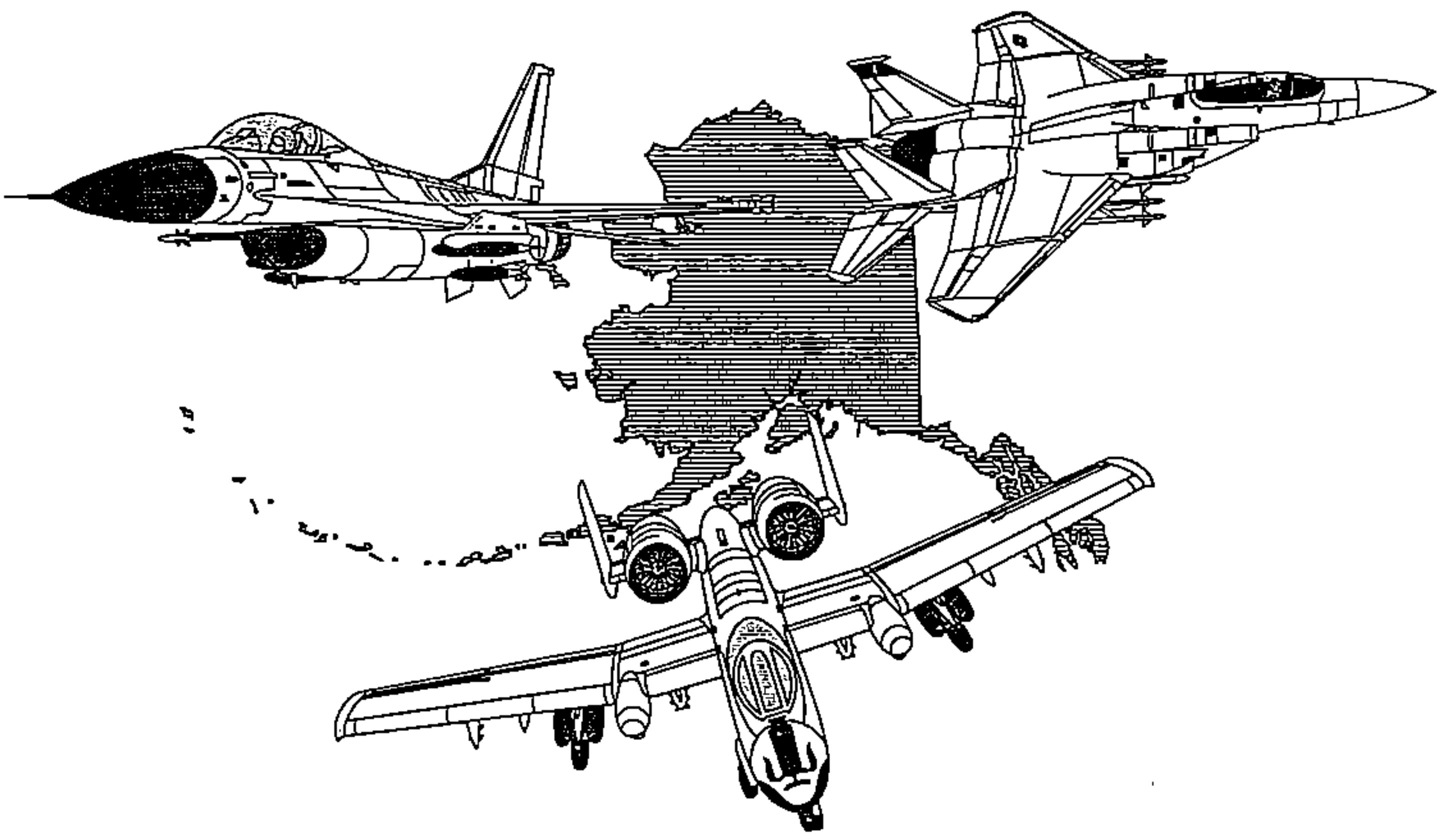
FINAL

Environmental Impact Statement
ALASKA MILITARY OPERATIONS AREAS

VOLUME III

- Technical Appendices



August 1995
Department of the Air Force
11th Air Force
Elmendorf AFB, Alaska

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APPENDIX A

DESCRIPTION OF THE EIAP AND MOA EIS CHRONOLOGY OF EVENTS

A.1 Description of the Environmental Impact Analysis Process (EIAP)

The Environmental Impact Analysis Process (EIAP) is the Air Force program that provides a process for making decisions based on an understanding of possible environmental consequences of the proposed action. EIAP is defined by *Air Force Regulation (AFR) 19-2*, implementing the National Environmental Policy Act (NEPA) and the President's Council on Environmental Quality (CEQ) regulations *(40 CFR Parts 1500-1508)*. *AFR 19-2* contains policies, responsibilities, and procedures for the Air Force EIAP within the United States and its territories. It applies to all Air Force activities and the Air National Guard.

AFR 19-2 gives procedures for preparing and processing an EIS, as follows. Brackets denote where original text has been summarized for clarity in relation to this EIS.

> **12. Preparing and Processing an EIS:**
>
> **a. Notice of Intent (NOI)--40 CFR 1508.22.** The NOI describing the proposed action must be published in the *Federal Register* and made available to newspapers and other media in the area (or areas) potentially affected by the proposed action....
>
> **b. Lead and Cooperating Agency Determination (40 CFR 1501.5).** [Lead and cooperating agencies are determined, and responsibilities of each concerning the preparation of the EIS are identified.]
>
> **c. Scoping (40 CFR 1501.7).** As soon as possible after the decision is made to prepare an EIS, and after the NOI is published, the public process called "scoping" must be used to determine the scope of issues to be addressed and to identify significant issues to be analyzed in depth related to the proposed action. This process should de-emphasize insignificant issues and narrow the scope of the EIS analysis accordingly (40 CFR 1500.4(g)). Scoping results in the proponent...identifying the range of actions, alternatives, and impacts to be considered in the EIS (40 CFR Part 1508.25).
>
> **d. Draft EIS.** [A preliminary draft EIS (40 CFR 1502.10) is prepared from the scope of issues decided on in the scoping process. Internal Air Force technical review is completed and coordinated, and the document is revised. When the review and revision is complete, a draft EIS is printed and distributed to the proper congressional delegations and other staff agencies and subsequently, to all others on the distribution list. The document is filed with the EPA.]
>
> **e. Public Review of Draft EIS (40 CFR 1502.19).** (1) The public comment period for the draft EIS is usually 45 days from publication of the notice in the *Federal Register*. If the statement is unusually long, a summary may be distributed to the public with an attached list of locations (such as public libraries) where the entire draft EIS may be reviewed. However, the EIS must be distributed to certain entities, such as agencies with jurisdiction by law or special expertise in evaluating the environmental impact involved.... (2) Public

meetings or hearings on the draft EIS should be held according to the standards in 40 CFR 1506.6 (c) and (d).

f. Response to Comments (40 CFR 1503.4). Responses to comments must be incorporated in the final EIS by either modifying the text or providing a written explanation in the comment section. When possible, comments of a similar nature may be grouped for a common response. Individual responses may also be made.

g. Preparing Final EIS. If the changes in the draft EIS are minor or limited to factual corrections, only a document that contains draft EIS comments, responses, and an errata sheet of changes may be prepared and circulated. However, the entire document with a new cover sheet must be filed with EPA (40 CFR 1503.4(c)). If more extensive modifications are required, the proponent must prepare a preliminary final EIS incorporating these modifications. The final EIS must be processed as outlined for the draft EIS except that the public need not be invited to comment during the 30 day post-filing waiting period (40 CFR 1503.1(b)).

h. Revisions and Supplements (40 CFR 1502.9). If at any time (during the planning process) there are substantial changes in the proposed action that would affect environmental concerns, or a significant new circumstance or information about environmental concerns becomes known, the proponent...must prepare revisions or supplements to the environmental documents to address these changes. The revisions or supplements are processed in the same way as the original document.

i. Mitigation. All measures that are proposed to minimize or mitigate expected significant environmental impacts must be identified in the final EIS. The proponent is responsible for implementing measures in the mitigation plan that are approved by the decision-maker. The proponent must make available to the public, on request, the status of mitigation measures associated with the action taken.

j. Decisions (40 CFR 1506.10). A decision on a proposed action must not be made until 30 days after the public has been notified that the final EIS has been filed with EPA.

k. Record of Decision (40 CFR 1505.2). The record of decision must be in writing and may be integrated into any other document required to implement the decision. The record of decision must be announced to the affected public except for classified portions. It should be concise and should explain the conclusion reached, the reason for the selection, and the alternatives considered. The alternative considered environmentally preferable must be identified, whether or not it was the alternative selected for implementation. All major factors considered, including essential considerations of national policy, should be summarized. The document must state whether all practicable means have been adopted to avoid or minimize environmental impact from the selected alternative; if not, explain why not. (Department of the Air Force. 10 August 1982. AFR 19-2, Sections 12a-k).

A.2 MOA EIS Chronology of Events

Table A-1 presents the MOA EIS chronology of events (to date) according to the EIAP outlined in section A.1 and the tentative schedule of events following the publication of the Final EIS.

Table A-1 MOA EIS Chronology of Events

Date	Action
9 July 1993	11th Air Force (11 AF), Pacific Air Forces (PACAF) published Notice of Intent to prepare an Environmental Impact Statement in *Federal Register*.
August 1993	Federal Aviation Administration (FAA) identified as a cooperating agency.
20 September through 15 November 1993	Scoping meetings held in Anchorage, Arctic Village, Chalkyitsik, Circle Hot Springs, Delta Junction, Eagle, Fairbanks, Fort Yukon, Glennallen, Lime Village, McGrath, Sleetmute, Talkeetna, and Venetie.
8 February 1994	Scoping meeting held in Tok.
November 1993 through August 1994	Technical reports and Preliminary and Approval versions of Draft EIS prepared. Air Force and peer review completed.
19 August 1994	Draft EIS submitted to Environmental Protection Agency (EPA).
2 September 1994	Notice of Availability of Draft EIS published in *Federal Register*. Copies sent to federal, state, and local agencies, and libraries. Executive Summaries sent to distribution list.
2 September 1994 through 30 November 1994	Public comment period for Draft EIS (extended 30 days for a total of 90 days).
17 September 1994 through 14 October 1994	Public hearings held in Anchorage, Arctic Village, Chalkyitsik, Circle Hot Springs, Delta Junction, Eagle, Fairbanks, Fort Yukon, Glennallen, Lime Village, McGrath, Sleetmute, Talkeetna, Tok, and Venetie.
December 1994 through July 1995	Preliminary and Approval versions of Final EIS (including responses to comments on Draft EIS) prepared. Air Force and peer review completed.
18 Aug 1995	Final EIS completed.
August 1995	FAA Circularization process commenced (tentative).
8 Sep 1995	Notice of Availability of Final EIS published in *Federal Register*. Copies sent to federal, state, and local agencies, and libraries. Executive Summaries sent to distribution list.
10 Oct 1995	End of post-filing waiting period for Final EIS.
January 1996	Final Record of Decision published (tentative).

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APPENDIX B

GEOGRAPHICAL MOA DESCRIPTIONS AND NOISE/FLIGHT SENSITIVE AREA LIST

This Appendix presents the geographical coordinates (latitude and longitude) for the MOAs under each alternative; a map depicting the shape of each MOA is included. The second part of the Appendix reproduces the current 11 AF *Noise/Flight Sensitive Area List*. These areas are also depicted on the maps in this appendix; they are numbered according to the list.

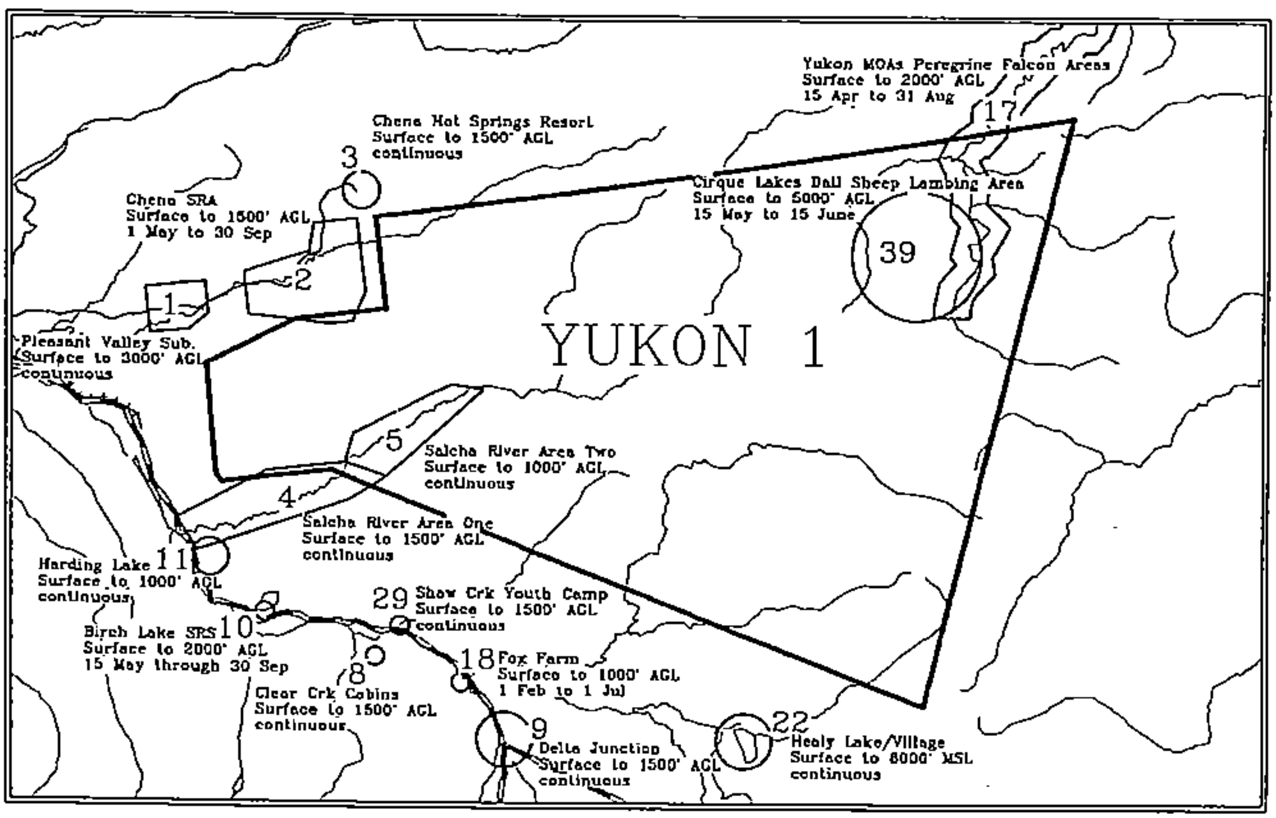
NOTE: The maps presented in this Appendix are for the purpose of depicting the shape of each MOA as well as illustrating the associated Noise-Sensitive/Flight Avoidance areas which are in place and would remain in place under any of the alternatives. The maps should be used in conjunction with the maps in the text, which show the entire airspace under the alternatives. **The maps are of varying scales and should not be used for navigational or other purposes, nor should they be considered wholly representative of the alternatives.**

B.1 GEOGRAPHICAL MOA DESCRIPTIONS

NORTHERN INTERIOR REGION

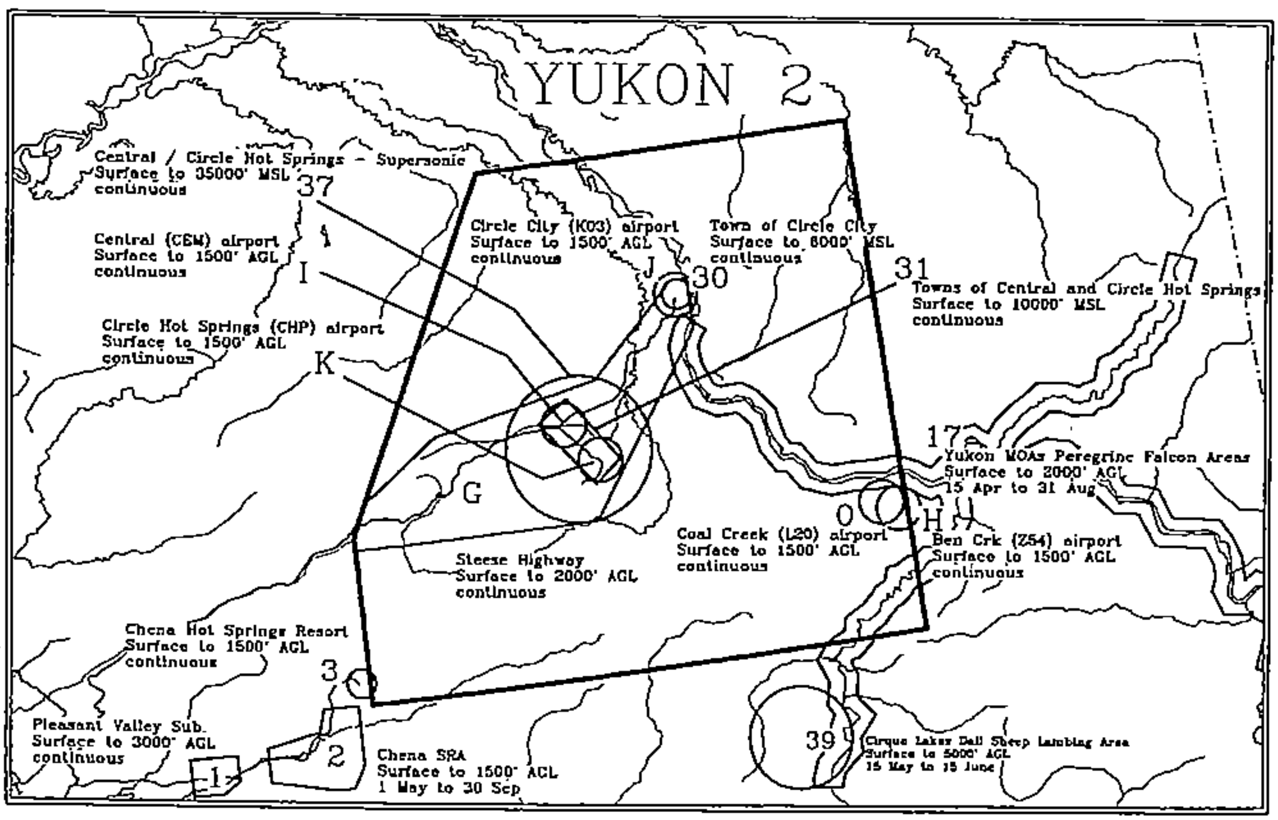
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
YUKON 1 MOA	YUKON 1 MOA
Beginning at lat. 64°46'11"N, long. 146°46'49"W to lat. 64°49'59"N, long. 146°23'09"W to lat. 64°49'59"N, long. 146°00'09"W to lat. 64°59'59"N, long. 146°00'09"W to lat. 64°59'59"N, long. 143°00'08"W to lat. 63°59'59"N, long. 144°00'08"W to lat. 64°12'28"N, long. 144°50'13"W to lat. 64°24'55"N, long. 145°42'07"W to lat. 64°31'17"N, long. 146°09'31"W to lat. 64°33'23"N, long. 146°18'39"W to lat. 64°33'24"N, long. 146°25'09"W to lat. 64°33'23"N, long. 146°46'09"W to lat. 64°34'24"N, long. 146°47'29"W to the point of beginning (excluding that portion wholly contained by R-2205 when active).	Under the NAA, YUKON 1 MOA would have the same coordinates as given under the Proposed Action.

