greatest potential force from a residual plastic piece is 0.16 pounds per second (equivalent to a medium-sized hailstone). The distribution of species, aerial extent of the proposed MOA, and current use of chaff and flares would not be expected to change any risk of an individual being struck by a medium hailstone-sized plastic piece.

No significant changes in noise levels or chaff and flare use would result in no significant impacts to physical resources in the Delta corridor.

4.6.2 NO ACTION

Under the No Action Alternative, MFE training would remain the same as under current conditions. The use of chaff and flares would continue in the Birch and Buffalo MOAs and in the Delta ATCAA. Biological resources would not change from existing conditions.

4.7 CULTURAL RESOURCES

4.7.1 PROPOSED ACTION

A summary of federal regulations and guidelines established for the management of cultural resources is presented in Section 3.7. Architectural resources under the proposed Delta MOA and listed on the National Register of Historic Places (NRHP) are also presented in Section 3.7.

No impacts to historic properties under the airspace are expected as a result of the proposed charting of the Delta MOA. Chaff and flare use are not expected to noticeably change from existing conditions or to impact historic properties under the airspace. Aircraft currently train in the airspace above the Delta corridor in the Delta ATCAA and in the Birch and Buffalo MOAs. Some increase in average noise levels associated with MFE training would be discernible at historic sites under the airspace. This increase from an estimated L_{dnmr} 41.0 to 45.2 dB would not be of a magnitude to impact historic structures.

Dot Lake, one of the recognized Alaska Native communities currently under the Buffalo MOA, would have a discernible reduction in aircraft noise with the proposed Delta MOA.

TRADITIONAL CULTURAL PROPERTIES

Two Alaska Native villages at Healy Lake and Dot Lake are located under the Buffalo MOA. These villages are under the existing Buffalo MOA, which supports channeling of low-level aircraft from the Yukon MOAs to the ranges associated with the Fox MOAs. Fewer low-level aircraft flights would be expected in the Buffalo MOA during an MFE with the charted Delta MOA. The purpose of the Delta MOA is to expand the training opportunity for aircrews participating in MFEs by expanding the airspace volume which they could use to transit between the Yukon and Fox MOAs. This expanded airspace would redistribute the aircraft and is projected to reduce the number of low-level flights in the Buffalo MOA (see Section 2.2.2). The net effect, as noted in Table 2.2-3, page 2-10, would be a discernible reduction in aircraft overflight noise to the Alaska Native villages under the Buffalo MOA. The number of supersonic events is expected to remain the same with the charting of the Delta MOA as no supersonic activity would occur within the proposed Delta MOA.

Alaska Natives use the area under the proposed Delta MOA Complex for subsistence hunting. Subsistence hunting and resource extraction for marketable products are important parts of the Alaska Native economics. The floor of the proposed Delta MOA is above 3,000 feet AGL. This is sufficiently high that military aircraft would not be expected to result in startle effects which could impact subsistence hunting or fishing. No MFEs during September supports Alaska Native hunting and guiding activities during hunting season.

No surface disturbance is proposed in conjunction with charting the Delta MOA. The annual average noise levels under the MOAs are not expected to noticeably change as a result of the Proposed Action, although average annual noise levels under the proposed Delta MOA between the Birch and Buffalo MOAs would increase. Aircraft noise would primarily occur on MFE training days.

Assuming SHPO and Alaska Native concurrence, no significant impacts to historic properties, traditional cultural properties, or Alaska Native activities are anticipated to result from the proposed charting of the Delta MOA.

4.7.2 NO ACTION

Under the No Action Alternative, the charting of the Delta MOA would not occur. Existing MFE training would continue to use the Delta ATCAA and the Birch and Buffalo MOAs to traverse the Delta corridor. Resources would continue to be managed in compliance with federal law and USAF regulations.

4.8 LAND USE

4.8.1 PROPOSED ACTION

The potential to affect land use under the proposed Delta MOA is slight. No direct construction would occur in any of the land use segments discussed in Section 3.8.2. The potential for indirect environmental consequences would be associated with aircraft overflights and aircraft noise.

Under the Proposed Action, subsonic noise would increase from a predicted L_{dnmr} of 41.0 to a predicted 45.2 in the area under the proposed Delta MOA between the Birch and Buffalo MOAs. This is primarily Segment 3 in Section 3.8.2. The USEPA has identified an annual average noise level of 55 L_{dn} as a level to begin assessing the potential for noise impacts. With projected noise levels below 55 L_{dn} under all but the Birch MOA (where noise levels reduce from 58.7 to 56.7 dB), it is unlikely the land use patterns, ownership, or management practices would be affected by the use of the airspace for MFE training. Supersonic flights would not occur in the Delta MOA and there would be no projected change in MFE supersonic activity above FL300. The proposed Delta MOA would have no direct effects from construction, no change in supersonic events, and noise levels below 55 L_{dnmr} throughout nearly all the airspace. No significant land use impacts would be anticipated.

The continued use of defensive chaff and flares would not be expected to impact land use. All of the Delta corridor segments discussed in Section 3.8.2 are under airspace where chaff and defensive flares are currently deployed during training. If a hunter, fisherman, hiker, resident, or other individual found a piece of plastic or wrapping material under the airspace and identified it as a residual material from deployed defensive chaff or flare, the individual could be annoyed. The proposed Delta MOA would not result in any noticeable change to current defensive chaff and flare use during MFEs.

Many Alaskan residents in rural areas treat light aircraft as residents of the lower 48 treat cars. General aviation aircraft are frequently parked at rural homes and straight highways serve as runways. Telephone and power lines are typically set far enough back from the roadway to permit this "joint use." The continued availability of the VFR corridors through the Birch and Buffalo MOAs during MFEs, combined with the 3,000-foot AGL floor of the proposed Delta MOA between the Birch and Buffalo MOAs, should result in no change to established Alaskan general aviation VFR transportation. Improved radio and radar communication is expected to support civil and military aviation throughout the Delta corridor. Civil aviation is discussed further in Sections 4.1 and 4.9.

4.8.2 NO ACTION

Under the No Action Alternative, the charting of the Delta MOA would not occur. No changes associated with aircraft overflights and aircraft noise would be anticipated. No changes to existing chaff and defensive flare training would occur.

4.9 SOCIOECONOMICS

The potential for environmental consequences to socioeconomics within the region of influence (ROI) focuses on the need to minimize impacts to aviation in Alaska. With such a range of aviation activities and the desire to be compatible with those activities to the extent possible, the USAF and FAA face several challenges. The USAF has implemented a series of projects to improve radio and radar communication within the airspace. These improvements were designed to meet one of the primary concerns of general aviation. Section 3.3, Safety, describes the improvements in radio and radar coverage which benefit the Delta corridor.

Based on the issues and concerns presented in Section 3.9, potential socioeconomic impacts were evaluated related to modifications in airspace use. Other resource analyses (e.g., airspace management, noise, and safety) were reviewed to determine the potential consequences to these resources, which may further result in social or economic impacts within the region. The potential for effects on airports under or near the modified airspace is also discussed in Section 4.1, Airspace Management.

The airport at Tok, outside the proposed Delta MOA boundaries, supports all-season general aviation activity in the region. The Delta MOA would not be expected to affect VFR traffic, although, under IFR conditions, an estimated one to two general aviation flights at Northway or Tok could be delayed approximately one hour during an MFE day.

4.9.1 PROPOSED ACTION

AIRSPACE MODIFICATIONS

Under the Proposed Action, Delta T-MOA airspace previously used on a temporary basis would be charted permanently. Scoping comments relayed concern that creation of the Delta MOA airspace would affect commercial and general aviation, and thereby potentially result in economic effects to regional business and communities. A series of mitigative actions were developed through USAF and FAA evaluation of air transportation needs. These actions were implemented as part of the Delta T-MOA to reduce the potential for social or economic impacts upon civil aviation. The continuation of VFR corridors, combined with the floor altitude of the proposed Delta MOA, provide for VFR transit of the Delta corridor during an MFE. The very specific, and limited, times for the Delta T-MOA activation were designed to meet military flight training requirements while allowing access to the airspace by general aviation. The USAF's SUAIS connects the improved radio and radar coverage and provides USAF sources of pilot communication to help deconflict military and civil aircraft. The proposed Delta MOA would be scheduled to avoid inference with high periods of recreational use, fishing, and hunting. The Delta T-MOA and the proposed Delta MOA would give priority to any medevac, firefighting, or emergency flights. Agreements were reached to provide minimum delay for return medevac flights to ensure aircraft were on station for emergencies.

Experience with the Delta T-MOA suggests there would be minimal effect upon VFR traffic or emergency activities. VFR traffic would continue to use established VFR corridors to transit the Delta airspace. Medical, fire, and other emergency flight activity in the proposed Delta MOA would be given priority during MFEs. IFR traffic would experience some delay, estimated at one hour at Fairbanks or Northway, when the proposed Delta MOA was active, IFR circumstances prevailed, and V-444 was not available for IFR traffic. Northway is of particular interest as a location for general aviation aircraft transiting from Canada into Alaska for customs and other activities.

Mitigations integrated into the Delta T-MOA include scheduling and publication of MOA activation. During a two-week MFE in 2007, approximately one to two general aviation aircraft seeking to fly IFR through the Delta corridor were delayed by approximately one hour. Continued mitigation and availability of USAF communication would reduce delays to a minimum. Such delays would not be expected to significantly affect transit or refueling of general aviation at Northway. The availability of VFR corridors, combined with the scheduling of MFE activity to avoid high-use general aviation periods such as weekends and hunting season, would reduce the potential for socioeconomic impacts.

Game management flights could either be scheduled to work around MFEs or, with adequate communication, game management flights during MFEs could be conducted on a "see-and-avoid" basis. Game management activity in the Yukon MOAs has been conducted in this manner since the AK MOA EIS was completed in 1995.

Accurate, advance communication of the USAF's proposal and scheduling mitigations is a key element in reducing civil aviation concerns and potential schedule impacts. Inaccurate communication of the proposed Delta MOA schedule and mitigations can cause civil aviation pilots to re-route and avoid the Delta corridor, resulting in civil aviation pilots deciding to alter flight routes to Fairbanks or to locations beyond Fairbanks. Advanced communication and accurate information regarding the proposed Delta MOA would be expected to result in no significant impact upon airport economics within the region.

Commercial aircraft which could not deconflict during a Delta MOA activation period would be required to fly south of the 63° corridor. Economic effects of this re-routing would amount to approximately 500 pounds of additional fuel and 7 minutes of additional flight time for one to two commercial flights per day arriving at Fairbanks. In the unlikely event that a commercial aircraft departed Fairbanks when the proposed Delta MOA was activated during an MFE, the departing aircraft could consume an additional 1900 pounds of fuel and 11 minutes of flight time to route south of 63 degrees at FL330 (personal communication, Peck 2008).

Charting of the proposed Delta MOA in combination with airspace scheduling mitigations, communication enhancements, and established corridors would not be expected to significantly impact airspace management within the region. The proposed airspace altitude provides VFR corridors and has a floor of 3,000 feet AGL over Delta Junction and 10,000 feet AGL west of the Birch MOA. General aviation would have continued access to airports under the proposed MOA. With proper communication of the mitigations incorporated into the proposed Delta MOA, no significant impacts upon socioeconomics or aviation resources in Alaska are anticipated.

NOISE DISTURBANCES

Under the Proposed Action, flight activity would occur over an expanded area resulting in average noise levels under the Birch MOA that are slightly reduced with the Delta MOA and noise levels under the Buffalo MOA that are noticeably reduced with the Delta MOA. Under the proposed Delta MOA between the Birch and Buffalo MOAs, noise levels are projected to increase by a discernable amount but would remain below 55 L_{dn} identified by the USEPA as protective of the public health and welfare. This 55 L_{dn} level represents a threshold below which adverse noise effects to human populations are generally not expected. West of the Birch MOA, noise levels would slightly increase to L_{dnmr} 43.4 dB. Anticipated changes in the noise environment in the affected area, whether decreases or increases in noise levels, would not be sufficient to affect the rural economies on lands underlying the airspace. The altitude floor of the Delta MOA would not produce an impact upon game species (see Section 4.6). Neither recreational nor subsistence hunting or fishing would be impacted. No adverse socioeconomic impacts are anticipated related to noise under the Proposed Action.

CHAFF AND FLARE USE

Defensive training using chaff and flares currently occurs in the Delta ATCAA and the Birch and Buffalo MOAs. The amount of chaff and flare use would not substantially change under the Proposed Action. Deployment of chaff and flares results in small plastic or nylon pieces falling to the ground, which are inert and widely dispersed. Flare usage has altitude restrictions to reduce the potential for fire. Defensive flares burn out in 500 feet, and the floor for release is either 3,000 feet or 5,000 feet above the ground, depending upon the season. There are no environmental impacts anticipated related to chaff and flare use that would result in any effects to socioeconomic resources in the region.

4.9.2 NO ACTION

Under the No Action Alternative, airspace use and related activity would remain the same as under existing conditions. Flight activity, noise levels, and training chaff and flare use would not change. No effects to socioeconomic resources would occur.

4.10 ENVIRONMENTAL JUSTICE

The environmental justice analysis examines the potential for disproportionate effects of the proposed airspace modifications and chaff and flare use on minority or low-income communities or youth populations in the region, as identified in Section 3.10. Alaska Natives are primary users of the natural resources under the training airspace. For many residents, subsistence fishing and hunting are vital, contributing substantially to people's diets and providing much-needed supplementary income.

4.10.1 PROPOSED ACTION

Under the Proposed Action, noise levels below the Delta MOA between the Birch and Buffalo MOAs would increase by a discernable amount. Anticipated levels would be below USEPA threshold levels, and hunting or fishing by Alaska Natives would be unlikely to be affected. Airspace scheduling to avoid hunting, fishing, and high recreation periods avoids Alaska Native concerns.

The population under the Delta MOA is lower income than the urban population of Fairbanks (see Section 3.10.2). The population under the Delta MOA is not disproportionately minority or low-income compared to the rural Alaskan areas throughout the state, nor are there disproportionate concentrations of youth. The changes in the noise environment, with small increases in some areas and small decrease in others, are not expected to impact Alaska Natives. The noticeable reduction in noise levels under the Buffalo MOA could minimally benefit two established Alaska Native communities. No significant adverse environmental impacts that might affect human populations are anticipated as a result of the Proposed Action. There are no disproportionate environmental justice impacts related to minority or low-income populations, nor would there be any special health or safety risks to children.

4.10.2 NO ACTION

Under the No Action Alternative, no changes in flight activity or chaff and flare use are anticipated. No environmental justice impacts or special health and safety risks to children would occur.

5.0 CUMULATIVE CONSEQUENCES

5.1 CUMULATIVE EFFECTS ANALYSIS

The Council on Environmental Quality (CEQ) regulations stipulate that the cumulative effects analysis in an Environmental Assessment (EA) considers the potential environmental consequences resulting from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 Code of Federal Regulations [CFR] 1508.7). Chapter 3.0 discussed the baseline conditions of the proposed charting of the Delta MOA. Chapter 4.0 discusses potential consequences under the training airspace. Chapter 5.0 identifies and evaluates projects that are reasonably foreseeable that could cumulatively affect environmental resources in conjunction with the charting of the Delta Military Operations Area (MOA).

Assessing cumulative effects begins with defining the scope of other actions and their potential 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. The first steps of the environmental impact analysis process helped identify other potential and planned actions. During early community outreach efforts, the public and agencies were asked to provide information about ongoing regional projects and the potential interaction of the charting of the Delta MOA with such projects. These initial discussions defined the Region of Influence (ROI), which in turn defined what actions should be considered cumulatively. The ROI for cumulative effects would have both spatial and temporal dimensions.

The CEQ identified and defined eight ways in which effects can accumulate: time crowding, time lag, space crowding, cross boundary, fragmentation, compounding effects, indirect effects, and triggers and thresholds. Furthermore, cumulative effects can arise from single or multiple actions and through additive or interactive processes (CEQ 1997).

Actions not identified in Chapter 2.0 as part of the proposal, but that could be considered as actions connected in time or space (40 CFR 1508.25) (CEQ 1997) may include projects that affect areas in or near the ROI, areas underlying the affected training airspace, as well as the airspace itself. This EA analysis addresses three questions to identify cumulative effects:

1. Does a relationship exist such that elements of the project alternatives might interact with elements of past, present, or reasonably foreseeable actions?
2. If one or more of the elements of the alternatives and another action could be expected to interact, would the alternative affect or be affected by impacts of the other action?
3. If such a relationship exists, does an assessment reveal any potentially significant impacts not identified when the alternative is considered alone?

An effort has been made to identify all actions that are being considered and that are in the planning phase at this time. To the extent that details regarding such actions exist and the actions have a potential to interact with the proposal, these actions are included in this cumulative analysis. This approach enables decision-makers to have the most current information available so that they can evaluate the environmental consequences of the Proposed Action.

5.1.1 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

Table 5.1-1, page 5-3, identifies past, present, and reasonably foreseeable actions which have the potential to interact with the proposed Delta MOA.

5.1.1.1 MILITARY ACTIONS

Recent past and ongoing military actions in the region were considered as part of the baseline or existing condition in the ROI. Each project on Table 5.1-1, page 5-3, was 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. Shared aircraft operations were a consideration.

Active military installations such as Eielson Air Force Base (AFB), Fort Wainwright, and Fort Greely experience continuous evolution of mission and training requirements. This process of change is consistent with the United States (U.S.) defense policy that the U.S. military must be ready to respond to threats to American interests throughout the world. Any new construction must comply with land use controls and environmental analysis.

As noted in Table 5.1-1, page 5-3, the cumulative actions which have the potential to interact with the proposed Delta MOA, including the beddown at Elmendorf AFB of F-22A and C-17 aircraft, are included in the aircraft projected to use the Delta MOA during a Major Flying Exercise (MFE). The F-16 Aggressor Squadron at Eielson AFB would be an active participant in MFEs. The cumulative airspace, noise, and related effects of training with these and other aircraft are assessed throughout this EA.

5.1.1.2 NON-FEDERAL ACTIONS

Non-federal actions include projects of the State of Alaska, various cities under the ROI, and private projects. The municipalities of Fairbanks and Delta Junction may have multiple construction projects occurring, especially in the summer months. Specific major actions within the vicinity of Eielson AFB are summarized in Table 5.1-1, page 5-3. Major non-federal actions which have the potential for cumulative consequences in the Delta corridor include proposed expanded resource development and the proposed railway between Fairbanks and Delta Junction.

5.1.2 CUMULATIVE EFFECTS

AIRSPACE MANAGEMENT AND AIR TRAFFIC CONTROL

Airspace management in this EA takes into consideration additional aviation activity associated with development described in Table 5.1-1, page 5-3. Experience with the Delta Temporary MOA (Delta T-MOA) in 2007 and 2008 resulted in an estimated one to two Instrument Flight Rule (IFR) aircraft being delayed approximately one hour. The analysis in this EA reflects increased traffic by an estimated one to two IFR delays per MFE day. Cumulative effects in terms of total aircraft potentially delayed are included in this EA and are not projected to be significant.

TABLE 5.1-1. CURRENT AND FUTURE MILITARY AND NON-MILITARY PROJECTS
(PAGE 1 OF 3)

Action	*Document*	*Description*
Military Projects		
Ground-based Midcourse Defense Initial Defensive Operations Capability (IDOC)	Record of Decision Fort Greely, Alaska April 2003	The Fort Greely IDOC consists of up to 40 sites equipped with ground-based interceptor missiles, communications systems, infrastructure, and support facilities. Construction is phased with the initial phase consisting of six silos and support facilities. Test firing of ground-based interceptors would not be proposed from the Fort Greely site. Construction and manpower growth at Fort Greely could result in soil erosion, water quality, and socioeconomic effects.
C-17 Beddown	Final EA Elmendorf AFB, Alaska September 2004	The addition of new C-17 aircraft brings the USAF Alaska airlift capabilities to state-of-the-art standards and increases its capacity. The beddown included C-17 aircraft and aircraft operations (both mission- and training-related), and the construction and use of support facilities on Elmendorf AFB. C-17 aircraft and C-130 aircraft are included as users of the proposed Delta MOA.
C-17 Training Areas	Final EA Elmendorf AFB, Alaska November 2005	C-17 training includes operations in Alaskan Special Use Airspace (SUA). The project also includes upgrading Runway 07/25 at Allen Army Airfield, frequent use of the runway as a C-17 assault landing zone, and frequent use of five existing drop zones for C-17 training. C-17 aircraft are included as users of the proposed Delta MOA.
Modification of Military Training Routes (MTRs)	Draft EA June 2005	The USAF is proposing to modify existing MTRs within the state of Alaska to better connect the MTRs with existing SUA. These changed MTRs would be used by aircraft with low level navigation missions. MFE training in the proposed Delta MOA includes low-level flight in the Birch and Buffalo MOAs.
Eielson BRAC projects	Identified as a BRAC action by BRAC Act of 2005	This project removes 354th Fighter Wing assigned A-10 aircraft from Eielson AFB. An Aggressor Squadron of F-16s replaces operational F-16s at Eielson AFB. The Aggressor Squadron F-16s are identified as a participant in MFE activity in this EA.
F-22A Beddown	Final EA Elmendorf AFB, Alaska May 2006	Two F-22A operational squadrons at Elmendorf AFB replaced and supplemented F-15C and F-15E aircraft which can be targeted by enemy air defenses at increasingly greater distances. F-22A training flights take place in existing Alaskan MOAs, Air Traffic Control Assigned Airspace (ATCAAs), and ranges. During training, F-22As employ defensive countermeasures such as chaff and flares in airspace authorized for their use and deploy munitions on approved ranges. F-22A capabilities increase the number of sonic booms experienced under training airspace. F-22A training is included in this Delta MOA EA.

TABLE 5.1-1. CURRENT AND FUTURE MILITARY AND NON-MILITARY PROJECTS
(PAGE 2 OF 3)

Action	*Document*	*Description*
F-35 Beddown	Eielson identified as a potential location for an operational wing in an on-going environmental impact analysis process (EIAP)	Basing locations for F-35 operational aircraft are being evaluated as part of a nationwide Environmental Impact Statement (EIS). One alternative location under consideration is Eielson AFB. If Eielson were selected as an F-35 operational location, there would be construction at the base and training in the airspace. F-35s, either locally or remotely based, are assumed to participate in MFE training in this Delta MOA EA.
Other aircraft changes at Eielson AFB	Eielson AFB is a dynamic installation and could have increases or decreases in aircraft assigned to the base	The USAF is undergoing a period of change with a new command responsible. This change and/or other restructuring of strategic defense responsibilities could affect aircraft changes at many bases, including Eielson AFB. Any future aircraft changes would be subject to separate environmental evaluation.
Future evaluation of the Alaska MOA and range capabilities	Proposed evaluation of Army and USAF airspace and range future needs. Pacific Alaska Range Complex (PARC) was established as the Cold War was drawing to a close	USAF and Army airspace and range requirements have evolved with the War on Terror and the development of new, unanticipated systems including long-range targeting capabilities, unmanned aircraft systems, and new rules of engagement. Should modifications to the Alaska ranges and/or airspace be proposed, such changes would be subject to separate environmental analysis.
Non-Military Projects		
Natural Gas Pipeline	Written Findings and Determination by the Commissioners of Natural Resources and Revenue for Issuance of a License under the Alaska Gasline Inducement Act (AGIA) May 2008	Alaska is pursuing the construction of a natural gas pipeline. Part of the construction staging and a pipeline extension could occur under the proposed airspace area. If construction was occurring during the time of the MFEs, this could temporarily increase noise and emissions in the area. Commentors noted the potential for increased general aviation activity to support pipeline construction and natural resources development. This increased activity is included as the one to two IFR aircraft which could be delayed at Fairbanks or Northway for approximately one hour during an MFE day.

Table 5.1-1. Current and Future Military and Non-Military Projects
(Page 3 of 3)

Action	*Document*	*Description*
Northern Rail Extension	Draft EIS 2007	Alaska Railroad is pursuing the construction of a railroad extension from North Pole to Delta Junction. The construction staging and rail extension would occur under the proposed airspace area. If construction was occurring during the time of the MFEs, this could temporarily increase noise and emissions in the area and ground activity under the training airspace.

NOISE

Noise conditions addressed for the charting of the Delta MOA take into consideration the F-22A beddown, the C-17 beddown, F-16 changes, A-10 changes, and the F-15C and F-15E changes associated with Base Realignment and Closure (BRAC) and other actions. The noise analysis for the charting of the Delta MOA presented in Section 4.2 is effectively a cumulative analysis. Rail line construction would increase localized noise levels, but would not be expected to have long-term regional effects. The Delta MOA would contribute no substantial cumulative noise effects other than those identified in Section 4.2. The redistribution of training aircraft throughout the proposed Delta MOA would not be expected to result in significant cumulative noise impacts.

SAFETY

Flight and ground safety associated with the charting of the Delta MOA is not expected to have any cumulative effects in conjunction with other past, present, and reasonably foreseeable actions. Cumulative airspace safety would not be expected to change with the mitigation measures, scheduling, and communication associated with the proposed Delta MOA in conjunction with other projects. Implementation of the Proposed Action would not result in any cumulative effects to safety.

AIR QUALITY

The floor of the proposed Delta MOA is above the mixing level within the Delta corridor. This would not result in cumulative effects from MFE tracking with recently beddown military aircraft. Ground level activities including construction effects at Fort Greely and rail development along the Delta corridor have the potential to affect local air quality. The Delta MOA would not be expected to have a cumulative contribution to any air quality environmental effects from these projects.

PHYSICAL RESOURCES

Cumulative construction projects on the ground under the proposed Delta MOA could affect soils and water resources. Because the Proposed Action has no ground disturbance, it would not affect physical resources under the airspace. Chaff and flare effects are not projected to substantively change for MFE training with the Delta MOA. The Proposed Action would not contribute to cumulative effects to earth and water resources.

BIOLOGICAL RESOURCES

Construction projects at Fort Greely and on the Delta corridor could disturb soils, vegetation, and wildlife. If any of these construction activities occur on undeveloped locations, native vegetation, wetlands, or special-status species could be affected. These projects have been or will be subject to the National Environmental Policy Act (NEPA) process, and any impacts to biological resources would be identified.

Charting the Delta MOA would not impact ground or sensitive species. No immediate adverse threats due to cumulative activities were identified for biological resources underneath the training airspace. The effects of aircraft noise during the MFEs in Alaska would be slight. The average annual noise levels and MOA altitude levels would not be expected to contribute to cumulative noise effects to biological resources under the airspace. The frequency of the training exercises is a maximum of 3.4 percent of the year.

CULTURAL RESOURCES

The Proposed Action would not impact cultural resources under the proposed airspace. Ground disturbance associated with other projects identified in Table 5.1-1, page 5-3, could affect cultural resources, but there would be no expected cumulative contribution to any effects by the proposed Delta MOA.

LAND USE AND RECREATION

The Proposed Action would not affect land use plans or land use patterns in the ROI. Implementation of the Natural Gas Pipeline and Northern Rail Extension proposals could temporarily increase traffic and construction under the airspace and could generate land use and transportation effects in the Delta corridor. Incremental effects of the Delta MOA would not be expected to create adverse cumulative effects to land use in the region.

SOCIOECONOMICS

Proposed personnel changes at Fort Greely and rail or pipeline construction would be expected to stimulate economic activity along the Delta corridor. The socioeconomic effects of MFE training activity occur mainly in the Fairbanks and Anchorage areas. These effects would be expected whether or not the charted Delta MOA increased the quality of MFE training. Economic activities in the region, including that related to Alaska Native subsistence activities, are not expected to experience any major limitations or negative effects under implementation of the Proposed Action separately or in conjunction with relevant past, present and reasonably foreseeable future actions. Table 5.1-1, page 5-3, suggests a number of military and non-military projects would increase the demand for construction employment and activity in the region. Although the increase in economic activity associated with a specific project would be temporary, lasting only for the duration of the construction period, the cumulative effects of the construction projects create employment for the foreseeable future.

Incremental effects of the beddown, in combination with potential impacts associated with the reasonably foreseeable future actions, would not be expected to create any significant or adverse cumulative effect to socioeconomic resources in the region.

ENVIRONMENTAL JUSTICE

Charting the Delta MOA would not separately or cumulatively contribute to any adverse impacts on minority, low-income, or youth populations in the ROI. The incremental effects of this proposal, in combination with potential impacts associated with the relevant past, present, and reasonably foreseeable future actions, would not be expected to have any cumulative environmental justice effects.

5.2 OTHER ENVIRONMENTAL CONSIDERATIONS

5.2.1 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 proposal compared to the long-term productivity derived from not pursuing the proposal.

Short-term effects to the environment are generally defined as a direct consequence of a project in its immediate vicinity. Short-term effects could include higher average annual noise levels in some areas. The proposed Delta MOA would be activated not more than 60 days per year. Short-term noise levels would change very little from current conditions and would not be expected to result in permanent or long-term changes in wildlife or habitat use. Continued use of chaff and flares along the Delta corridor would not negatively affect the long-term quality of the land, air, or water.

Charting the Delta MOA is an aeronautical chart action with short-term benefits and no expected long-term productivity effects. Short-term effects would include beneficial effects of enhanced realistic training and detrimental effects of short-term delays to an estimated one to two IFR aircraft and re-routing of one to two commercial flights per MFE day.

5.2.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For Alaska airspace, most impacts are short-term and temporary due to the infrequent use of the airspace or longer lasting, but negligible, consumption of fuel, oil, and lubricants due to delays, rescheduling, or re-routing of civilian aircraft. This consumption is approximately 500 pounds of jet fuel for each commercial aircraft unable to deconflict during a Delta MOA activation period.

MFE training operations would involve consumption of essentially the same amount of nonrenewable resources, such as fuel, and commitment of chaff and flares, with the charted Delta MOA as with existing conditions. The change in MFE training associated with charting the Delta MOA would not significantly decrease the availability of minerals or petroleum resources or result in a substantial irreversible or irretrievable commitment of resources.

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APPENDIX A

ALASKA MILITARY OPERATIONS AREAS SPECIAL USE AIRSPACE INFORMATION SERVICE PAMPHLET

I AM NOT A PILOT. WHY SHOULD I KNOW ABOUT MOAs AND SUAIS?

The information in this pamphlet is for all persons traveling in the vicinity of Military Operations Areas (MOAs) in Alaska. For persons on the ground, this pamphlet provides information on where low flying military aircraft and "jet noise" may occur.