Figure B-1 Map depicting YUKON 1 MOA and Flight Avoidance areas under the Proposed Action and all Alternatives.



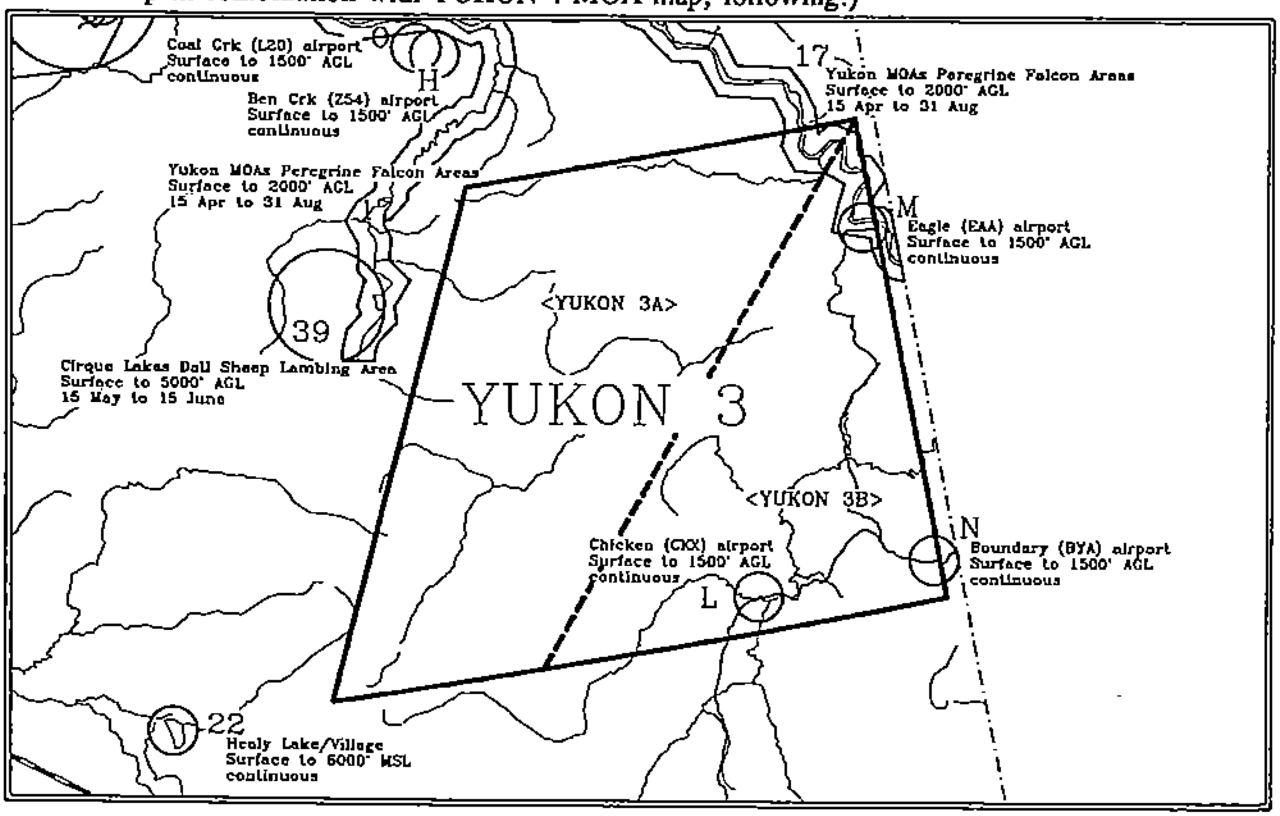
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
YUKON 2 MOA	YUKON 2 MOA
Beginning at lat. 66°09'59"N, long. 145°05'09"W to lat. 66°09'59"N, long. 143°00'09"W to lat. 64°59'59"N, long. 143°00'08"W to lat. 64°59'59"N, long. 146°00'09"W to lat. 65°22'59"N, long. 146°00'09"W to the point of beginning. Excludes airspace below 2,000 feet AGL in the area beginning at lat. 65°27'03"N, long. 145°55'32"W to lat. 65°34'59"N, long. 145°30'09"W to lat. 65°39'59"N, long. 144°35'09"W to lat. 65°51'59"N, long. 144°05'09"W to lat. 65°51'59"N, long. 144°00'09"W to lat. 65°44'59"N, long. 144°00'09"W to lat. 65°20'59"N, long. 144°40'09"W to lat. 65°20'59"N, long. 146°00'09"W to lat. 65°22'59"N, long. 146°00'09"W to the point of beginning. Excludes airspace 1,500 ft AGL and below within 3 NM radius of: Ben Creek (Z54) airport, lat. 65°16'48"N, long. 143°03'00"W; Central (CEM) airport, lat. 65°34'30"N, long. 144°46'54"W; Circle City (K03) airport, lat. 65°49'54"N, long. 144°04'24"W; Circle Hot Springs (CHP) airport, lat. 65°29'12"N, long. 144°36'30"W. Coal Creek (L20) airport, lat. 65°18'41"N, long. 143°08'08"W.	Under the NAA, YUKON 2 MOA would have the same coordinates as given under the Proposed Action.

Figure B-2 Map depicting YUKON 2 MOA and Flight Avoidance areas under the Proposed Action and all Alternatives.



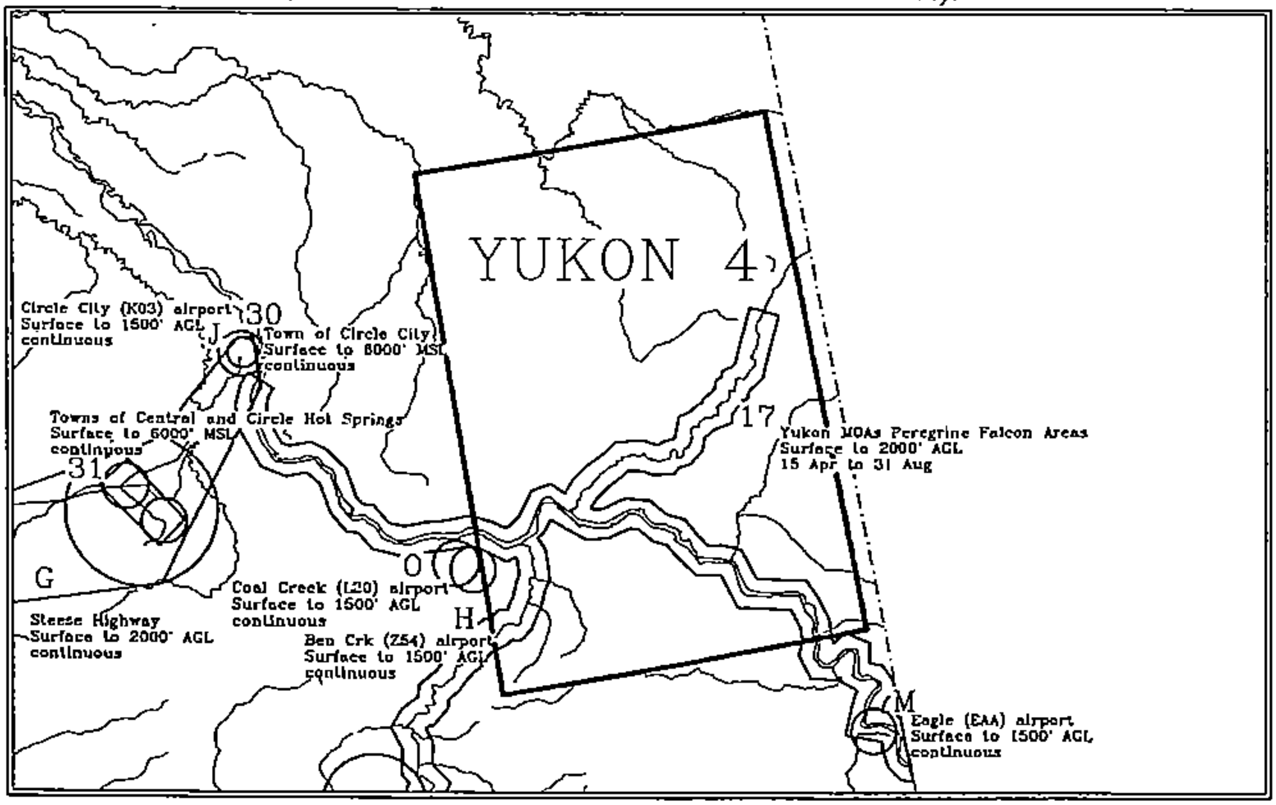
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
YUKON 3 MOA	YUKON 3 TMOA
Beginning at lat. 64°59'59"N, long. 143°00'08"W to lat. 64°59'59"N, long. 141°05'00"W to lat. 63°59'59"N, long. 141°05'00"W to lat. 63°59'59"N, long. 144°00'08"W to the point of beginning. Excludes airspace 1,5000 ft AGL and below within 3 NM radius of: Chicken (CKX) airport, lat. 64°04'18"N, long. 141°57'00"W; Eagle (EAA) airport, lat. 64°46'36"N, long. 141°08'54"W; and Boundary (BYA) airport, lat. 64°04'42"N, long. 141°06'42"W.	Beginning at lat. 66°09'59"N, long. 143°00'09"W to lat. 66°10'00"N, long. 141°05'00"W to lat. 64°00'00"N, long. 141°05'00"W to lat. 63°59'59"N, long. 144°00'08"W to lat. 64°59'59"N, long. 144°00'08"W to point of beginning.
Boundary changes in mitigated alternatives: YUKON 3 is divided into two MOAs by a line running from lat. 64°59'59"N, long. 141°05'00"W to lat. 63°59'59"N, long. 143°00'00"W. North and west of the line is YUKON 3A, south and east is YUKON 3B	

Figure B-3 Map depicting YUKON 3 MOA and Flight Avoidance areas under the Proposed Action and Alternatives A and B. (YUKON 3TMOA under the No Action Alternative would be depicted by this map in combination with YUKON 4 MOA map, following.)



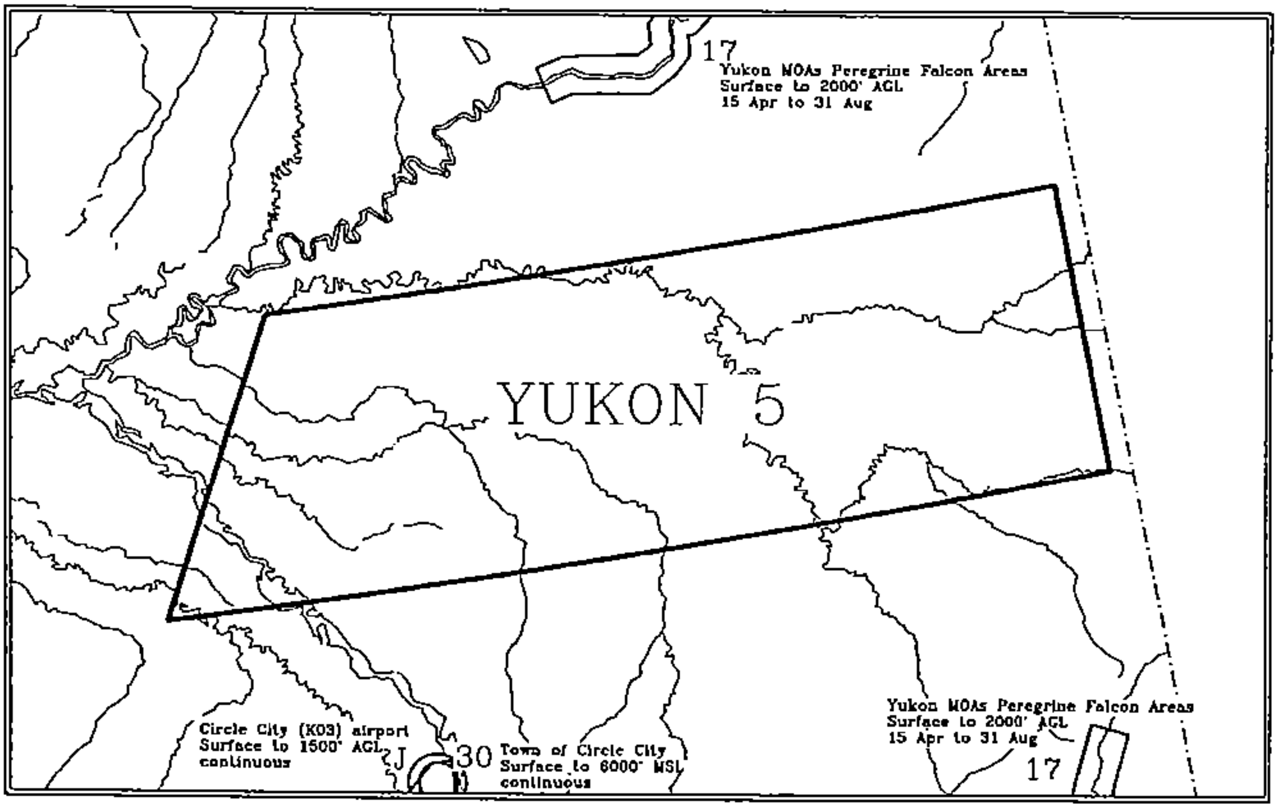
PROPOSED ACTION ALTERNATIVE A[1]	NO ACTION ALTERNATIVE
YUKON 4 MOA	(see YUKON 3 TMOA)
Beginning at lat. 64°59'59"N, long. 143°00'08"W to lat. 64°59'59"N, long. 141°05'00"W to lat. 66°09'59"N, long. 141°05'00"W to lat. 66°09'59"N, long. 143°00'09"W to the point of beginning. Excludes airspace 1,500 ft AGL and below within 3 NM radius of: Ben Creek (Z54) airport, lat. 65°16'48"N, long. 143°03'00"W.	
[1] YUKON 4 MOA is not part of ALTERNATIVE B airspace.	

Figure B-4 Map depicting YUKON 4 MOA and Flight Avoidance areas under the Proposed Action and Alternative A (see also YUKON 3 MOA for No Action Alternative).



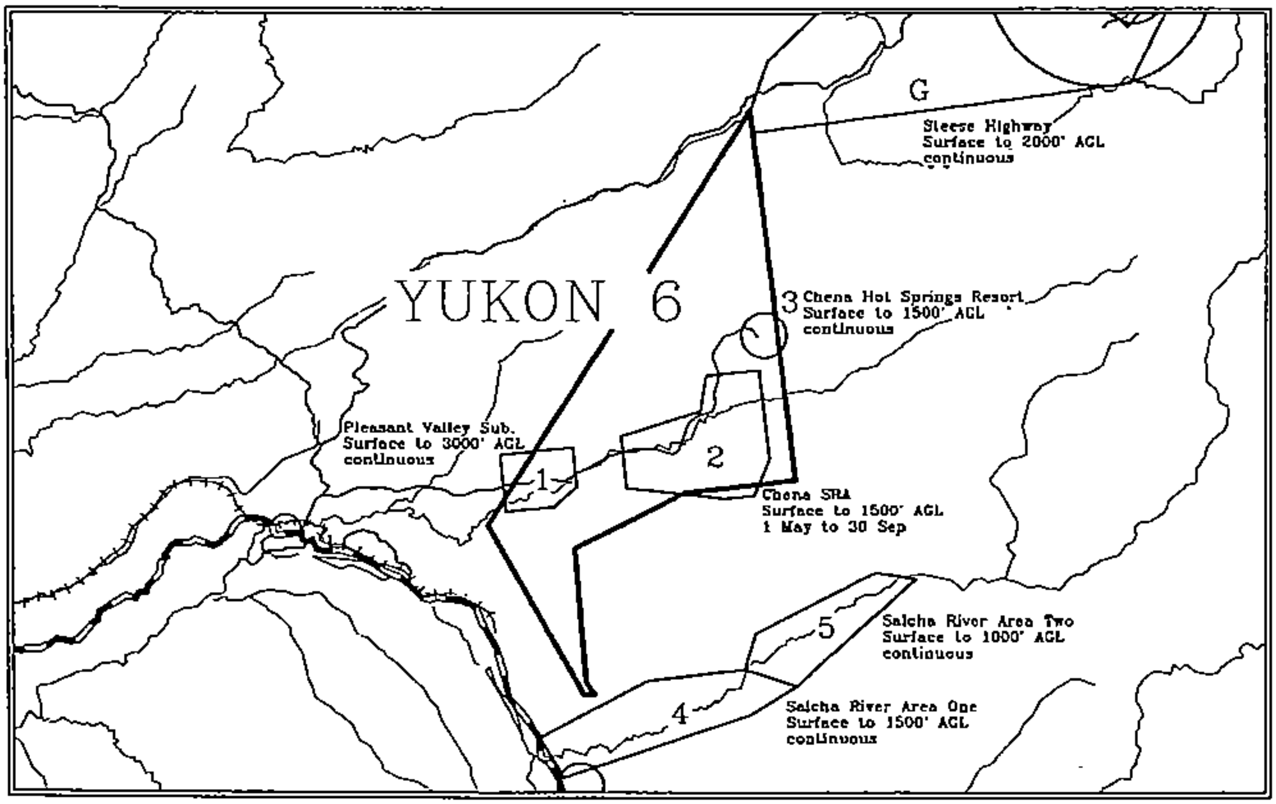
PROPOSED ACTION ALTERNATIVE A[1]	NO ACTION ALTERNATIVE
YUKON 5 MOA	YUKON 4 TMOA
Beginning at lat. 66°09'59"N, long. 145°05'09"W to lat. 66°40'00"N, long. 144°30'00"W to lat. 66°40'00"N, long. 141°05'00"W to lat. 66°09'59"N, long. 141°05'00"W to lat. 66°09'59"N, long. 143°00'09"W to the point of beginning.	Beginning at lat. 66°10'00"N, long. 145°05'00"W to lat. 66°40'00"N, long. 144°30'00"W to lat. 66°40'00"N, long. 141°05'00"W to lat. 66°10'00"N, long. 141°05'00"W to point of beginning.
[1] YUKON 5 MOA is not part of ALTERNATIVE B airspace.	

Figure B-5 Map depicting YUKON 5 MOA and Flight Avoidance areas under the Proposed Action and Alternative A; this map also represents YUKON 4 TMOA under No Action Alternative.



PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
YUKON 6 MOA	YUKON 1A TMOA
Beginning at lat. 65°22'59"N, long. 146°00'09"W to lat. 64°49'00"N, long. 147°04'00"W to lat. 64°33'23"N, long. 146°48'09"W to lat. 64°33'23"N, long. 146°46'09"W to lat. 64°34'24"N, long. 146°47'29"W to lat. 64°46'11"N, long. 146°46'49"W to lat. 64°49'59"N, long. 146°23'09"W to lat. 64°49'59"N, long. 146°00'09"W to lat. 64°59'59"N, long. 146°00'09"W to the point of beginning (excluding that portion wholly contained by R-2205 when active).	Beginning at lat. 65°22'59"N, long. 146°00'09"W to lat. 64°49'00"N, long. 147°04'00"W to lat. 64°33'23"N, long. 146°48'09"W to lat. 64°33'23"N, long. 146°46'09"W to lat. 64°34'24"N, long. 146°47'29"W to lat. 64°46'11"N, long. 146°46'49"W to lat. 64°49'59"N, long. 146°23'09"W to lat. 64°49'59"N, long. 146°00'09"W to the point of beginning (excluding that portion wholly contained by R-2205 when active).

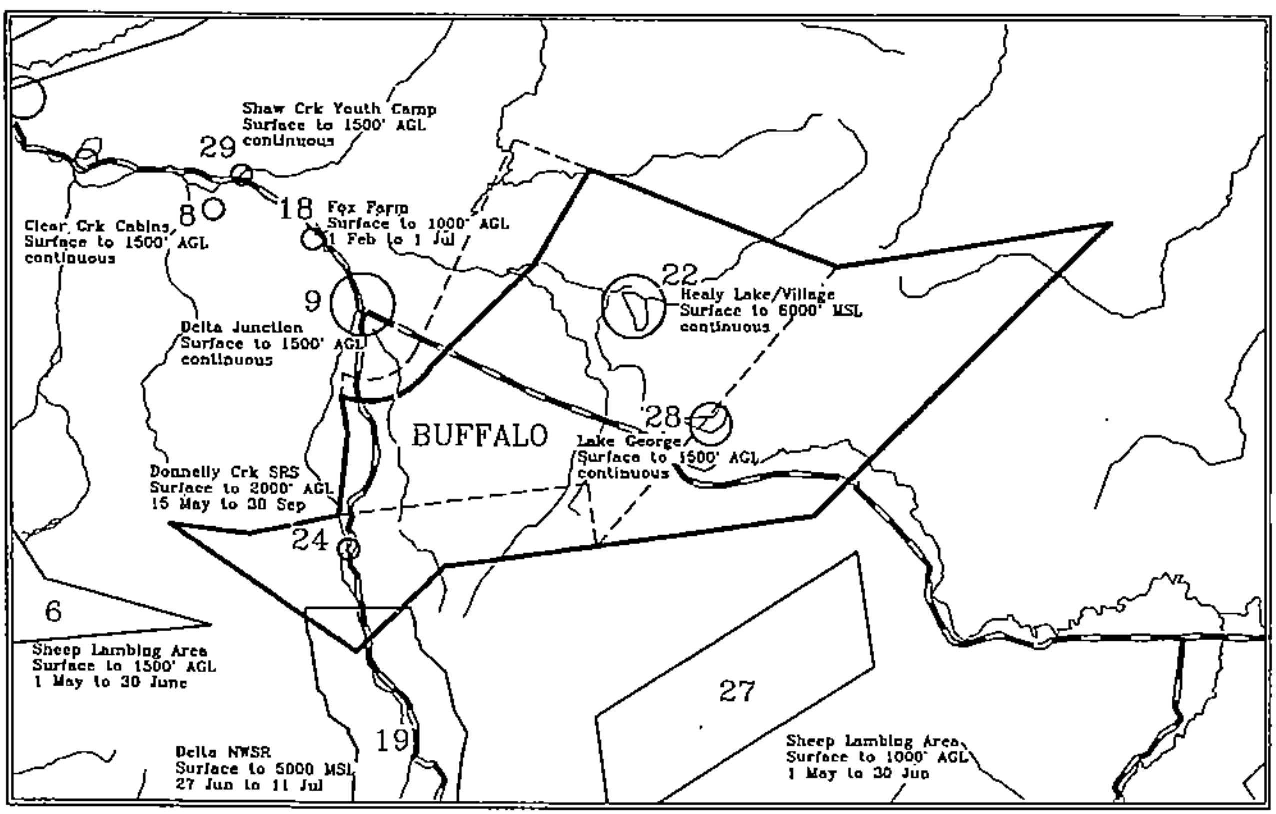
Figure B-6 Map depicting YUKON 6 MOA and Flight Avoidance areas under the Proposed Action and all Alternatives (YUKON 6 MOA and YUKON 1A TMOA under No Action Alternative are the same airspace).



SOUTHERN INTERIOR REGION

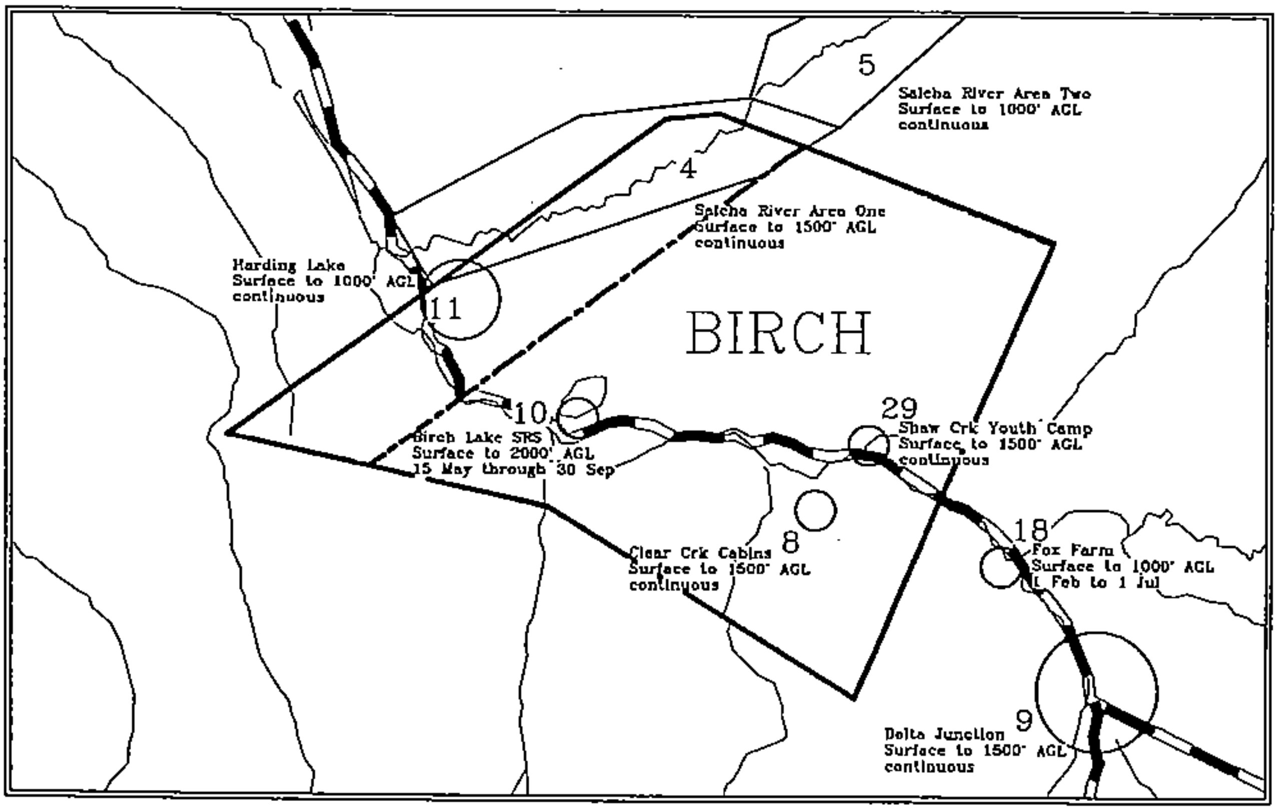
PROPOSED ACTION ALTERNATVE A ALTERNATVE B	NO ACTION ALTERNATIVE
BUFFALO MOA	**BUFLO TMOA**
Beginning at lat. 64°12'28"N, long. 144°50'13"W to lat. 63°59'59"N, long. 144°00'08"W to lat. 63°59'59"N, long. 143°00'00"W to lat. 63°37'00"N, long. 144°13'00"W to lat. 63°37'00"N, long. 145°33'00"W to lat. 63°30'00"N, long. 145°54'00"W to lat. 63°43'59"N, long. 146°30'08"W to lat. 63°42'14"N, long. 146°13'34"W to lat. 63°42'59"N, long. 145°54'09"W to lat. 63°50'29"N, long. 145°50'08"W to lat. 63°54'09"N, long. 145°50'27"W thence via a seven (7) NM arc counterclockwise of the BIG VORTAC to lat. 63°55'58"N, long. 145°30'24"W to lat. 64°04'12"N, long. 145°05'16"W to the point of beginning. Excludes airspace 1,500 ft AGL and below within 3 NM radius of the Black Rapids (5BK) airport, lat. 63°32'06"N, long. 145°51'39"W.	Beginning at lat. 63°59'59"N, long. 144°00'08"W to lat. 63°36'58"N, long. 145°00'00"W to lat. 63°43'00"N, long. 145°00'00"W to lat. 63°42'59"N, long. 145°54'09"W to lat. 63°50'29"N, long. 145°50'08"W to lat. 63°54'09"N, long. 145°50'41"W thence via a seven (7) NM arc counterclockwise of the BIG VORTAC to lat. 63°56'06"N, long. 145°30'18"W to lat. 64°04'12"N, long. 145°05'16"W to lat. 64°12'30"N, long. 144°50'10"W to the point of beginning.

Figure B-7 Map depicting (solid line) BUFFALO MOA and Flight Avoidance areas under the Proposed Action and Alternatives A and B; dashed line represents the BUFLO TMOA under the No Action Alternative (where it deviates from the Proposed BUFFALO MOA).



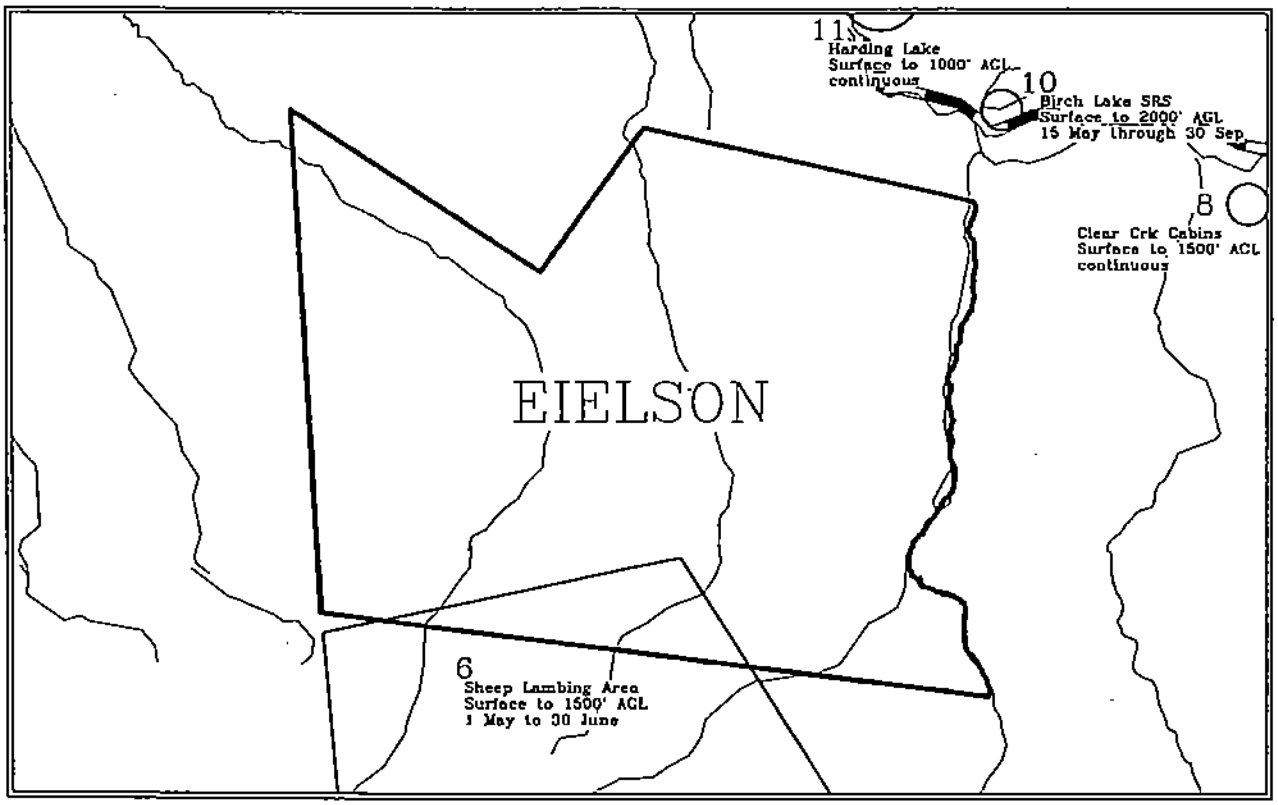
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
BIRCH MOA	**EIELSON A TMOA**
Beginning at lat. 64°19'58"N, long. 147°19'09"W to lat. 64°33'24"N, long. 146°25'09"W to lat. 64°33'23"N, long. 146°18'39"W to lat. 64°24'55"N, long. 145°42'07"W to lat. 64°03'34"N, long. 146°10'58"W to lat. 64°14'44"N, long. 146°43'23"W to the point of beginning.	lat. 64°19'58"N, long. 147°19'09"W to lat. 64°33'24"N, long. 146°25'09"W to lat. 64°33'23"N, long. 146°18'39"W to lat. 64°24'59"N, long. 145°42'09"W to lat. 64°03'34"N, long. 146°10'58"W to lat. 64°14'44"N, long. 146°43'23"W to the point of beginning.
Boundary changes in mitigated alternatives: The western boundary is moved eastwards to a line running from lat. 64°31'17"N, long. 146°09'31"W to lat. 64°17'43"N, long. 147°03'29"W	

Figure B-8 Map depicting BIRCH MOA and Flight Avoidance areas under the Proposed Action, Alternatives A and B, and EIELSON A TMOA under the No Action Alternative.



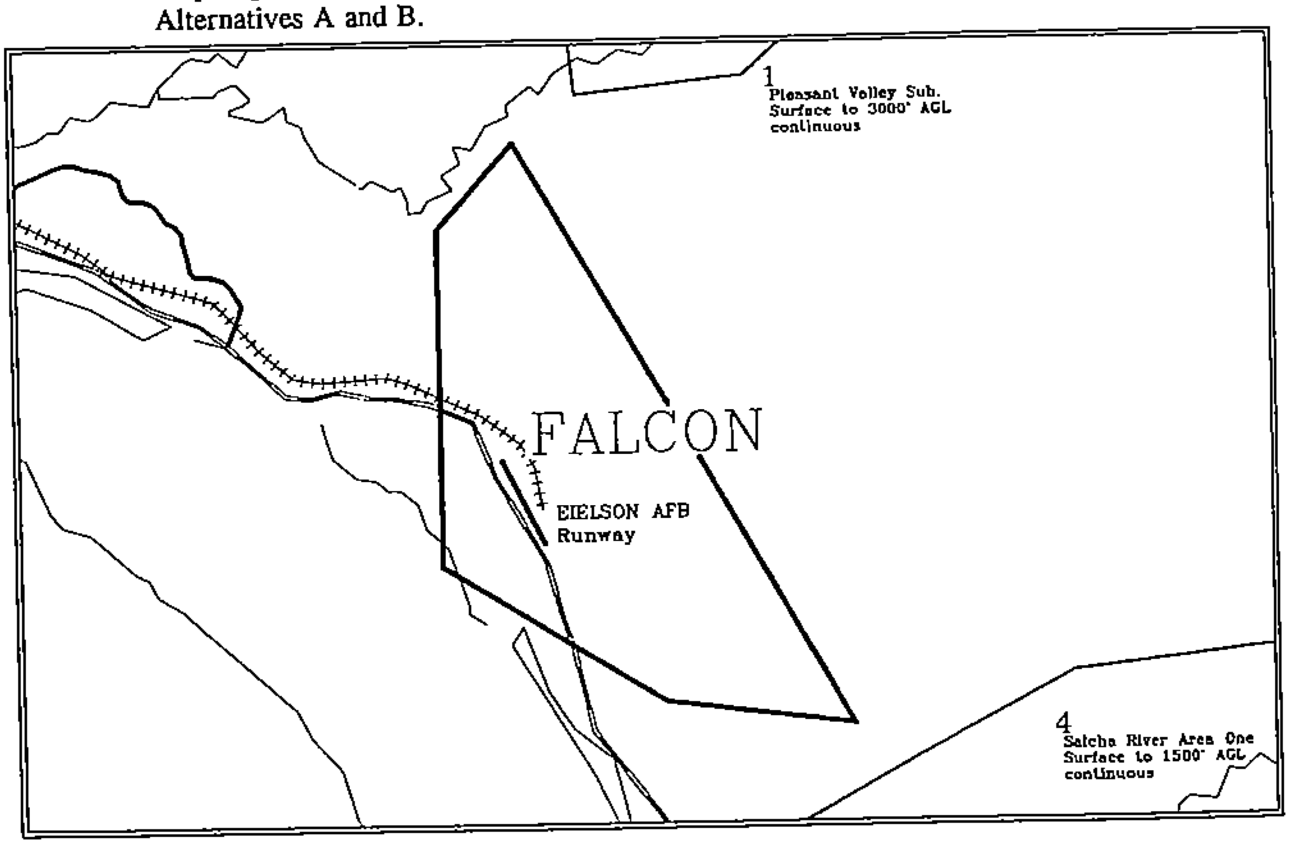
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
EIELSON MOA	EIELSON B TMOA
Beginning at lat. 63°50'49"N, long. 146°47'38"W to lat. 63°58'00"N, long. 148°00'00"W to lat. 64°22'28"N, long. 147°58'09"W to lat. 64°13'28"N, long. 147°32'08"W to lat. 64°19'58"N, long. 147°19'09"W to lat. 64°17'43"N, long. 147°03'29"W to lat. 64°14'44"N, long. 146°43'23"W thence along the east bank of the Little Delta and East Fork Rivers to the point of beginning.	Beginning at lat. 64°22'28"N, long. 147°58'09"W to lat. 64°13'28"N, long. 147°32'08"W to lat. 64°19'58"N, long. 147°19'09"W to lat. 64°14'44"N, long. 147°43'23"W thence along the east bank of the Little Delta and East Fork Rivers to lat. 63°50'49"N, long. 146°47'38"W to lat. 63°58'00"N, long. 148°00'00"W to the point of beginning. From 15 May to 30 Sep, EIELSON B TMOA would have a floor of 100 ft AGL north of line extending from lat. 64°10'00"N, long. 148°00'00"W to lat. 64°04'00"N, long. 146°50'00"W and a floor of 1,500 ft AGL south of the line.

Figure B-9 Map depicting EIELSON MOA and Flight Avoidance areas under the Proposed Action, Alternatives A and B, and EIELSON B TMOA under the No Action Alternative.