SUAIS INFORMATION

For current information on MOA activity and range status, contact:

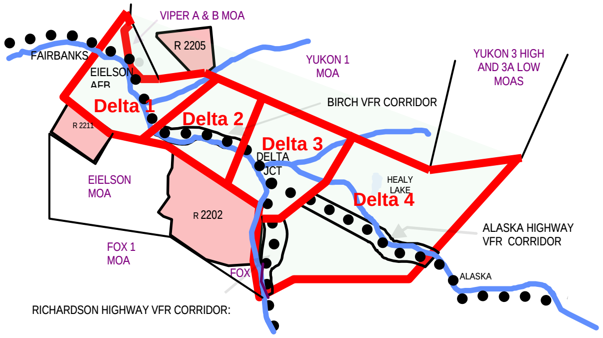
<u>EIELSON RANGE CONTROL</u>
VHF 125.3
1-800-758-8723
(907) 372-6913

To file a **<u>NOISE COMPLAINT</u>** call the
24 HOUR FEEDBACK LINE
1-800-538-6647
1-800-JET-NOISE

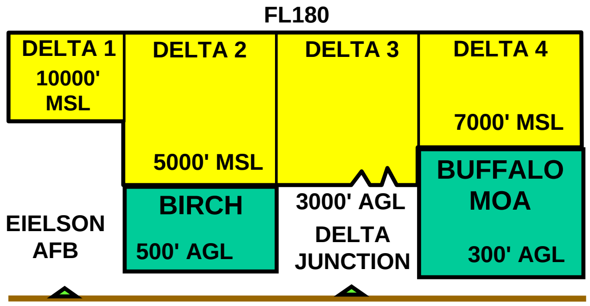
For **<u>ADDITIONAL INFORMATION</u>** about military activity in Alaska see our web site at:
http://www.elmendorf.af.mil
under Featured Links, select
"Alaska Airspace Info"

THIS PAMPHLET IS PROVIDED FOR INFORMATION PURPOSES ONLY. IT IS NOT INTENDED TO REPLACE OFFICIAL GUIDANCE AVAILABLE THROUGH THE FAA. IT IS RECOMMENDED THAT PILOTS CONTACT THE NEAREST FLIGHT SERVICE STATION FOR THE LATEST NOTAM INFORMATION ON RESTRICTED/SPECIAL USE AIRSPACE.

TENTATIVE DELTA TEMPORARY MOA



SIDE VIEW



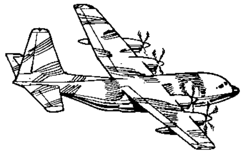
The Air Force has applied for the Delta Temporary MOA and is expecting a decision by HQ FAA mid February 2008. If approved, this MOA will only be utilized during 2008 major exercises (dates listed on flip side). Usage times will be published by NOTAM 30 days prior to the start of each exercise. The exercise activation times will normally consist of a morning and evening period. Each period will last 1.5 – 2.5 hours. Reference NOTAMs for actual activation times. This MOA will be returned to the FAA immediately upon completion of military use. By publishing times 30 days in advance in the NOTAMs, other users can plan their flights around the small activation windows. Emergency aircraft, air evacuation, Life Flight, and fire fighting aircraft will always have priority over military training. Please refer to the AK Airspace webpage for the most current updates:

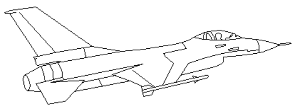
http://www.elmendorf.af.mil
Select **"Alaska Airspace Info"**

ALASKA
MILITARY OPERATIONS AREAS (MOAs)

SPECIAL USE AIRSPACE INFORMATION SERVICE (SUAIS)

IMPORTANT INFORMATION ON MILITARY AIRCRAFT OPERATIONS IN ALASKA FOR ALL PILOTS, RESIDENTS, AND VISITORS





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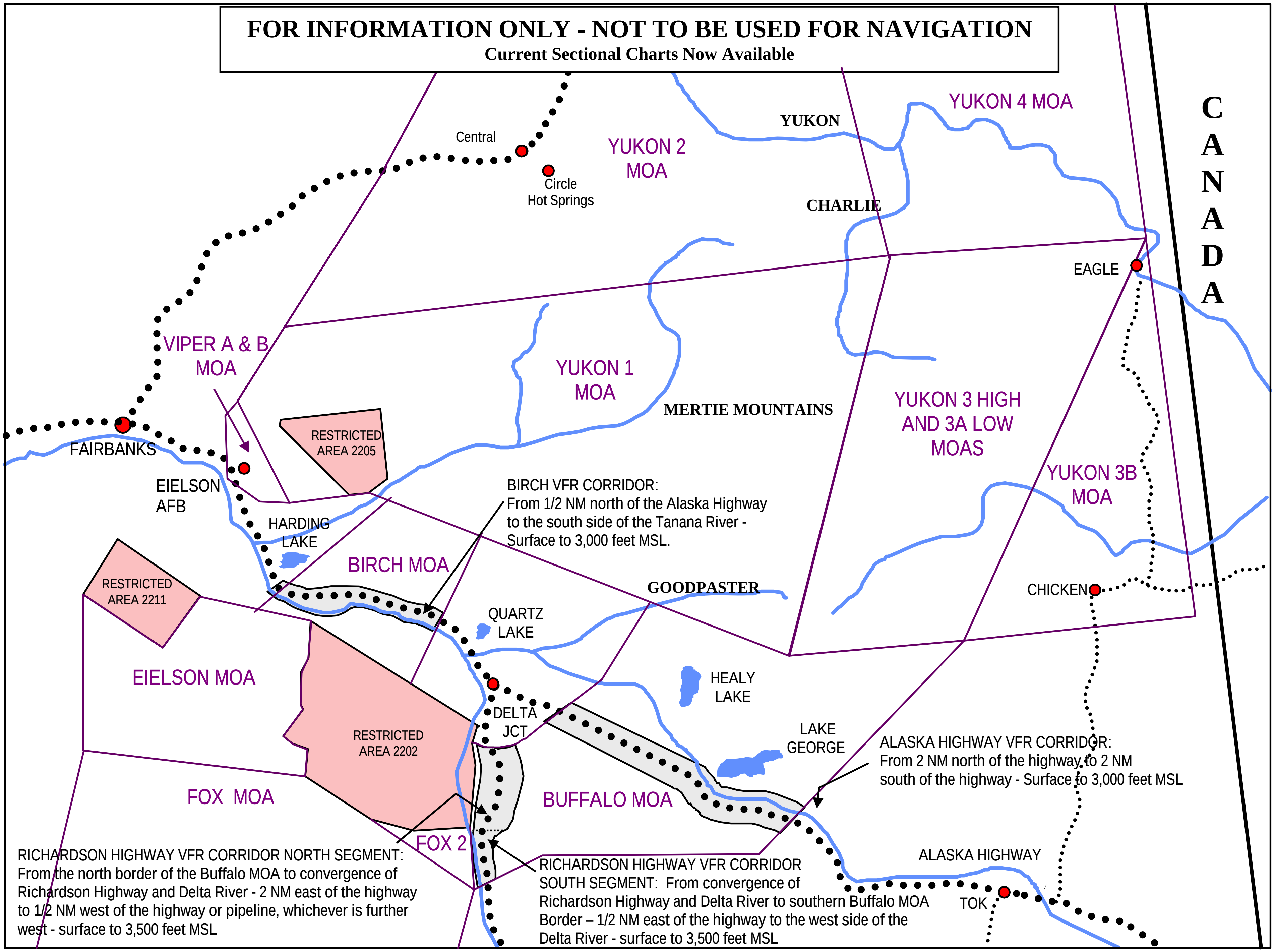
DEPARTMENT OF THE AIR FORCE
11TH AIR FORCE
ELMENDORF AFB, ALASKA



FOR INFORMATION ONLY - NOT TO BE USED FOR NAVIGATION

Current Sectional Charts Now Available

BIRCH VFR CORRIDOR:
From 1/2 NM north of the Alaska Highway to the south side of the Tanana River - Surface to 3,000 feet MSL.

ALASKA HIGHWAY VFR CORRIDOR:
From 2 NM north of the highway to 2 NM south of the highway - Surface to 3,000 feet MSL

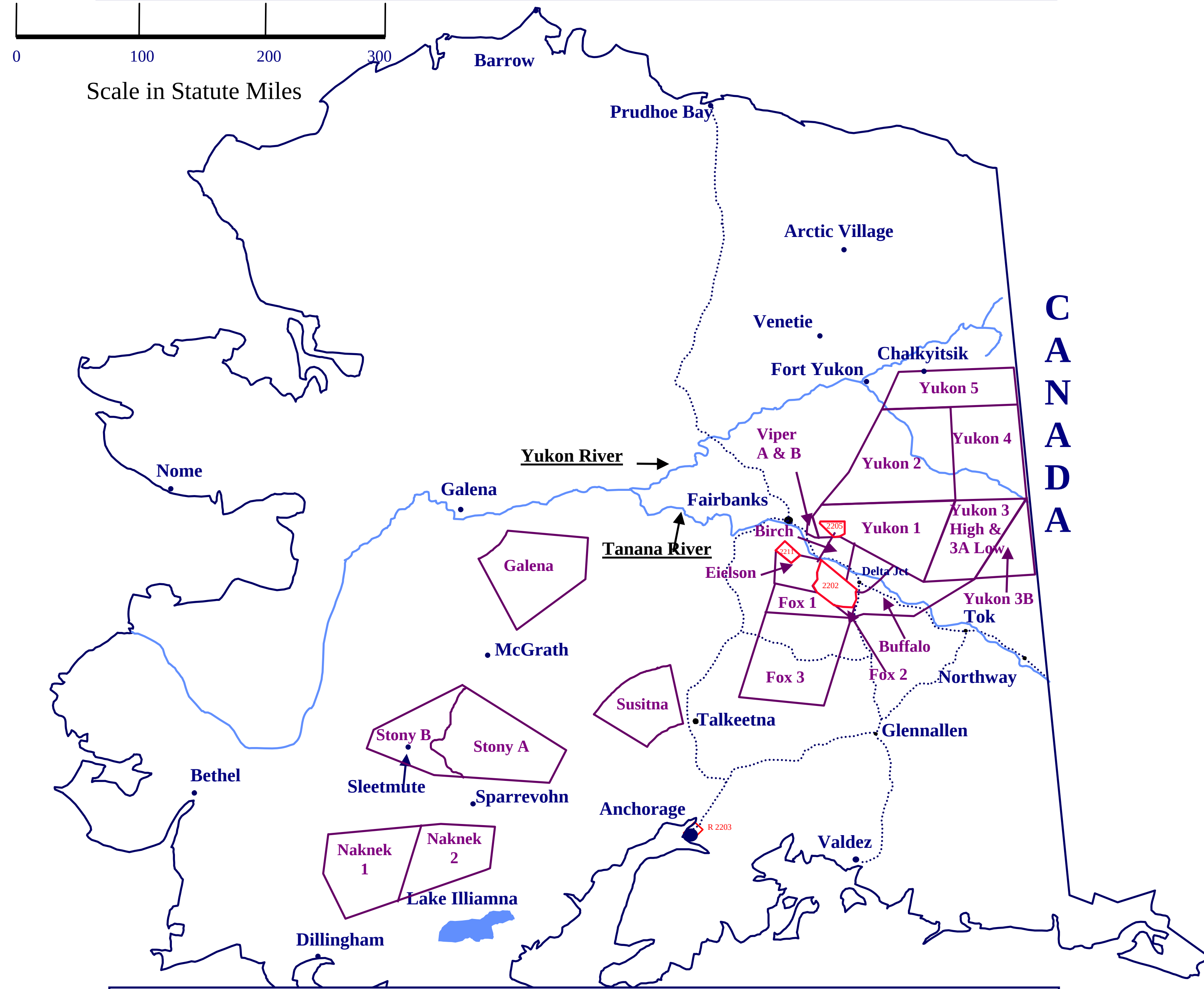
RICHARDSON HIGHWAY VFR CORRIDOR NORTH SEGMENT:
From the north border of the Buffalo MOA to convergence of Richardson Highway and Delta River - 2 NM east of the highway to 1/2 NM west of the highway or pipeline, whichever is further west - surface to 3,500 feet MSL

RICHARDSON HIGHWAY VFR CORRIDOR SOUTH SEGMENT: From convergence of Richardson Highway and Delta River to southern Buffalo MOA Border – 1/2 NM east of the highway to the west side of the Delta River - surface to 3,500 feet MSL

ALASKA MILITARY OPERATIONS

FOR INFORMATION ONLY - NOT TO BE USED FOR NAVIGATION

Current Sectional Charts Now Available



SPECIAL USE AIRSPACE LIMITS

FOX 1	5,000' AGL - 17,999' MSL
FOX 2	7,000' MSL - 17,999' MSL
FOX 3	5,000' AGL - 17,999' MSL
GALENA	1,000' AGL - 17,999' MSL
NAKNEK 1	3,000' AGL - 17,999' MSL
NAKNEK 2	3,000' AGL - 17,999' MSL
STONY A	100' AGL - 17,999' MSL
STONY B	2,000' AGL - 17,999' MSL
SUSITNA	** - 17,999' MSL

**** FOR SUSITNA, FLOOR OF 5,000' AGL OR 10,000' MSL, WHICHEVER IS HIGHER**

BIRCH	500' AGL	5,000' MSL
BUFFALO	300' AGL	6,999' MSL
EIELSON	100' AGL	17,999' MSL
YUKON 1	100' AGL	17,999' MSL
YUKON 2	100' AGL	17,999' MSL
YUKON 3 HIGH	10,000' MSL	17,999' MSL
YUKON 3A LOW	100' AGL	9,999' MSL
YUKON 3B	2,000' AGL	17,999' MSL
YUKON 4	100' AGL	17,999' MSL
YUKON 5	5,000' AGL	17,999' MSL
VIPER A	500' AGL	10,000' MSL
VIPER B	10,001' MSL	17,999' MSL

WHAT IS THE SPECIAL USE AIRSPACE INFORMATION SERVICE?

The Special Use Airspace Information Service (SUAIS) is a 24-hour service provided to civilian pilots. The SUAIS' primary function is to assist pilots in planning flights through or around MOAs and Restricted Airspace within central Alaska. The service provides "near real time" information on military activity in the Fairbanks and Delta Junction areas. SUAIS also provides information on Army artillery firing and known helicopter operations.

CONTACT INFORMATION AND HOURS OF OPERATION

Eielson Range Control is an airspace facilitator at Eielson Air Force Base, Alaska. It is normally staffed from 7 a.m. to 5 p.m., Monday through Friday (except federal holidays), and times when military flying is in progress in the Interior Alaskan MOAs and Restricted Areas. After hours, telephone and radio callers will receive the airspace status through a recorded message. Eielson Range Control is equipped with UHF and VHF radios and radar displays.

Pilots can call SUAIS at 1-800-758-8723 or 372-6913 from the Fairbanks area. If airborne, contact Eielson Range Control, VHF 125.3. SUAIS information can also be found on the Elmendorf AFB home page at www.elmendorf.af.mil under Featured Links, select "Alaska Airspace Info" then select "Special Use Airspace Information Service". Obtain the most current MOA status information from any Automated Flight Service Station (AFSS), Anchorage Center, or Eielson Range Control.

WHY USE SUAIS?

SAFETY: Eielson Range Control monitors all military activity in MOAs and can advise civilian pilots of high-speed military aircraft operating in them. The MOAs adjacent to the Richardson and ALCAN Highways between Tok, Delta Junction, and Fairbanks are areas of heavy general aviation use. VFR transit corridors have been established along the highways, but the MOAs are of special concern since they are subject to flights at high speed/low altitude by military aircraft.

EFFICIENCY: Military Restricted Areas are not always in use. Eielson Range Control can advise civilian aircraft of current restricted area status.

EMERGENCY: Eielson Range Control can assist in clearing military aircraft out of this airspace if requested by the FAA or other agencies for emergency operations such as air ambulance missions or fire fighting operations.

HOW TO USE SUAIS

PREFLIGHT: Call the SUAIS phone number to find out which MOAs along your route of flight are scheduled to be active and during what times.

INITIAL RADIO CONTACT WITH RANGE CONTROL: Provide your present position (with reference to a NavAid or a well known geographic reference), altitude, and intended route of flight. Conveying intentions is critical to helping the system enhance flight safety in areas that lack low altitude radio coverage.

POSITION REPORTS: To promote safety and improve everyone's situational awareness pilots are encouraged to provide routing and destination updates, particularly if your route of flight changes.

SUAIS RADIO AND RADAR COVERAGE

Radio relay stations permit pilots flying as low as a few hundred feet to contact Eielson Range Control in the Tanana Valley between Lake George and Fairbanks. Aircraft flying in mountainous terrain to the east of the Tanana River will need to be as high as the tops of the highest terrain in their immediate vicinity. The general area of coverage is bounded by 50 miles North of Circle, Fairbanks to the west, Black Rapids to the south, and Lake George to the east. The ability to detect light aircraft without transponders is limited. **Transponder use is highly recommended.**

Eielson Range Control ***does not*** provide air traffic control. They can provide information on the status of airspace and the ***approximate*** locations of ***military aircraft*** in the area. IFR vectoring, processing of flight plans, etc., is not provided. ***Use of the SUAIS constitutes an acknowledgment, understanding and acceptance of these limitations***.

SPRING/SUMMER 2008 MAJOR EXERCISE SCHEDULE

The following schedule lists dates when higher than usual levels of activity can be expected in Alaskan MOAs. Military flying activities ***are not limited*** to these dates. Military aircraft may be encountered at any time throughout the year.

Military flight activity will normally increase two business days prior to major exercises to allow pilots to familiarize themselves with the airspace. The major exercises dates are listed below.

Dates below subject to change
Check the web site for updates

RED FLAG-Alaska 08-02	7-18 April 2008
NORTHERN EDGE 08	5-16 May 2008
RED FLAG-Alaska 08-03	9- 20 June 2008
RED FLAG-Alaska 09-01	6-17 Oct 2008

APPENDIX B
CHARACTERISTICS OF CHAFF

APPENDIX B CHARACTERISTICS OF CHAFF

Chaff is currently authorized for use in the existing Delta Air Traffic Control Assigned Airspace (ATCAA), Buffalo Military Operations Area (MOA), and Birch MOA, and under the Proposed Action, training chaff would continue to be employed in the charted Delta MOA. Chaff 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 thinner than 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 cartridge is approximately 95 grams or 3.35 ounces (United States Air Force [Air Force] 1997). Since chaff can obstruct radar, its use is coordinated with the Federal Aviation Administration (FAA). RR-170 combat chaff is used during Major Flying Exercise (MFE) training in Alaska Special Use Airspace (SUA). RR-170 and RR-188 chaff are the same size. RR-188 chaff has D and E band dipoles removed to avoid interference with FAA radar. RR-170 chaff dipoles are cut to disguise the aircraft and produce a more realistic training experience in threat avoidance.

1.0 CHAFF CHARACTERISTICS

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 (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 chaff fibers 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 or RR-170 chaff.

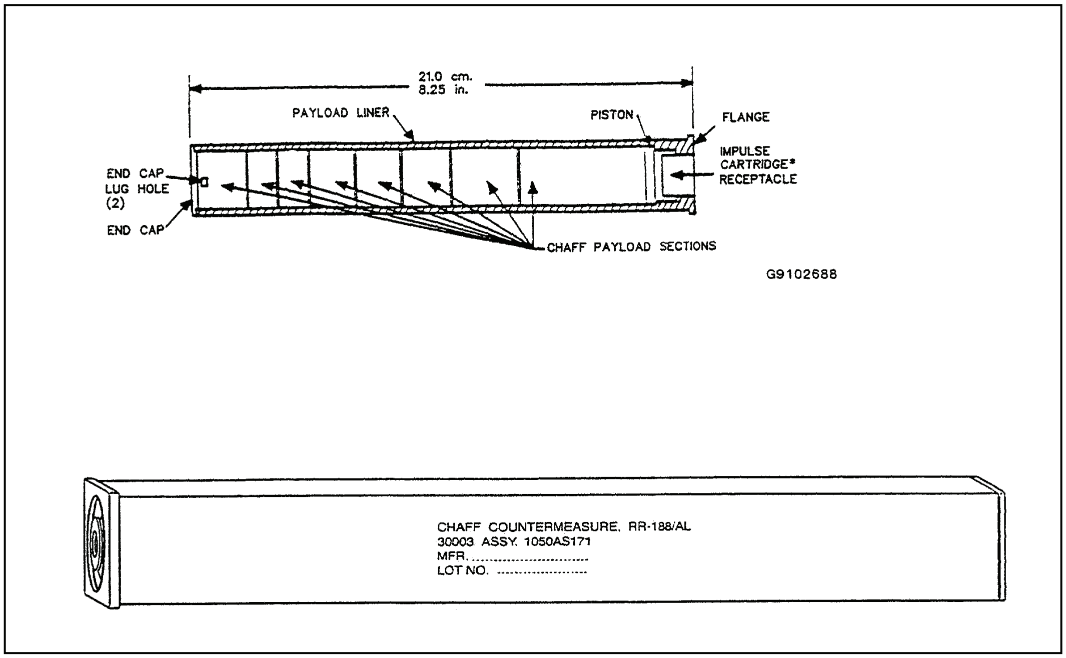


FIGURE 1. RR-188 OR RR-170 CHAFF CARTRIDGE

TABLE 1. COMPONENTS OF RR-188 OR RR-170 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 OR RR-170 CHAFF

Attribute	*RR-188 or RR-170*
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

The F-22A uses the same chaff material in a slightly different chaff cartridge to expedite clean ejection of the chaff. The chaff cartridge design 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 an opened RR-188 chaff with all the pieces. The F-22A delayed-opening chaff is packaged in two sets of soft packs that retain approximately the same number of dipoles per cut as RR-170 chaff. The differences are two end caps and six parchment paper wraps that facilitate deployment. Two end caps, two pistons, six approximately 2-inch by 4-inch paper pieces, and chaff fibers fall to the ground with each chaff cartridge deployed. Other aircraft, including foreign aircraft, participating in MFE training discharge comparable chaff fibers and similar residual pieces to those described for RR-170 chaff.

2.0 CHAFF EJECTION

Chaff is ejected from aircraft 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 is ejected, followed by the chaff fibers, and, in the case of F-22A chaff, three mylar pieces. The plastic tube remains within the aircraft. Debris from the ejection consists of two small, square pieces of plastic 1/8-inch thick (i.e., the piston and the end cap), three mylar strips, and the felt spacer. Table 3 lists the characteristics of BBU-35/B impulse cartridges used to pyrotechnically eject chaff.

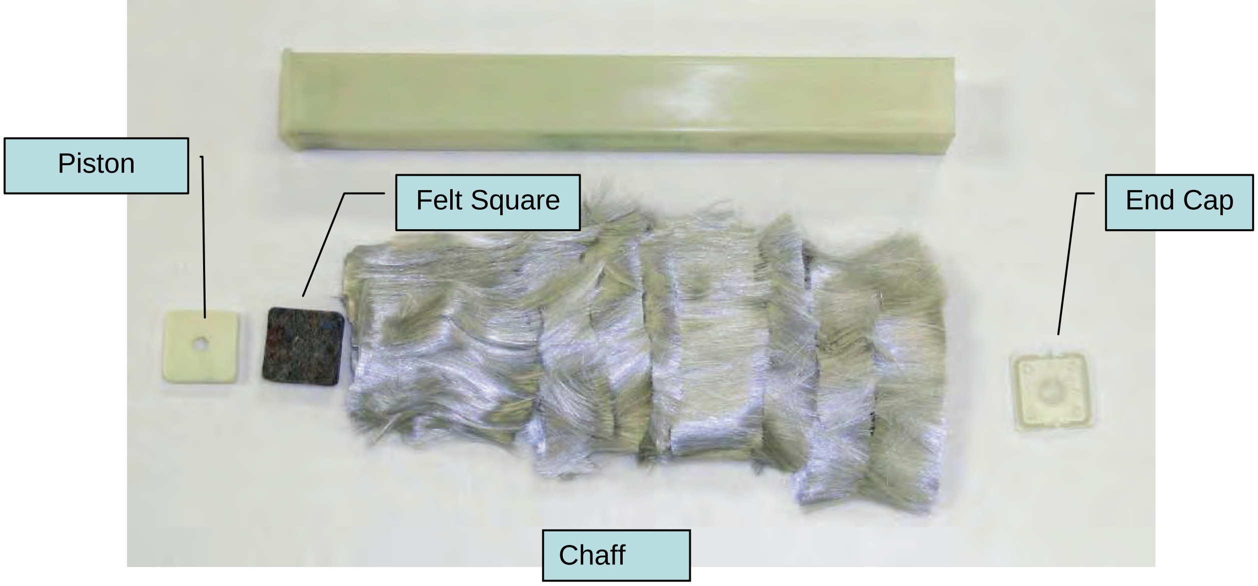


FIGURE 2. RR-170 A/AL CHAFF

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. The net result is that chaff is normally manufactured to tolerance levels in excess of 99 percent reliability.

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 ^{o}F	
Temperature Shock	Shock from –70 ^{o}F to +165 ^{o}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

3.0 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.

4.0 ENVIRONMENTAL EFFECTS OF CHAFF

The potential for effects of chaff deposition and fragmentation in the environment has been of interest to agencies and the public. There has also been interest by land management agencies in the military use of chaff. This interest is largely driven by concern that the fragmentation of chaff fibers was not documented. Does chaff begin breaking down almost immediately following ejection? Does it become small enough to be inhaled by man or by wildlife? Conversely, if the chaff does not fragment, could chaff particles be ingested by livestock or wildlife? What would be the environmental effects of chaff particles?

A variety of studies on the effects of chaff have been conducted over the past 40 years for the Army, Navy, Air Force, National Guard Bureau, and Canadian Forces Headquarters (Government Accountability Office [GAO] 1998). The focus of these studies ranged from effects on livestock from ingestion of chaff (Canada Department of Agriculture 1972) to environmental impacts from the deposition of chaff fibers on marine and terrestrial ecosystems (Air Force 1997). In the early 1990s, ACC prepared a study on the known environmental consequences of chaff and other defensive measures (Air Force 1997). None of the studies demonstrated significant environmental effects of chaff.

In response to continuing concern on the part of private citizens with the military's use of chaff, Senator Harry Reid (Nevada) requested that the GAO conduct an independent evaluation of chaff use. The subsequent GAO report (1998) acknowledged that citizens and various public interest groups continued to express concerns of potentially harmful or undesirable effects of chaff on the environment. The report recommended that the Secretaries of the Air Force, Army, and Navy determine the merits of open questions made in previous chaff reports and whether additional actions are needed to address them.

4.1 ATMOSPHERIC EFFECTS

The DoD engaged a "Select Blue Ribbon Panel" of independent, non-government scientists to 1) review the environmental effects of radio frequency (RF) chaff used by the United States (U.S.) military; and 2) to make recommendations to decrease scientific uncertainty where significant environmental effects of RF chaff are possible. The report of the Blue Ribbon Panel (Spargo

1999) identified a variety of issues of interest, and included specific recommendations for the further evaluation of chaff use.

The fate of chaff fibers after release was of particular interest to the Blue Ribbon Panel. The panel requested additional data on the degree of chaff fragmentation and the potential for re-suspension of chaff or chaff fragments in the natural environment. Two issues related to chaff fragmentation and re-suspension were identified (Spargo 1999).

> **Atmospheric effects:** What fraction of emitted chaff breaks up from mid-air turbulence into respirable particles?
>
> **Ground effects:** What fraction of chaff reaching the ground is subsequently abraded, re-suspended, and reduced to respirable sized particles?

An independent study on chaff fragmentation and re-suspension rates was initiated to evaluate these issues. *The Fate and Distribution of Radio-Frequency Chaff*, Desert Research Institute (DRI) was released on 1 April 2002. A parallel independent study also addressed chaff fragmentation and resuspension (Cook 2002).

Both studies used atmospheric chaff fragmentation tests and a fluidized bed to simulate chaff fragmentation in the atmosphere. The ground chaff fragmentation tests used wind generation in a portable environmental chamber to simulate chaff fragmentation after it falls to the ground.

4.2 MID-AIR TURBULENCE EFFECTS

Chaff in the military training environment released at altitudes below 30,000 feet above ground level (AGL) are typically deposited on the ground within ten hours of formation (DRI 2002). Atmospheric fragmentation, which appears to occur, takes place within the first 2 hours of release, likely immediately after release, when the density of fibers within the cloud is at its greatest. The DRI findings suggest that in the simulated mid-air column, relatively little fragmentation occurs between 2 and 8 hours (DRI 2002).

The experimental data obtained from tests were not sufficiently robust to definitively conclude when most chaff fragmentation occurs. Most fragmentation could occur immediately upon ejection or within the first 2 hours after ejection. While chaff fragmentation in the DRI tests appeared to be minor, some fragmentation did occur, and there was some degree of formation of particles sufficiently small as to be considered respirable. Abrasion tests suggested that on the order of one part mass in 10^7 may be abraded to particulate matter less than 10 micrograms in diameter (PM_{10}) or smaller (DRI 2002). The data sampling and testing did result in a small fraction of chaff being converted to respirable particles. The data suggest that this is not a significant factor in the fate of training chaff in the mid-air column. DRI concluded that virtually none of the airborne chaff was degraded to respirable size particles of PM_{10} or less. Based on these tests, there is little environmental risk from airborne chaff abrading to respirable particles prior to the chaff being deposited on the surface.

4.3 SURFACE EFFECTS AND FRAGMENTATION

The 1998 GAO report recommended that the Secretaries of the Air Force, Army, and Navy determine the merits of open questions made in previous chaff reports and whether additional actions were needed to address them. The Select Blue-Ribbon Panel of independent, non-government scientists (Spargo 1999) identified a need for further investigation of the re-suspension of chaff and chaff fragments once deposited on the surface.

4.3.1 GROUND SURFACE EFFECTS

Following deposition on the ground, chaff is subjected to various physical processes that may break the individual fibers into fragments. Processes that may induce fragmentation on the ground include wind-driven re-suspension and deposition, wind-driven interaction with soils, wind-driven interaction with plants, disturbance by animals, and vehicular traffic. Processes that may induce fragmentation on water include wind and wave action. Field studies on ground fragmentation were conducted to gain information on the relative importance of these processes and to address different test approaches to evaluate post-deposition fragmentation (DRI 2002; Cook 2002).

Results of these studies indicate that, once deposited on the ground, chaff undergoes rapid fragmentation. Typically between 5 and 10 percent of the chaff in these tests was reduced to particles less than 10 microns in length over a 2-hour period. In nature, assuming similar wind, soil interaction, and other processes are at work, it seems likely that most chaff would be reduced to fragments less than 10 microns within a matter of days of deposition. Chaff fragmentation on the ground surface is primarily wind driven. Increasing airflow in these studies resulted in increasing fragmentation. This suggests that higher wind levels in the ambient environment would lead to increased fragmentation (DRI 2002).