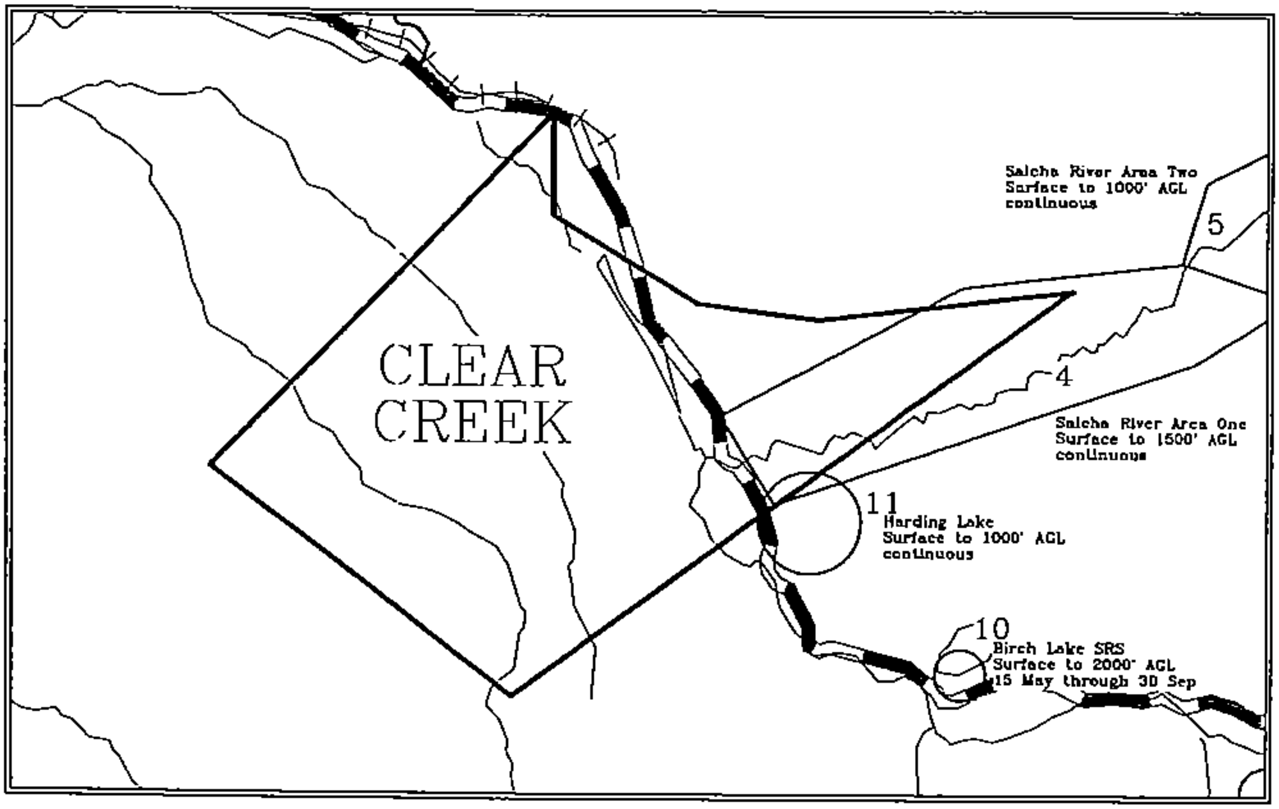
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
FALCON MOA	
Beginning at lat. 64°33'23"N, long. 146°48'09"W to lat. 64°49'00"N, long. 147°04'00"W to lat. 64°47'00"N, long. 147°09'00"W to lat. 64°38'30"N, long. 147°11'00"W to lat. 64°34'30"N, long. 146°59'00"W to the point of beginning (excluding the Eielson AFB Class D airspace, when active).	There would be no FALCON MOA under the No Action Alternative.

Figure B-10 Map depicting FALCON MOA and Flight Avoidance areas under the Proposed Action and Alternatives A and B.



PROPOSED ACTION ALTERNATIVE B	ALTERNATIVE A NO ACTION ALTERNATIVE
CLEAR CREEK MOA	
Beginning at lat. 64°42'29"N, long. 147°10'04"W to lat. 64°29'58"N, long. 147°44'09"W to lat. 64°19'58"N, long. 147°19'09"W to lat. 64°33'24"N, long. 146°25'09"W to lat. 64°33'23"N, long. 146°46'09"W to lat. 64°33'23"N, long. 146°48'09"W to lat. 64°34'30"N, long. 146°59'00"W to lat. 64°38'30"N, long. 147°11'00"W to the point of beginning (excluding the Eielson AFB Class D airspace, when active).	Under Alternative A and the No Action Alternative, there would be no CLEAR CREEK MOA.

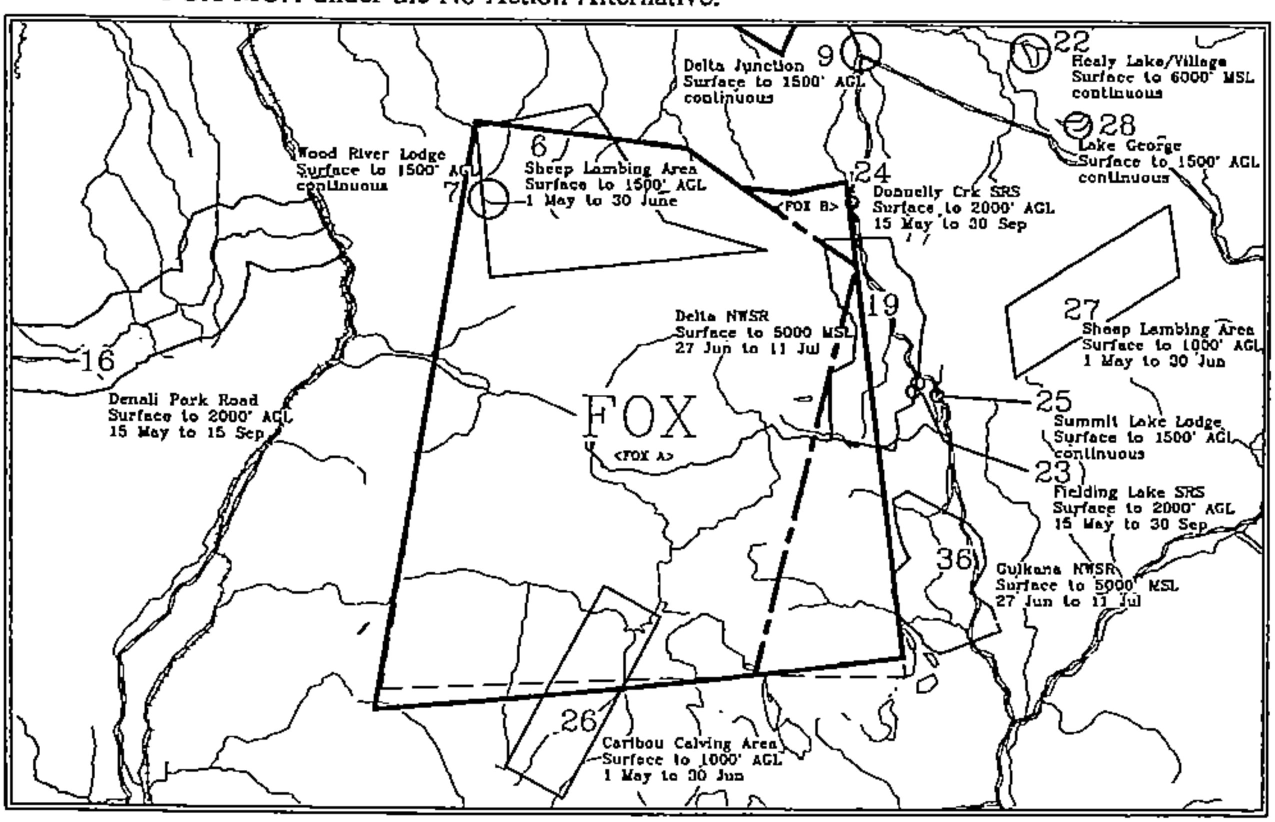
Figure B-11 Map depicting CLEAR CREEK MOA and Flight Avoidance areas under the Proposed Action and Alternative B.



SOUTHCENTRAL REGION

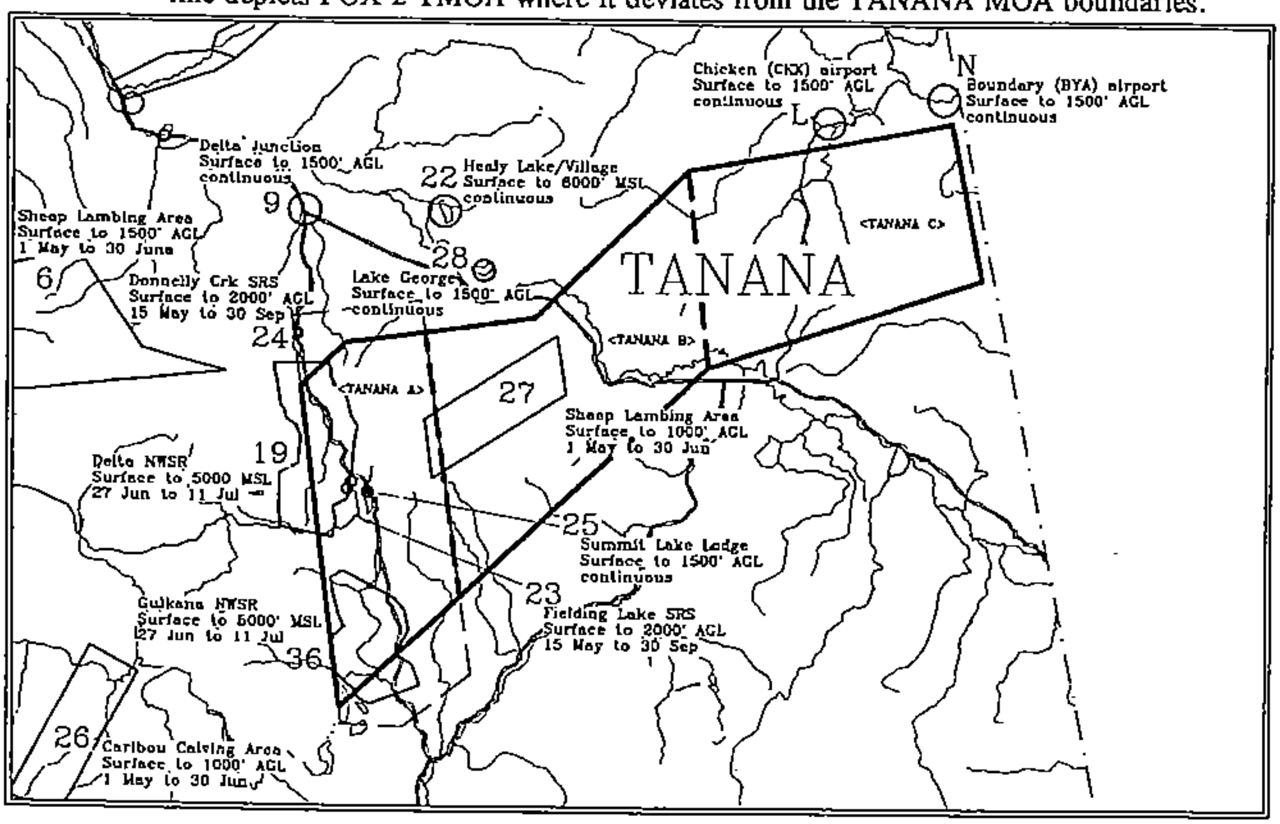
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
FOX MOA	FOX 1 TMOA
Beginning at lat. 63°58'00"N, long. 148°00'00"W to lat. 63°50'49"N, long. 146°47'38"W to lat. 63°43'59"N, long. 146°30'08"W to lat. 63°42'14"N, long. 146°13'34"W to lat. 63°42'59"N, long. 145°54'09"W to lat. 63°30'00"N, long. 145°54'00"W to lat. 62°30'00"N, long. 145°54'00"W to lat. 62°30'00"N, long. 148°50'50"W to the point of beginning. Excludes airspace below 7,000 feet MSL within the area contained by: lat. 63°43'59"N, long. 146°30'08"W to lat. 63°42'14"N, long. 146°13'34"W to lat. 63°42'59"N, long. 145°54'09"W to lat. 63°30'00"N, long. 145°54'00"W to the point of beginning.	Beginning at lat. 63°58'00"N, long. 148°00'00"W to lat. 63°50'49"N, long. 146°47'38"W to lat. 63°43'59"N, long. 146°30'08"W to lat. 63°42'14"N, long. 146°13'34"W to lat. 63°42'59"N, long. 145°54'09"W to lat. 62°27'00"N, long. 145°54'00"W to lat. 62°30'00"N, long. 146°45'00"W to lat. 62°33'00"N, long. 148°48'00"W to the point of beginning.
Boundary changes for mitigated alternatives: The south-east corner is moved westward to lat. 62°30'00"N, long. 146°43'19"W FOX is divided into two MOAs by a line running from lat. 63°43'59"N, long. 146°30'08"W to lat. 63°30'00"N, long. 145°54'00"W South of the line is FOX A, the smaller area north of the line is FOX B.	

Figure B-12 Map depicting FOX MOA (solid line) and Flight Avoidance areas under the Proposed Action and Alternatives A and B; dashed line depicts FOX 1 TMOA where it deviates from proposed FOX MOA under the No Action Alternative.



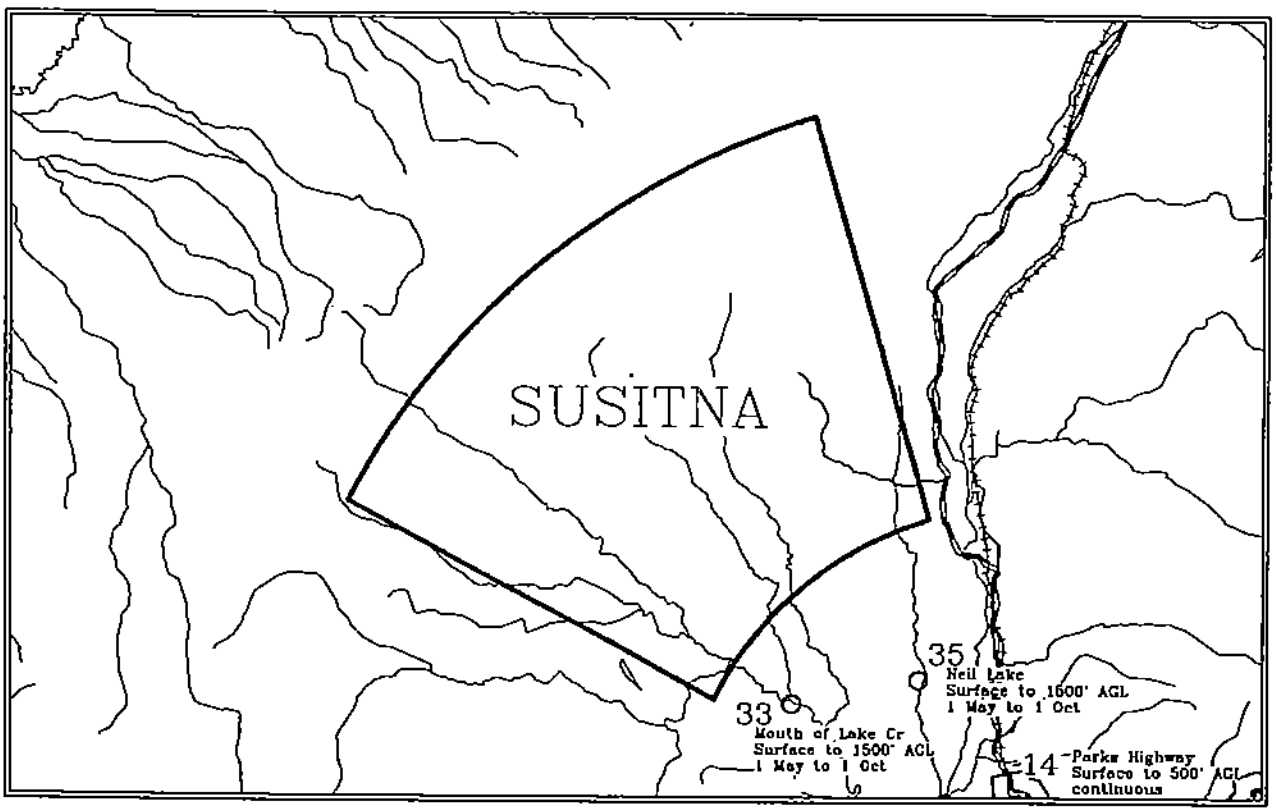
ALTERNATIVE B[1]	NO ACTION ALTERNATIVE[2]
TANANA MOA	FOX 2 TMOA
Beginning at lat. 62°30'00"N, long. 145°54'00"W to lat. 63°30'00"N, long. 145°54'00"W to lat. 63°37'00"N, long. 145°33'00"W to lat. 63°37'00"N, long. 145°00'00"W to lat. 63°37'00"N, long. 144°13'00"W to lat. 63°59'59"N, long. 143°00'00"W to lat. 63°59'59"N, long. 141°05'00"W to lat. 63°30'00"N, long. 141°05'00"W to lat. 63°23'00"N, long. 143°05'00"W to lat. 62°47'37"N, long. 145°00'00"W to the point of beginning. Excludes airspace 3,000 AGL and below west of the line: lat. 63°37'00"N, long. 145°00'00"W to lat. 62°47'37"N, long. 145°00'00"W,	Beginning at lat. 63°43'00"N, long. 145°54'01"W to lat. 63°43'00"N, long. 145°00'00"W to lat. 62°33'00"N, long. 145°00'00"W to lat. 62°25'00"N, long. 145°30'00"W to lat. 62°27'00"N, long. 145°54'00"W to the point of beginning.
[1] TANANA MOA is not part of the PROPOSED ACTION or ALTERNATIVE A.	[2] FOX 2 TMOA would make up a small portion of the TANANA MOA proposed under Alternative B.
Boundary changes for mitigated alternatives: TANANA is divided into three MOAs by lines running from 63°37'00"N, long. 145°00'00"W to lat. 62°47'37"N, long. 145°00'00"W and from lat. 63°59'59"N, long. 143°00'00"W to lat. 63°23'00"N, long. 143°05'00"W. The western section is TANANA A, the middle section is TANANA B, and the eastern section is TANANA C.	

Figure B-13 Map depicting TANANA MOA and Flight Avoidance areas under the Alternative B; the dashed line depicts FOX 2 TMOA where it deviates from the TANANA MOA boundaries.



PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
SUSITNA MOA	SUSITNA MOA
Beginning at lat. 62°18'34"N, long. 152°40'14"W thence clockwise on the 89 DME arc of the BGQ VORTAC to lat. 63°00'43"N, long. 150°41'38"W to lat. 62°14'08"N, long. 150°18'20"W thence counterclockwise on the 41 DME arc of the BGQ Vortac to lat. 61°54'58"N, long. 151°12'53"W to the point of beginning.	Under the NAA, SUSITNA MOA would have the same coordinates as given under the Proposed Action.