Baseline sampling results from this study indicated minimal chaff concentrations (1 microgram/square foot) in the soil of an area heavily utilized for military aircraft training using chaff. This may indicate extensive fragmentation and dispersal of chaff used for training purposes on the range. The naturally occurring materials that comprise chaff, wind driven turbulence, fragmentation, and dispersal of PM_{10} size particles provide a sufficient basis to explain this finding. In essence, chaff particles, once on the ground, appear to rapidly degrade and become indiscernible from ambient silica and aluminum soil materials (DRI 2002, Cook 2002).

4.3.2 AQUATIC SURFACE AND SUBSTRATE EFFECTS

Potential aquatic and marine effects of chaff have been of interest to both the Air Force and the Navy. Aquatic environments are sensitive to any chemicals released from any sources. The questions asked regarding chaff in an aquatic environment deal with the dissolution of the chaff in the water or marine environment, the potential resulting release of chemicals which could be mobile within the aquatic ecosystems, and the potential sensitivity of aquatic organisms to released chemicals (Farrell and Siciliano 2005). Although not specifically tested, chaff fragments in a marine environment would be subject to both wind and wave action. This suggests that chaff fragmentation in an aquatic marine environment would be similar to chaff fragmentation observed in ground fragmentation tests.

Chaff deposition on the water surface would be subject to physical factors and would be expected to become part of the underlying sediment. The Navy sponsored a series of studies to address the potential for chaff materials to concentrate in the sediment. An area in the Chesapeake Bay was identified as a location for Navy-sponsored studies. A series of studies were performed in the Chesapeake Bay to address whether chaff release was contributing to aluminum levels in the Chesapeake Bay (Wilson *et al.* 2001). An estimated 500 tons of chaff had been deposited over the bay during aircraft and Navy maneuvers for both research and training purposes from the mid-1970s to 1995. As part of the Wilson study, a series of sediment sampling locations were tested at various sampling depths to determine whether increased aluminum could be detected. A background sampling location at approximately the same depths was sampled in an area not subject to chaff deposition.

The studies found no significant difference in mean aluminum concentrations between the sediments that were from the control site and those taken from areas of heavy chaff use. The results did demonstrate some variation in the types of aluminum at the test and control locations. Inorganic monometric aluminum concentrations were significantly lower under the chaff use areas than in the background conditions. Mean concentrations of organic monometric aluminum were significantly higher in the sediment under the high chaff use area than in the control area. Exchangeable aluminum (AL_{EX}) represents aluminum bound to the soil by an electrostatic charge. AL_{EX} is a good indicator of soil acidity and of the concentration of potential toxic aluminum present. AL_{EX} concentrations under the heavy chaff use area were numerically lower but not significantly different from those of the control area (Wilson *et al.* 2001).

Sediment sampling in the Chesapeake Bay area did not indicate that aluminum concentrations below the flight path were significantly increased as a result of chaff use. Aluminum concentrations in fish, plants, or other biota were not assessed in the sediment survey.

Aluminum is not known to accumulate to any great extent in most invertebrates under non-acid conditions. It is unlikely that much, if any, of the aluminum present as a result of chaff use would be available for uptake by aquatic plants, fish, or other biota. The conclusions reached by Wilson *et al.* suggested that deployment of chaff resulted in minimal but statistically significant increases in nontoxic aluminum in sediment under the flight path. Concentrations of aluminum of toxicological interest were significantly lower under the heavy chaff use area than in background sediment samples (Wilson *et al.* 2001).

Additional studies were conducted to evaluate the potential for chaff concentrations to be harmful to aquatic organisms. A Chesapeake Bay study by Systems Consultants for the U.S. Navy found no evidence that chaff was acutely toxic to six species of aquatic organisms (Arfsten *et al.* 2002). Concentrations of chaff at between 10 to 100 times the exposure levels expected to be found in the Chesapeake Bay were placed in tanks containing a variety of aquatic organisms. American oysters, blue mussels, blue crab, and killifish were among the species tested. There was no significance in mortality as a result of exposure to concentrations of chaff of one to two orders of magnitude greater than expected chaff concentrations (Arfsten *et al.* 2002).

Chaff was not found to result in concentrations of aluminum which would produce environmental impacts in the Chesapeake Bay environment. Part of the reason for this may be that chaff is comprised of nearly entirely aluminum and silicate with some trace elements. Aluminum and silicate are the most common minerals in the earth's crust. Ocean waters are in constant exposure to crust materials, and there would be little reason to believe that the addition of small amounts of aluminum and silicate from chaff would have any effect on either the marine environment or sediment.

Before becoming part of the sediment, could chaff particles have environmental consequences? Chaff particles in the aquatic environment are similar to natural particles produced by sponges. The most abundant ocean shallow water sponges have siliceous spicules (small spikes) which are very similar to chaff. All fresh water sponges also contain spicules. Sponge spicules are simple, straight, needle-like silicon dioxide spikes, often with sharp pointed ends. Sponge spicules range from 1 to 30 micrometers (µm) in diameter and from 40 to 850 µm in length. Chaff fibers are approximately 25 µm in diameter and can break down to different lengths. Thus, naturally occurring sponge spicules are approximately the same diameter and can be the same length as chaff fibers. Both marine and fresh water sponges are abundant in the environment and aquatic animals regularly come in contact with spicules. A variety of species feed on sponges, including ring-necked ducks, crayfish, sea urchins, clams, shrimp, larval king crabs, and hawks-bill turtles. These species do not purposefully consume spicules but they do come in contact with spicules as a result of consuming sponges. Aquatic organisms are regularly exposed to and consume materials of the same size and similar composition to chaff fibers (Spargo 1999). This contact and consumption would reduce the likelihood that free floating chaff particles would result in environmental consequences.

Chaff in an aquatic environment has not been found to significantly increase the concentration of any toxic aluminum constituents in sediments under airspace that has undergone 25 years of chaff operations. Concentrations of chaff in test environments were not found to result in a significant change in mortality to a variety of marine organisms in the Chesapeake Bay area. No effect was seen in marine organisms exposed to concentrations of 10 times and 100 times the expected environmental exposure. Marine and fresh water sponges normally create chaff-like spicules and foraging species are exposed to and consume these spicules on a regular basis with no detrimental effect. Chaff release in airspace above an aquatic environment is not expected to affect the environment and likely is not discernible within the environment.

4.4 CHAFF EFFECTS ON RADAR SYSTEMS

Chaff is designed to interfere with radar so that a maneuvering aircraft can escape a radar lock from an opposing radar. This use of chaff in training could affect weather monitoring radar. Weather radar has become increasingly important to predicting both flight and ground weather effects.

4.4.1 WEATHER TRACKING RADAR

The primary weather surveillance radar operated by the National Weather Service (NWS), FAA, and the DoD is the Weather Surveillance Radar-1988 Doppler (WSR-88D system) (National Research Council 2002). DoD training uses chaff as a defensive countermeasure. Within the CONUS, the Air Force uses RR-188 chaff to reduce, but not eliminate, chaff caused echoes to weather and other radars. In certain regions of the CONUS, including near DoD training areas in the west and southwest, RR-188 chaff can be seen as a major radar echo contaminant (Elmore *et al.* 2004). Chaff deployed in PACAF training areas can include RR-188 chaff, as well as combat coded chaff which creates a chaff echo.

The Next Generation Weather Radar (NEXRAD) system provides Doppler radar coverage to most of the U.S. Designed in the mid-1980s, NEXRAD is continuing to be upgraded to meet air traffic and weather prediction requirements (National Research Council 2002). As part of the ongoing NEXRAD modernization, the NWS is adding polarimetric capability to existing operational radars. These capabilities improve the radar's ability to identify and classify hydrameteor types, such as rain, hail, ice crystals, and to distinguish non-meteorological types, such as chaff (Ryzhkov *et al.* 2003). Several radar images have distinctive properties which can be differentiated using radar classification algorithms.

4.4.2 AIRSPACE AND RANGE ISSUES

The improvements in NEXRAD have enhanced the ability of radar systems to detect RR-188 chaff. Investigations have been conducted to see whether RR-188 training chaff could be deployed and remain within the boundaries of a training airspace. By its very nature, chaff is light and designed to remain airborne to permit the evading aircraft to maneuver while the chaff cloud breaks radar contact. Could chaff be deployed at a low enough altitude that, under specific meteorological conditions, chaff particles would stay within the surface area under the training airspace? In most cases, this is not possible because the meteorological conditions and chaff fall rate are unpredictable. It has not been possible to determine where chaff particles would fall. The chaff plume migrates with the prevailing wind at altitude. In a series of case studies designed to track chaff plumes, the chaff plume from a release at altitudes between 15,000 to 22,000 feet above mean sea level (MSL), under moderate wind and stable atmosphere conditions, produced chaff plumes that traveled over 100 miles in two hours and could be expected to stay aloft for approximately another three hours. The total expected distance traveled by the deployed chaff prior to being deposited on the surface could be in the 120 to 300 mile range (DRI 2002).

The nature of chaff and the diversity of meteorological conditions mean that deployed chaff will continue to be an echo contaminant. This echo effect can be partially addressed through the radar operators understanding when and where chaff is deployed and, possibly, through additional software or hardware refinement to distinguish and differentiate the chaff echo contamination.

4.4.3 PACAF TRAINING AIRSPACE ASSETS

The ability of NEXRAD to track chaff and the distances chaff could travel relative to Continental U.S. (CONUS) training airspace creates a scenario which could affect Pacific Air Forces (PACAF) training airspace. PACAF training in Hawaiian overwater Warning Areas and the Pacific Alaska Range Complex (PARC) permits the use of combat coded chaff for realistic training. Should there be changes in the use of chaff for training within the CONUS, PACAF airspace would continue to be available for diversified training, including MFEs. Training within PACAF-managed airspace has the current ability to support the concept of "train as you will fight" using combat coded chaff. Likewise, should additional restrictions be placed upon use of chaff in CONUS airspace, the PACAF airspace could increase in training value.

4.5 CHAFF CONCLUSIONS

Although large numbers of chaff bundles are deployed in training, modern chaff is typically not easy to identify in the environment unless the chaff bundle fails to properly deploy and a clump of chaff is deposited on the surface. Chaff particles are difficult to identify in an environment subject to training chaff use for decades. The reasons for the difficulty in identifying chaff or chaff particles is because chaff is found to rapidly fragment on the surface and chaff is primarily composed of silica and aluminum, two of the most common elements in the earth's crust. Multiple studies to identify chaff particles or to locate elevated concentrations on the ground or in substrate have had limited success, primarily because chaff rapidly fragments in the environment and becomes indiscernible from ambient soil particles. No biological effects to marine organisms have been observed even when such organisms are subject to substantially higher concentrations than could be expected to occur as a result of training. The use of parchment paper in place of Mylar for delayed opening chaff reduces the deposition of plastic pieces to the environment to the level experienced with similar non delayed opening chaff.

Chaff radar reflectivity produces echoes on upgraded NEXRAD radar used for weather and air traffic in the CONUS. The ability of PACAF training airspace to accommodate combat coded chaff in offshore Hawaiian Warning Areas and the PARC enhances pilot training realism without unduly affecting weather or air traffic radars.

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APPENDIX C
CHARACTERISTICS AND ANALYSIS OF FLARES

APPENDIX C CHARACTERISTICS AND ANALYSIS OF FLARES

1.0 INTRODUCTION

Aircraft participating in Major Flying Exercises (MFEs) use a variety of self-protection flares in approved airspace over parts of Alaska. 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 characteristics, ejection, risks, and associated regulations.

2.0 FLARE CHARACTERISTICS

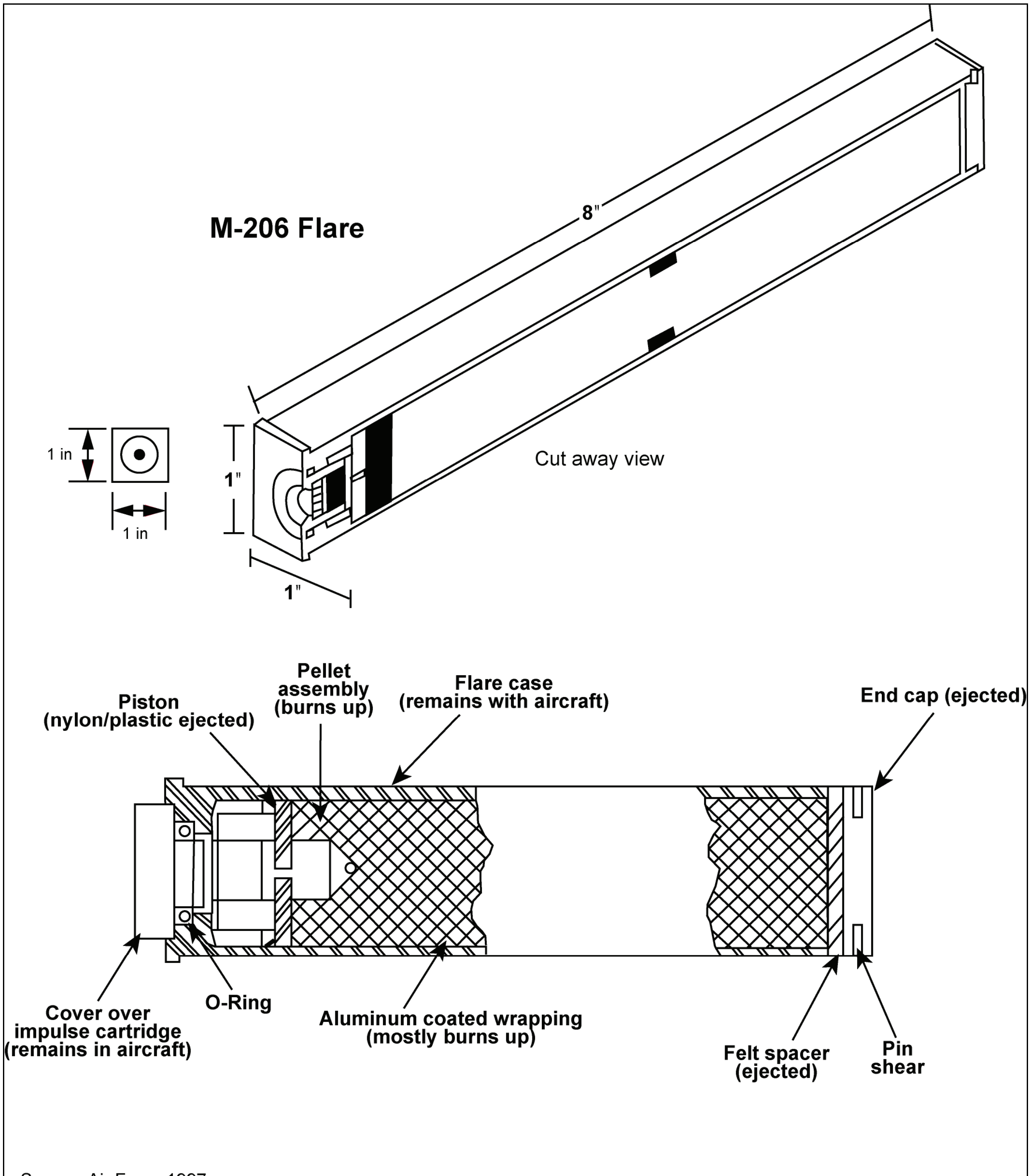
Self-protection flares are primarily mixtures of magnesium and Teflon (polytetrafluoroethylene) molded into rectangular shapes (United States Air Force [Air Force] 1997). Longitudinal grooves provide space for materials that aid in ignition. Typically, flares are wrapped with an aluminum-coated mylar or filament-reinforced tape (wrapping) and inserted into an aluminum (0.03 inches thick) case that is closed with a felt spacer and a small 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, the flare material, and the end cap out of the aircraft into the airstream.

The F-22A uses MJU-10/B flared. The F-15 uses either the MJU-10/B or MJU-7 A/B flare. Table 1 presents the types of aircraft and flares which could be normally expected during Pacific Air Forces (PACAF) exercises in the Pacific Alaska Range Complex (PARC). There are three types of ignition mechanisms for self-protection flares: non-parasitic, parasitic, and semi-parasitic. The non-parasitic flare is discharged from the aircraft before ignition. The parasitic flare ignites inside the tube within the aircraft and is discharged already burning. The semi-parasitic flare is thrust out of the case by a firing mechanism that also begins the flare ignition process. Both the MJU-10/B and MJU-7 A/B are semi-parasitic flares.

Figure 1 is a drawing of a simple M-206 flare. It is 1 inch wide, 1 inch high, and 8 inches long. When the firing device is electronically triggered, gas pressure pushes the small nylon or plastic piston. A hole extends through the piston and concurrently starts the flare burning. The piston pushes the flare out of the casing, pops off the plastic end cap, splits the wrapping material, and deploys the flare. Figure 2 presents an M-206 countermeasure flare and the aluminum case, which stays in the aircraft.

TABLE 1. TYPICAL SELF-PROTECTION FLARES USED FOR TRAINING IN PACAF-SCHEDULED AIRSPACE

Attribute	*ALA-17*	*M-206*	*MJU-7 A/B*	*MJU-10/B*	*MJU-23/B and A/B*
Aircraft	B-52, AC-130	A-10, F-16, C-130, C-17	F-16, F-15, C-130	F-15, F-22A	B-1B
Mode	Parasitic	Parasitic	Semi-parasitic	Semi-parasitic	Non-parasitic
Configuration	2 cylindrical cartridges in series	Rectangular	Rectangular	Rectangular	Cylindrical
Size	Each cylinder 4.75x2.25 inches (diameter)	1x1x8 inches (8 cubic inches)	1x2x8 inches (16 cubic inches)	2.66x2x8 inches (42.6 cubic inches)	10.5x2.75 inches (diameter) (90.7 cubic inches)
Impulse cartridge	None; electrically activated M-2 squib	M-796	BBU-36/B	BBU-36/B	BBU-46/B
Safety and Initiation (S&I) Device	None	None	Slider assembly	Slider assembly	Slider assembly with ignition charge
Weight (nominal)	Pellet: 18 oz Canister: 10 oz	6.9 ounces	13 ounces	40 ounces	43 ounces
Other Comments	Canister ejected with first unit	None	None	None	None



Source: Air Force 1997

FIGURE 1. M-206 FLARE

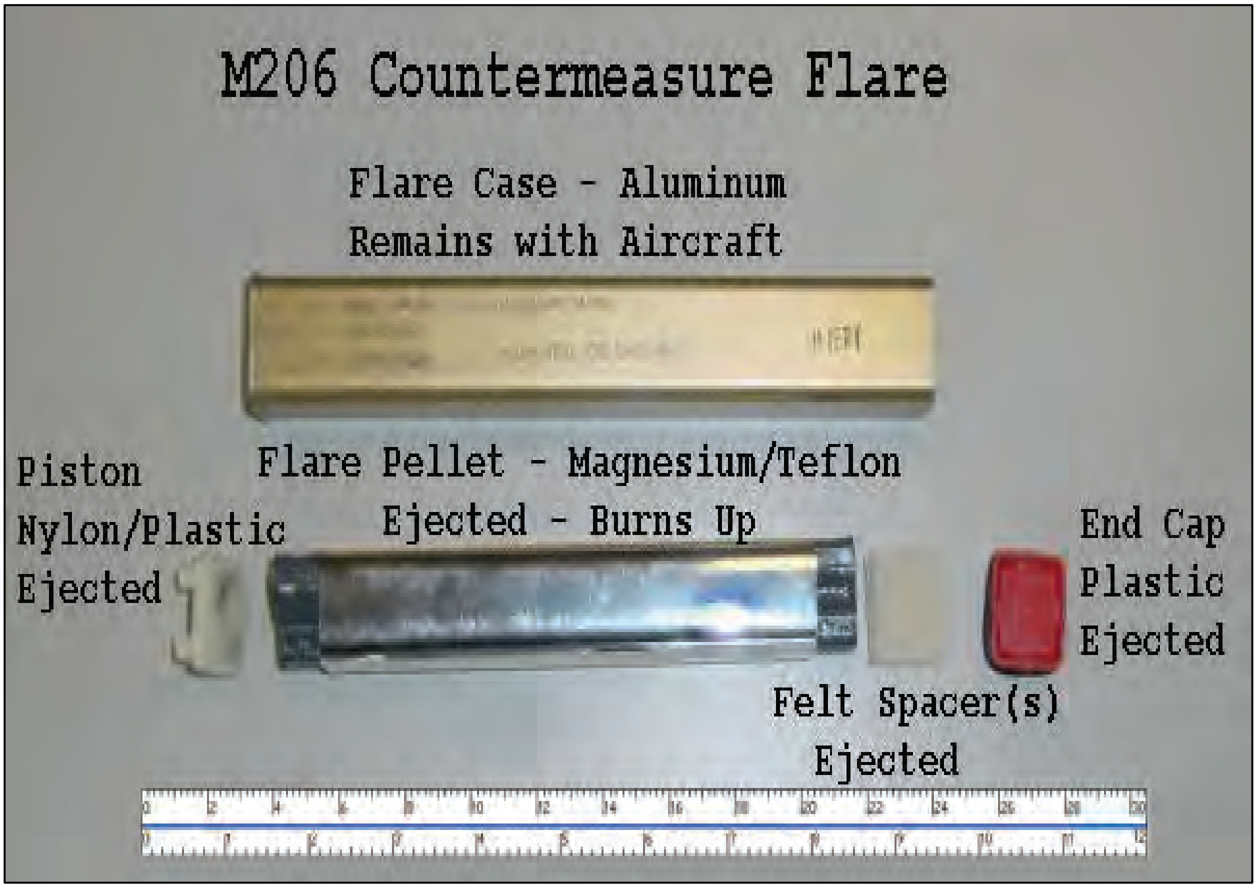


FIGURE 2. M-206 COUNTERMEASURE FLARE

A flare may be compared to a muzzle-loading rifle. There is a firing cap, a powder charge, wadding between the charge and the bullet, and a wad at the end that keeps everything in place. The electrical firing "cap" creates a gas that ejects the plastic or nylon slider, 2 felt spacers that hold everything in place, and the end cap. The "bullet" is a magnesium/Teflon flare pellet that is ejected and burns up in 4 to 5 seconds.

Figure 3 is a drawing of an MJU-7 A/B flare. The MJU-7 A/B is a semi-parasitic flare which contains a charge that is ignited as the flare is ejected from the aircraft. The MJU-7 A/B is 2 inches wide, 1 inch high, and 8 inches long. The MJU-7 A/B is similar to the M-206, with a flare pellet, a nylon or plastic slider (or piston), felt spacers, and an end cap. In addition, the MJU-7 A/B contains a safe and initiation (S&I) device which is ejected with flare deployment. The S&I device provides for the ignition and also splits open the wrapping as the flare exits the aircraft. Figure 4 presents a cutaway view of all parts of the MJU-7 A/B flare.

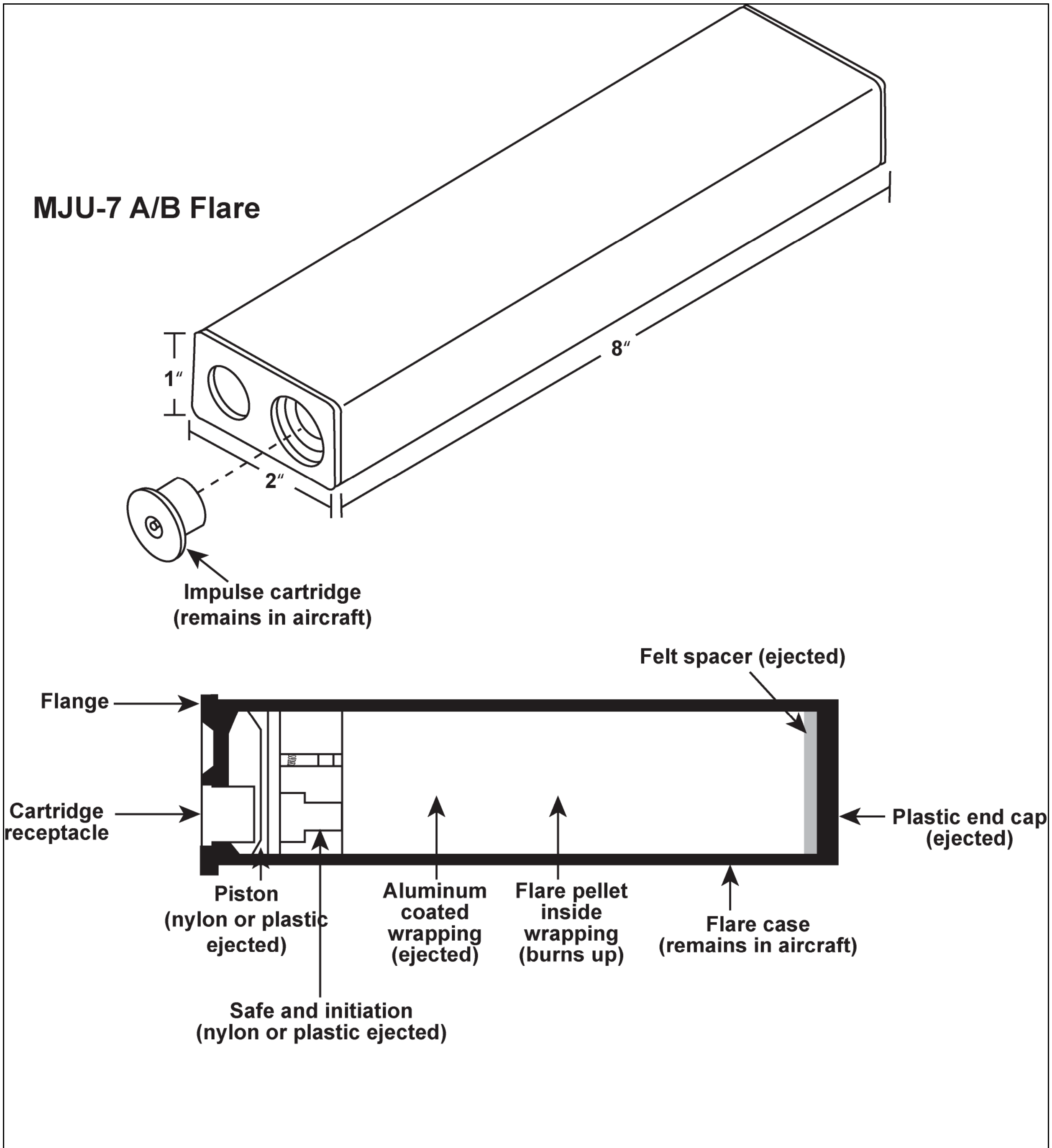


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FIGURE 3. MJU-7 A/B FLARE

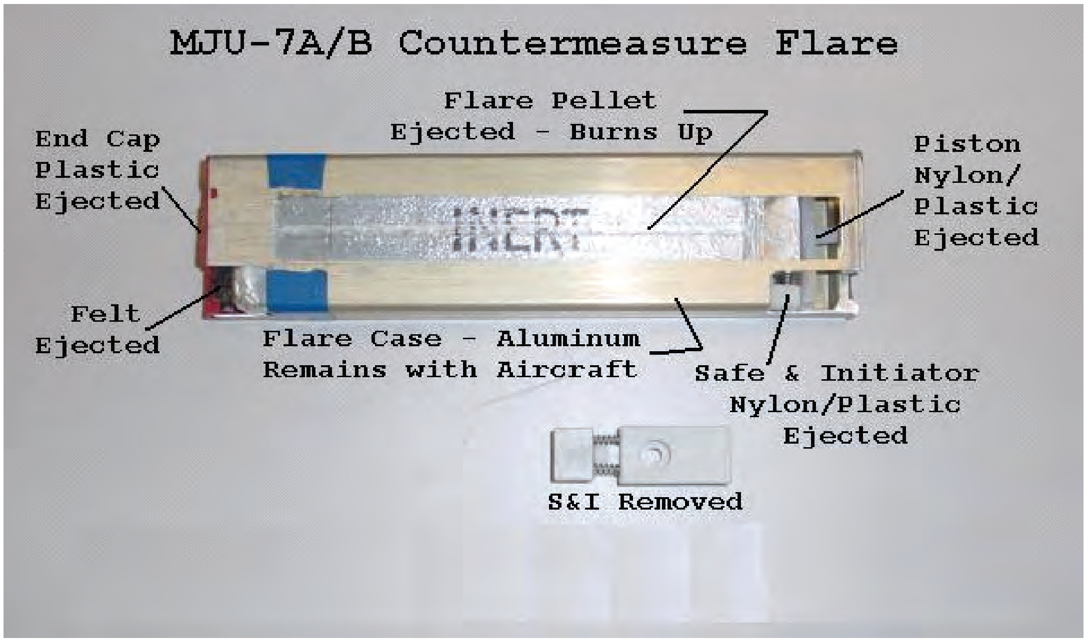

FIGURE 4. MJU-7 A/B COUNTERMEASURE FLARE (CUT AWAY VIEW)

The flare used by the F-22A is the MJU-10/B flare. Figure 5 is a drawing of the MJU-10/B flare. The primary difference between the MJU-7 A/B and the MJU-10/B flare types is that the MJU-10/B flare is twice as large as the MJU-7 A/B. Table 2 provides a summary description of the M-206, MJU-7 A/B, and MJU-10/B flares. The M-206 contains a flare pellet of approximately 7 cubic inches. The MJU-7 A/B flare pellet is approximately 14 cubic inches and the MJU-10/B flare pellet is approximately 36 cubic inches. Table 3 presents the typical composition of F-22A and F-15 defensive flares. The flares are expelled from the flare cartridges with a BBU-36/B impulse charge. Table 4 presents the components of this impulse charge.

Other types of flares which could be used during exercises in PACAF training airspace include B-1B, B-52, Navy, and foreign aircraft participating in the exercise. The B-1B uses the MJU-23/B flare as noted in Table 1. The MJU-23/B, shown in Figure 6, is a non-parasitic cylindrical flare used only on the B-1B aircraft. It is 10.5 inches long and 2.75 inches in diameter. The MJU-23/B flare includes the same S&I device as the semi-parasitic MJU-7 A/B flare. The MJU-23/B has a plastic end cap with 0.5 inches of black rubber potting compound designed to absorb the shock of hitting spring-loaded doors on the aircraft. Earlier versions of the MJU-23 used an aluminum piston and included strips of felt spacers on the side and circular felt spacers in the cylinder. The newer MJU-23/B replaces the aluminum with a plastic piston, retains circular felt spacers, and reduces the side felt spacer strips. The MJU-23/B uses the BBU-46/B impulse cartridge.

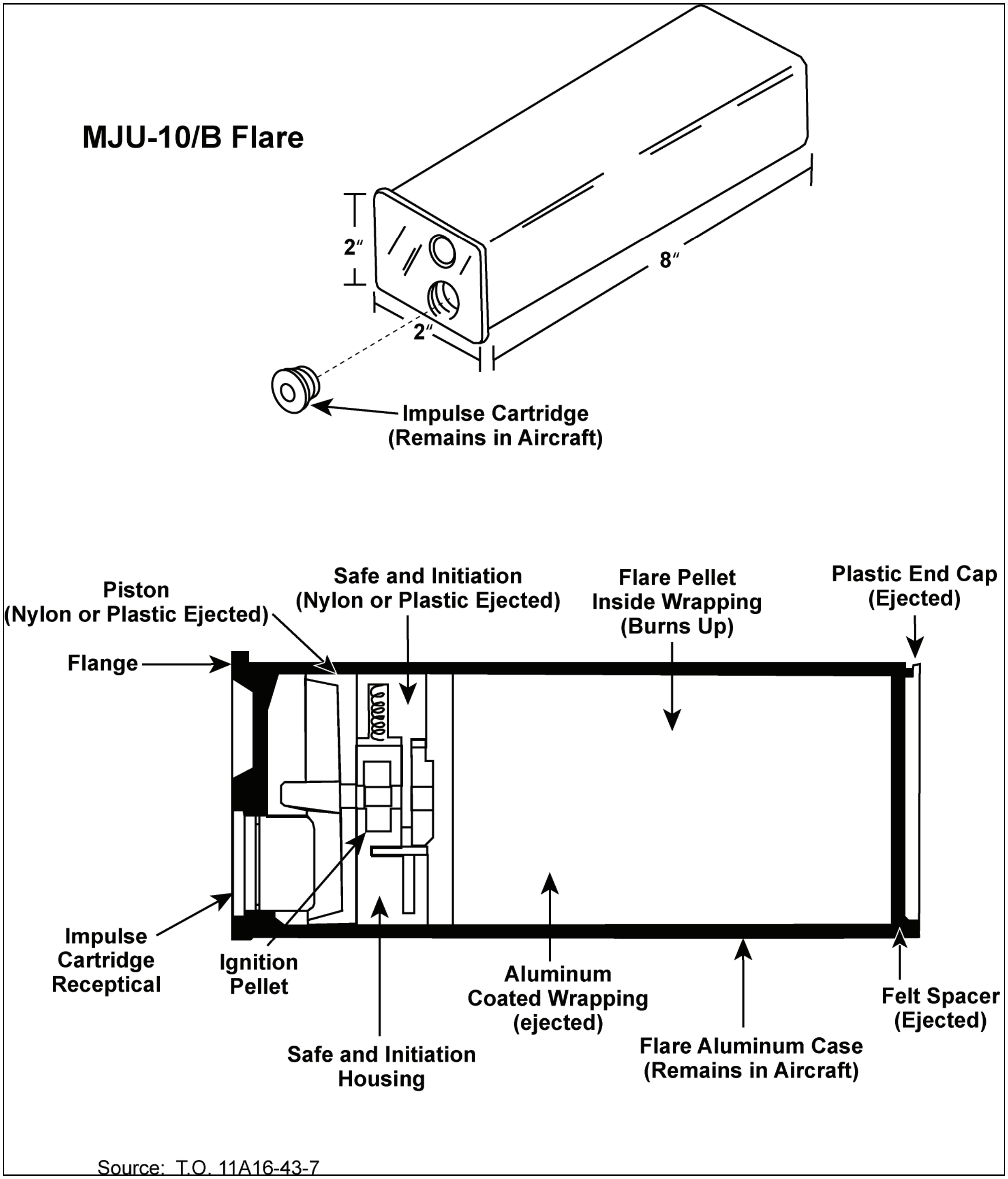

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FIGURE 5. MJU-10/B FLARE

TABLE 2. DESCRIPTION OF M-206, MJU-7 A/B, AND MJU-10/B FLARES

Attribute	*M-206*	*MJU-7 A/B*	*MJU-10/B*
Aircraft	F-16, A-10, AC-130, C-17	F-15, F-16, AC-130	F-15, F-22A
Mode	Parasitic	Semi-parasitic	Semi-parasitic
Configuration	Rectangle	Rectangle	Rectangle
Size	1x1x8 inches (8 cubic inches)	1x2x8 inches (16 cubic inches)	2x2x8 inches (32 cubic inches)
Impulse Cartridge	M-796	BBU-36/B: MJU-7	BBU-36/B
S&I Device	None	Slider Assembly	Slider Assembly
Weight (nominal)	6.8 ounces	13 ounces	40 ounces
Felt Spacers	1 to 2, 1x1 inch	1 to 2, 1x2 inches	1 to 2, 2x2 inches

TABLE 3. TYPICAL COMPOSITION OF MJU-10/B AND MJU-7 A/B SELF-PROTECTION FLARES

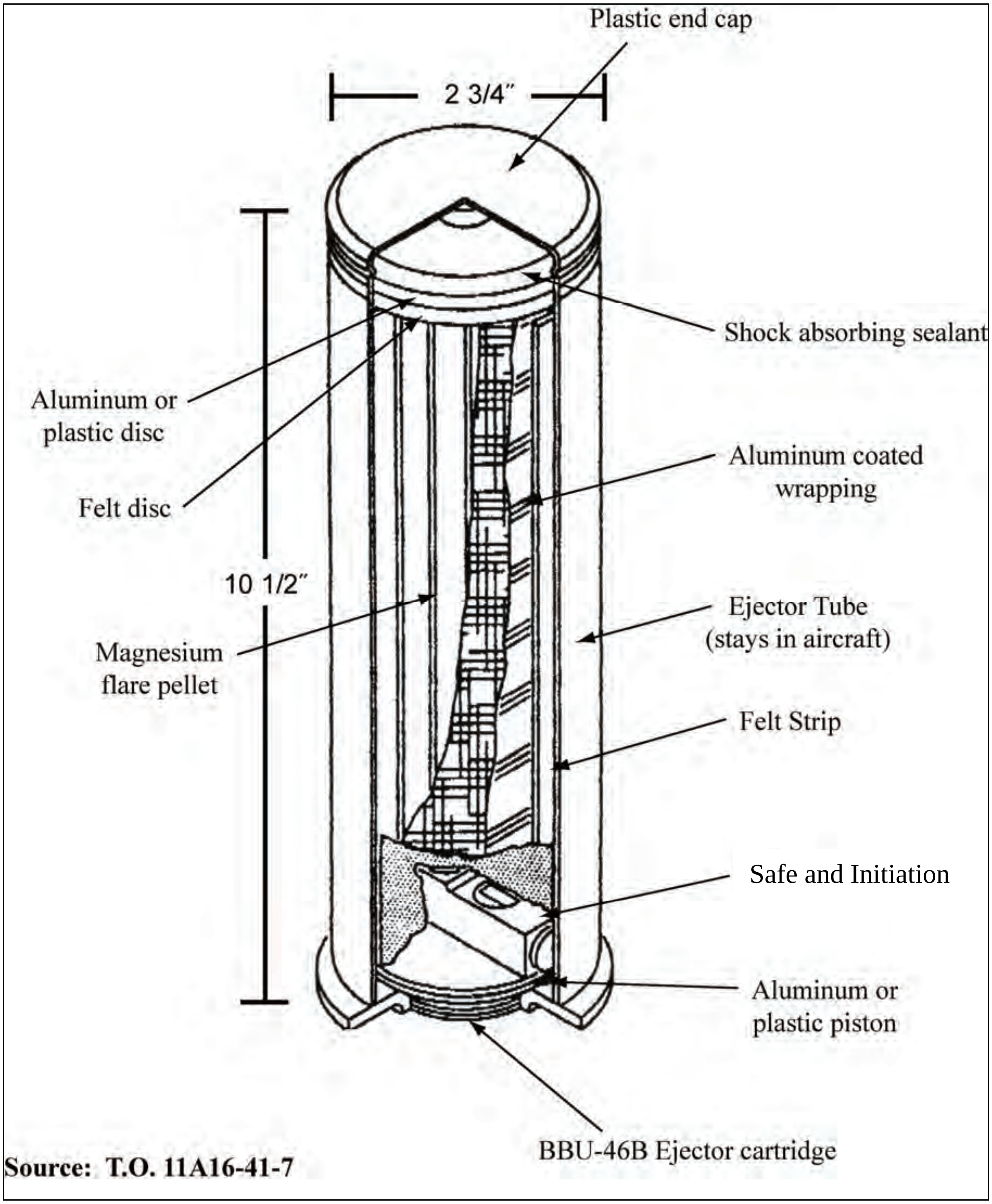
Part	*Components*
Combustible	
Flare Pellet	Polytetrafluoroethylene (Teflon) (-[C_2F_4]$_n$ – n=20,000 units) Magnesium (Mg) Fluoroelastomer (Viton, Fluorel, Hytemp)
First Fire Mixture	Boron (B) Magnesium (Mg) Potassium perchlorate ($KClO_4$) Barium chromate ($BaCrO_4$) Fluoroelastomer
Immediate Fire/ 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

TABLE 4. 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	0.01 cubic inches
Weight	100 mg
Compaction	6,200 psi
Composition	42.5 percent boron 52.5 percent potassium perchlorate 5.0 percent Viton A
Booster Charge	
Volume	0.01 cubic inches
Weight	150 mg
Compaction	5,100 psi
Composition	20 percent boron 80 percent potassium nitrate
Main Charge	
Volume	0.061 cubic inches
Weight	655 mg
Compaction	Loose fill
Composition	Hercules #2400 smokeless powder (50-77% nitrocellulose, 15-43 percent nitroglycerine)

Source: Air Force 1997



Source: T.O. 11A16-41-7

FIGURE 6. MJU-23/B FLARE USED BY B-1B AIRCRAFT

The B-52 uses the ALA-17 A/B flare as noted in Table 1. ALA-17A/B flares consist of two independently fired aluminum cylinders, each 4.75 inches long and 2.25 inches in diameter, crimped together end-to-end. The ALA-17 A/B flare with the two cylinders is 9.5 inches long, 2.25 inches in diameter, and from the outside, looks similar to the MJU-23/B flare. When the top cylinder is fired, the flare pellet is ejected from the aircraft, along with the entire bottom cylinder. Impulse cartridges are not used; the flares are fired directly with an electrically activated squib set in potting compound. The M-2 squib weights about 0.0022 ounces and is composed of 40 percent potassium chlorate, 32 percent lead thiocyanate, 18 percent charcoal, and 10 percent Egyptian lacquer (Global Security 2008).

Navy defensive flares are also used in PARC airspace. The MJU-8 A/B is an example of a Navy flare. The MJU-8 A/B is 5.8 inches long and 1.42 inches in diameter. It looks like a 1/4 scale MJU-23/B flare. MJU-8 A/B materials are similar to Air Force flares, except the end cap is aluminum instead of plastic. A small aluminum cap (less than 0.5 inches in diameter) is used to contain the igniter composition and the inside diameter of the case forms a positive piston stop. This results in the piston not being ejected. Residual materials include the nearly 1 1/2-inch diameter aluminum end cap, one felt spacer of the same size, an S&I device, and one up to 12 inches x 2 1/4 inch piece of aluminum-coated duct tape-type wrapping material.

Other Navy flares and flares of other participating aircraft have comparable components to the flare types described for Air Force use. Other flares produce a similar number of residual pieces which settle on the surface following deployment during training.

3.0 ENVIRONMENTAL EFFECTS OF FLARES

3.1 FLARE RELIABILITY

Initial concerns regarding defensive training flare use focused on questions of flare reliability, fire risk, and flare emissions. Flare reliability is important because a flare failure could have a variety of environmental consequences. Reliability is determined by testing the flares after manufacture. Flare testing consists of selecting 80 flares randomly from a lot of several thousand flares. Lot acceptance testing for the MJU-7 A/B, the most heavily used flare, examines the success of ignition and burn, pellet breakup, and indication of dispenser damage. The specification requires that a flare lot pass an ignition and ejection test. In this test, with a sample size of 80, two failures would be acceptable, but three failures would result in the entire flare lot being rejected (Air Force 1997). To ensure that good lots are not erroneously rejected in these tests, the flares would have to be designed to a reliability of 99 percent (assuming a confidence level of 95 percent). Therefore, the reliability of the MJU-7 A/B flare is expected to be approximately 99 percent. Other factors are required to achieve comparable levels of reliability. Flares are manufactured to avoid rejection of the entire lot. These levels of reliability are reasonable when the purpose of the flare is taken into consideration. A flare is designed to protect life and a multi-million dollar investment.

3.2 FLARE FAILURES

There are four different types of flare failure. One failure would be if the flare was electrically triggered but did not release and did not burn. Such a flare would be treated as unexploded ordnance (UXO) when the aircraft returned to the base, and the flare would be removed for disposal.

A second type of flare failure would be if the flare burned but did not release from the aircraft. This would be an extremely dangerous situation for the pilot. There is one known case of this occurring; in 1980, an F-102 aircraft was destroyed and the pilot ejected. Reliability of flare ignition and deployment has been substantially improved since then.

A third type of flare failure would be a released flare at an improper altitude or that did not burn correctly. If a burning flare struck the ground, it could result in a fire, with potential environmental consequences. If a broken part of a flare struck the ground, it would not burn unless subject to temperatures or friction generating temperatures in the one to two thousand degree range.

A fourth type of flare failure is if a flare were released from the aircraft but did not burn, either in whole or part, and becomes a dud flare on the ground. There are two potential locations for a dud flare: on or off military-controlled land. Military-controlled land includes the base airfield where, at times, an unburned flare (the first type of failure) is jolted out of its container during a landing and becomes a dud flare (the fourth type of failure) on or adjacent to the runway. Military-controlled land also includes training ranges over which flares are deployed. Non-military controlled land includes lands managed by other governmental agencies and private lands.

The first type of flare failure results in an unburned flare returning to the base. This would be handled as UXO and would not normally be treated as a potential environmental impact. The second type of flare failure is an extremely rare case of a flare causing a Class A accident with loss of an aircraft and possibly a life. Such a situation would be quantified in terms of flight safety and would be part of the documented Class A accident rates for the specific aircraft. As noted above, there is only one documented case of this type of flare failure.

The third type of flare failure is a flare which is still burning when it strikes the ground. Documented cases of this have occurred. Upon investigation, such cases are nearly always the case of a flare being deployed at too low an altitude.

If a flare struck the ground while still burning, it could ignite surface material and cause a fire. This has occurred at active military training ranges where flare- or munitions-caused fires are documented. In all known cases, the flares burning when they struck the ground were released at a very low altitude. Table 5 presents the time-to-distance for a falling object, such as a flare. Release at an altitude below 300 feet has the potential for a flare that burns in 4 to 5 seconds to still be burning when it strikes the ground. On active military ranges, firebreaks are established to reduce the potential for fires to spread off the range.

The best way to reduce the risk of flare-caused fires is to establish adequate minimum altitudes for flare release. In 8 seconds, a flare would fall approximately 1,000 feet. An M-206 or an MJU-7 A/B flare is designed to burn out within 150 to 400 feet. Where flares are deployed at a minimum altitude of 1,500 feet above the ground, the likelihood of a flare-caused fire is substantially reduced. In areas where flares are used within training airspace over public or private lands, the minimum altitude for flare deployment is typically between 1,500 to 2,000 feet above ground level (AGL). Further restrictions on flare use are often established in specified fire conditions. For PARC Military Operations Areas (MOAs), flares may only be deployed above 5,000 feet AGL from June 1 through September to reduce the potential for fires. For the remainder of the year, the minimum altitude for flare use is 2,000 feet AGL. These altitudes are well above the safety standards set by the Department of Defense (DoD).

TABLE 5. FLARE BURN-OUT RATE AND DISTANCE

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.

3.3 DUD FLARES

The fourth type of flare failure is a dud flare on the ground. A dud flare on nonmilitary land, either public or private land, has the potential to produce environmental consequences. United States (U.S.) military training ranges where flares are used were contacted to estimate the potential for locating a dud flare on the ground. The military has personnel experienced with UXO who survey military ranges to identify and remove live ordnance or dud flares. Experience from the Goldwater Range in Arizona and the Utah Test and Training Range identified very few dud flares on the ground. The surveys were not scientific studies that evaluated the entire military training ranges, but did survey areas within which 95 to 99 percent of the UXO would be expected. In areas where approximately 200,000 flares had been deployed, an estimated 18 duds were found on the ground. This calculates to a ratio of approximately 1 in 10,000.

There is no instance of a dud flare or any flare debris striking an individual. A dud M-206 flare would be an approximately 3/4 pound piece of material falling at a speed of over 100 miles per hour. It is extremely unlikely that an individual could be struck by such a falling object, but if someone were, it could cause severe injury or death. Dud flares are extremely rare, but they are dangerous.

Although very few dud flares would be expected on the ground, and fewer would be expected to be found, any located dud flare should be treated as UXO. Figure 7 is approximately 40 percent of an M-206 flare and wrapping that did not burn. Apparently, during deployment, the

M-206 flare pellet broke before it was completely ignited and the unburned portion was deposited on the military training range. A dud flare would probably not ignite even in a campfire unless it was on a very hot bed of coals. If a dud flare were shot with a bullet or cut with a power saw, the friction could cause it to ignite. If a dud flare were struck by an ax, it is unlikely, but possible, that an ignition could occur. Should a flare be ignited, it would burn at a temperature of 2,000°F and could result in severe injury or death.

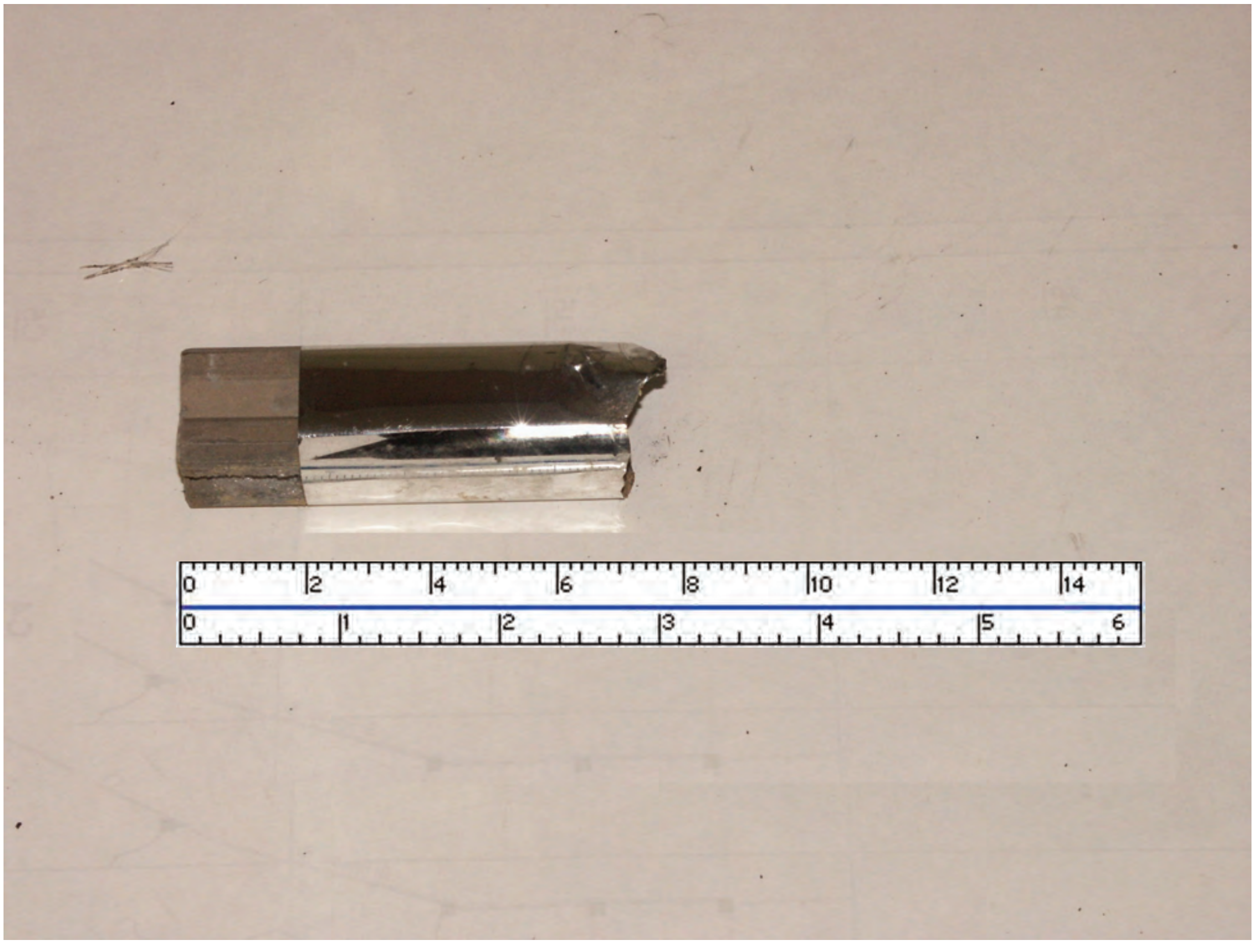


FIGURE 7. APPROXIMATELY 40 PERCENT OF AN M-206 FLARE

The primary environmental message for anyone in the public finding a dud flare (an extremely unlikely event) is: mark its location but do not touch it. The likelihood of finding a dud flare is extremely remote, and the likelihood of a dud flare igniting is even more remote, but because there would be dud flares on the ground under the airspace, someone has the potential to come upon one. The message is: do not touch it; tell an authority about its location.

The number of dud flares on the ground is few. If a dud flare fell in a water body, it would deteriorate over time. The chemicals released during deterioration would not be expected to be of sufficient quantity to cause a noticeable reduction in the water quality or impact upon marine resources.

3.4 FLARE EMISSIONS

Environmental questions have also been raised regarding flare emissions, including flare ash. Studies on ash components were performed by measuring residual materials after flares were ignited in a furnace (Air Force 1997). Constituents from combustion were identified, and a worst case scenario was estimated to calculate whether flare emissions or flare ash could result in an environmental impact.

The M-206 and MJU-7 A/B do not contain lead although some earlier flares had lead in the firing mechanism, and some flares still contain chromium in the firing mechanism. A statistical model was used to calculate emission concentrations of lead and chromium with the goal of learning what level of flare emissions or ash would be required to achieve toxic levels of lead or chromium. The model calculated that 1.5 million MJU-7 A/B flares would have to be released below an altitude of 400 feet AGL over a 10,000 acre training range before the level of chromium emissions would become a health risk. Approximately 400,000 flares are deployed by Air Combat Command (ACC) aircraft in all ACC training airspace approved for defensive flare training (Air Force 1997). No location has the combination of flare numbers, altitude, and range area. The number of flares is smaller, the minimum release altitude is higher, and the training area is substantially larger. Flare emissions are not now, nor is it feasible that they could become, a health hazard (Air Force 1997).

There are also trace elements of boron in the flare pellet. To achieve a toxic level of boron, flare ash from approximately 4,000 flares would annually need to fall on an acre of land. It would be almost impossible to deposit 4,000 flares on one acre of land. In fact, it would not be possible for a high performance military aircraft to purposefully deposit even one flare on a specific acre of land. Flare emissions and flare ash are not likely to result in measurable air quality or physical effects to the environment.

3.5 FLARE RESIDUAL MATERIALS

Environmental questions have been raised regarding flare materials which are not consumed during the flare burn and which are deposited on the surface following flare deployment. Table 6 presents the residual materials from representative flares used in PARC training airspace.

Residual materials identified as MJU-7 wrapping materials are included in Figure 8 with a pen for scale. This is believed to be the wrapping from an MJU-7 A/B flare and was attributed to training aircraft over private property. Range workers were shown residual flare materials and asked to see if they could find such materials on the range. The workers located a variety of residual materials including the materials pictured in Figures 7, 9, and 10. Figure 9 is the piston or nylon slider assembly from an M-206 flare. The M-206 is a parasitic flare where ignition occurs as the flare is discharged. The burn occurs very quickly and parts, such as portion of the wrapping material, may not be consumed. Wrapping material is not a risk, but it can be viewed as a piece of unanticipated debris by anyone finding it on public or private land under airspace assessed for flare use.

TABLE 6. RESIDUAL MATERIAL DEPOSITED ON THE SURFACE FOLLOWING DEPLOYMENT OF ONE FLARE

Material	FLARE TYPE			
	M-206	*MJU-7/B*	*MJU-10/B*	*MJU-23/B*
End Cap	One 1 inch x 1 inch x 1/4 inch plastic or nylon	One 2 inch x 1 inch x 1/4 inch plastic or nylon	One 2 inch x 2 inch x 1/4 inch plastic or nylon	One 2 3/4 inch diameter x 1/4 inch thick round plastic disc
Piston	One 1 inch x 1 inch x 1/2 inch plastic or nylon	One 2 inch x 1 inch x 1/2 inch plastic or nylon	One 2 inch x 2 inch x 1/2 inch plastic or nylon	One approximately 2 3/4 inch diameter x 1/2 inch aluminum (or plastic) piston
Spacer	One or two 1 inch x 1 inch felt	One or two 2 inch x 1 inch felt	One or two 2 inch x 2 inch felt	One 1/2 inch thick x 2 3/4 inch diameter rubber shock absorber sealant, two (1/8 inch x 2 3/4 inch diameter) felt discs, up to four 1 inch x 10 inch felt strips
Wrapping	One up to 2 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 3 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 4 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 4 1/2 inch x 20 inch piece of aluminum-coated stiff duct-tape type material
S&I Device	N/A	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device

FIGURE 8. MJU-7 RESIDUAL FLARE WRAPPING MATERIALS

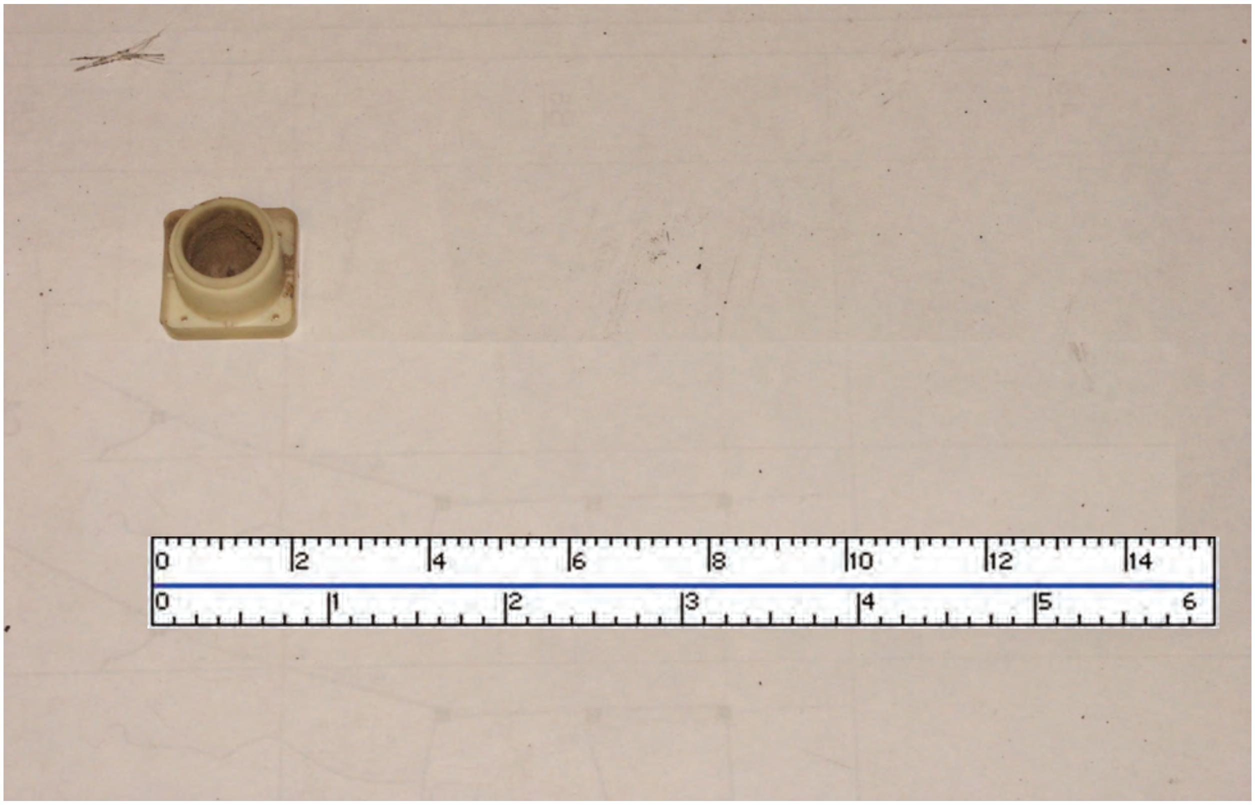


FIGURE 9. M-206 PISTON

The weight of flare residual materials is of interest to assess whether the materials represent a safety risk. Weights of residual components for representative flares are presented in Table 7. The M-206 piston and felt cushion together weigh approximately 0.06 ounces. The M-206 and MJU-7 A/B wrapping materials have a high surface-to-weight ratio and do not fall with much force. The heaviest residual component is the S&I device used in several flares (Table 6). Each S&I device weighs about .07 to .08 ounces depending upon material which may be melted to the S&I device. Two S&I devices are pictured in Figure 10 with some melted fibers from the wrapping material attached.