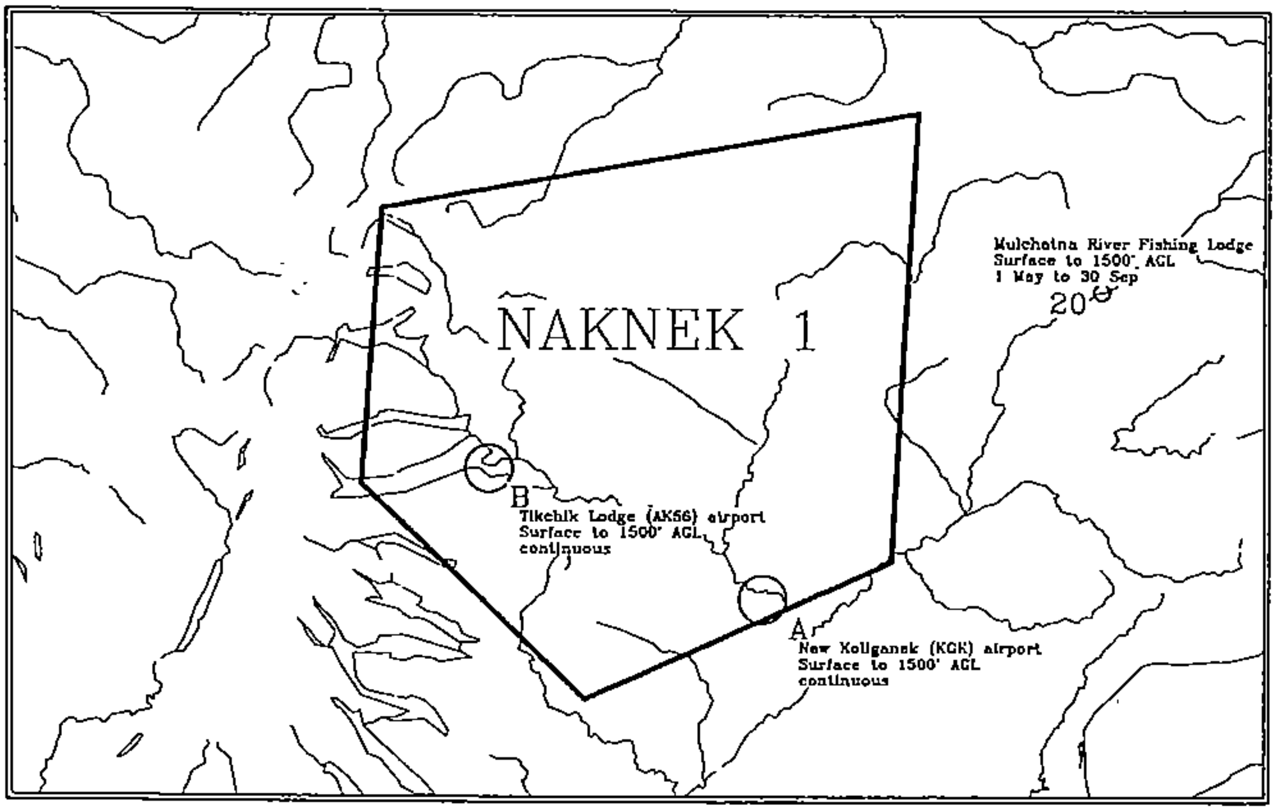
Figure B-14 Map depicting SUSITNA MOA and Flight Avoidance areas under the Proposed Action and all Alternatives.



WESTERN REGION

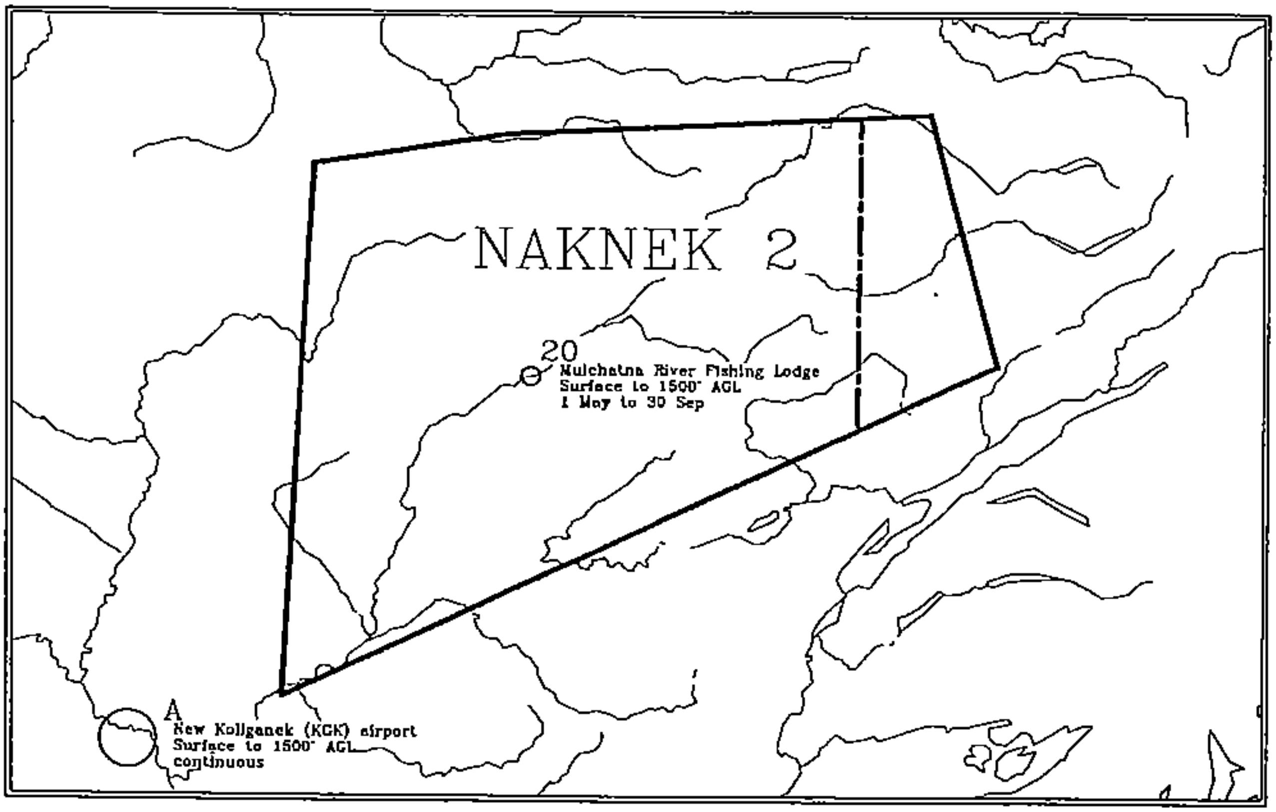
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
NAKNEK 1	NAKNEK 1
Beginning at lat. 60°29'57"N, long. 159°00'08"W to lat. 60°45'57"N, long. 156°43'08"W to lat. 59°48'57"N, long. 156°45'08"W to lat. 59°29'57"N, long. 158°00'08"W to lat. 59°54'57"N, long. 159°00'08"W to the point of beginning. Excludes airspace 1,500 ft AGL and below within 3 NM radius of: New Koliganek (ZGK) airport, lat. 59°43'36"N, long. 157°17'00"W. Tikchik Lodge (AK56) airport, lat. 59°58'00"N, long. 158°28'00"W.	Under the NAA, NAKNEK 1 MOA would have the same coordinates as given under the Proposed Action.

Figure B-15 Map depicting NAKNEK 1 MOA and Flight Avoidance areas under the Proposed Action and all Alternatives.



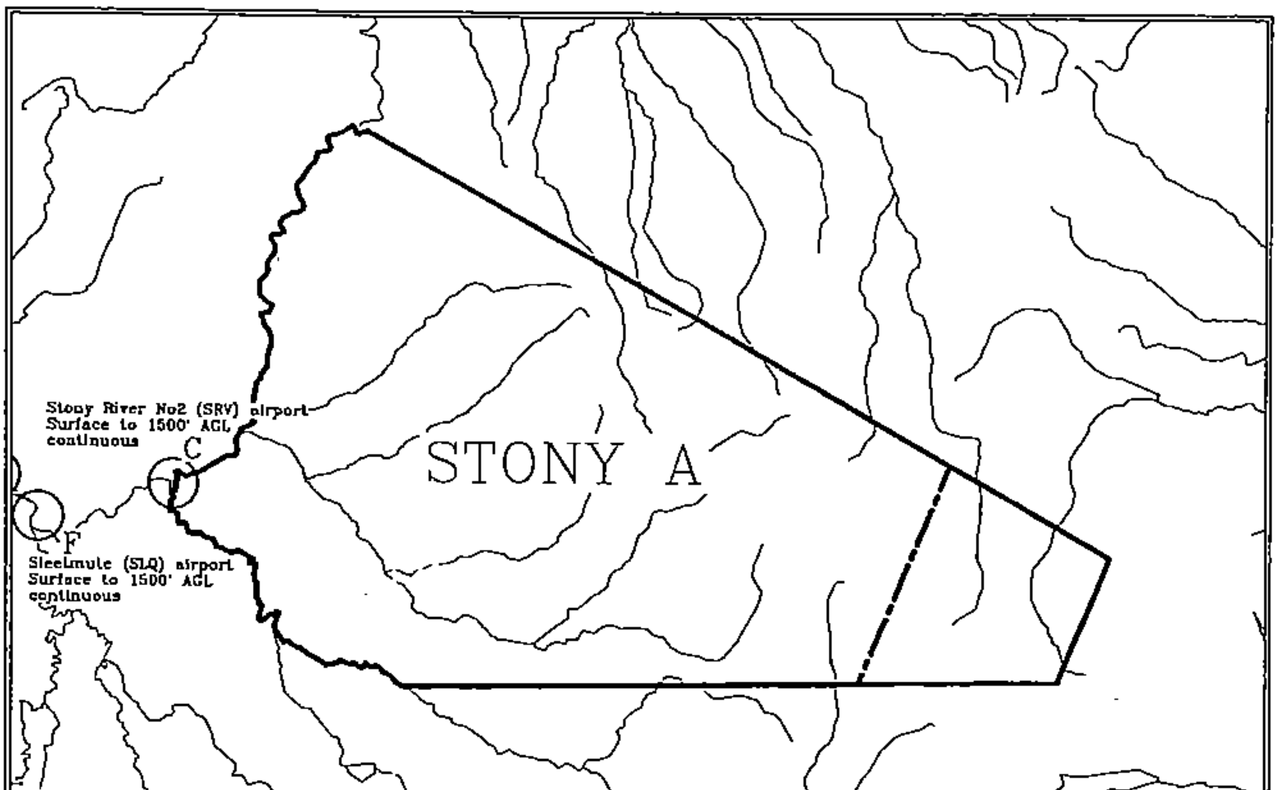
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
NAKNEK 2	NAKNEK 2
Beginning at lat. 60°45'57"N, long. 156°43'08"W to lat. 60°49'58"N, long. 156°00'08"W to lat. 60°52'58"N, long. 154°28'08"W to lat. 60°25'58"N, long. 154°13'08"W to lat. 59°48'57"N, long. 156°45'08"W to the point of beginning.	Under the NAA, NAKNEK 2 MOA would have the same coordinates as given under the Proposed Action.
Boundary changes for mitigated alternatives: The eastern boundary is moved westward to a line running from lat. 60°52'33"N, long. 154°43'15"W to lat. 60°18'58"N, long. 154°43'15"W	

Figure B-16 Map depicting NAKNEK 2 MOA and Flight Avoidance areas under the Proposed Action and all Alternatives.



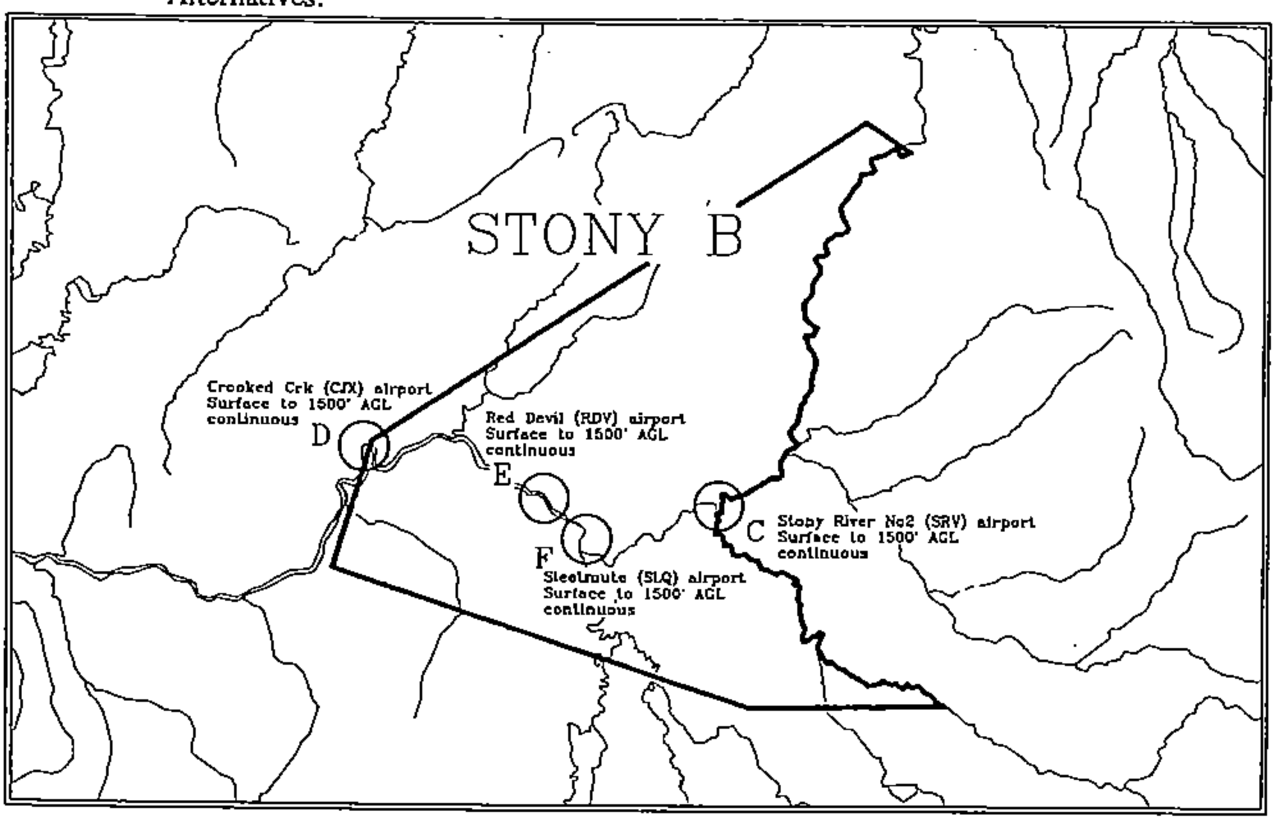
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
STONY A	STONY A
Beginning at lat. 62°31'28"N, long. 155°48'08"W to lat. 61°39'58"N, long. 152°34'08"W to lat. 61°24'58"N, long. 152°48'08"W to lat. 61°23'58"N, long. 155°35'08"W thence northward along the east bank of the Stony River until it joins the Kuskokwim River, thence northward along the east bank of the Kuskokwim River until it joins the point of beginning. Excludes airspace 1,500 ft AGL and below within 3 NM radius of: Stony River No2 (SRV) airport, lat. 61°47'24"N, long. 156°35'12"W.	Under the NAA, STONY A MOA would have the same coordinates as given under the Proposed Action.
Boundary changes for mitigated alternatives: The eastern boundary is moved westward to a line running from lat. 61°51'22"N, long. 153°14'44"W to lat. 61°25'01"N, long. 153°38'39"W	

Figure B-17 Map depicting STONY A MOA and Flight Avoidance areas under the Proposed Action and all Alternatives.



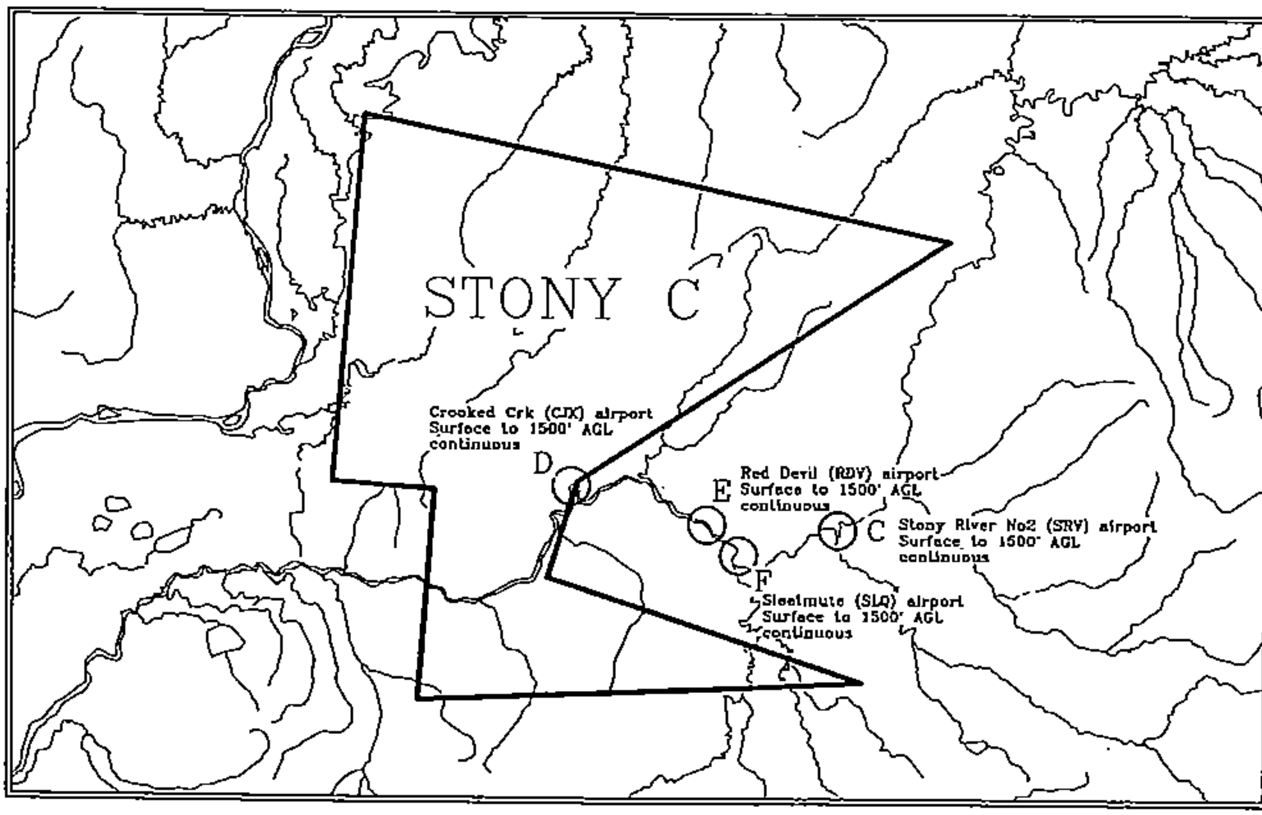
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
STONY B	STONY B
Beginning at lat. 61°23'58"N, long. 155°35'08"W to lat. 61°22'58"N, long. 156°25'08"W to lat. 61°37'12"N, long. 158°14'09"W to lat. 61°52'57"N, long. 158°06'09"W to lat. 62°34'58"N, long. 156°00'08"W to lat. 62°31'28"N, long. 155°48'08"W thence southward along the east bank of the Kuskokwim River until it joins the Stony River, thence southward along the east bank of the Stony River until it joins the point of beginning. Excludes airspace 1,500 ft AGL and below within 3 NM radius of: Stony River No2 (SRV) airport, lat. 61°47'24"N, long. 156°35'12"W. Crooked Crk (CJX) airport, lat. 61°52'12"N, long. 158°08'06"W. Red Devil (RDV) airport, lat. 61°47'18"N, long. 157°20'42"W. Sleetmute (SLQ) airport, lat. 61°42'36"N, long. 157°09'12"W.	Under the NAA, STONY B MOA would have the same coordinates as given under the Proposed Action.

Figure B-18 Map depicting STONY B MOA and Flight Avoidance areas under the Proposed Action and all Alternatives.