TABLE 7. M-206 AND MJU-7 A/B COMPONENT WEIGHTS

Component	*Weight*
M-206	
Plastic end cap	0.08896 ounces
Piston and cushion assembly	0.06271 ounces
Felt spacer	0.01896 ounces
Wrapper (2 inches x 13 inches)	0.3135 ounces
MJU-7 A/B	
End cap	0.10500 ounces
S&I Device (clean)	0.6606 ounces
Piston	0.10500 ounces
Felt spacer	0.01604 ounces
Wrapper (3 inches x 13 inches)	0.4696 ounces

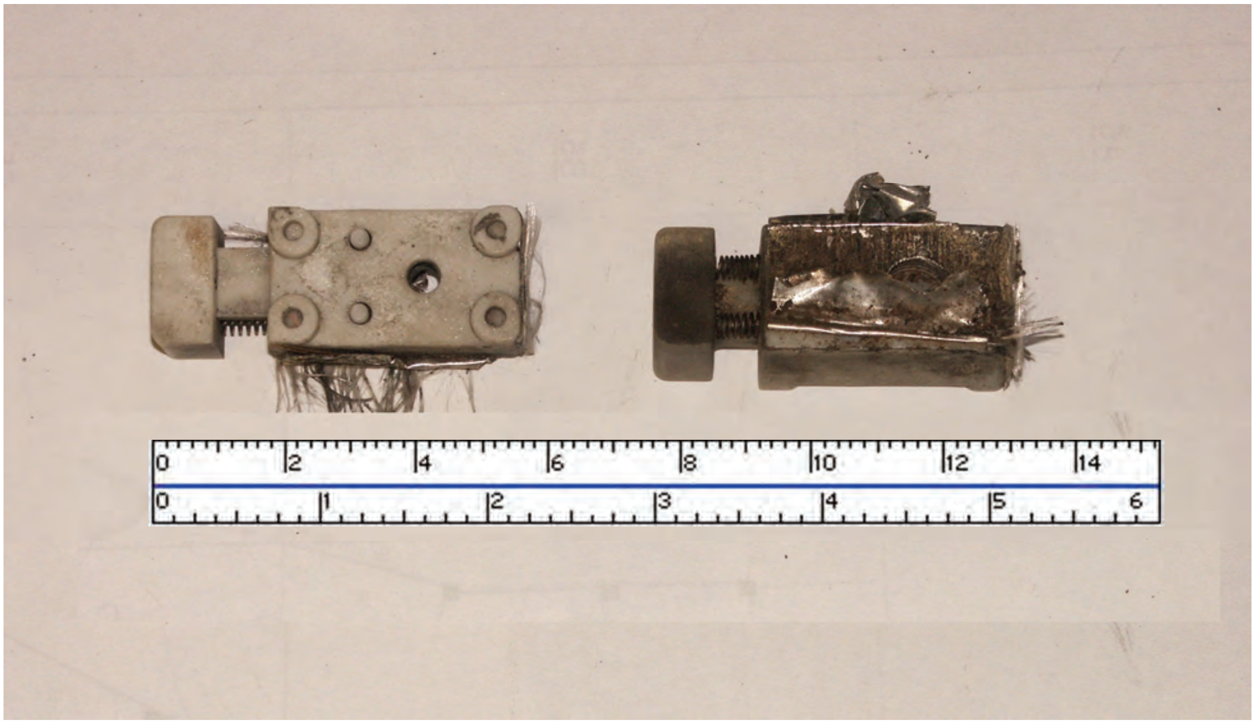


FIGURE 10. TWO S&I DEVICES USED IN MJU-10/B, AND OTHER FLARE TYPES

Calculations were made that take into consideration the weight and surface area of the S&I device. At gravitational rates of acceleration, an S&I device could strike the ground at a momentum of from 0.08 to 0.16 pounds per second (see Table 8). By comparison, if an element with a momentum of 0.1 pounds per second were to strike an individual's unprotected head, there is a one percent possibility of a concussion (Air Force 1997). This means that if an S&I device struck an unprotected individual with no hat, it could cause injury comparable to that of a marble-sized hailstone.

TABLE 8. MJU-7 A/B COMPONENT HAZARD

	MAXIMUM SURFACE AREA		
Component	***Area (in^2)***	***Terminal Velocity (ft/sec)***	***Momentum (lb-sec)***
S&I Device	1.65	58	0.08
Piston	1.65	23	0.005
End Caps	2.0	21	0.005
	MINIMUM SURFACE AREA		
S&I Device	0.413	115	0.16
Piston	0.413	46	0.01
End Caps	0.125	84	0.02

Table 9 quantifies how often an S&I device could be expected to strike a structure, a vehicle, or a person. The assumptions behind this table are that approximately 2,000 MJU-7 A/B-type flares would be annually deployed over an area of 2,000 square miles with a population of one person per square mile. Based on studies performed in the U.S., individuals were, in aggregate, out of doors and unprotected, with no hat, approximately 10 percent of the time (Tennessee Valley Authority 2003, Klepeis *et al.* 2001). Other assumptions are 2.7 persons per family and 2 structures plus 2 vehicles per family. In an area with one person per square mile and these assumptions, there would be an expected structure hit once in 13 years by a hailstone-sized S&I device under the airspace where MJU-7 A/B flares were used for training. No damage would be expected to the structures.

TABLE 9. S&I DEVICE POTENTIAL ANNUAL STRIKES

Persons Per Square Mile	*Structure*	*Vehicle*	*Person*
0.1	.0075	0.00005	0.0000025
1.0	.075	0.0005	0.000025
10.0	.75	0.005	0.00025

Table 9 can be used to calculate other population densities and other exposures of a population. For example, if there were a population of one person per square mile with all individuals unprotected one hundred percent of the time (living out of doors with no hat or 10 times the table), there would be an expected 0.00025 person struck by an S&I device annually or one person in 4,000 years. These results demonstrate that it is very unlikely that an individual could be struck by one of these objects with the force of a large hailstone, and if a person were struck on an unprotected head, there would be an approximately one percent chance of a concussion.

Some of the flare materials which fall to the surface after deployment are larger than an S&I device. Table 6 lists larger pieces from the MJU-10/B and MJU-23/B flares, including the end caps and wrapping. The surface to mass ratio of most of these pieces would not be expected to permit the pieces to achieve a terminal velocity as great as the S&I device. Some parts, such as the ALA-17A/B flare debris include the entire bottom cylinder assembly, as well as the end cap and felt spacers from the top flare. The debris from an ALA-17A/B flare could fall in an orientation that the terminal velocity could produce a momentum in the 0.10 to 0.20 range. The relative low use of these flares reduces potential risk from the bottom cylinder assembly. ACC units are estimated to annually use fewer than 4,000 of these flares worldwide.

End caps, felt spacers, sliders, and wrapping material fall to the earth with each flare deployed. Most flare types have a plastic S&I device which falls to the ground. These dropped objects are extremely unlikely to pose a risk of injury or environmental damage, but the materials would fall to the ground under airspace where such flares are used in training. Figure 11 is an example of an M-206 flare wrapper on the ground. To the untrained eye, as the wrapping material weathers, the wrapper may have the appearance of a natural object, such as the stick in the foreground. However, individuals finding and identifying these pieces could express annoyance with the residual flare materials.

FIGURE 11. A FLARE WRAPPER PARTIALLY COVERED BY PINE NEEDLES.

4.0 FLARE CONCLUSIONS

Section 2.0 describes typical flares used regularly or intermittently in PACAF-scheduled training airspace. Marine conditions under offshore Hawaiian Warning Areas and land conditions under PARC training airspace were considered. The environmental consequences of realistic military training with flares can be summarized as:

- The risk of a fire can be greatly reduced through adjusting the minimum altitude for deployment of self-protection flares. There is still the possibility of a mistake where a flare could be deployed at too low an altitude, but establishing minimum altitudes substantially reduces the potential for that mistake or for a flare-caused fire in the environment.
- Dud flares are infrequent with today's technology. The important environmental piece of information for dud flares is that, if one is found, it should be left where it is, its location should be marked, and authorities should be notified. Environmental analyses could explain that the risk from a falling dud flare striking anything is so low as to be inconsequential. If a dud flare were found, it should not be moved and an authority should be notified.
- There is almost no discernible trace from flare ash. A burning flare can be seen, but there is almost no detectable air or soils pollution that could come from the number of flares burned within a training airspace.

- Debris from the M-206, the MJU-7 A/B, and MJU-10/B flares has very little safety risk. Flare debris would have little environmental effect except that it could be an annoyance if found.

5.0 REFERENCES

Global Security. 2008. ALA-17 Flare Cartridge. http://www.globalsecurity.org/military/systems/aircraft/systems/ala-17.htm

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. Prepared for Headquarters Air Combat Command, Langley AFB, VA.

APPENDIX D
PUBLIC INVOLVEMENT AND AGENCY CORRESPONDENCE

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION FOR ENVIRONMENTAL PLANNING (IICEP) LETTERS AND DISTRIBUTION LISTS

Sample General IICEP Letter

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

30 Apr 08

MEMORANDUM FOR Marcia Combes
U.S. Environmental Protection Agency
222 W 7th Avenue, #19
Anchorage, AK 99513-7588

FROM: Deputy Commander
611th Air Operations Center
10471 20th Street, Ste. 160
Elmendorf AFB, AK 99506-2200

SUBJECT: Environmental Assessment for Charting of the Delta MOA Complex

1. The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to gauge potential environmental consequences related to charting the Delta Military Operations Area (MOA) complex. The proposed Delta MOA will improve access to vital training in the Alaskan ranges during Major Flying Exercises such as Red Flag Alaska and Northern Edge. It will also increase flight safety and assure the potential for quality air combat training by separating civil and military aviation during activation periods, and by extending defensive chaff and flare use to new and modified airspaces. The proposed MOA constraints facilitate scheduling of training while minimizing disruptions to civil aviation as the MOA will be activated a maximum of twice per day, limited to 1.5 to 2.5-hour time blocks, for no more than 60 days per year. This EA will evaluate the environmental impacts associated with the proposed Delta MOA and a No Action Alternative.

2. The Air Force published a notice of EA preparation in the Fairbanks Daily News-Miner on March 16, 2008 and the Delta Wind on March 13, 2008. These early notices supported public meetings in Tok, Delta Junction, and Fairbanks on March 18, 19, and 20, 2008. The Air Force also published a notice of EA preparation in the Anchorage Daily News on April 5, 2008 supporting the public meeting held in Anchorage on 8 April, 2008.

3. In an effort to analyze the potential effects of this proposed charting of the Delta MOA, the Air Force or its contractor, Science Applications International Corporation (SAIC), may be contacting you in their data collection efforts. Please provide your comments or information regarding the proposed EA not later than May 20, 2008 to be incorporated in the preparation of the draft EA. We thank you in advance for your assistance in this activity.

4. If you have any specific questions about the proposal, we would like to hear from you. Please feel free to contact Mr. Jim Hostman at the above address. Mr. Hostman can be reached at (907) 552-4151.

RICK STRICKLAND, Colonel, USAF
Deputy Commander

Attachments:
1. Public Handout
2. Military Operations Areas Map

Attachment 1

DELTA MOA
Environmental Assessment, Alaska

Why is the Delta MOA Complex Needed?

Activities

Start and Sign In: 6:00 p.m.
Air Force Welcome and Briefing
Discussion and Comments on Topic Areas
Finish: 8:00 p.m.

The Proposed Action creates the Delta MOA Complex to:

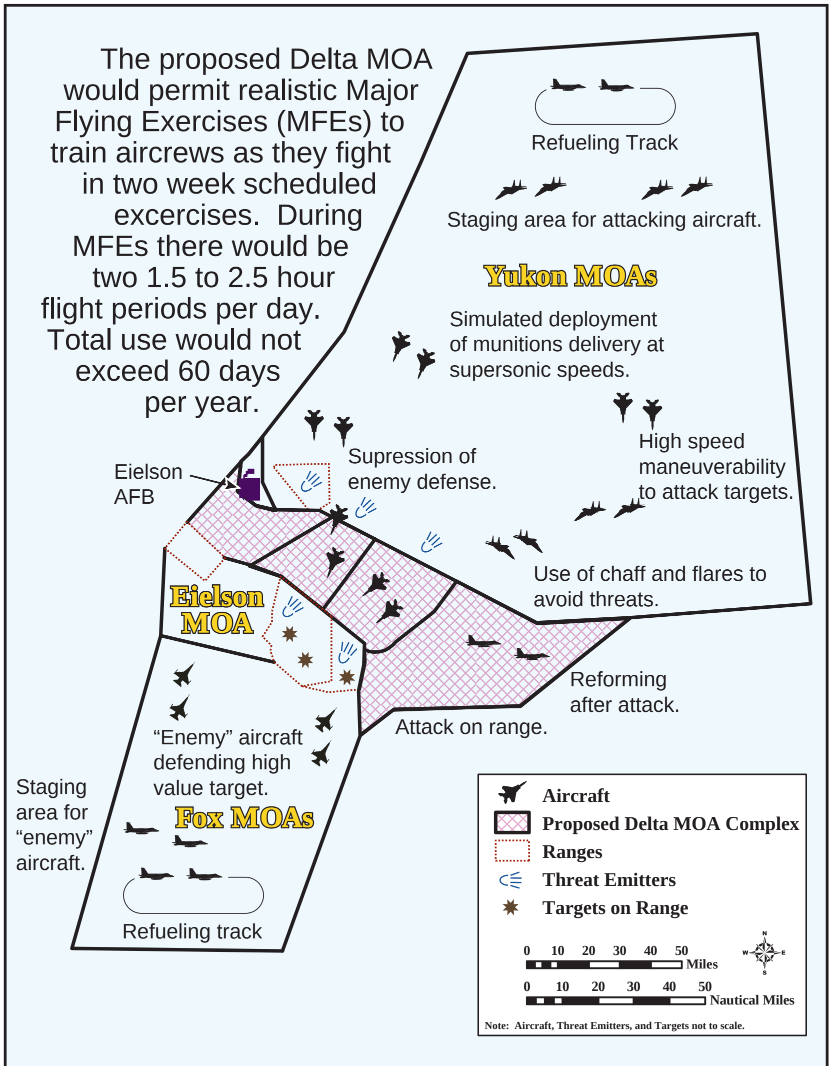
- meet training requirements,
- change airspace use,
- extend defensive chaff and flare use to new and modified airspace, and;
- schedule training to minimize disruption to civil aviation.

The United States Air Force proposes to improve required training opportunities for Major Flying Exercises including Red Flag Alaska and Northern Edge by charting the Delta Military Operations Area (MOA) complex.

The Delta MOA is proposed to be:

- activated for two week periods
- activated for 1.5 to 2.5 hour time periods twice per day
- total use would not exceed 60 days per year.

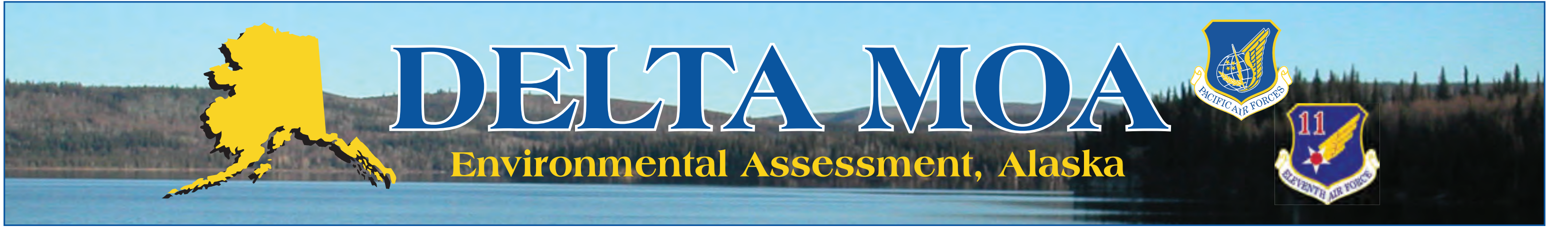
The Draft EA will evaluate the potential environmental consequences on environmental resources from the Proposed Action and No-Action Alternatives.



The proposed Delta MOA would permit realistic Major Flying Exercises (MFEs) to train aircrews as they fight in two week scheduled excercises. During MFEs there would be two 1.5 to 2.5 hour flight periods per day. Total use would not exceed 60 days per year.

Simplified depiction of MFEs in Alaskan Airspace

Attachment 1



DELTA MOA

Environmental Assessment, Alaska

The National Environmental Policy Act (NEPA) guides the Environmental Assessment.

The Draft Environmental Assessment (EA) analyzes the following resources to determine the potential environmental consequences associated with this proposal. The Proposed Action creates the Delta Military Operations Airspace (MOA) complex to meet the training requirements, changes airspace use, extends defensive chaff and flare use to new airspace, and schedules training to minimize distruption to civil aviation.

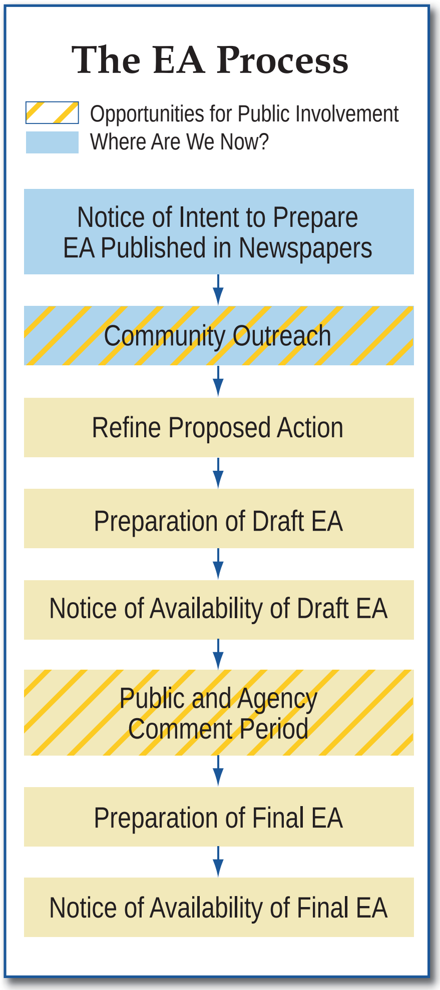
- **Airspace Operations**
  Airspace, Noise, Air Quality, and Safety (ground and air)
- **Natural Resources**
  Physical and Biological Resources
- **Cultural Resources**
  Native Alaskan and Historical Resources
- **Human Resources**
  Land Use, Socioeconomics, and Environmental Justice

Your comments will be used to help shape and refine the proposal and will guide the environmental analysis. Persons wishing to mail comments should mail them before **April 30, 2008,** to the address below, in order to be considered in the Draft EA.

Send written comments to:
James W. Hostman
611 CES/CEVQP
10471 20th Street, Suite 302
Elmendorf AFB, AK 99506
jim.hostman@elmendorf.af.mil

For general information, contact:
Alaskan Command
Public Affairs
907-552-2341

Your involvement and input are essential to the environmental process.



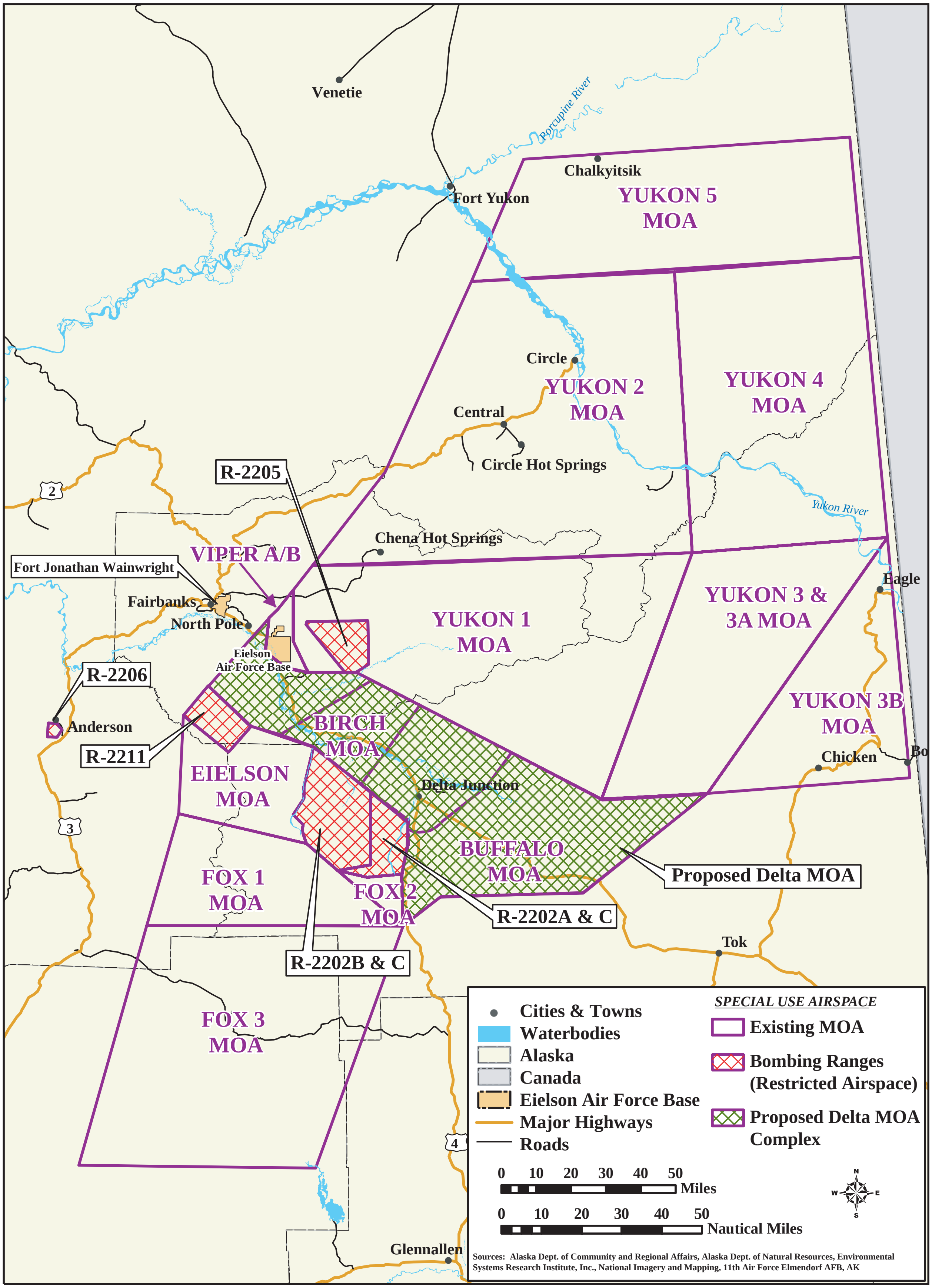
The EA Process

▨ Opportunities for Public Involvement
🟦 Where Are We Now?

Notice of Intent to Prepare EA Published in Newspapers
↓
Community Outreach
↓
Refine Proposed Action
↓
Preparation of Draft EA
↓
Notice of Availability of Draft EA
↓
Public and Agency Comment Period
↓
Preparation of Final EA
↓
Notice of Availability of Final EA

Public Meetings

- **Tuesday, March 18, 2008**
  University of Alaska, Tok Center
  Tok, AK
- **Wednesday, March 19, 2008**
  Jarvis West Building
  Delta Junction, AK
- **Thursday, March 20, 2008**
  Pioneer Park, Exhibit Hall
  Fairbanks, AK



Sources: Alaska Dept. of Community and Regional Affairs, Alaska Dept. of Natural Resources, Environmental Systems Research Institute, Inc., National Imagery and Mapping, 11th Air Force Elmendorf AFB, AK

Military Operations Airspace Map
Attachment 2

General IICEP Letter Distribution List
(included attachments to General IICEP Letter)

Bureau of Land Management
Fairbanks Field Office
1150 University Avenue
Fairbanks, AK 99709

National Park Service, Alaska Regional Office
ATTN: Regional Director
240 W 5th Avenue, Rm. 114
Anchorage, AK 99501

Grant Hilderbrand
State of Alaska
Department of Fish and Game
Division of Wildlife Conservation
333 Raspberry Rd.
Anchorage, AK 99515

Jim Freechione
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

Michael Menge
State of Alaska
Department of Natural Resources
550 W 7th Street, Ste. 500
Anchorage, AK 99501-3561

Sue Magee
State of Alaska
Division of Governmental Coordination
550 W 7th Avenue, Ste. 1660
Anchorage, AK 99501

Kevin Gardner
U.S. Army Alaska
730 Quartermaster Road
Fort Richardson, AK 99505

U.S. Department of Agriculture
NRCS
510 L Street
Anchorage, AK 99501-1935

Marcia Combes
U.S. Environmental Protection Agency
222 W 7th Avenue, #19
Anchorage, AK 99513-7588

Sample Alaska Native IICEP Letter

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

30 Apr 08

Ted Charles, President
Native Village of Dot Lake
PO Box 2279
Dot Lake, AK 99737

Col Rick Strickland
Deputy Commander, 611th Air Operations Center
10471 20th Street, Ste. 160
Elmendorf AFB, AK 99506-2200

The United States Air Force is preparing an Environmental Assessment (EA) to gauge potential environmental consequences related to charting the Delta Military Operations Area (MOA) complex. The proposed Delta MOA will improve access to vital training in the Alaskan ranges during Major Flying Exercises such as Red Flag Alaska and Northern Edge. It will also increase flight safety and assure the potential for quality air combat training by separating civil and military aviation during activation periods, and by extending defensive chaff and flare use to new and modified airspaces. The proposed MOA constraints facilitate scheduling of training while minimizing disruptions to civil aviation as the MOA will be activated a maximum of twice per day, limited to 1.5 to 2.5-hour time blocks, for no more than 60 days per year. This EA will evaluate the environmental impacts associated with the proposed Delta MOA and a No Action Alternative.

Pursuant to our American Indian/Alaska Native policy, I ask you to consider whether this proposal will significantly affect any of your Tribe's rights, protected tribal resources, or Indian Lands. I would appreciate a reply by May 20, 2008, with your analysis. If yes, please specify which tribal right(s), protected tribal resource(s) or Indian Land(s) will be affected and how it (they) will be significantly impacted. If you reply by indicating a significant effect to your rights, resources, or land, we invite you to consult with us on a Government-to-Government basis as a way to discuss issues before we move forward with further environmental analysis and public comment.

We look forward to working with you to address any concerns you may have on this project. Please feel free to contact my Airspace and Range Operations Team Chief, Major Rob Peck, at (907) 552-2430 or email Robert.Peck@elmendorf.af.mil if you have questions.

Respectfully,

RICK STRICKLAND, Colonel, USAF
Deputy Commander

Attachments:
1. Public Handout
2. Military Operations Areas Map

Alaska Native IICEP Letter Distribution List
(included attachments to General IICEP Letter)

Julie Kitka
Alaska Federation of Natives
1577 C Street
Suite 300
Anchorage, AK 99501-5113

Gary Harrison
Chickaloon Village Traditional Council
PO Box 1105
Chickaloon, AK 99788-0057

William Miller
Dot Lake Village Council
PO Box 2275
Dot Lake, AK 99737-2275

Darrell Hess
Fairview Community Council
328 E 15th Avenue, #1
Anchorage, AK 99501

Ben Saylor
Healy Lake Traditional Council
PO Box 60300
Fairbanks, AK 99706-0300

Gordon Carlson
Native Village of Cantwell
PO Box 94
Cantwell, AK 99729-0094

Maria Coleman
Native Village of Eklutna
8131 Harvest Circle
Anchorage, AK 99502

Bob Roses
Northeast Community Council
8200 E 2nd Avenue
Anchorage, AK 99504

Paul Edwin
Chalkyitsik Village
PO Box 57
Chalkyitsik, AK 99788

Paul Nathaniel
Circle Village Council
PO Box 89
Circle, AK 99733

David Howard
Eagle Traditional Council
PO Box 19
Eagle, AK 99738-0019

Stephanie Kesler
Government Hill Community Council
PO Box 100018
Anchorage, AK 99510-0018

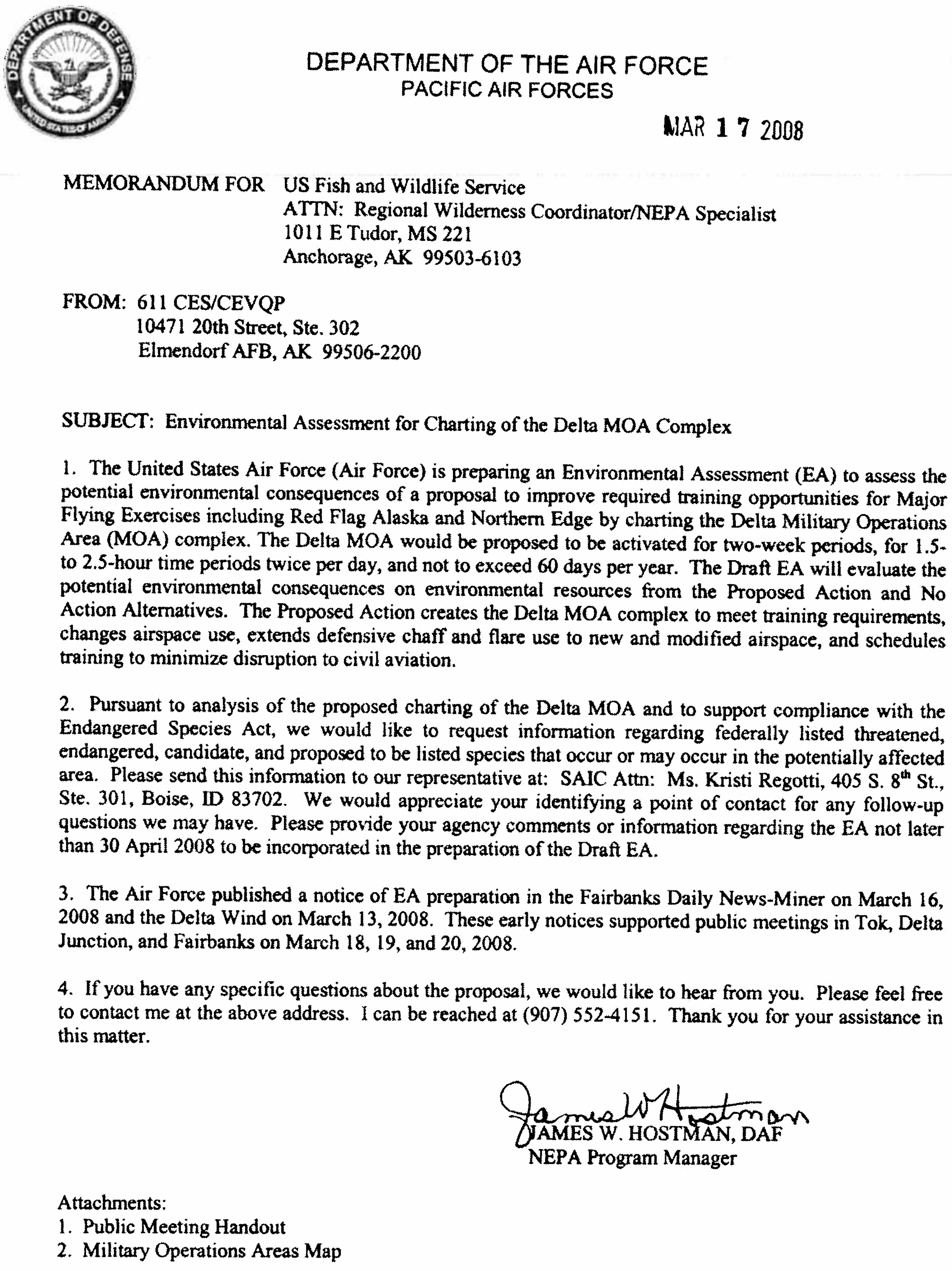
Hugh Wade
Mountain View Community Council
733 N Flower Street
Anchorage, AK 99508

Ted Charles
Native Village of Dot Lake
PO Box 2279
Dot Lake, AK 99737

JoAnn Polston
Native Village of Healy Lake
PO Box 73158
Fairbanks, AK 99707

Harold Brown
Tanana Chiefs Conference
122 First Avenue, Ste. 600
Fairbanks, AK 99701

Sample U.S. Fish and Wildlife IICEP Letter



DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

MAR 17 2008

MEMORANDUM FOR US Fish and Wildlife Service
ATTN: Regional Wilderness Coordinator/NEPA Specialist
1011 E Tudor, MS 221
Anchorage, AK 99503-6103

FROM: 611 CES/CEVQP
10471 20th Street, Ste. 302
Elmendorf AFB, AK 99506-2200

SUBJECT: Environmental Assessment for Charting of the Delta MOA Complex

1. The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to assess the potential environmental consequences of a proposal to improve required training opportunities for Major Flying Exercises including Red Flag Alaska and Northern Edge by charting the Delta Military Operations Area (MOA) complex. The Delta MOA would be proposed to be activated for two-week periods, for 1.5- to 2.5-hour time periods twice per day, and not to exceed 60 days per year. The Draft EA will evaluate the potential environmental consequences on environmental resources from the Proposed Action and No Action Alternatives. The Proposed Action creates the Delta MOA complex to meet training requirements, changes airspace use, extends defensive chaff and flare use to new and modified airspace, and schedules training to minimize disruption to civil aviation.

2. Pursuant to analysis of the proposed charting of the Delta MOA and to support compliance with the Endangered Species Act, we would like to request information regarding federally listed threatened, endangered, candidate, and proposed to be listed species that occur or may occur in the potentially affected area. Please send this information to our representative at: SAIC Attn: Ms. Kristi Regotti, 405 S. 8th St., Ste. 301, Boise, ID 83702. We would appreciate your identifying a point of contact for any follow-up questions we may have. Please provide your agency comments or information regarding the EA not later than 30 April 2008 to be incorporated in the preparation of the Draft EA.

3. The Air Force published a notice of EA preparation in the Fairbanks Daily News-Miner on March 16, 2008 and the Delta Wind on March 13, 2008. These early notices supported public meetings in Tok, Delta Junction, and Fairbanks on March 18, 19, and 20, 2008.

4. If you have any specific questions about the proposal, we would like to hear from you. Please feel free to contact me at the above address. I can be reached at (907) 552-4151. Thank you for your assistance in this matter.

James W Hostman
JAMES W. HOSTMAN, DAF
NEPA Program Manager

Attachments:
1. Public Meeting Handout
2. Military Operations Areas Map

U.S. Fish and Wildlife Service IICEP Letter Distribution List
(included attachments to General IICEP Letter)

US Fish and Wildlife Service
Fairbanks Field Office
101 12th Avenue, Room 110
Fairbanks, AK 99701-6237

US Fish and Wildlife Service
ATTN: Regional Wilderness Coordinator/NEPA Specialist
1011 E Tudor, MS 221
Anchorage, AK 99503-6103

Sample SHPO IICEP Letter

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

30 Apr 08

MEMORANDUM FOR Judith Bittner
Alaska Department of History and Archaeology
550 W 7th Avenue, Suite 1310
Anchorage, AK 99501

FROM: Deputy Commander
611th Air Operations Center
10471 20th Street, Ste. 160
Elmendorf AFB, AK 99506-2200

SUBJECT: Environmental Assessment for Charting of the Delta MOA Complex

1. The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to gauge potential environmental consequences related to charting the Delta Military Operations Area (MOA) complex. The proposed Delta MOA will improve access to vital training in the Alaskan ranges during Major Flying Exercises such as Red Flag Alaska and Northern Edge. It will also increase flight safety and assure the potential for quality air combat training by separating civil and military aviation during activation periods, and by extending defensive chaff and flare use to new and modified airspaces. The proposed MOA constraints facilitate scheduling of training while minimizing disruptions to civil aviation as the MOA will be activated a maximum of twice per day, limited to 1.5 to 2.5-hour time blocks, for no more than 60 days per year. This EA will evaluate the environmental impacts associated with the proposed Delta MOA and a No Action Alternative.

2. The Air Force published a notice of EA preparation in the Fairbanks Daily News-Miner on March 16, 2008 and the Delta Wind on March 13, 2008. These early notices supported public meetings in Tok, Delta Junction, and Fairbanks on March 18, 19, and 20, 2008. The Air Force also published a notice of EA preparation in the Anchorage Daily News on April 5, 2008 supporting the public meeting in Anchorage on 8 April, 2008.

3. The purpose of this correspondence is to initiate Section 106 process of the National Historic Preservation Act of 1966 (as amended) in the potentially affected areas under the proposed airspace (refer to attachment 2). We are in the early stages of gathering information concerning previous archaeological and historical studies for this area and would appreciate any assistance you could provide in identifying and retrieving this important information. We are also interested in any concerns you may have concerning this proposal and potential effects on significant cultural resources.

4. We look forward to hearing from you not later than May 20, 2008 in order to incorporate updated information in the draft EA. Please send this information to our representative at: SAIC Attn: Ms. Kristi Regotti, 405 S. 8th St., Ste. 301, Boise, ID 83702. We would also appreciate a point of contact we may contact for any follow-up questions we may have.

5. If you have any specific questions about the proposal please feel free to contact Mr. Jim Hostman by telephone at (907) 552-4151; or by e-mail to jim.hostman@elmendorf.af.mi. You may also contact Ms. Karlene Leeper, Historic Preservation and Cultural Resources Program Manager at (907) 552-5057 or email to karlene.leeper@elmendorf.af.mil. Thank you for your assistance in this matter.

RICK STRICKLAND, Colonel, USAF
Deputy Commander

Attachments:
1. Public Handout
2. Military Operations Areas Map

PUBLIC MEETING MATERIALS

DELTA MOA

Environmental Assessment, Alaska

Welcome
to this
Delta MOA
Air Force
Public Meeting

DELTA MOA

Environmental Assessment, Alaska

The Air Force encourages you to learn about the charting of the Delta MOA Proposed Action and No-Action alternatives. We would like to hear your inputs and concerns on these issues.

To be involved in the charting of the Delta MOA proposal, please provide information by submitting written comment to:

James W. Hostman
611 CES/CEVQP
10471 20th Street, Suite 302
Elmendorf AFB, AK 99506
(907) 552-4151
jim.hostman@elmendorf.af.mil

DELTA MOA

Environmental Assessment, Alaska

Why is the Delta MOA Complex Needed?

The United States Air Force proposes to improve required training opportunities for Major Flying Exercises including Red Flag Alaska and Northern Edge by charting the Delta Military Operations Area (MOA) complex.

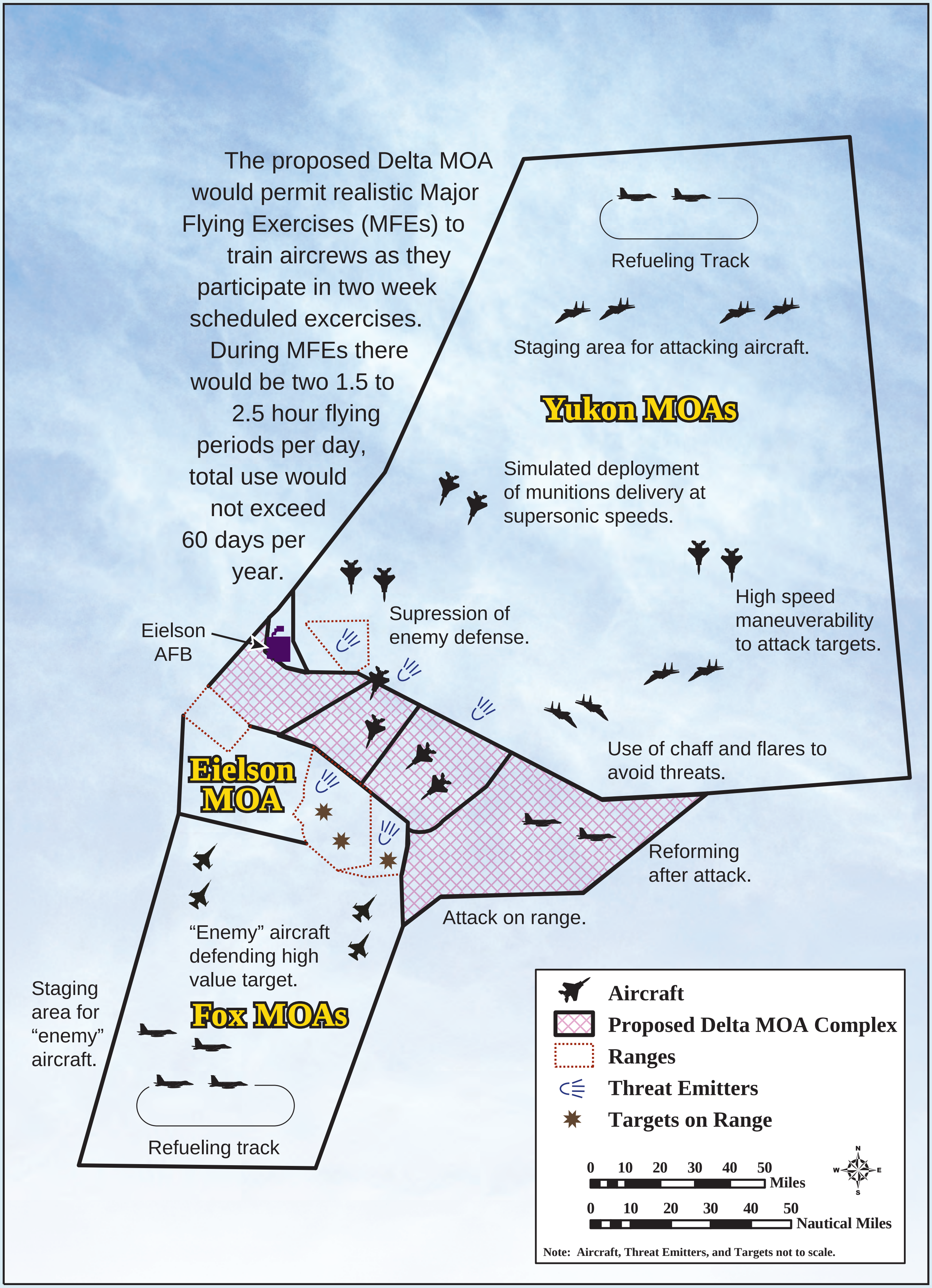
The Delta MOA is proposed to be:

- activated for two week periods
- activated for 1.5 to 2.5 hour time periods twice per day
- total use would not exceed 60 days per year.

The Draft EA will evaluate the potential environmental consequences on environmental resources from the Proposed Action and No-Action Alternatives.

The Proposed Action creates the Delta MOA Complex to:

- meet training requirements,
- change airspace use,
- extend defensive chaff and flare use to new and modified airspace, and;
- schedule training to minimize disruption to civil aviation.



Simplified depiction of MFEs in Alaskan Airspace

DELTA MOA

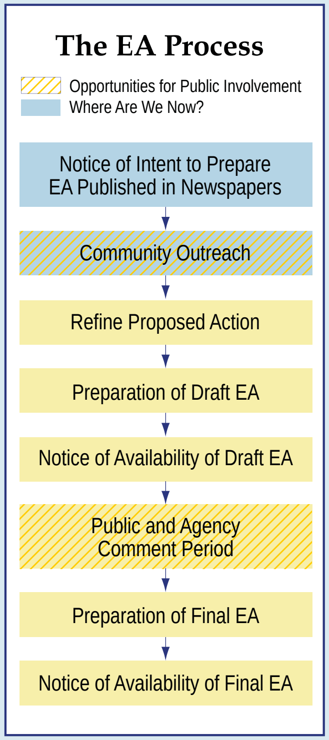
Environmental Assessment, Alaska

The National Environmental Policy Act guides the Environmental Assessment.

The Draft Environmental Assessment (EA) analyzes the following resources to determine the potential environmental consequences associated with this proposal. The Proposed Action creates the Delta Military Operations Airspace (MOA) complex to meet the training requirements, changes airspace use, extends defensive chaff and flare use to new airspace, and schedules training to minimize distruption to civil aviation.

- **Airspace Operations**
  Airspace, Noise,
  Air Quality, and
  Safety (ground and air)
- **Natural Resources**
  Physical and
  Biological Resources
- **Cultural Resources**
  Native Alaskan and
  Historical Resources
- **Human Resources**
  Land Use, Socioeconomics,
  and Environmental Justice

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 in Newspapers
↓
Community Outreach
↓
Refine Proposed Action
↓
Preparation of Draft EA
↓
Notice of Availability of Draft EA
↓
Public and Agency Comment Period
↓
Preparation of Final EA
↓
Notice of Availability of Final EA

There are numerous opportunities to be involved in the Delta MOA Environmental Assessment process.

Public Meetings

- **Tuesday, March 18, 2008**
  University of Alaska, Tok Center
  Tok, AK.
- **Wednesday, March 19, 2008**
  Jarvis West Building
  Delta Junction, AK.
- **Thursday, March 20, 2008**
  Pioneer Park, Exhibit Hall
  Fairbanks, AK.

Please take this opportunity to:

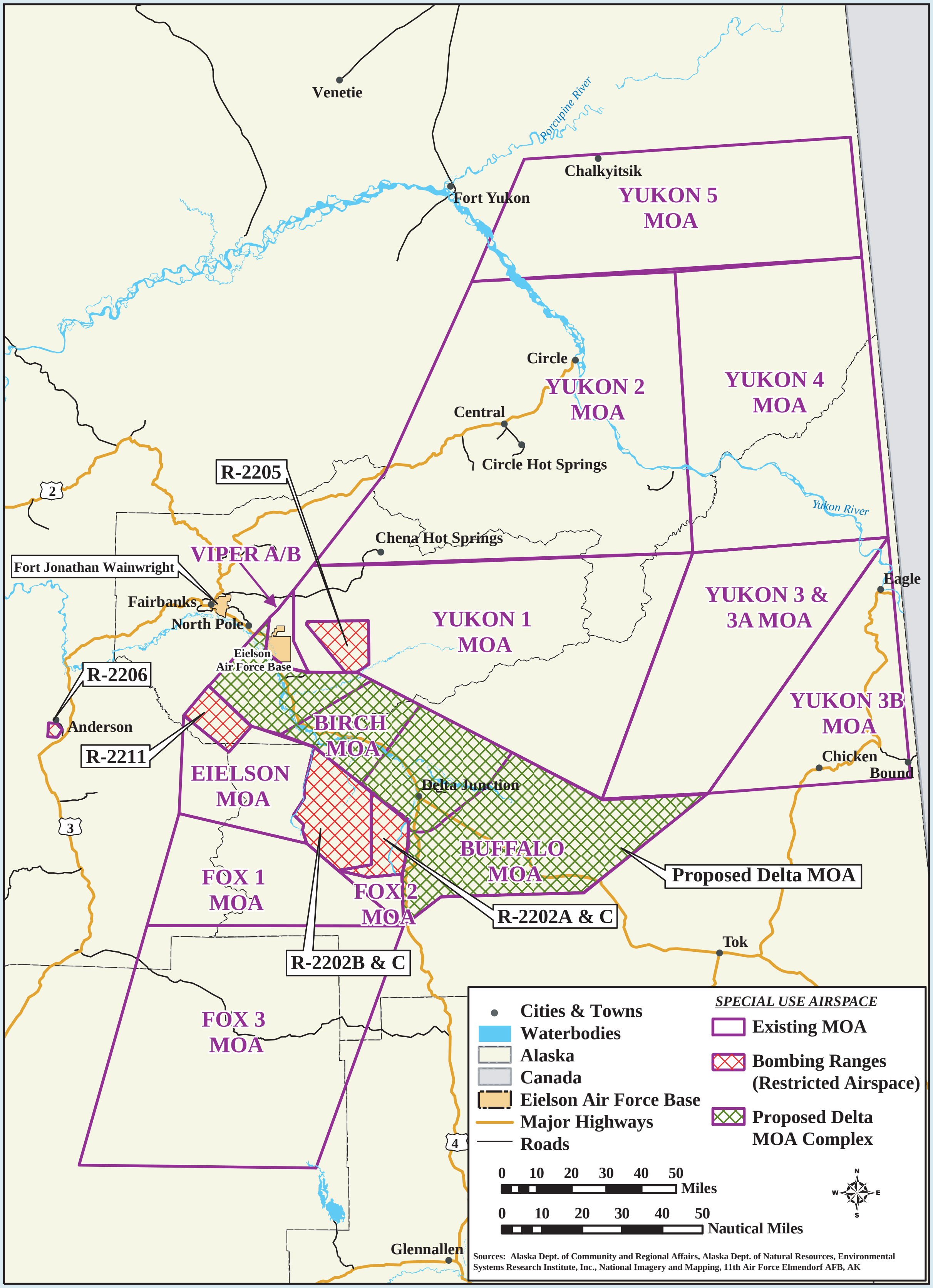
- Learn more about the proposal
- Identify community specific issues
- Make sure you are included on our mailing list

Public Comment Period

Submit written comments during this meeting or mail written comments before **April 30, 2008** to:

James W. Hostman
611 CES/CEVQP
10471 20th Street, Suite 302
Elmendorf AFB, AK 99506
(907) 552-4151
jim.hostman@elmendorf.af.mil

The Air Force will consider public and agency comments and will use this information to prepare the Draft EA.



Proposed Delta MOA Complex

DRAFT ENVIRONMENTAL ASSESSMENT DISTRIBUTION LIST

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University of Alaska Fairbanks
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Fairbanks AK 99775

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US Fish and Wildlife Service
Fairbanks Field Office
101 12th Avenue, Room 110
Fairbanks AK 99701-6237

Alaska State Library
333 Willoughby Avenue, 8th floor
PO Box 110571
Juneau AK 99801

Fairbanks North Star Borough Public Library
Noel Wien Library
1215 Cowles Street
Fairbanks AK 99701-4313

North Pole Branch Library
601 Snowman Lane
North Pole AK 99705

Ft Richardson Library/Education Complex
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Healy Lake Traditional Council
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Anchorage AK 99513-7588

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Darrell Hess
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Anchorage AK 99501

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Anchorage AK 99503-6103

Maria Coleman
Native Village of Eklutna
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Anchorage AK 99502

Harold Brown
Tanana Chiefs Conference
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Fairbanks AK 99701

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APPENDIX E
RELEVANT STATUTES, REGULATIONS, AND GUIDELINES

APPENDIX E RELEVANT STATUTES, REGULATIONS, AND GUIDELINES

GENERAL

National Environmental Policy Act (NEPA) of 1969 (Public Law [PL] 91-190, 42 United States Code [USC] 4347, as amended). Requires federal agencies to take the environmental consequences of proposed actions into consideration in their decision-making process. The intent of NEPA is to protect, restore or enhance the environment through well informed federal decisions. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee federal policy in this process.

Air Force Instruction 32-7061, Environmental Impact Analysis Process (EIAP), as promulgated at 32 CFR Part 989. Air Force implementation of the procedural provisions of NEPA and CEQ regulations.

AFPD 32-70, Environmental Quality. Requires that the Air Force comply with applicable federal, state, and local environmental laws and regulations, including NEPA. Executive Order (EO) 11514, Protection and Enhancement of Environmental Quality, as amended by EO 11991, sets policy directing the federal government in providing leadership in protecting and enhancing the environment.

Intergovernmental Coordination Act and EO 12372, Intergovernmental Review of Federal Programs. Requires federal agencies to cooperate with and consider state and local views in implementing a federal proposal. AFI 32-7061 requires proponents to implement a process known as Interagency and Intergovernmental Coordination for Environmental Planning (IICEP), which is used for the purpose of agency coordination and implements scoping requirements.

Ensuring Quality of Information Disseminated to the Public by the Department of Defense. This memorandum, signed February 10, 2003 requires that all components of the Department of Defense adopt standards of data quality for information they disseminate.

AIRSPACE

Federal Aviation Act of 1958. Created the Federal Aviation Administration (FAA) and charges the FAA Administrator with ensuring the safety of aircraft and the efficient utilization of the National Airspace System, within the jurisdiction of the United States.

Federal Aviation Regulation Part 71 (1975). Delineates the designation of federal airways, area low routes, controlled airspace, and navigational reporting points.

Federal Aviation Regulation Part 73 (1975). Defines special use airspace and prescribes the requirements for the use of that airspace.

Federal Aviation Regulation Part 91 (1990). Describes the rules governing the operation of aircraft within the United States.

FAA Order 7400.2. Prescribes policy, criteria, and procedures applicable to rulemaking and non-rulemaking actions associated with airspace allocation and utilization, obstruction evaluation and marking airport airspace analyses, and the establishment of air navigation aids.

FAA Order 7110.65. Prescribes air traffic control procedures and phraseology for use by personnel providing air traffic control services in the United States.

ACOUSTIC ENVIRONMENT

Executive Order (EO) 12088 Federal Compliance with Pollution Control Standards (1978). Requires the head of each executive agency to be responsible for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution, including noise pollution, with respect to federal facilities and activities under the control of the agency.

Federal Interagency Committee on Urban Noise (1980). Defines noise levels for various land uses and may result in areas that will not qualify for federal mortgage insurance. Additional sections allow for noise attenuation measures that are often required for HUD approval.

SAFETY

AFI 32-2001 The Fire Protection Operations and Fire Prevention Program (1 April 1999). Defines the requirements for Air Force installation fire protection programs, including equipment, response times, and training.

AFI 32-3001 Explosive Ordnance Disposal Program (1 October 1999). Regulates and provides procedures for explosives safety and handling. Defines criteria for quantity distances, clear zones, and facilities associated with ordnance.

AFI 91-202 The US Air Force Mishap Prevention Program (1 August 1998). Establishes mishap prevention program requirements, assigns responsibilities for program elements, and contains program management information.

AFI 91-301, Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH). Program implements AFPD 91-3, Occupational Safety and Health by outlining the AFOSH Program. The purpose of the AFOSH Program is to minimize loss of Air Force resources and to protect Air Force people from occupational deaths, injuries, or illnesses by managing risks.

Air Force Manual 91-201, Safety: Explosives Safety Standards. Establishes safety standards, provides planning guidance, and defines safety requirements for explosives operations of any kind (including testing, disassembling, modifying, storing, transporting, and handling explosives or ammunition) at Air Force facilities.

Department of Defense Flight Information Publication. Indicates locations of potential hazards (e.g., bird aggregations, obstructions, and noise sensitive locations) under military airspace and defines horizontal and/or vertical avoidance measures. Updated monthly to present current conditions.

PHYSICAL RESOURCES

Federal Water Pollution Control Act of 1948. Establishes procedures and programs for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters, thus protecting habitat conditions in aquatic and wetland ecosystems.

Clean Water Act of 1977 (33 USC 1251-1387). Requires a National Pollution Discharge Elimination System (NPDES) permit for all discharges into waters of the United States to reduce pollution that could affect any form of life. Section 404 of this act regulates development in streams and wetlands and requires a permit from the U.S. Army Corps of Engineers.

EO 19988 Floodplain Management (1977). Requires that governmental agencies, in carrying out their responsibilities, provide leadership and take action to restore and preserve the natural and beneficial values served by floodplains.

BIOLOGICAL RESOURCES

Lacey Act of 1900 (16 USC 3371-13378). Brings the unlawful taking of fish, wildlife, and plants under federal jurisdiction by prohibiting specimens taken illegally from being shipped across state boundaries.

Migratory Bird Treaty Act of 1918 (16 USC 701-715s). Establishes protection for migratory birds and their parts (including eggs, nests, and feathers) from hunting, capture, or sale.

Bald Eagle Protection Act of 1940 (16 USC 668-668c). Protects bald eagles and golden eagles by prohibiting the take, possession, or transportation of these species, dead or alive, and includes protection of their nests and eggs.

Fish and Wildlife Coordination Act of 1958 (16 USC 661-666c as amended). Provides for conservation and management of fish and wildlife by encouraging cooperation between the U.S. Fish and Wildlife Service and other federal, state, public, and private agencies.

Wilderness Act of 1964 (16 USC 1131). Directs the Secretary of the Interior to review every roadless area greater than or equal to 5,000 acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System. The act provides criteria for determining suitability and establishes restrictions on activities that can be undertaken on designated areas.

Endangered Species Act of 1973 (16 USC 1531-1544, as amended). Establishes measures for the conservation of plant and animal species listed, or proposed for listing, as threatened or endangered, including the protection of critical habitat necessary for their continued existence.

EO 11990 Protection of Wetlands (1977). Requires the governmental agencies, in carrying out their responsibilities, to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. Factors to be considered include conservation and long-term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, and wildlife.

Fish and Wildlife Conservation Act of 1980 (16 USC 2901-2911 as amended). Promotes state programs, and authorizes funding for grants, aimed at developing and implementing comprehensive state non-game fish and wildlife management plans.

North American Wetlands Conservation Act (16 USC 4401-4412) (1989). Supports the management and preservation of waterfowl by funding the implementation of the

North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, the U.S., and Mexico.

CULTURAL RESOURCES

***National Historic Preservation Act of 1966*, as amended.** Provides the principal authority used to protect historic properties, establishes the National Register of Historic Places (NRHP), and defines, in Section 106, the requirements for federal agencies to consider the effects of an action on properties listed on, or eligible for, the NRHP.

Archaeological Resources Protection Act (ARPA) of 1979 (16 USC section 470aa-47011). Ensures the protection and preservation of archaeological sites on federal or Native American lands and establishes a permitting system to allow legitimate scientific study of such resources.

Protection of Historic and Cultural Properties (36 CFR section 800) (2000). Provides an explicit set of procedures for federal agencies to meet their obligations under the National Historic Preservation Act including inventorying resources and consultation with State Historic Preservation Officers (SHPOs) and federally recognized tribes.

Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001-3013). Requires protection and repatriation of Native American burial items found or, or taken from, federal or tribal lands, and requires repatriation of burial items controlled by federal agencies or museums receiving federal funds.

AFI 32-7065 Cultural Resource Management (2004). Sets guidelines for protecting and managing cultural resources on lands managed by the Air Force.

American Indian Religious Freedom Act of 1978 (42 USC section 1996). States that it is the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.

EO 13007 Indian Sacred Sites (1996). Requires that, to the extent practicable, federal agencies accommodate access to, and ceremonial use of, sacred sites by Native American religious practitioners, and to avoid adversely affecting the physical integrity of sacred sites.

EO 13084 Consultation and Coordination with Indian Tribal Governments (1998). Requires that federal agencies have an effective process to permit elected officials and other representatives of Indian tribal governments to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.

Department of Defense (DoD) American Indian and Alaska Native Policy (21 November 1999). This policy emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis and requires an assessment, through consultation, of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before decisions are made by the services.

LAND USE

Department of Transportation Act of 1966 (49 USC 303), Section 4(f) (formerly 49 USC 1651 (b)(2) and 49 USC 1653f). Protection of certain public lands and all historic sites was originally mandated in Section 4(f) of the 1966 Department of Transportation Act. Public law 90-495 (amended in 1968) amended Section 4(f) to its most commonly known form. In 1983, PL 97-449 re-codified the Act from 49 USC 1651 to 49 USC 303. Congress has amended this Act three other times without substantive changes. It is referred to as Section 4(f) in the Federal Highway Administration Environmental Procedures (23 CFR 772). It declares a national policy to preserve, where possible, "the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites." It protects cultural resources that are on or eligible for the National Register of Historic Places.

Section 6(f) (3)-Land and Water Conservation Funds Act. Section 6(f)(3) of the 1964 Land and Water Conservation Funds (L&WCF) Act requires that all property acquired or developed with L&WCF assistance be maintained perpetually in public recreation use. Title 36, Chapter 1, Part 59 describes post-completion compliance responsibilities. These responsibilities apply to each 6(f) property regardless of the extent of program participation. The State is responsible for compliance and enforcement of these provisions and to ensure consistency with the contractual agreement with the National Park Service.

ENVIRONMENTAL JUSTICE

EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1995). Requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The essential purpose of EO 12898 is to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

AF Guidance, Interim Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (November 1997). Provides guidance for implementation of EO 12898 in relevant Air Force environmental impact assessments.

EO 13045 Protection of Children from Environmental Health Risks and Safety Risks (1998). This Executive Order directs federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

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APPENDIX F
AIRSPACE MANAGEMENT

APPENDIX F 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.

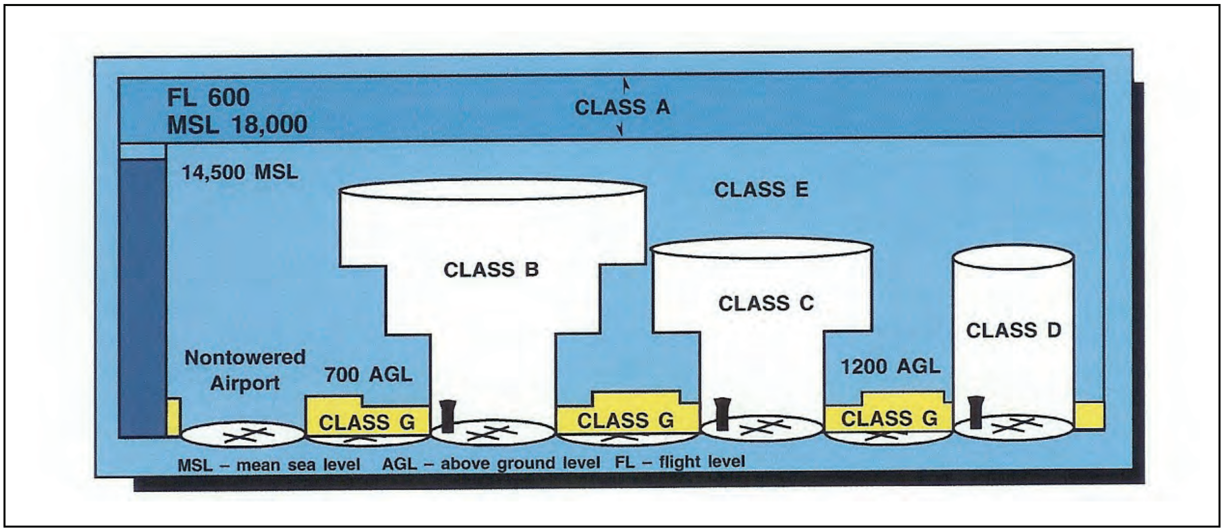
- **Surface Area Designated For An Airport.** When so designated, the airspace will be configured to contain all instrument procedures.
- **Extension To A Surface Area.** There are Class E airspace areas that serve as extensions to Class B, C, and D surface areas designated for an airport. This airspace 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.

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APPENDIX G
AIRCRAFT NOISE ANALYSIS AND AIRSPACE OPERATIONS

APPENDIX G 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 G-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 G-1 reflects Lmax values for typical aircraft associated with this assessment operating at the indicated flight profiles and power settings.