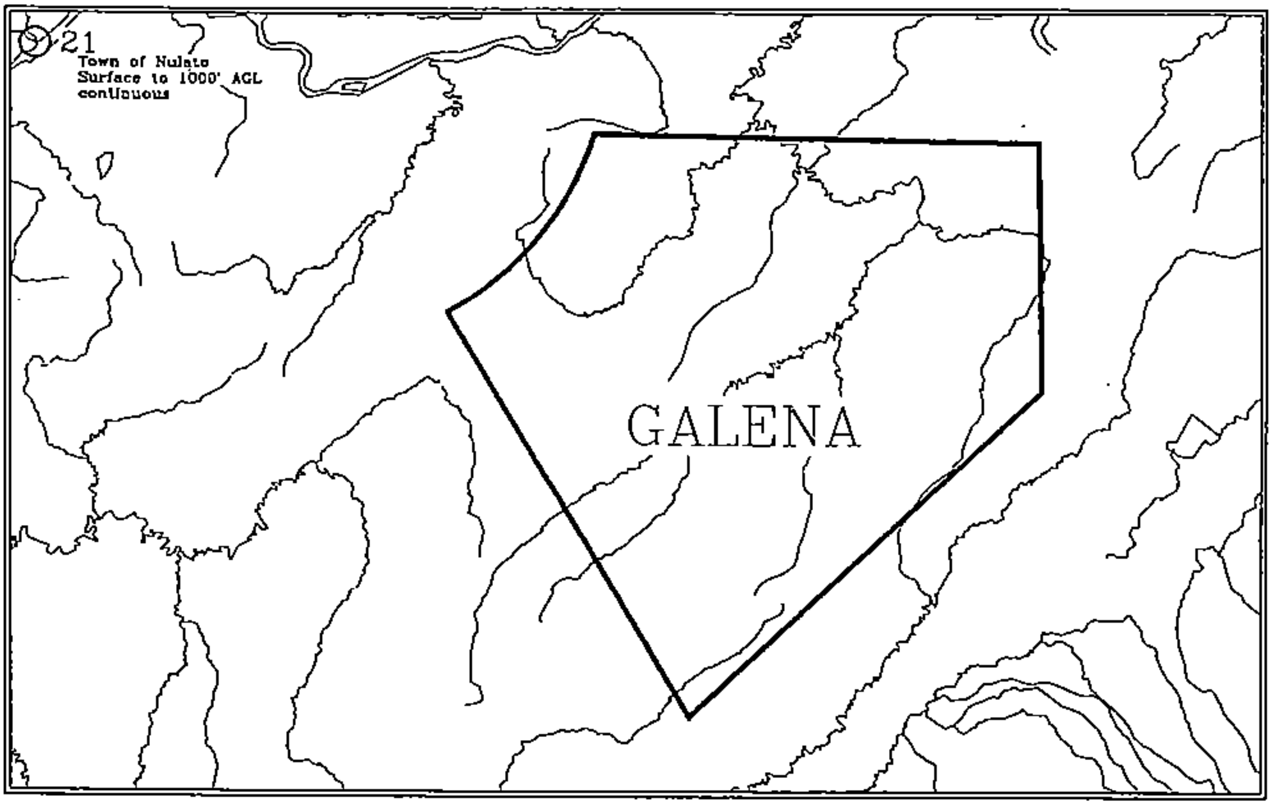
PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
	STONY C TMOA
There would be no STONY C MOA under the PROPOSED ACTION, ALTERNATVE A, or ALTERNATIVE B.	Beginning at lat. 61°23'00"N, long. 156°25'00"W to lat. 61°16'00"N, long. 158°55'00"W to lat. 61°50'00"N, long. 158°55'00"W to lat. 61°50'00"N, long. 159°30'00"W to lat. 62°50'00"N, long. 159°30'00"W to lat. 62°35'00"N, long. 156°00'00"W to lat. 61°53'00"N, long. 158°06'00"W to lat. 61°37'15"N, long. 158°14'00"W to the point of beginning. Excludes airspace 1,500 ft AGL and below within 3 NM radius of: Flat (FLT) airport, 62°27'00"N, 157°58'00"W; Shageluk (SHX) airport, 62°42'00"N, 159°33'00"W; Decourcy Mt. Mine (Z-99) airport, 62°04'00"N, 158°27'00"W; and Crooked Creek (CJX) airport, 62°42'00"N, 158°08'00"W.

Figure B-19 Map depicting STONY C TMOA and Flight Avoidance areas under the No Action Alternative.



PROPOSED ACTION ALTERNATIVE A ALTERNATIVE B	NO ACTION ALTERNATIVE
GALENA MOA	GALENA MOA
Beginning at lat. 64°09'53"N long. 156°00'01"W, thence counterclockwise via a 40 NM radius arc from the Galena VORTAC to lat. 64°34'03"N long. 155°16'45"W to lat. 64°32'58"N long. 153°00'09"W to lat. 63°59'58"N long. 153°00'09"W to lat. 63°16'58"N long. 154°45'08"W to the point of beginning.	Under the NAA, GALENA MOA would have the same coordinates as given under the Proposed Action.

Figure B-20 Map depicting GALENA MOA and Flight Avoidance areas under the Proposed Action and all Alternatives.



B.2 NOISE/FLIGHT SENSITIVE AREA LIST

The 11 AF maintains a *Noise/Flight Sensitive Area List*, which details Flight Avoidance areas around specific sites considered sensitive to aircraft noise and/or overflight. These sites currently include residential areas, biologically sensitive areas, recreation areas, and high traffic areas (either ground vehicles or aircraft), etc. These Flight Avoidance areas are subject to change as environmental sensitivities change. The restriction parameters are the geographic coordinates (i.e., the size and shape of the Flight Avoidance area), altitudes (e.g., surface to 3000' AGL, surface to 1500' AGL, etc.), and time of year (e.g., 1 May to 30 September, continuous, etc.).

The *Noise/Flight Sensitive Area List* is reviewed annually by 611 AOG/DOOU and approved by 611 AOG/CC to ensure all entries are still valid. Potential additions or deletions to the list that are brought to the attention of 611 AOG/DOOU are reviewed. Revisions may be initiated by state, federal, or public concerns. Revisions identified outside of the annual review are resolved as they occur.

For the EIS analysis, the current list is considered to be part of the existing environment, and these Flight Avoidance areas are taken into account in the analysis of environmental consequences for each alternative to the extent practicable. The Flight Avoidance areas are depicted on the MOA maps in the preceding section; the numbers shown on the maps correspond to the numbers on this list.

NOISE/FLIGHT SENSITIVE AREA LIST
11 Air Force
(Current as of 6 Apr 95)

1. Pleasant Valley Subdivision
   a. Description: 64 55'N/147 00'W to
   64 55'N/146 45'W to
   64 51'30"N/146 45'W to
   64 50'N/146 50'W to
   64 50'N/147 00'W to
   Point of beginning
   b. Altitude: Surface to 3000' AGL
   c. Time of year: continuous

2. Chena Recreation Area
   a. Description: 65 00'N/146 16'W to
   65 00'N/146 05'W to
   64 52"N/146 05'W to
   64 49'N/146 09'W to
   64 49'N/146 15'W to
   64 51'N/146 35'W to
   64 55'33"N/146 35'W to
   64 57'N/146 18'W to
   Point of beginning
   b. Altitude: Surface to 1500' AGL
   c. Time of year: 1 May to 30 Sep

3. Chena Hot Springs Resort
   a. Description: Two mile radius around 65 03'N/146 03'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: continuous

4. Salcha River Area One
   a. Description: 64 26'20"N/146 54'W to
   64 30'N/146 15'W to
   64 32'N/146 05'W to
   64 34'N/146 15'W to
   64 34'N/146 35'W to
   64 30'N/146 58'W to
   Point of beginning
   b. Altitude: Surface to 1500' AGL
   c. Time of year: continuous

5. Salcha River Area Two
   a. Description: 64 34'N/146 15'W to
   64 37'N/146 12'W to
   64 41'N/145 46'W to
   64 40'N/145 38'W to
   64 32'N/146 05'W to
   Point of beginning
   b. Altitude: Surface to 1000' AGL
   c. Time of year: continuous

6. Sheep Lambing Area
   a. Description: 63 57'N/148 00'W to
   63 34'N/148 00'W to
   63 34'N/146 24'W to
   63 40'N/146 58'W to
   63 59'N/147 20'W to
   Point of beginning
   b. Altitude: Surface to 1500' AGL
   c. Time of year: 1 May to 30 June

7. Wood River Lodge
   a. Description: Three mile radius around 63 46'N/147 58'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: continuous

8. Clear Creek Cabins
   a. Description: One mile radius around 64 13'05"N/146 13'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: continuous

9. Delta Junction
   a. Description: Three mile radius around 64 02'30"N/145 43'30"W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: continuous

10. Birch Lake State Recreation Site
    a. Description: One mile radius around 64 19'N/146 39'W
    b. Altitude: Surface to 2000' AGL
    c. Time of year: 15 May through 30 Sep

11. Harding Lake
    a. Description: Two mile radius around 64 25'30"N/146 51'W
    b. Altitude: Surface to 1000' AGL
    c. Time of year: continuous

12. Hog Farm
    a. Description: One mile radius around 61 59'N/147 01'W
    b. Altitude: Surface to 1000' AGL
    c. Time of year: continuous

13. Ryan Lodge
    a. Description: One mile radius around 62 02'N/146 40'W
    b. Altitude: Surface to 1500' AGL
    c. Time of year: continuous

14. Parks Highway
    a. Description: Two miles either side of the highway from Willow, 61 45'N/150 02'W, to Palmer, 61 36'N/149 07'W
    b. Altitude: Surface to 500' AGL
    c. Time of year: continuous

15. Glenn Highway
    a. Description: Two miles either side of Glenn Highway from Sheep Mountain NDB, 61 49'N/147 30'W, to Palmer, 61 36'N/149 07'W
    b. Altitude: Surface to 1000' AGL
    c. Time of year: continuous

16. Denali Park Road
    a. Description: Five miles either side of the road from the park entrance, 63 44'N/148 55'W, to Kantishna, 63 32'N/150 57'W
    b. Altitude: Surface to 2000' AGL
    c. Time of year: 15 May to 15 Sep

17. Yukon MOAs Peregrine Falcon Areas
    a. Description: Two miles either side of the river
       - Upper Yukon River: Between 64 41'N/141 00'W and 65 46'N/144 00'W
       - Charley River: Between 64 41'N/143 38'W and 65 19'N/142 46'W
       - Kandik River: Between 65 44'N/141 17'W and 65 22'N/142 30'W
       - Porcupine River: Between 67 24'N/141 00'W and 66 59'N/143 08'W
    b. Altitude: Surface to 2000' AGL
    c. Time of year: 15 Apr to 31 Aug

18. Fox Farm
    a. Description: One mile radius around 64 09'12"N/145 52'30"W
    b. Altitude: Surface to 1000' AGL
    c. Time of year: 1 Feb to 1 Jul

19. Delta National Wild and Scenic River
    a. Description: 5 miles either side of the river from 63 03'N/145 59'W to 63 34'N/145 53'W
    b. Altitude: Surface to 5000 MSL
    c. Time of year: 27 Jun to 11 Jul

20. Mulchatna River Fishing Lodge
    a. Description: One mile radius around 60 24'N/155 54'W
    b. Altitude: Surface to 1500' AGL
    c. Time of year: 1 May to 30 Sep

21. Town of Nulato
    a. Description: Two mile radius around 64 43'N/158 09'W
    b. Altitude: Surface to 1000' AGL
    c. Time of year: continuous

22. Healy Lake/Village
    a. Description: Three mile radius around 63 59'N/144 45'W
    b. Altitude: Surface to 6000' MSL
    c. Time of year: continuous

23. Fielding Lake State Recreation Site
    a. Description: One mile radius around
        (1) 63 10'N/145 40'W
        (2) 63 11.2'N/145 38'W
    b. Altitude: Surface to 2000' AGL
    c. Time of year: 15 May to 30 Sep

24. Donnelly Creek State Recreation Site
    a. Description: One mile radius around 63 39'40"N/145 53'W
    b. Altitude: Surface to 2000' AGL
    c. Time of year: 15 May to 30 Sep

25. Summit Lake Lodge
    a. Description: One mile radius around 63 09'N/145 32'W
    b. Altitude: Surface to 1500' AGL
    c. Time of year: continuous

26. Caribou Calving Area
    a. Description: Five miles either side of the line from 62 17'N/148 00'W to 62 43'N/147 22'W
    b. Altitude: Surface to 1000' AGL
    c. Time of year: 1 May to 30 Jun

27. Sheep Lambing Area
   a. Description: 63 21'N/145 05'W to
      63 33'N 144 05'W to
      63 22'N/144 05'W to
      63 10'N/145 05'W to
      Point of beginning
   b. Altitude: Surface to 1000' AGL
   c. Time of year: 1 May to 30 Jun

28. Lake George
   a. Description: Two mile radius around 63 47'N/144 32'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: continuous

29. Shaw Creek Youth Camp
   a. Description: One mile radius around 64 16'N/146 06'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: continuous

30. Town of Circle City
   a. Description: Two mile radius around 65 50'N/144 04'W
   b. Altitude: Surface to 6000' MSL
   c. Time of year: continuous

31. Towns of Central and Circle Hot Springs
   a. Description: 65 35'N/144 55'W to
      65 38'N 144 45'W to
      65 29'N/144 30'W to
      65 26'N/144 39'W to
      Point of beginning
   b. Altitude: Surface to 10,000' MSL
   c. Time of year: continuous

32. Mouth of Alexander Creek
   a. Description: One mile radius around 61 25'N/150 35'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: 1 May to 1 Oct

33. Mouth of Lake Creek
   a. Description: One mile radius around 61 54.3'N/150 54.5'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: 1 May to 1 Oct

34. Mouth of Kroto (Deshka) Creek
   a. Description: One mile radius around 61 42'N/150 18.3'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: 1 May to 1 Oct

35. Neil Lake
   a. Description: One mile radius around 61 56'N/150 23'W
   b. Altitude: Surface to 1500' AGL
   c. Time of year: 1 May to 1 Oct

36. Gulkana National Wild and Scenic River
   a. Description: Five miles either side of the river from 62 52'N/145 36'W to 62 31'N/145 31'W
   b. Altitude: Surface to 5000' MSL
   c. Time of year: 27 Jun to 11 Jul

37. Towns of Central and Circle Hot Springs (Supersonic)
   a. Description: No supersonic operations within a ten mile radius of 65 31'N/144 43'W
   b. Altitude: Surface to 35,000' MSL
   c. Time of year: Continuous

38. Hunting Season in/near the Yukon 1 MOA
   a. Description: Within two miles of the Salcha River from 64 28'N/147 00'W to Caribou Airfield. Within two miles of the Tanana River from Fairbanks to Big Delta. The southern entry/exit gates of the YUKON 1 MOA. To the max extent possible, cross these areas above 8,000' AGL. If this is not possible, try to cross the rivers at 90 degrees.
   b. Altitude: Surface to 8,000' AGL
   c. Time of year: 1 Sep to 30 Sep

39. Cirque Lakes Dall Sheep Lambing Area
   a. Description: Seven mile radius around 64 48'N/143 45'W
   b. Altitude: Surface to 5,000' AGL
   c. Time of year: 15 May to 15 June

Exclusion areas defined in the DOPAA :

A. New Koliganek (KGK) airport
   a. Description: Three mile radius around 59 43'36"N/157 17'00"W
   b. Altitute: Surface to 1500' AGL
   c. Time of year: continuous

B. Tikchik Lodge (AK56) airport
   a. Description: Three mile radius around 59 58'00"N/158 28'00"W
   b. Altitute: Surface to 1500' AGL
   c. Time of year: continuous

C. Stony River No2 (SRV) airport
   a. Description: Three mile radius around 61 47'24"N/156 35'12"W
   b. Altitute: Surface to 1500' AGL
   c. Time of year: continuous

D. Crooked Creek (CJX) airport
   a. Description: Three mile radius around 61 52'12"N/158 08'06"W
   b. Altitute: Surface to 1500' AGL
   c. Time of year: continuous

E. Red Devil (RDV) airport
- a. Description: Three mile radius around 61 47'18"N/157 20'42"W
- b. Altitute: Surface to 1500' AGL
- c. Time of year: continuous

F. Sleetmute (SLQ) airport
- a. Description: Three mile radius around 61 42'36"N/157 09'12"W
- b. Altitute: Surface to 1500' AGL
- c. Time of year: continuous

G. Steese Highway
- a. Description: 65 27'04"N/145 55'23"W to
  65 35'00"N/145 30'00"W to
  65 40'00"N/144 35'00"W to
  65 52'00"N/144 05'00"W to
  65 52'00"N/144 00'00"W to
  65 45'00"N/144 00'00"W to
  65 21'00"N/144 40'00"W to
  65 21'00"N/146 00'00"W to
  65 23'00"N/146 00'00"W to
  Point of beginning
- b. Altitute: Surface to 2000' AGL
- c. Time of year: continuous

H. Ben Creek (Z54) airport
- a. Description: Three mile radius around 65 16'48"N/143 03'00"W
- b. Altitute: Surface to 1500' AGL
- c. Time of year: continuous

I. Central (CEM) airport
- a. Description: Three mile radius around 65 34'30"N/144 46'54"W
- b. Altitute: Surface to 1500' AGL
- c. Time of year: continuous

J. Circle City (K03) airport
- a. Description: Three mile radius around 65 49'54"N/144 04'24"W
- b. Altitute: Surface to 1500' AGL
- c. Time of year: continuous

K. Circle Hot Springs (CHP) airport
- a. Description: Three mile radius around 65 29'12"N/144 36'30"W
- b. Altitute: Surface to 1500' AGL
- c. Time of year: continuous

L. Chicken (CKX) airport
- a. Description: Three mile radius around 64 04'18"N/141 57'00"W
- b. Altitute: Surface to 1500' AGL
- c. Time of year: continuous

M. Eagle (EAA) airport

a. Description: Three mile radius around 64 46'36"N/141 08'54"W
b. Altitute: Surface to 1500' AGL
c. Time of year: continuous

N. Boundary (BYA) airport

a. Description: Three mile radius around 64 04'42"N/141 06'42"W
b. Altitute: Surface to 1500' AGL
c. Time of year: continuous

O. Coal Creek (L20) airport

a. Description: Three mile radius around 65 18'N/143 08'W
b. Altitute: Surface to 1500' AGL
c. Time of year: continuous

APPENDIX C

OPERATIONAL MISSIONS AND TACTICAL FLYING TRAINING PROGRAM IN ALASKA; AIRCRAFT AND MUNITIONS CHARACTERISTICS

C.1 Operational Missions

The following operational missions are accomplished during routine and exercise tactical flying training. Definitions are taken from the *Air Force Manual 1-1: Basic Aerospace Doctrine of the USAF, Tactical Aircraft Manual 2-1: Tactical Air Operations*, and *MCM 3-1, Volume I: Mission Employment Tactics*. Supersonic operations are a necessary component of some operational training missions as U.S. and allied aircrews need to train to exploit supersonic capabilities both offensively and defensively. The units assigned to 11 AF are tasked with these operational missions as part of their Design Operational Capability statement.

C.1.1 Air-to-Air Missions

Air-to-air training missions include detection, interception, and destruction or neutralization of target aircraft. Following is an overview of the general types of air-to-air training missions.

C.1.1.1 Counter Air

The goal of counter air is to gain control of the aerospace environment. The first goal of counter air is air superiority, which means no prohibitive enemy interference. The ultimate goal of counter air is air supremacy, which means no effective enemy interference.

C.1.1.2 Offensive Counter Air

Offensive counter air goals are to seek out and neutralize or destroy enemy aerospace forces at a time and place of our choosing by seizing the initiative at the onset of hostilities, conducting operations in the enemy's aerospace environment, and neutralizing or destroying the enemy's aerospace forces and supporting infrastructure.

C.1.1.3 Defensive Counter Air/Air Defense

The goals of defensive counter air/air defense are to detect, identify, intercept, and destroy enemy aerospace forces that are attempting to attack friendly forces or penetrate friendly airspace; and to defend friendly lines of communication, protect friendly bases, and protect friendly land and naval forces while denying the enemy the freedom to carry out offensive operations.

C.1.2 Air-to-Ground Missions (Ordnance Delivery)

Air-to-ground missions include low-altitude, high speed subsonic, highly maneuverable ingress to the target area, weapons delivery, and a similar egress from the target area. Aircraft may be intercepted by opposing aircraft at some point during ingress/egress, and may be forced into an air combat engagement. Following is an overview of the general types of air-to-ground operations missions.

C.1.2.1 Air Interdiction

Air interdiction goals are to delay, disrupt, divert, or destroy an enemy's military potential before it can be brought to bear against friendly forces. Missions are performed at such distances from friendly surface forces that detailed integration is not required. Interdiction directed against targets which have a near-term effect on the scheme of maneuver of friendly ground forces require coordination prior to being executed (formerly referred to as battlefield air interdiction.

C.1.2.2 Air Support/Forward Air Control

Close air support/forward air control supports surface operations by attacking hostile targets (i.e., enemy tanks, artillery) in proximity to friendly surface forces. The missions require detailed coordination and integration with the fire and maneuver plans of friendly surface forces.

C.1.2.3 Suppression of Enemy Air Defenses

The goals of this operational mission are to neutralize, destroy, or temporarily degrade enemy air defensive systems (i.e., surface-to-air missiles) in a specific area by physical and/or electronic attack; and allow friendly aerospace forces to perform their missions without interference from enemy air defenses.

C.1.3 Specialized Tasks

These tasks enhance the execution and successful completion of the missions of the Air Force, other U.S. military services, NATO allies, and allies from other nations.

C.1.3.1 Air Refueling

Air refueling can be used to enhance airpower flexibility and responsiveness during deployment and employment by improving the range of tactical aircraft. Air refueling acts as a force multiplier and facilitates extended airborne operations. It helps enhance our global power by reducing our dependence on forward basing and foreign enroute bases.

C.1.3.2 Electronic Combat

Electronic combat employs electronic warfare; elements of command, control, and communications countermeasures; and suppression of enemy air defenses to create or exploit weaknesses in an enemy's offensive, defensive, and supporting capabilities. Electronic combat can be accomplished by an asset targeted against ground-based or airborne early warning assets; ground-controlled intercept sites; surface-to-air missile/antiaircraft artillery systems; and command, control and communication nodes. Electronic combat is conducted to help U.S. forces achieve objectives and may be required to successfully complete a mission.

C.2 Tactical Flying Training in Alaska

To ensure that its aircrews are capable of performing the missions described above, the 11 AF uses a building block approach to tactical flying training. This approach establishes that each aircrew member is able to perform basic tasks before he or she is allowed to advance to the next operational level. Training for an F-15C pilot begins with the basics of air combat training; F-15E, F-16, and OA-10 aircrew members begin with low-altitude tactical navigation and low-altitude step down training. These various training events are described in more detail below.

C.2.1 Air Combat Training

Air combat training normally involves two to four aircraft practicing the maneuvers and fundamentals of offensive and defensive aerial tactics. Pilots learn the capabilities of threat aircraft and weapons systems while using tactics to exploit the adversary's weaknesses. Air combat training normally occurs throughout the vertical limits of a Military Operations Area (MOA) structure; however, if engagements occur or descend below 5,000 feet AGL, training rules strictly limit the types of maneuvers allowed. A typical scenario involves opposing forces, with one group defending an area while the other group attempts to pass through or engage the defensive group. The goal of air combat training is to refine pilot skills in radar and visual lookout as well as offensive and defensive tactics and weapons employment. Basic fighter maneuvering, air combat maneuvering, and air combat tactics training are used to refine air-to-air skills and form the building blocks of air combat training.

C.2.1.1 Basic Fighter Maneuvering

Basic fighter maneuvering is fundamental to all air-to-air maneuvering. Normally conducted with two similar aircraft, this training is used to practice individual offensive and defensive maneuvering against a single adversary. Offensive and defensive aircraft maneuvering and weapons employment are emphasized on these missions.

C.2.1.2 Air Combat Maneuvering

Air combat maneuvering training usually involves three similar aircraft. This training emphasizes intra-flight coordination, survival tactics, and two-ship maneuvering against a single adversary. Air combat maneuvering training scenarios may place the adversary either within visual range or beyond visual range, depending on specific training objectives.

C.2.1.3 Air Combat Tactics

Air combat tactics training involves three to four aircraft, designated as either friendly or enemy forces, and separated as far as possible in the maneuvering airspace. Training begins with opposing forces coming toward each other within specified altitude bands to ensure safe separation. The purpose of this training is team work, targeting and sorting, and intercept tactics to enhance survival. If two different type of aircraft train together, the training is called Dissimilar Air Combat Training.

C.2.1.4 Composite Force Training

Composite force training is defined as scenarios employing multiple flights of the same or different types of aircraft, each under the direction of its own flight leader, performing the same or different roles.

C.2.2 Intercept Training

Radar-equipped fighter aircraft train to detect, intercept, identify, and if necessary, destroy hostile aircraft at altitudes as low as 300 feet AGL and up to 50,000 feet MSL. A maximum number of four aircraft are normally involved. Low-altitude intercepts occur below 5,000 feet AGL, medium-altitude intercepts between 5,000 feet AGL and 25,000 feet MSL, and high-altitude intercepts above 25,000 feet MSL. In a typical intercept training scenario, the interceptor(s) and target(s) are positioned beyond the expected detection capability of the interceptor's on-board radar. The target aircraft attempts to penetrate the area protected by the interceptor. The interceptor, in many cases aided by ground-based or airborne radars, attempts to detect the target, maneuver to identify the aircraft, and reach a position from which armament could be successfully used.

C.2.3 Low-Altitude Air-to-Air Training

Low-altitude air-to-air training normally involves two to four aircraft practicing the fundamentals of offensive and defensive counter air with specific emphasis on training below 5,000 feet AGL. It is often flown in conjunction with other training missions such as simulated surface attack or low-altitude intercept training. The goal of low-altitude air-to-air training is to refine pilot skills in radar and visual lookout and maneuvering at low-altitude. Typically, one or more aircraft are designated as interceptor, tasked to locate and intercept aircraft flying at low altitude enroute to a target. During the actual training, an ingressing aircraft must detect and react appropriately to negate the interceptor's attack and proceed to the target area. Maneuvering is restricted because of the aircraft's low altitude. Training is optimized when the interceptors are dissimilar aircraft. This training is most valuable when conducted over land, especially in mountainous or hilly terrain with changing elevations and obstacles.

C.2.4 Low-Altitude Step Down Training

Low-altitude step down training is the certification process for pilots to become adept at operating at low-altitude in a safe manner. Pilots must learn to navigate at low-altitude while maintaining tactical formation to maximize self-defense capabilities. Hard turns, climbs, and dives need to be practiced frequently to maintain maneuvering proficiency. Low-altitude step down training begins at approximately 2,000 feet AGL, and pilots must demonstrate proficiency at each altitude before descending to a lower altitude. Typical training altitudes are 2,000, 1,500, 500, and 300 feet AGL. Military Training Routes (MTRs) are an excellent vehicle for initial training, but as formations get larger and training scenarios more complex, the restrictions placed on flight along MTRs limits training potential.

C.2.5 Low-Altitude Tactical Navigation

Navigation by reference to ground features and onboard navigation equipment, at high speeds and low altitude, is difficult because of the limited ability to see terrain features beyond a short distance from the line of flight. Even with today's onboard navigation equipment, pilots must be able to verify their navigation progress to detect potential system errors. Navigation at low altitude and high speed requires regular practice to maintain proficiency, increase situational awareness, and avoid task saturation. Where training allows, pilots also practice terrain masking, attempting to hide the aircraft from simulated enemy radar. Night navigation training is also accomplished under simulated or actual low visibility conditions with the use of onboard sensors such as ground mapping radar, terrain following radar, and infrared or low light television sensors that provide reference to ground features. Military Training Routes designed for either visual or instrument conditions are the primary airspace used for initial tactical navigation training, but MOAs are an alternative.

C.2.6 Simulated Low-Altitude Surface Attack Tactics

Simulated low-altitude surface attack tactics training involves two or four aircraft performing low-altitude tactical navigation, and simulating multiple weapons deliveries against simulated targets within a MOA or along a Military Training Route. The simulated targets could be bridges, railroad yards, airfields, or other cultural features. No munitions are actually released during this training event.

C.3 Aircraft Characteristics

In addition to the aircraft assigned to Eielson and Elmendorf AFBs, the following aircraft could also be expected to fly in Alaska as part of deployed training or a Major Flying Exercise. Although this list is not all-inclusive, it presents the major aircraft types that could be found in the theater.

KC-135 Stratotanker: The KC-135 has been in service for nearly 40 years and is the military version of the Boeing 707. The KC-135 provides air-to-air refueling to a wide assortment of Air Force, Navy, Marine, and allied aircraft through a flying "rigid" flight refueling boom capable of transferring up to 1,000 gallons of fuel per minute.

E-3A Sentry: The E-3A provides long-range high- or low-level surveillance of all air vehicles (manned or unmanned) in all weathers and above all kinds of terrain. Along with its capabilities for airborne surveillance, it offers a platform for a command and control center for quick-reaction deployment and tactical operations.

HH-60D Blackhawk: The HH-60 helicopter is designed to carry 11 fully equipped troops plus a crew of three. It has a large cabin which enables it to be used without modification for medical evacuation, reconnaissance, command and control, troop resupply, or search and rescue missions.

A-10/OA-10A Thunderbolt II: The A-10 is the first Air Force aircraft specifically designed for close air support of ground forces. It is a simple, effective and survivable twin-engine aircraft that can be used against all ground targets, including tanks and other armored vehicles. The A-10/OA-10 is a subsonic aircraft and can cruise at 420 knots.

F-4G Phantom II: The remaining F-4Gs in the Air Force Inventory are capable of passing real-time target information to its missiles prior to launch. Working as "hunter-killer" teams of two aircraft, such as the F-4G and F-16C, the F-4 "hunter" can detect, identify, and locate enemy radars and then direct weapons for their destruction or suppression. This two-engine, afterburning aircraft is capable of supersonic airspeeds of more than Mach 2 at 40,000 feet MSL.

F-14 Tomcat: The F-14 Tomcat is a two seat, Navy fighter aircraft which serves in the air defense and fleet defense role. It is powered by two afterburning engines, capable of supersonic airspeeds of more than Mach 2. Like the F-111, the F-14 has variable-sweep wings which allow the pilot to fly from slow approach speeds to supersonic velocity at a variety of altitudes.

F-15C Eagle: The F-15 Eagle is an all-weather, extremely maneuverable, tactical fighter designed to gain and maintain air superiority in aerial combat. It is powered by two afterburning engines and is capable of supersonic airspeeds of Mach 2.5 plus, and has a ceiling above 50,000 feet MSL.

F-15E Strike Eagle: The F-15E is an all-weather, dual-role tactical fighter aircraft capable of both air-to-air and air-to-ground missions. Unlike other F-15 models, the F-15E uses two crew members: a pilot and a weapons systems officer. The F-15E is powered by two afterburning engines and is capable of supersonic airspeeds of Mach 2.5 plus, and has a ceiling above 50,000 feet MSL.

F-16C/D Fighting Falcon: The F-16 is a single seat multi-role fighter capable of air-to-air and air-to-ground missions using a wide variety of munitions. It is powered by a single afterburning engine capable of 27,600 pounds of static thrust. The plane weighs approximately 19,200 pounds empty and up to 42,300 pounds fully loaded. It is capable of a maximum speed above Mach 2, has a ceiling above 50,000 feet MSL.

F-18 Hornet: The F-18 is a single seat multi-role fighter capable of air-to-air and air-to-ground missions using a wide variety of munitions. It is powered by two afterburning engines capable of 16,000 pounds of static thrust each. The plane weighs approximately 23,050 pounds empty and up to 37,175 pounds fully loaded. It is capable of a maximum speed above Mach 1.8, has a ceiling approximately 50,000 feet.

F-22 (Advanced Tactical Fighter - ATF): The F-22 is the next generation air superiority fighter, a follow-on to the F-15. The aircraft is still being tested, but should be operational by the end of the decade. It is designed to cruise at Mach 2.5 plus, with a ceiling above 50,000 feet MSL. It is also designed to carry the Advanced Medium Range Air-to-Air Missile.

F-111: The F-111 is a tactical strike aircraft that can fly at supersonic speeds, and operate from tree-top level to altitudes above 60,000 feet. It has variable-sweep wings, allowing the pilot to fly from slow approach speeds to supersonic velocity at sea level and more than twice the speed of sound at higher altitudes. The primary function of the F-111 is that of a multipurpose tactical fighter-bomber.

EF-111 Raven: The EF-111 is designed to provide electronic countermeasures support for tactical air forces. It carries two crew members: a pilot and electronic warfare officer. It can detect, sort, and identify different enemy radars observing an attack force and make the threat radars ineffective. Like the F-111, it has two after-burning engines and is capable of Mach 2.2 at 40,000 feet MSL.

F-117A: The F-117A is a twin-engine aircraft designed to exploit low-observable stealth technology. It can penetrate dense threat environments and attack high-value targets with pinpoint accuracy. It is capable of high subsonic airspeeds.

A-6E Intruder: The A-6E is a medium-attack aircraft operated by the U.S. Navy. It carries a pilot and a bombardier-navigator, and can deliver a wide variety of weapons in all weather conditions. It has two, non-afterburning turbojet engines and operates at high subsonic airspeeds.

EA-6B Prowler: The EA-6B is a subsonic, electronic countermeasures aircraft. Like the A-6E, it has two turbojet engines and operates a high subsonic airspeeds. The EA-6B carries a pilot and three electronic warfare officers, and provides tactical electronic countermeasures support to composite air wings.

A-7D/K Corsair II: The A-7D/K is a subsonic, single-engine attack aircraft operated by the Air National Guard. The aircraft features high-altitude maneuverability under various weapon loads.

B-1B Lancer: The B-1B is a multi-role, long-range strategic bomber able to fly intercontinental missions without refueling, and capable of penetrating present and predicted sophisticated enemy defenses. Its electronic jamming equipment, infrared countermeasures, radar location and warning systems complement the aircraft's reduced radar cross section (one-hundredth that of the B-52) and low altitude, high-speed flight. The B-1B currently holds 36 world records for speed, payload, and distance; has four afterburning engines; and is capable of supersonic airspeed.

B-2A: The B-2A is a multi-role bomber capable of delivering both nuclear and conventional munitions. It is the world's first operational bomber designed to exploit low-observable stealth technology. The B-2A has four non-afterburning, turbojet engines and is capable of high subsonic airspeeds.

B-52G/H Stratofortress: For more than 35 years, B-52s have been the primary manned strategic bomber force for the United States. Updated with modern technology, the B-52 fleet will continue into the 21st century. The aircraft is powered by eight turbojet engines and is capable of subsonic airspeeds.

C-130: The C-130 is the transport workhorse of the tactical airlift fleet. First production models were built in 1955, and this transport has been delivered in many different versions including transport, air refueling, communications, search and rescue, and gunships. The newest versions have a range, with a maximum payload, of approximately 2,050 nautical miles and can cruise at speeds up to 375 miles per hour.

C.4 Munitions Characteristics

The following air-to-ground munitions and expendables are typical of those used on the air-to-ground weapons ranges in Alaska.

MJU-7/10, 206 Flares: Flares are small, intense heat sources, somewhat similar to highway safety flares or boating signal flares. Flares consist of an extruded pellet made of a composite of magnesium and Teflon®. Standard flare components are an ignition device, a small plastic piston, the flare pellet wrapped in aluminum foil, and a plastic or aluminum endcap. When a flare is activated, an electrical firing mechanism simultaneously ignites and expels the flare from the aircraft. The flare begins burning immediately and is designed to burn completely within 4 to 5 seconds after ejection, being completely consumed during this time so that no burning material reaches the ground. The flare cartridge remains in the aircraft. MJU-7/10s and 206 flares are carried on most modern fighter aircraft. Flares are used either to decoy heat-seeking missiles or for illumination.

RR-170 Chaff: Chaff consists of fine filaments of fiberglass with an aluminum coating. When released from an aircraft as a "burst," chaff becomes a diffuse radar-reflecting cloud that obscures the aircraft from ground or airborne radar. This radar screen allows the aircraft to evade radar positioning and target acquisition by either ground or airborne opponents.

BDU-33 & BDU-50: BDUs (bomb dummy units) are inert munitions used to simulate the ballistics of live ordnance. They can be configured with smoke spotting charges to aid in the scoring of practice weapons deliveries. The BDU-33 is a small 25 pound class munition that simulates the Mk-82 500 pound bomb. The BDU-50 is a full size, inert version of the Mk-82. Use of a full-size simulated weapon enhances training realism by allowing a pilot to experience the weight of the actual ordnance and changes in aircraft handling characteristics associated with increased weight and aerodynamic drag.

Mk-82/Mk-84, Inert and Live: The Mk-82 and Mk-84 are the most common free-fall bombs employed by the U.S. Air Force today. The Mk-82 is a 500 pound class munitions and the Mk-84 is a 2,000 pound class munitions. Each has a slender body with a long tapered nose. The live versions contain H-6, Tritonal, or Minol II explosives. The explosive weight accounts for approximately 36 percent of the total weight of the Mk-82 and approximately 48 percent of the Mk-84 weight.

GBU-10/GBU-12: The GBU-10/GBU-12 series laser-guided bombs are comprised of the basic Mk-84/Mk-82 bomb bodies (inert or live), an airfoil group, computer control group, and guidance kit. The GBU kits provide precision guidance capabilities to otherwise unguided munitions. The laser-guided bombs are used to home on targets illuminated by a laser beam and the weapons flight envelope permits the delivery aircraft to standoff from the target for increased survivability.

AGM-65: The AGM-65 "Maverick" is a lightweight air-to-ground missile capable of launch-and-leave tactics against ground tactical targets. The missile has been fielded with various seeker and warhead combinations for use under varying conditions.

20mm/30mm Ammunition: 20mm and 30mm ammunition are used frequently by the USAF on OA-10As, F-15Es, and F-16s. This ordnance can either be target practice/high explosive/high explosive incendiary (TP/HE/HEI) or inert. Virtually all of the ordnance expended during training operations would be inert.

2.75 FFAR: The 2.75 FFAR is a fold-fin rocket used by the USAF for training operations on the Stuart Creek (R-2205) and Oklahoma (R-2202) Impact Areas. This rocket can be equipped with either a high explosive or an inert warhead. The type used by the USAF at the Stuart Creek and Oklahoma Impact Areas would be inert.