TABLE G-1. REPRESENTATIVE A-WEIGHTED INSTANTANEOUS MAXIMUM (LMAX) IN DECIBELS UNDER THE FLIGHT TRACK FOR AIRCRAFT AT VARIOUS ALTITUDES IN THE PRIMARY AIRSPACE[1]

Aircraft Type	*Airspeed*	*Power Setting*[2]	*300 AGL*	*500 AGL*	*1,000 AGL*	*2,000 AGL*	*5,000 AGL*	*10,000 AGL*	*20,000 AGL*
F-15C	520	81% NC	119	114	107	99	86	74	57
F-22A[3]	520	70% ETR	120	116	108	99	85	71	54
F-16A	450	87% NC	112	108	101	93	80	67	50
F-18A	500	92% NC	120	116	108	99	85	71	54
B-1B	550	101% RPM	117	112	106	98	86	75	61
C-17	230	3	94	87	78	68	54	43	32
C-130	180	2	90	84	77	69	58	49	39

Notes: 1. Level flight, steady, high-speed conditions.
2. Engine power setting while in a MOA. The type of engine and aircraft determines the power setting: RPM = rotations per minute, NC = percent core RPM, and ETR = engine throttle ratio.
3. Projected based on F-22A composite aircraft.
AGL = above ground level
Sources: Air Force 2006a, 2006b; Tetra Tech, Inc. 2004

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

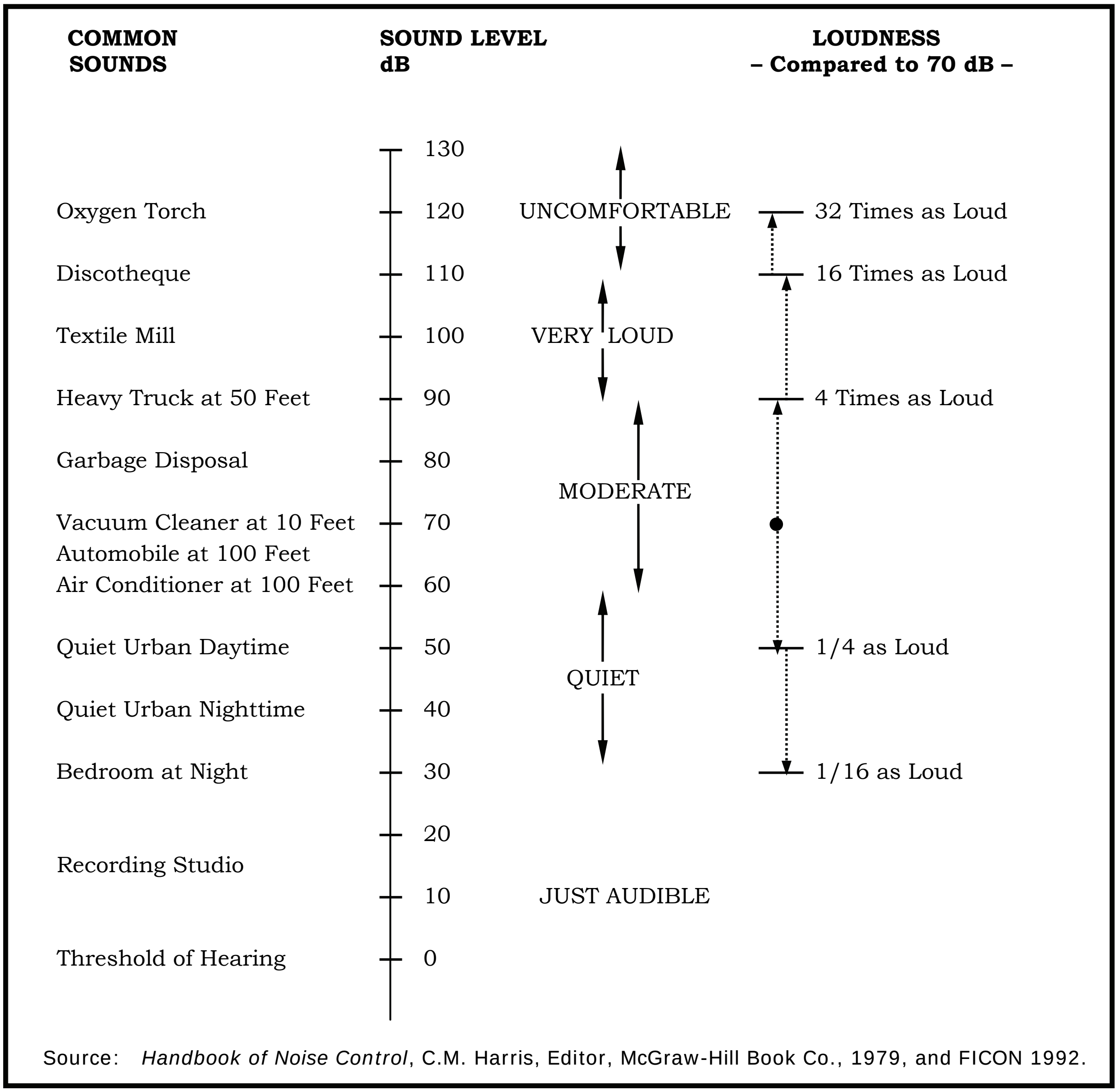
Individual time-varying noise events have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely 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 G-2 shows SEL values corresponding to the aircraft and speeds reflected in Table G-1.

TABLE G-2. SOUND EXPOSURE LEVEL (SEL) IN DECIBELS UNDER THE FLIGHT TRACK FOR AIRCRAFT AT VARIOUS ALTITUDES IN THE PRIMARY AIRSPACE[1]

Aircraft Type	*Airspeed*	*300 AGL*	*500 AGL*	*1,000 AGL*	*2,000 AGL*	*5,000 AGL*	*10,000 AGL*	*20,000 AGL*
F-15C	520	116	112	107	101	91	80	65
F-22A[2]	520	118	114	108	101	89	77	62
F-16A	450	110	107	101	95	85	74	59
F-18A	500	118	114	108	101	89	77	62
B-1B	550	116	112	107	101	92	82	70
C-17	230	102	97	88	82	72	62	52
C-130	180	99	95	90	84	76	68	55

Note: 1. Level flight, steady, high-speed conditions.
2. Projected based on F-22A composite aircraft.
AGL = above ground level
Sources: Air Force 2006a, 2006b, 2007



Source: *Handbook of Noise Control*, C.M. Harris, Editor, McGraw-Hill Book Co., 1979, and FICON 1992.

FIGURE G-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 G-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 G-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).

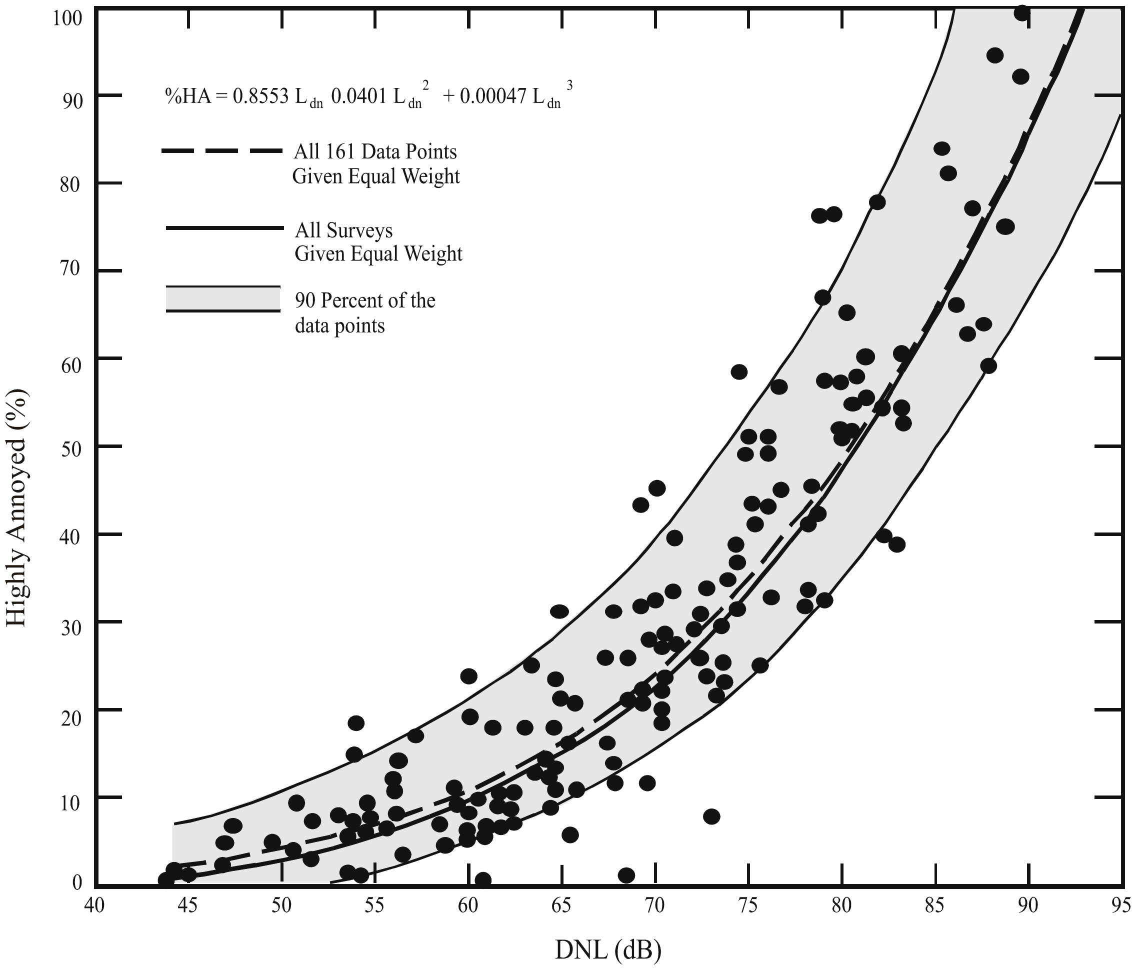


Figure G-2. Community Surveys of Noise Annoyance (Source: Schultz 1978)

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).

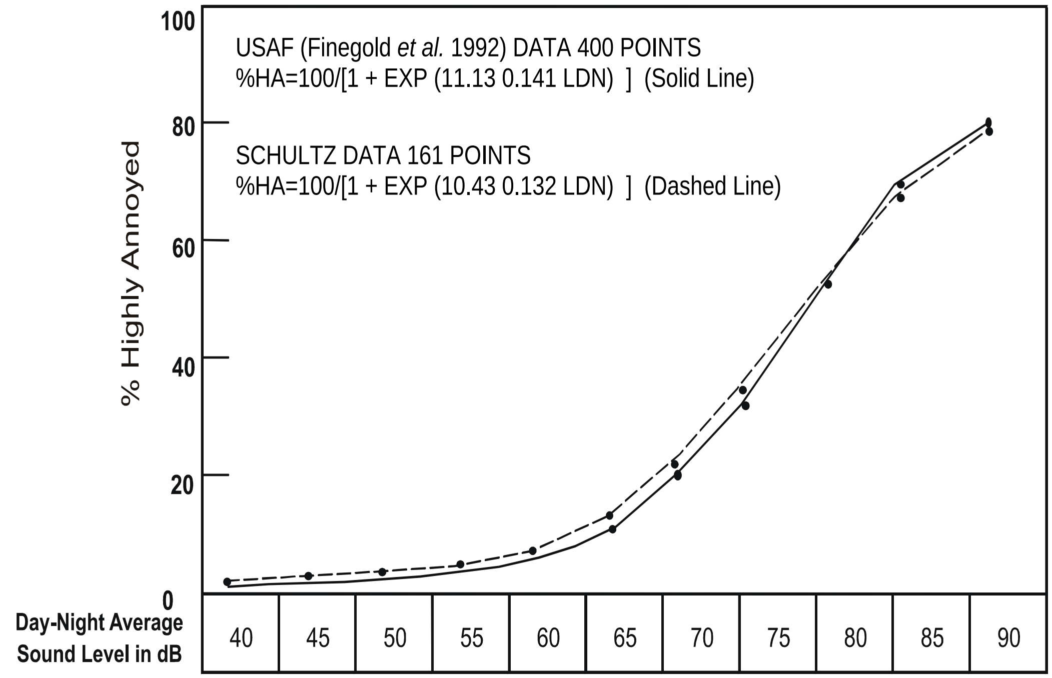
The Schultz curve is generally applied to annual average DNL. In Section 1.2, L_{dnmr} was described and presented as being appropriate for quantifying noise in military airspace. In the current study, the Schultz curve is used with L_{dnmr} as the noise metric. L_{dnmr} is always equal to or greater 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 G-3 shows the relation between annoyance, DNL, and CDNL.

TABLE G-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



Calculated %HA Points	**USAF**	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Figure G-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 G-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 G-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 G-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 G-4

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 G-4

(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 G-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 G-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.

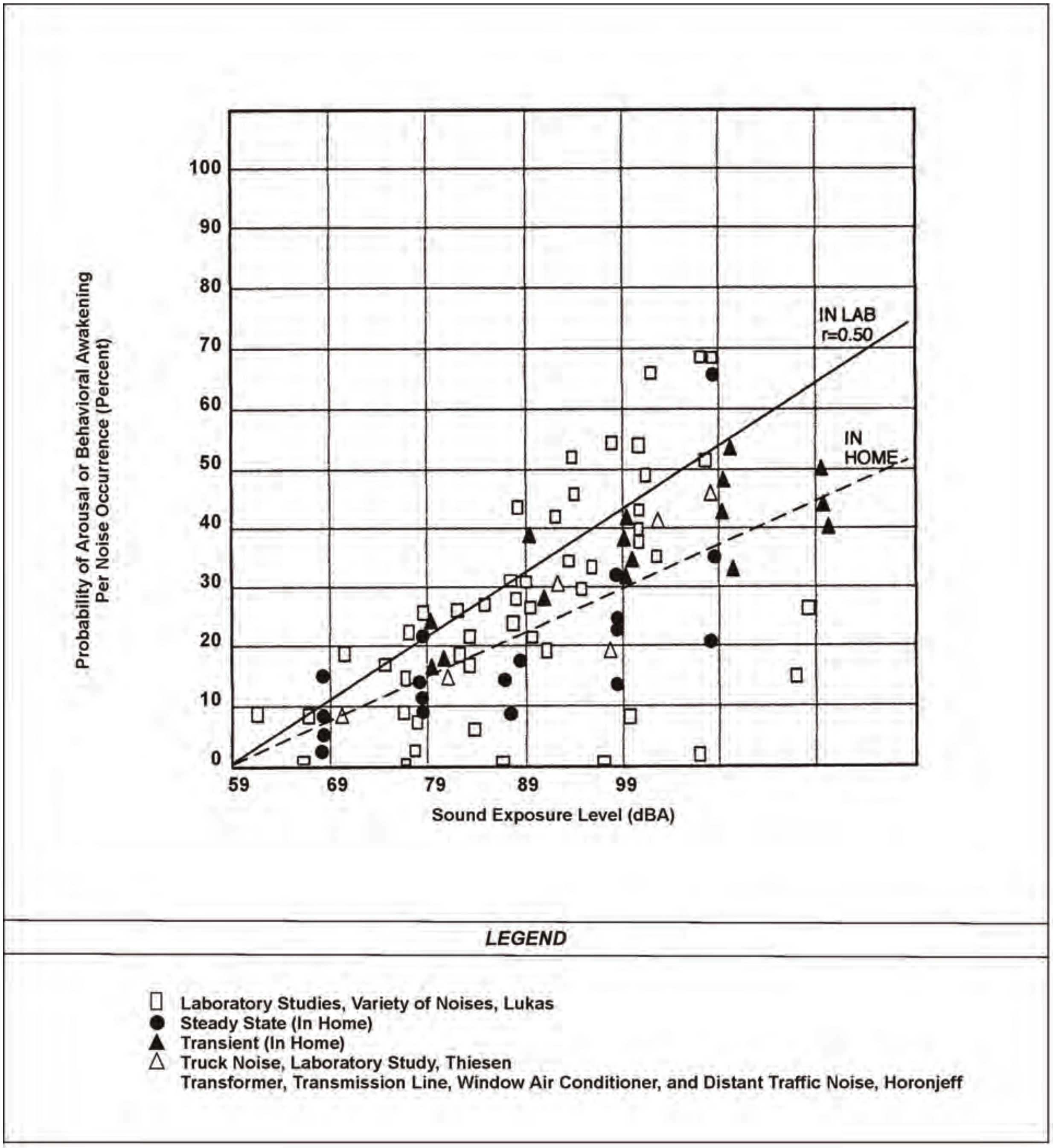


FIGURE G-4. PROBABILITY OF AROUSAL OR BEHAVIORAL AWAKENING IN TERMS OF SOUND EXPOSURE LEVEL

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 4.6 and Appendix H 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 G-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 G-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 G-5 shows the generation and evolution of a sonic boom N-wave under the aircraft. Figure G-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.

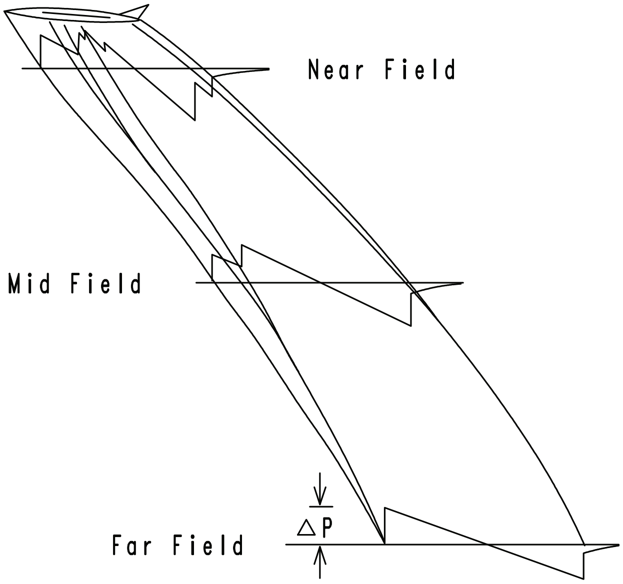


FIGURE G-5. SONIC BOOM GENERATION, AND EVOLUTION TO N-WAVE

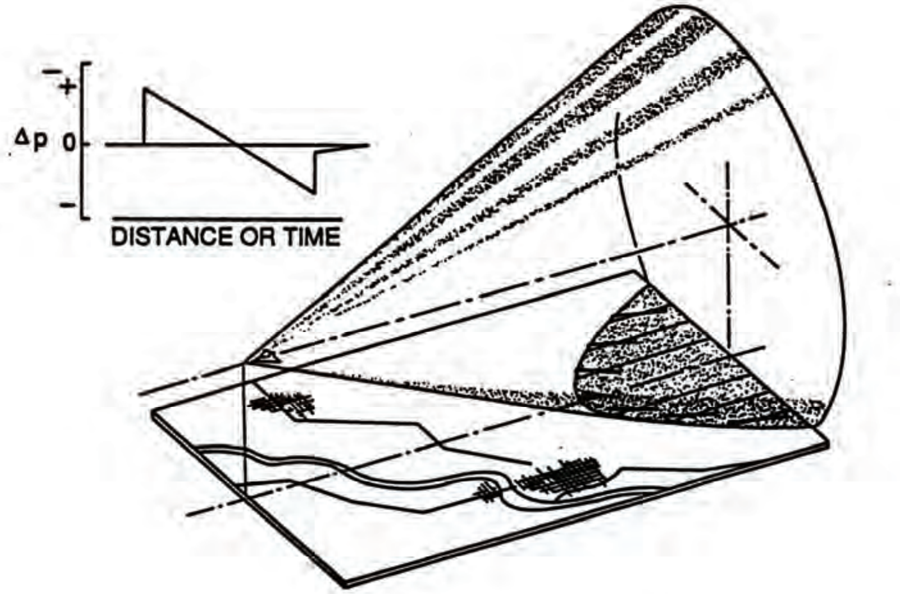


FIGURE G-6. SONIC BOOM CARPET IN STEADY FLIGHT

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 G-7 illustrates the complexity of a nominal full mission.

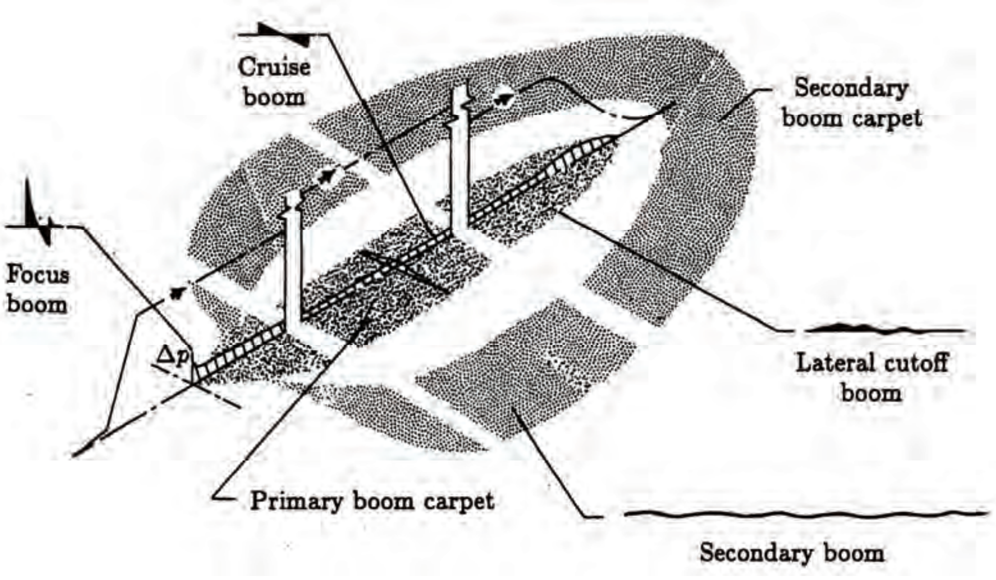


FIGURE G-7. COMPLEX SONIC BOOM PATTERN FOR FULL MISSION

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 G-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 G-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.

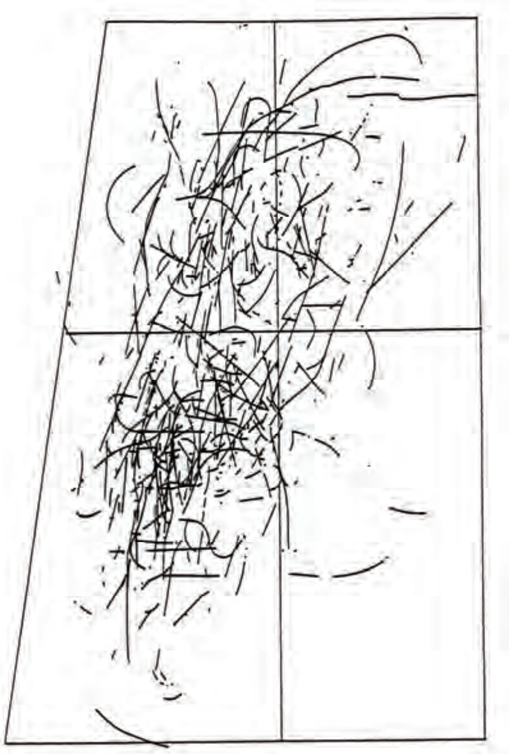


Figure G-8. Supersonic Flight Tracks in Supersonic Air Combat Training Airspace

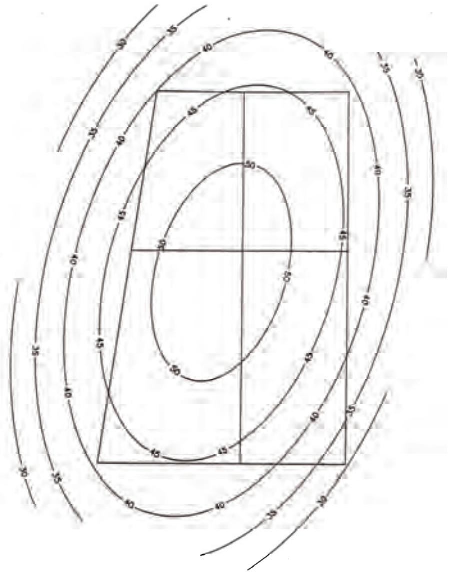


Figure G-9. Elliptical CDNL Contours in Supersonic Air Combat Training Airspace

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APPENDIX H

REVIEW OF EFFECTS OF AIRCRAFT NOISE, CHAFF, AND FLARES ON BIOLOGICAL RESOURCES

APPENDIX H REVIEW OF EFFECTS OF AIRCRAFT NOISE, CHAFF, AND FLARES ON BIOLOGICAL RESOURCES

1.0 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 used by the F-15C, F-15E, and the proposed use by F-22A.

2.0 AIRCRAFT NOISE

The review of the noise effects literature shows that the most documented reaction of animals newly or infrequently exposed to low-altitude aircraft and sonic booms is the "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 variable 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 "crack-crack" 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). Furthermore, there are no studies that have investigated the potential for adverse effects to wildlife due to long-term exposure to aircraft noise.

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). Aircraft noise has the potential to be most detrimental during periods of stress, especially winter, gestation, and calving (DeForge 1981). Krausman *et al.* (1998) studied the response of wild bighorn sheep (*Ovis canadensis*) in a

790-acre enclosure to frequent F-16 overflight 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.

Wild ungulates typically have little to no response to sonic booms. Workman *et al.* (1992) studied the physiological and behavioral responses of pronghorn (*Antilocapra americana*), 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. After successive sonic booms, this response decreased greatly, indicating habituation.

A recent study in Alaska documented only mild short-term reactions of caribou (*Rangifer tarandus*) to military overflights in the Yukon Military Operations Areas (MOAs) (Lawler *et al.* 2005). A large portion of the Fortymile Caribou Herd calves underneath the Yukon MOAs. The authors concluded that military overflights did not cause any calf deaths, nor did cow-calf pairs exhibit increased movement in response to the overflights. Because daily movements increase with calf age, the authors controlled for calf age in their analysis. Lawler *et al.* (2005) generally only observed higher-level reactions, such as rising quickly from a bedded position or extended running, when the faster F-15 and F-16s were within 1,000 feet above ground level (AGL). They also noted considerable variation in responses due to speed, slant distance, group size and activity, and even individual variation with groups.

In contrast, a study of the Delta Caribou Herd in interior Alaska found that female caribou with calves exposed to low-altitude overflights moved about 2.5 kilometers more per day than those not exposed (Maier *et al.* 1998). The authors, however, stated that this distance was of low energetic cost. Furthermore, this study did not consider calf age in their analyses (Lawler *et al.* 2005), which may bias results. Harrington and Veitch (1991) expressed concern for survival and health of woodland caribou calves in Labrador, where military training flights are allowed within 100 feet AGL.

Few studies of the effects of low-altitude overflights have been conducted on moose (*Alces alces*) or Dall's sheep (*Ovis dalli*). Andersen *et al.* (1996) observed that moose responded more adversely to human stimuli than mechanical stimuli. Beckstead (2004) reported on a study of the effects of military jet overflights on Dall's sheep under the Yukon 1 and 2 MOAs in Alaska. He could find no difference in population trends, productivity, survival rates, behavior, or habitat use between areas mitigated and not mitigated for low-level military aircraft by the Alaska MOAs Environmental Impact Statement (EIS) (United States Air Force [Air Force] 1995). In the mitigated area, flights are restricted to above 5,000 feet AGL during the lambing season, while the unmitigated area could experience flights as low as 100 feet AGL. Similarly, large-force Major Flying Exercises did not adversely affect Dall's sheep.

MARINE MAMMALS

The effects of noise on marine mammals, such as dolphins and whales, have been relatively well studied. Noise behaves differently underwater than in air, so a brief description of noise characteristics in the ocean environment is necessary.

Water is denser than air; therefore, sound waves travel five times faster in water (about 5,000 feet per second) than air (Stocker 2002). This density also allows sound to travel farther underwater. In addition, there are few obstacles (such as trees, houses, etc.) underwater that block sound. Since sound waves are influenced by density, factors that influence the density of water also affect the travel of sound. Temperature, pressure, and salinity can result in varied water densities. The following discussion is from Air Force (2001).

Propagation of sound from air to water is a complicated topic. For a pressure wave arriving at the air/water interface at angles steeper than 13 degrees, the wave is transmitted into the water and propagates at a shallower angle in the water. The pressure in the water at the interface is double the incident pressure, and falls off according to propagation conditions in the water column.

For energy incident from air on the sea surface at angles less than 13 degrees, there is no transmission of energy as a propagating wave into the water. Instead, there is only an evanescent, or non-propagating, wave whose amplitude decays exponentially with depth in the water. As before, there is a doubling of pressure at the interface, but the impact is limited to a region close to the surface and point of incidence. The wave does not propagate on its own in water, but is "bound" to the pressure field in the air. It thus appears to travel horizontally at the velocity of the aircraft.

Because the plane is moving, subsonic noise from an aircraft can have angles both more and less than the critical 13 degrees. The pressure doubles at the surface, propagates for steep arrivals, and decays with depth for the less steep arrivals. For certain ocean conditions, the propagating energy may travel significant distance with low loss intensity. For this reason, a loitering airplane or helicopter may be more worrisome than a fast-moving or supersonic aircraft.

As for military fixed-wing aircraft traveling at subsonic speeds, noise source levels are generally less than 210 decibels (dB) (re 1 μPa at 1 m). For flights at an altitude of 1,000 feet, the maximum sound pressure level at the sea surface would be no greater than about 155 dB (re 1 μPa), which is well below most harassment thresholds in current use (Air Force 2001).

Because marine mammals rely on sound for communication, navigation, and capturing prey, the effect of noise on marine mammals is of particular concern. Anthropogenic noise in the ocean occurs from a variety of sources, ranging from small boats to icebreakers, to oil drilling and seismic exploration. Most of these noise sources are of greater concern than aircraft, for the reasons discussed above. For example, underwater noise from icebreakers (192 to 205 dB are 1 μPa at 1 m) have the potential to result in temporary hearing damage to beluga whales (*Delphinapterus leucas*) staying within 1 to 4 km of an icebreaker for 20 minutes (Erbe and Farmer 2000). In general, reported behavioral responses of marine mammals to aircraft noise range from no reaction to diving (Air Force 2001, Moore and Clarke 2002).

Perry *et al.* (2002) studied the above-water response of gray seals (*Halichoerus grypus*) and harbor seals (*Phoca vitulina*) to sonic booms. They observed no behavioral responses of gray seals to sonic booms, but harbor seals appeared more vigilant. Similarly, gray seals fitted with heart rate monitors showed no change in heart rate during or after a sonic boom while harbor seals showed a slight increase. Perry *et al.* (2002) concluded that sonic booms did not affect breeding behavior of the seals.

SMALL MAMMALS

A few researchers have studied the potential affects 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). Nest attendance, time-activity budgets, and provisioning rates of nesting peregrine falcons (*Falco peregrinus*) in Alaska were found not to be significantly affected by jet aircraft overflights (Palmer *et al.* 2003). 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). However, bald eagles can be disturbed by fixed-wing aircraft. Recorded reactions to disturbance ranged from an alert posture to flushing from a nest or perch. Grubb and King (1991) reported that 19 percent of breeding eagles were disturbed when an aircraft was within 625 meters (2,050 feet).

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.

3.0 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 are several flare components, including plastic end caps, felt spacers, aluminum-coated wrapping material, plastic retaining devices, and plastic pistons. Specific issues are (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 potential; and (6) potential 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 lighter plastic parts. The plastic parts, such as end caps, are inert and are not expected to be used by or consumed by any species. The aluminum coated wrapping, as it degrades, could produce fibrous materials similar to naturally occurring nesting materials. 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.

Bovine hardware disease is of concern for domestic cattle. Hardware disease, or traumatic reticuloperitonitis, is a relatively common disease in cattle. The disease results when a cow ingests a foreign object, typically metallic. 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 M-206 and MJU-7 A/B flares, the plastic materials of the end cap and slider and the flexible aluminum wrapping would be less likely to result in injury than a metallic object.

Flares used for training by F-15 and F-22 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 Alaska training airspace, flares must be released above 5,000 feet AGL from June 1 to September 30 to reduce any potential of a flare-caused fire. For the remainder of the year when soils and vegetation are moist or snow covered, flares can be released above 2,000 feet AGL. 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 and requires a temperature of 1,200 degrees Fahrenheit for ignition. Self-ignition is highly unlikely under natural conditions.

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APPENDIX I
MID-AIR COLLISION AVOIDANCE PAMPHLET

354TH FIGHTER WING
EIELSON AFB, ALASKA

MID-AIR COLLISION AVOIDANCE PAMPHLET

12 MARCH 2007

MEMORANDUM FOR ALASKA AVIATORS **12 MARCH 2007**

FROM: 354th Fighter Wing Flight Safety Office

SUBJECT: Military Flying in Interior Alaska

1. This pamphlet is offered to give you a working knowledge of the military airspace used in interior Alaska. This airspace is shared with the military, flying businesses and civilians who fly for pleasure. The information in this pamphlet is focused toward reducing the risk of a mid-air collision between civil and military aviators.

2. Some pilots refer to the “Big Sky” theory of air traffic control. This method of air traffic “control” is based upon two conditions: 1) lots of airspace, and 2) very few airplanes. Although the Alaskan skies are spacious, the “Big Sky” method of mid-air collision avoidance is risky at best, and in the Fairbanks flying area is unreasonable.

3. There are six active airfields within five miles of the International Airport, serving helicopters, light planes, jumbo jets, and everything in between. Also, Eielson Air Force Base is home to fighters, tankers, helicopters, light aircraft, Red Flag Alaska and many other transient aircraft. Add to this the pipeline patrol aircraft and the numerous small airports and backyard runways scattered throughout the Interior and the potential for a traffic conflict becomes high.

4. In this environment a pilot using knowledge, good visual and radio lookout, and help from ground-based radar is much better off than the pilot using the “Big Sky” method. Good pilots know the location of all high density traffic areas, and the general flight characteristics of the primary types of aircraft operating in these areas. Knowing the location and restrictions (if any) is beneficial to all pilots. The smart pilot is not averse to requesting radar advisories whenever possible. Special Use Airspace Information Service (SUAIS) is available 24 hours a day and can be a great aid to pilots flying in Alaska. This pamphlet will discuss SUAIS and its use along with other information you can use to avoid a near miss or a mid-air collision. Remember.... flying safety is no accident.

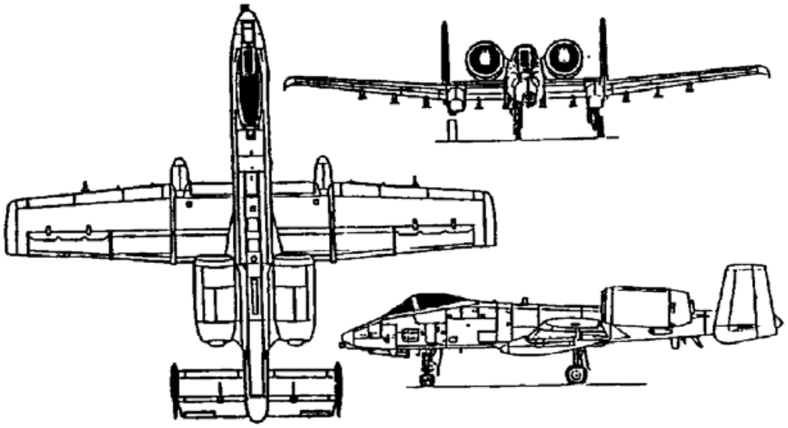
5. If you have any questions about military flying at Eielson Air Force Base, or any of our military operating areas, please call the Eielson Safety Office at 377-1155.

//Signed//
MATTHEW W. MITCHELL, Lt Col, USAF
Chief of Safety

AIRCRAFT BASED AT EIELSON

A-10A THUNDERBOLT II

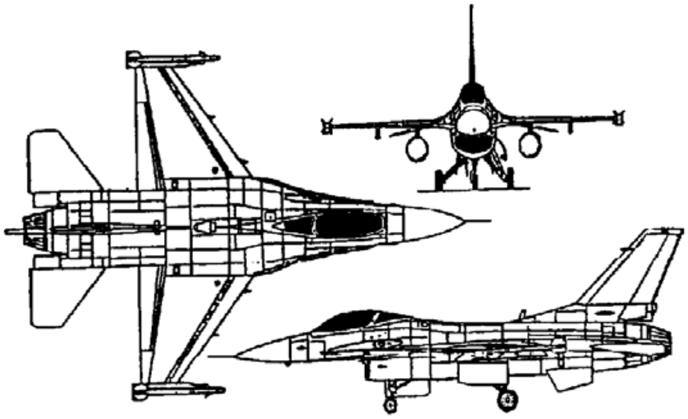
The Fairchild A-10A Thunderbolt II is dedicated to Close Air Support role, flying in support of army ground forces. The A-10A uses its 30-millimeter Gatling gun, air-to-ground missiles, rockets, and 16,000-pound payload to suppress enemy ground forces. They usually fly in formation, typically between 300 and 3,000 feet AGL. Formations are generally very loose with up to a mile or more between aircraft. Positioning of the #2 aircraft ranges from a line abreast to 45-60 degrees echelon or even directly in trail. So, if you visually acquire only one aircraft, watch the surrounding sky for its partner(s). Another aircraft could be out in front to the side, or behind. Remember, if you only see one, you don’t know if it’s the leader or a wingman. Their gray paint, low operating altitude and degree of maneuverability enhances the A-10’s survivability in a hostile environment. Unfortunately, in peacetime these same characteristics make them hard for other pilots to see. In peacetime, they operate their red and green navigation lights full bright and leave their anti collision strobe lights (located on wing tips and tail) flashing at all times. The A-10A operates at speeds between 200 and 350 KIAS. A-10s are not limited to training within the Military Operations Area (MOA). They can fly enroute navigation sorties outside MOAs as long as they comply with FAA regulations. Their slow airspeed allows this. They normally fly between 300-2000 Ft AGL when flying outside of MOAs.



F-16C FIGHTING FALCON

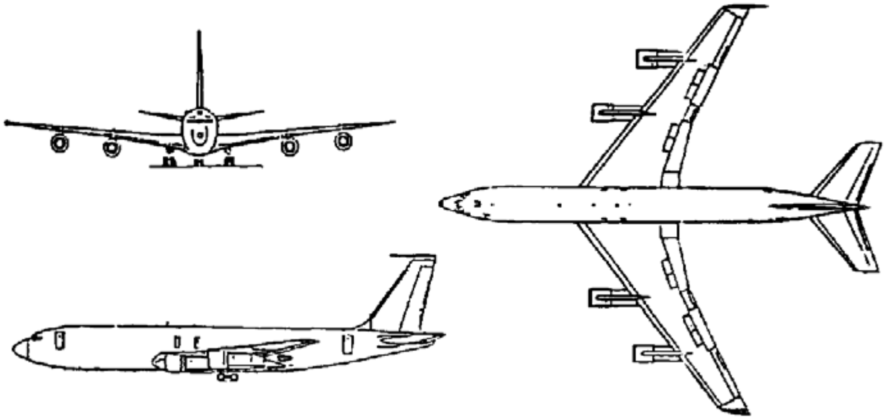
The General Dynamic F-16 Fighting Falcon is a multi-role tactical fighter with full air-to-air and air-to-ground combat capabilities. The F-16 has the capability to fight its way to a target, deliver air-to-ground ordnance, and then fight its way back to safety. This may be accomplished using a variety of tactics. The pilots train to become experts with these tactics in the Interior (MOA) airspace as well as Restricted Area R-2202, R-2205, and R-2211 and military training routes (MTR). The F-16 carries onboard radar that can detect other aircraft at great distances beyond visual range. This enhances the pilot’s ability to see and avoid other aircraft. However, because of its small size (wing span=33 feet), high speed (normal operating speeds at low level = 400 to 550 KIS), and extremely effective gray camouflage paint scheme, it can be difficult to acquire.

F-16s also use widely spread formations and could be in formations consisting of four or more aircraft. The F-16 also has an anti collision strobe light mounted on top of the vertical stabilizer.



KC-135 STRATOTANKER

The Boeing KC-135 Stratotanker provides air refueling for fighter, bomber, and transport aircraft. The KC-135 aircrews train in the local area flying both VFR and IFR approach patterns. Although they are substantially larger than the fighter aircraft based at Eielson AFB, their paint scheme blends in well with the surrounding area. The KC-135 flies between 150 and 250 KIAS when below 10,000 feet.



SPECIAL USE AIRSPACE INFORMATION SERVICE

What is it? SUAIS is a 24-hour service provided to civilian pilots flying in and around MOAs and Restricted Areas in Interior Alaska. Pilots can call SUAIS at **1-800-R**estricted **J**oint **U**se-**USAF** (1-800-758-8723), 372-6913 from the Fairbanks area, or VHF **125.3, call sign Eielson Range Control**. Primary coverage is along the AK Hwy. The further from the highway, typically the coverage quality is reduced. For more on SUAIS log on to: http://www.elmendorf.af.mil/shared/media/document/AFD-061130-054.pdf.

Who is Eielson Range Control (ERC)? ERC is an airspace manager at Eielson AFB, Alaska. It is normally staffed from 7 a.m. to 5 p.m., Monday through Friday (except federal holidays), and times when Air Force flying is in progress in Interior Alaskan MOAs and Restricted Areas. After hours, telephone and radio callers will hear the airspace status through a recorded message. ERC is equipped with UHF and VHF radios and radar displays.

Why use it?

First: safety. Eielson Range Control can advise civilian pilots of high-speed military aircraft operating in shared MOA airspace. Of particular concern are the Birch and Buffalo MOAs overlaying the Richardson and AK highways between Tok, Delta Junction, Glennallen, and Fairbanks--military aircraft occasionally use the corridor.
Second: efficiency. Military Restricted Areas are not always in use during the charted operating times. When not in use, ERC can clear civilian aircraft through these areas. ERC can also clear military aircraft out of any airspace if civilian aircraft emergency operations-for example, an air ambulance mission-requires it.

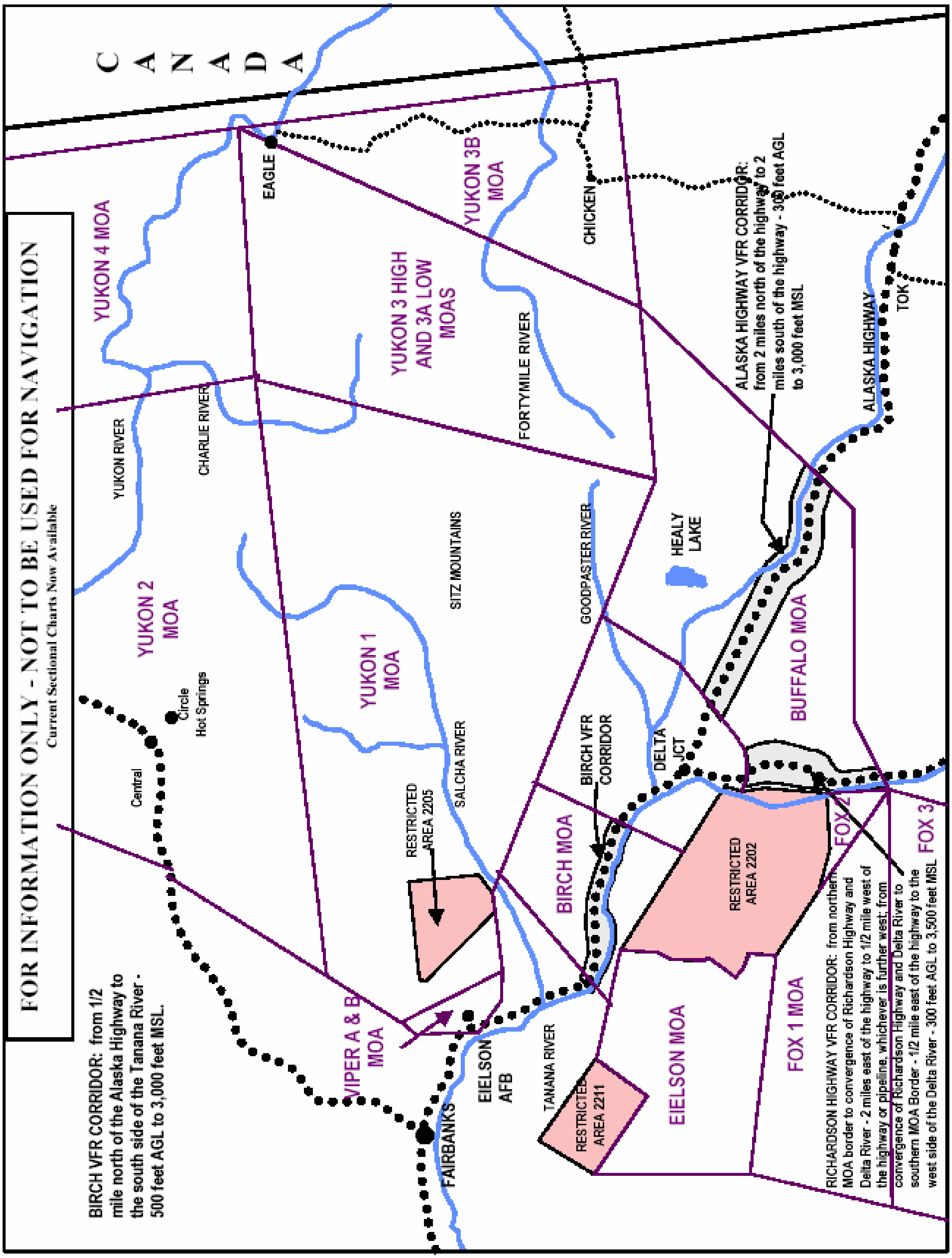
Where is SUAIS radio and radar coverage provided? Currently, through a series of radio relays, aircraft flying in the vicinity of R-2202, R-2205, R-2211 and the western Yukon MOAs talk to ERC. Coverage extends along the Alaska Highway toward the Canadian border and south of the Alaska Range to Glenallen. Aircraft flying in mountainous terrain to the east of the Tanana River will need to be at or above the tops of the highest terrain in their immediate vicinity. The ability to see non-transponder-equipped light aircraft is limited and unpredictable. Squawking is highly encouraged.

Can Eielson Range provide air traffic control? No. Service is limited to advisory information on the active/inactive status of airspace and the approximate locations of Air Force aircraft. IFR vectoring, processing of flight plans, etc., cannot be provided. However, ERC is an excellent source of information and should be used to develop your situational awareness on the airspace. Conveying your intentions to ERC is critical to helping the system enhance flight safety.

Does SUAIS include current Army operations? SUAIS includes Army artillery firing at all hours, and known helicopter operations. It also provides Army Unmanned Aerial Vehicle operations information in their area of coverage between Donnelly Dome and Fairbanks.

History. The Air Force created SUAIS in 1994 to enhance both safety and efficient airspace use in Interior Alaska. Since then, it has become a regular feature of general and commercial aviation in the area. For more information log on to the following Web site: http://www.elmendorf.af.mil/11AF/611AOG/611AOS/webdocs/suais/suais.htm

SPECIAL UISE AIRSPACE



FOR INFORMATION ONLY - NOT TO BE USED FOR NAVIGATION

Current Sectional Charts Now Available

BIRCH VFR CORRIDOR: from 1/2 mile north of the Alaska Highway to the south side of the Tanana River - 500 feet AGL to 3,000 feet MSL.

ALASKA HIGHWAY VFR CORRIDOR: from 2 miles north of the highway to 2 miles south of the highway - 300 feet AGL to 3,000 feet MSL

RICHARDSON HIGHWAY VFR CORRIDOR: from northern MOA border to convergence of Richardson Highway and Delta River - 2 miles east of the highway to 1/2 mile west of the highway or pipeline, whichever is further west; from convergence of Richardson Highway and Delta River to southern MOA Border - 1/2 mile east of the highway to the west side of the Delta River - 300 feet AGL to 3,500 feet MSL

FLYING IN THE EIELSON AFB AREA

Awareness of MOAs, MTRs, and Restricted Areas is essential to safe flying. Red Flag Alaska exercises bring large numbers of military aircraft to operate in these areas.

Eielson AFB aircraft use three bombing (and artillery) ranges (R-2202, R-2205, and R-2211). These ranges are clearly depicted on sectional charts. It is essential that civilian aircraft avoid flying in these ranges when they are in use. Fairbanks Approach Control can be contacted to determine whether the ranges are in use. In addition, civilian aircraft can contact Eielson Range Control on 125.3 (SUAIS) to obtain clearance to fly through these areas when conditions permit.

Eielson AFB also uses several permanent MOAs. There are no FAA controlling agencies that civilian aircraft can contact for traffic advisories when the MOAs are active. Limited traffic information within approximately 25 nm of the bombing ranges can be obtained from Eielson Range Control on 125.3 (see SUAIS). While range control may help, diligent visual lookout must be practiced when flying through active MOAs in the interior.

Fighter aircraft from Eielson AFB also use many MTRs in the area. These routes, both VR and IR, are depicted on sectional charts; however, only the route centerline is shown (almost all interior routes are 10nm wide). Generally these routes extend from the surface to 3000 feet AGL; but some go as high as 17,000’ MSL. The routes are active by NOTAM Advisory. Flight Service Stations can tell you which routes are active within 100NM. Generally, fighter aircraft flying in MTRs are low altitude and high speed. It is best to avoid active MTRs if at all possible.

DO:

- Become familiar with the Interior military airspace.
- Avoid flying through active MOAs and MTRs, whenever possible.
- Contact nearest FSS or Fairbanks Approach to determine if ranges, MOAs, or MTRs are active.
- Contact Eielson Range Control for SUAIS in the vicinity of Eielson AFB, interior ranges or MOAs.
- When flying through active MOAs or MTRs maintain a constant visual lookout (ahead and behind) for military traffic.

DON’T:

- EVER fly through an active restricted area without contacting Eielson Range Control on 125.3 for permission. Live bombing, artillery or surface to air missile firings may be in progress.
- Fly through active Military Airspace unless it is impractical to go around it.

VISUAL APPROACHES/DEPARTURES

Military aircraft flying visual approaches to Eielson usually fly across the Tanana River at 2,000 feet MSL, often in close formation, to line up with the runway. They will then operate in a rectangular or overhead pattern. Visual departures will make climbing turns out of traffic, usually toward one of the restricted areas.

INSTRUMENT APPROACHES/DEPARTURES

Both military and civilian aircraft practice instrument procedures at Eielson. The TACAN and ILS approaches basically extend along the runway centerline out to about twelve miles (approximately over Harding Lake for Runway 31).

SPECIAL CONSIDERATIONS FOR RED FLAG ALASKA EXERCISES

Red Flag Alaska is a series of large scale flying exercises, which occur in the Eielson AFB area several times a year. These exercises may have up to 100 military aircraft flying in the Eielson AFB area at one time (in the span of two hours). It is very hazardous to fly VFR within the Interior Military Operations Areas during Red Flag Alaska exercise periods. These periods are usually two hours long; normally one period is in the morning and one in the afternoon. Fairbanks FSS, Fairbanks Approach, or Eielson Range Control (VHF 125.3) can confirm these exercise periods. Civilian aircraft flying from Northway or Glenallen to Fairbanks can avoid Red Flag Alaska airspace by flying at altitudes between 7,500 MSL up to Class A Airspace. You are encouraged to participate in the Special Use Airspace Information Service (SUAIS) provided by Eielson Range Control when airborne. This service is described above and also in pamphlets obtained at any Flight Service Station in the interior or on the web page. The web page also contains the Cope Thunder annual schedule. There you will get all the military airspace information you desire.

LIGHTS OUT OPERATIONS AT NIGHT

Military operations now require pilots to train with Night Vision Goggles (NVGs). This training involves flying with reduced aircraft lighting and in some cases no exterior lights at all. At times pilots practice NVG takeoffs and landings which require Eielson AFB airfield lighting to be turned down or even off. A NOTAM will be posted listing times, Restricted Airspace and/or MOAs being used. Pilots relying only on See and Avoid will not be able to see these aircraft, nor in some cases the airfield and should avoid the area or coordinate with the controlling agency in order to ensure positive separation. Safety procedures are in place using radar to ensure that military aircrews know when VFR aircraft enter the airspace. If necessary, they will turn their lights on and stop training if an unsafe situation develops.

WAKE TURBULENCE

Dangerous? **YES!** Unexpected, invisible, and unpredictable? **NO!** The one positive aspect of wake turbulence is its predictable occurrence. Wake turbulence is a vortex created by any wing producing lift. The vortex trails the wing tips and spreads outwards and downwards at 500 feet per minute. All aircraft produce some degree of wake turbulence, however, the greater the generating aircraft weight and the slower it flies, the more powerful the vortices. Cargo aircraft and passenger airliners produce powerful wake turbulence that could have a dramatic effect on the unsuspecting general aviation pilot. Here are some good rules of thumb for avoiding wake turbulence. During cruise, avoid flying directly behind and below other aircraft. During landing, fly your approach above the heavy aircraft and land beyond the point where the aircraft lowers its nose to the runway; during takeoff, liftoff before the rotation point of the heavy aircraft and climb above its flight path. Allow adequate time separation between yourself and the aircraft in front of you, even if traveling perpendicular to its flight path. Don't get caught in these horizontal tornadoes.....Think Ahead!

EIELSON'S CLASS "D" AIRSPACE

Defined as that airspace within a 4.7nm radius of Eielson extending from the surface up to, but not including 3,000 feet AGL. The control tower is operational daily from 0700-2300 local time and other times by NOTAM. Eielson tower must be contacted if operating in the Class D Airspace. Frequencies are 127.2 and 352.05. **NOTE:** There is a long stretch of the Tanana River that lies well within the 4.7nm radius of the Class D Airspace. Also take note that Eielson TACAN lies at the south end of the 14,500-foot runway (That's almost three miles!). As such, when traversing the Eielson Class D Air space, it is advisable not to use just the river or TACAN (DME) as a guide to "five miles", instead remain well clear to the west of the river and always contact the tower if able.

REPORTING CONFLICTS WITH MILITARY AIRCRAFT

If you are unfortunate enough to have a close encounter with a military aircraft in the Eielson AFB area then please report it to the FAA and to the Eielson AFB Safety Office. Reporting the incident to the Eielson Safety Office is the best way to ensure that action is taken to prevent further incidents. To report incidents call (907) 377-1155 or (907) 377-1025. You can also reach the Safety Office by mail at:

354 FW/SE
354 Broadway St., Unit 13A
Eielson AFB AK 99702-1894

or email at:
354fw.se@eielson.af.mil

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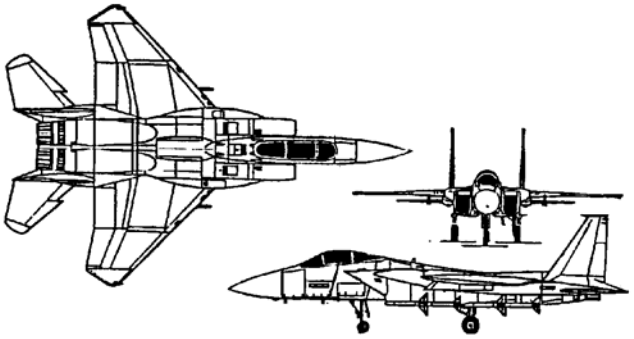
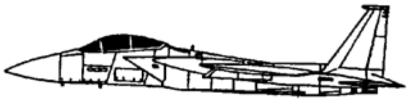
FREQUENT VISITING AIRCRAFT

F-15 EAGLE

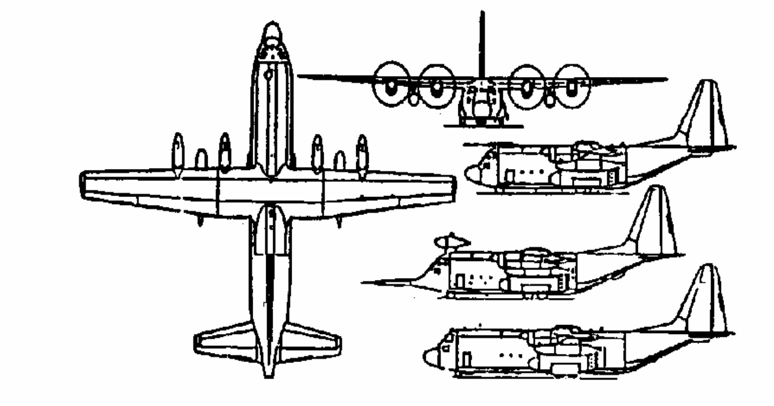
The F-15C is the Air Force's all-weather air superiority fighter. The F-15E is an air-to-ground version of the F-15C. Based at Elmendorf AFB, these aircraft utilize the Interior airspace frequently. They also use Eielson AFB for instrument approach training. F-15's operate at all altitudes and all airspeeds. Both models of the F-15 carry an onboard radar that can detect other aircraft at great distances. They are painted gray camouflage and are very hard to see.





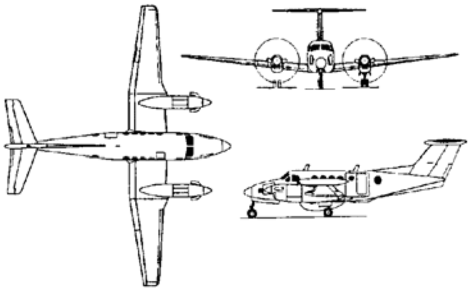
C-130 HERCULES

The C-130 Hercules is used for tactical transport and airdrop. Special versions of the C-130 include rescue, weather, special operations, and gunship variants. They all operate at airspeeds between 150 and 250 KIAS in the landing pattern. These aircraft sometimes participate in exercises in the Interior MOAs and fly at very low altitudes (300 to 500 feet above the ground). Watch for groups of 2-6 aircraft in 2,000' to 4,000' trail formation. Active duty aircraft are generally gray and ANG are typically green camouflage. Like the A-10, these aircraft are not limited to operations within MOAs. They can be found flying VFR practically anywhere.



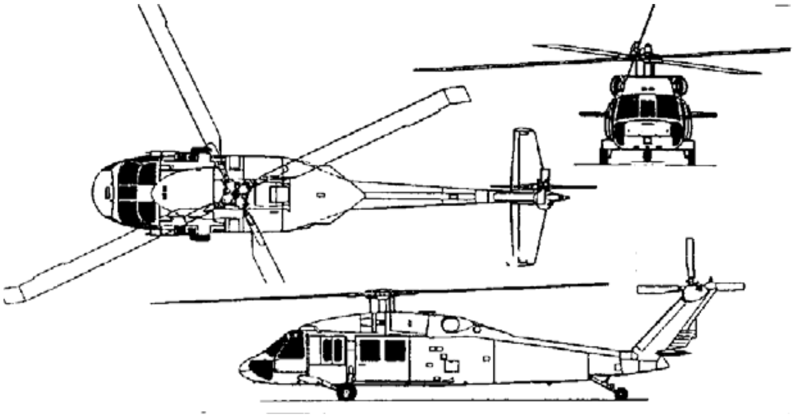
C-12 KING AIR

The Beech King Air is used for personnel transport throughout Alaska and frequents the Eielson area. It travels at 250 KIAS, and is capable of operating out of bare-base airfields.



HH-60 BLACK HAWK

The Sikorsky HH-60 Black Hawk helicopter performs a variety of roles around Eielson including support of range operations, search and rescue exercises, and re-supply of Eielson's outlying sites. They fly low altitude from the surface to 1,000 feet above the ground, between 120 and 150 KIAS.



OTHERS

C-5 and C-17 cargo aircraft are occasional visitors to Eielson and these are somewhat larger than the aging C-141. They typically fly similar profiles as the C-130. KC-10 refueling aircraft also visit from time to time. They are the military derivative of the DC-10 and typically operate above FL 180.

EIELSON AFB AIRFIELD INFORMATION

LOCATION	22 miles east of Fairbanks, Alaska
RUNWAY 31/13	14,500 feet, concrete, two north arresting cables, one south arresting cable
ELEVATION	547 feet MSL
LIGHTING	Airfield Rotating Beacon (1 Green, 2 White)
RUNWAY	High Intensity Runway Lighting (HIRL) with Sequenced Flashing, Precision Approach Path Indicator (PAPI)
NAVAIDS	**TACAN-CH 98** Runway 31 ILS-109.90 Runway 13 ILS-110.50
RADAR	No radar approaches at this time
CLASS “D” AIRSPACE	4.7 nm radius up to 3,000 feet MSL
FREQUENCIES	TOWER-127.2 (VHF) OR 352.050 (UHF) GROUND-121.8 (VHF) OR 275.8 (UHF)
SUAIS	RANGE CONTROL-125.3 (VHF) 1-800-758-8723 or 372-6913 from Fairbanks area http://www.elmendorf.af.mil/11AF/611AOG/611AOS/webdocs/suais/suais.htm. http://www.eielson.af.mil

EIELSON AFB AIR TRAFFIC CONTROL CONTACTS

Commander, Airfield Operations Flight	Capt James Hudnell	(907) 377-3116
Chief Controller	SMSgt John Turner	(907) 377-7050
Chief, ATC Training Standardization	MSgt Johnny Cofer	(907) 377-4362

A Superior Pilot Is One Who Stays Out Of Trouble By Using Superior Judgment To Avoid Situations, Which Might Require The Use Of Superior Skills!

This pamphlet published by Eielson AFB Flight Safety Office
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and
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