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APPENDIX D

AIRSPACE

D.1 Introduction

Airspace, once considered a limitless medium, is a limited national resource which must be controlled, managed, and protected. The purpose of this appendix is to acquaint the reader with information about that resource in order to better understand how the actions described within this environmental document affect our airspace system. A brief history of federal control over national airspace is followed by a detailed look at the current national airspace system. Next, highlights of an impending reclassification of our airspace system is given for comparison. Finally, airspace required for military operations, Special Use Airspace and airspace for special use, is explained. Throughout, the reader is referred to other source documents for additional information. (NOTE: All designated airspace categories discussed throughout this appendix are depicted on various aeronautical charts; however, no one type of chart depicts all categories. As always, it is the pilot's responsibility to be familiar with the airspace of intended flight and comply with all rules and regulations for flight through each type of airspace.)

D.2 History

The Federal Government has a long history of regulatory oversight of various aspects of aviation within the United States. In 1926, Congress passed the Air Commerce Act in response to an increased amount of air activity. This was the first federal law to regulate aviation in the United States. The Act authorized the Secretary of Commerce to establish a system of airways and navigation aids across the country, and also called for rules governing the manufacture of airplanes and the licensing of airplanes and pilots. A Bureau of Air Commerce was set up to carry out these measures.

During the 1930s the rapid growth of civil aviation created a need for more effective government regulation. In 1938, Congress passed the Civil Aeronautics Act which established the Civil Aeronautics Authority to deal with every aspect of civil aviation. The Authority included a five-member board, which, in 1940, became the Civil Aeronautics Board (CAB). This Act also included an administrative office, which became the Civil Aeronautics Administration (CAA) in 1940.

In the 1950s, the beginnings of jet airliner service and faster aircraft in ever increasing numbers created new challenges and hazards along the nation's air routes. Congress passed the Federal Aviation Act in 1958 which created the Federal Aviation Agency (FAA). The FAA was subsequently renamed the Federal Aviation Administration in 1967. This agency absorbed the Civil Aeronautics Administration, the Airways Modernization Board, and the safety rule-making functions of the Civil Aeronautics Board. The economic regulatory function of the CAB continued until 1978 when Congress passed the Airlines Deregulation Act. Gradually, the CAB lost its control of routes by 1982, its fare setting authority in 1983, and was finally dissolved by 1985.

The Federal Aviation Act of 1958, as amended, gave the FAA exclusive responsibility for safely and efficiently managing all national airspace within the continental United States. The Act requires the FAA, in exercising this responsibility, to give full consideration to the requirements of national defense and of commercial and general aviation, and to the public right of freedom of transit through the navigable airspace.

Executive Order No. 10854 extended the application of the Act to the overlying airspace of those areas of land or water outside the United States beyond the 3 nautical mile (NM) offshore limit where the United States, under international agreement or other lawful arrangement, has appropriate jurisdiction or control. This includes United States Protectorates and designated flight information regions (FIRs). Any airspace action, rulemaking or nonrulemaking, that concerns airspace beyond the 3 NM offshore limit requires the coordination of the Departments of Defense (DoD) and State (DOS) (and consequently additional leadtime to meet that coordination requirement). Under the provisions of Executive Order No. 10854, airspace actions must not be inconsistent with the requirements of national defense, or be in conflict with any international treaties or agreements made by the United States, or be inconsistent with the successful conduct of the foreign relations of the United States. In this respect, the DoD and DOS have preemptive authority over FAA over airspace use beyond the 3 NM offshore limit. All Executive Order No. 10854 coordination is conducted at the headquarters level. (Note: Presidential Proclamation No. 5928, 1988, extended the United States territorial boundary limit from 3 to 12 nautical miles; see Warning Area description.)

D.3 National Airspace System (NAS)

The NAS consists of the common network of United States airspace; air navigation facilities, equipment and services; airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures; technical information; and manpower and material. Included are system components shared jointly with the military. The principal aviation user groups of the NAS include commercial air carriers, general aviation, and the military services. Each of these groups have unique and sometimes conflicting needs. All users want the flexibility to operate safely with minimum constraints on the navigable airspace. The current National Airspace System, over which the FAA exercises its responsibilities, has recently undergone a reclassification. This reclassification will bring the United States into compliance with international agreements.

D.3.1 Current National Airspace System

In 1978, the International Civil Aviation Organization (ICAO) recognized the need to study the diverse range of regulations and airspace classifications in use by member nations and to develop an international standard. The ICAO is an agency of the United Nations, and almost every country belongs to the ICAO. The ICAO is responsible for air safety standards and gaining international cooperation in aviation matters.

From the beginning (1979) the United States, as an ICAO member, has been among the leaders to develop a simplified airspace system. Parallelling this international effort was our own National Airspace Review (NAR). The FAA published the initial NAR recommendations in 1982, with a subsequent Notice of Proposed Rulemaking No. 89-28 appearing in the Federal Register in October 1989, proposing the airspace reclassification. In March 1990, the ICAO adopted Amendment 33 to Annex 11, Air Traffic Services, which established seven international classes of airspace (A through G), to be effective November 14, 1991. The FAA's final rule, appearing in the December 17, 1991 Federal Register, mandated that on September 16, 1993, the United States Airspace will be fully reclassified. Familiar acronyms such as TCA, ATA, ARSA, and PCA are no longer be used by the FAA.

The goals of reclassification are to enhance flying safety and to simplify the system. The FAA uses six alphabetic classifications: Class A, B, C, D, E, and G, with Class F not being used in the United States. NOTE: Controlled airspace is now defined as airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification; controlled airspace is a generic term that covers Class A, Class B, Class C, Class D, and Class E airspace. Class G is uncontrolled airspace. Class A airspace is the most restrictive, each successive class is less restrictive with Class G the least restrictive. The new system classifications are defined in the following paragraphs. See Figure D-1 for a comparison of the old and new classifications.

D.3.1.1 Class A Airspace

Positive Control Airspace (18,000 MSL to FL 600) is now Class A Airspace. No operating rules have changed within this category of airspace.

D.3.1.2 Class B Airspace

Terminal Control Areas is now Class B Airspace. The only operational change involves weather minima. Since all aircraft within Class B Airspace are under positive control, the FAA is relaxing weather standards to allow VFR operations when aircraft can remain clear of clouds and have 3 statute miles visibility.

D.3.1.3 Class C Airspace

Airport Radar Service Areas is now Class C Airspace. Separation is provided to all aircraft, and no operational changes have occured in this class of airspace. Noticeably absent from Class B and Class C Airspace are Control Zones. Control Zone restrictions are included in both classes. In some cases, the Class B or C Airspace area have not extend outward enough to protect IFR arrival aircraft. In those cases, Class E Airspace extends outward from Class B or C Airspace. That keeps IFR traffic within controlled airspace, but does not extend the boundaries of the more regulated airspace. VFR pilots need only maintain the controlled airspace weather minima to operate in these Class E extensions; radio contact is not mandatory.

D.3.1.4 Class D Airspace

Class D Airspace combines Airport Traffic Areas and Control Zones whose associated airports have Federal ATC towers. Class D Airspace includes tower controlled airports, normally has a 4.4 NM radius core area, and a ceiling of 2,500 feet above the airport elevation (converted to MSL and rounded to the nearest hundred feet). VFR operations are subject to Control Zone weather minima, IFR traffic subject to ATC clearances, and all operations require radio contact with the tower. Various site specific configurations of this category of airspace are permitted in order to allow as many as possible nearby non-tower satellite airports to be designated with Class E Airspace (less restrictive).

D.3.1.5 Class E Airspace

Class E Airspace now contains all remaining controlled airspace (Control Zones without a tower, Continental Control Area, Federal Airways, etc.). Both IFR and VFR operations are permitted with aircraft separation being provided by ATC for IFR and Special VFR traffic only. VFR traffic advisories may be available, workload permitting. Existing operating rules did not change.

D.3.1.6 Class F Airspace

Is not used in the United States.

D.3.1.7 Class G Airspace

All uncontrolled airspace is now Class G Airspace. Little uncontrolled airspace above 1,200 feet above the surface of the earth remains in the contiguous 48 states. Due to mountainous terrain Class G Airspace extends up to 14,500 MSL only in some areas of the western United States. Airspace above Class A Airspace (FL 600) is also Class G Airspace. There are no changes to existing operating rules. Both IFR and VFR operations are permitted, however no IFR separation is provided. Traffic advisories may be provided by ATC, workload permitting. As in all the preceding classes of airspace, safety advisories are provided to users of this class of airspace.

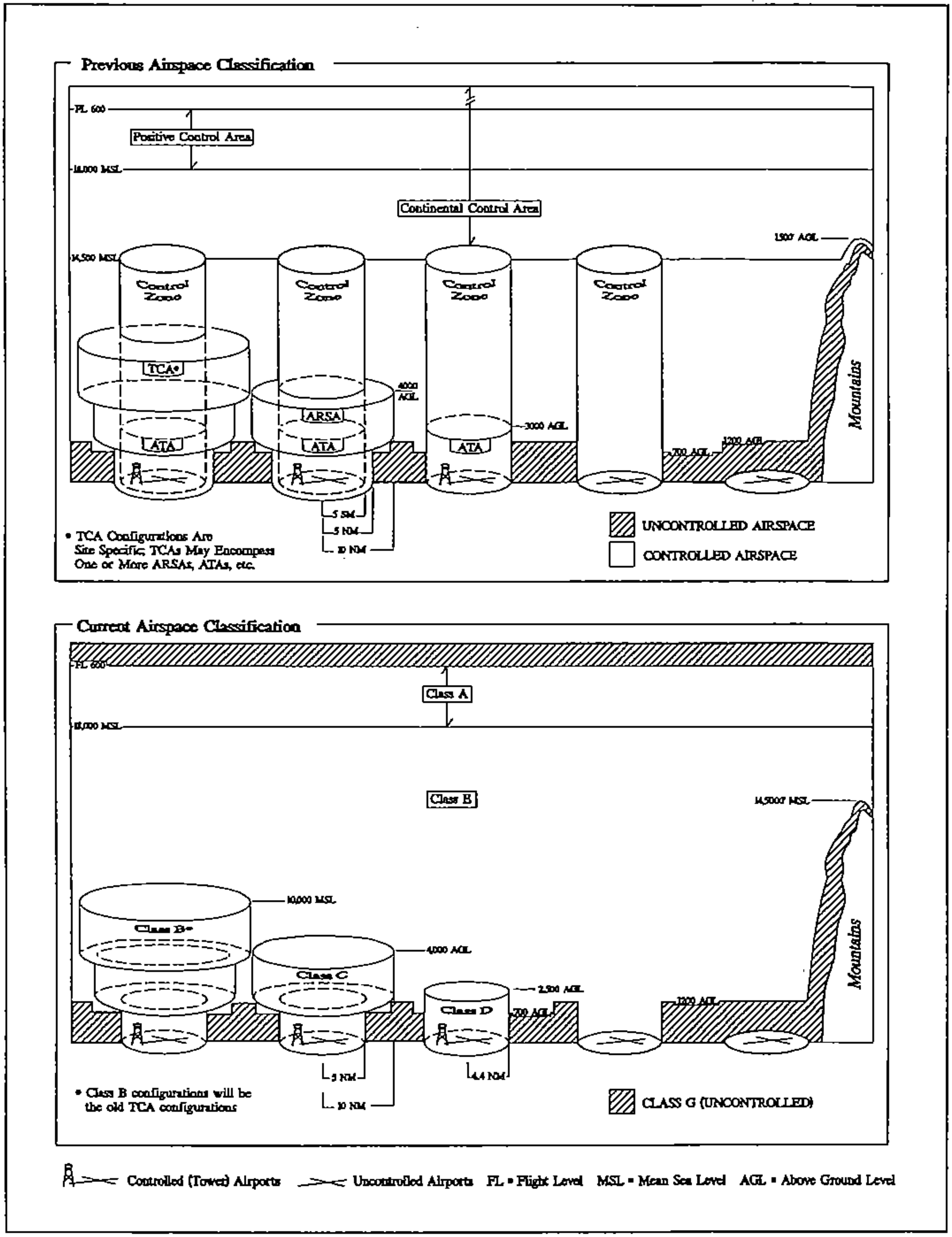

Figure D-1 National Airspace Classification

D.4 Military Operations

Airspace is required by the Department of Defense (DoD) to accomplish the operational, training, research and development, testing, and evaluation missions. Military users compete with commercial and general aviation users for this limited navigable resource. Airspace that contains military operations is generally limited in size, time of day available, and type of operations that can be conducted. In addition to the constraints imposed by this competition with civil aviation (for the limited available airspace) are the constraints imposed by application of the provisions of the National Environmental Policy Act (NEPA) of 1969. All Special Use Airspace (SUA) actions require formal compliance with the provisions of NEPA. Environmental compliance has literally become the determining factor that must be resolved before a military aeronautical proposal becomes reality to satisfy mission needs. Within the NAS, there are two general types of airspace where various military operations may be conducted, Special Use Airspace and Airspace for Special Use (see Table D-1 Airspace for Military Operations).

D.4.1 Special Use Airspace

Because there is a need to segregate certain military testing and training activities which are incompatible with or potentially dangerous to civilian aircraft, a Special Use Airspace program was developed. The origins of this program can be traced to various "airspace reservations" and "danger areas" which were established pursuant to the Air Commerce Act of 1926 and the Civil Aeronautics Act of 1938 to provide for national security and to denote the existence of hazards to aircraft. Many of these areas were established in areas of the country which at that time were relatively remote. Security and minimal exposure of the population and civil aviation to hazardous activities were the main reasons for selecting these areas.

The SUA program, as it is known today, was instituted in 1961 as a revision to FAR Part 73. Prior to the 1970's, certain non-hazardous military flight training (i.e., aerobatics, and air combat maneuvering) was conducted across the country in free airspace with civil aviation being unaware of either the location or the type of activity being conducted. In 1975, the FAA, prompted by increasing concern over the potential for collision between civil and military aircraft, established a new category of SUA, the Military Operations Area (MOA). MOAs were designed to contain non-hazardous military flight training and to indicate to the public where these activities are conducted. The military services agreed to conduct non-hazardous training within these charted MOAs rather than in uncharted, free airspace as was done in the past. Even though the implementation of the MOA program resulted in a sudden and significant increase in the total number of SUA areas, the confining of non-hazardous training to MOAs actually reduced the amount of airspace previously used for military training. Today, SUA consists of Restricted Areas, Warning Areas, Prohibited Areas, Controlled Firing Areas, Alert Areas, and Military Operations Areas, and are described below. The majority of SUA categories are for military use. Special Use Airspace proposals are considered either rulemaking (Restricted Areas, Prohibited Areas, and certain regulatory Warning Areas) or nonrulemaking (remaining SUA categories) by the FAA. Airspace actions that significantly impact (deny or restrict) the public's access to airspace are considered under FAA's rulemaking authority. Rulemaking cases relate to the designation, alteration, or revocation of airspace by rule, regulation, or order. Rulemaking actions, often controversial, require a formal, lengthy process (publication of Notice of Proposed Rulemaking in Federal Register, docket action, public hearing, etc.) before a final decision is published in the Federal Register and the airspace charted. Nonrulemaking cases are those concerning non-regulatory airspace, navigational aids, ground structures, and airports where public notification and participation is warranted. Processing nonrulemaking actions can also be lengthy and controversial, and normally require circularization to the public for comment before a final determination is reached. Additional information on SUA can be found in the following: FAR Part 73, FAA Handbook 7400.2, DoD FLIP General Planning (Chapter 2), AP/1A, AP/2A, and AP/3A. (SUA is not affected by reclassification.)

D.4.1.1 Restricted Area

Restricted Areas are rulemaking airspace designated under FAR Part 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. This airspace is used to contain hazardous military activities and lies within the territorial airspace of the United States. The term "hazardous" implies, but is not limited to, live firing of weapons and/or aircraft testing. Most restricted areas are designated joint use and IFR/VFR operations in the area may be authorized by the controlling air traffic control (ATC) facility when it is not being used by the using agency. (The using agency is that agency, organization, or military command whose activity established the requirement for the special use airspace. An ATC facility may be the using agency for joint use areas when the facility is specified in a letter of procedure as having priority for use of the area.) Some restricted areas are designated non-joint use (continuous) because of mission requirements. In the case of a non-joint use restricted area, the using agency and the controlling agency are usually the same entity.

Restricted area floors normally begin at 1,200 above the surface of the earth. Where adverse aeronautical effect is determined to be minimal and provisions are made for aerial access to private or public use land which underlies the restricted area, lower limits may be established, where needed, to accommodate the planned activity. The surface may be designated as the floor only when the using agency either owns, leases, or by agreement otherwise controls the underlying surface. Restricted areas are depicted on en route charts. Where joint use is authorized, the name of the ATC controlling facility is also shown.

D.4.1.2 Prohibited Area

Prohibited Areas are rulemaking airspace designated under FAR Part 73 within which no person may operate an aircraft without the permission of the using agency. Prohibited areas are designated to prohibit flight over a surface area in the interest of national security and welfare. Prohibited areas are normally designated from the surface of the earth to a specified altitude and are normally in continuous operation. For example, much of the airspace above the nation's capitol is classified as a prohibited area. Prohibited areas, few in number at any one time, are depicted on enroute charts. This category of SUA is not currently used by the military. For military operations, a non-joint use (continuous) restricted area serves much the same purpose as a prohibited area.

D.4.1.3 Warning Area

Warning Areas are nonrulemaking airspace designed for military activities in international airspace. They are equivalent to ICAO "danger areas" and exclusively located over the coastal waters of the United States and its territories. Activity may be hazardous, but international agreements do not prohibit flight in international airspace, thus no restriction to flight is imposed. DoD Directive 4540.1, *Use of Airspace by US Military Aircraft and Firings Over the High Seas*, applies to activities conducted in this airspace. Executive Order No. 10854, cited previously, establishes the relationship between the DoD, DOS, and FAA regarding warning areas and military operations within international airspace under the purview of FAA air traffic services. In 1988, Presidential Proclamation No. 5928 extended the United States territorial boundary limit from 3 to 12 nautical miles. Special FAR (SFAR) 53 established certain Regulatory Warning Areas within the new (3-12 NM) territorial airspace to allow continuation of military activities while further regulatory requirements are determined (SFAR 53 currently will expire on December 27, 1993). The Regulatory Warning Area concept allows for hazardous activity between 3 NM and 12 NM, and is similar to a Restricted Area by limiting access to all nonparticipants. Warning areas are depicted on en route charts.

D.4.1.4 Controlled Firing Area

Controlled Firing Areas are nonrulemaking airspace where activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons and property on the ground. Activities are immediately suspended when a spotter aircraft, radar, or ground lookout position indicates an aircraft might be approaching the area. Because the activity is controlled, no restrictions are placed on participating aircraft. Controlled firing areas are not depicted on aeronautical charts.

D.4.1.5 Alert Area

Alert Areas are nonrulemaking airspace which may contain a high volume (over 250,000 annual operations) of pilot training activities (air traffic transitioning from a primary airfield to other areas such as MOAs or an auxiliary field) or an unusual type of aerial activity where prior knowledge would significantly enhance safety (high volume oil rig helicopter traffic), neither of which is hazardous to aircraft. Alert areas are depicted on aeronautical charts for the information of nonparticipating pilots. All activities within an alert area are conducted in accordance with Federal Aviation Regulations, and pilots of participating aircraft as well as pilots transiting the area are equally responsible for collision avoidance. Alert areas are informative only, and there are no restrictions placed on nonparticipating IFR or VFR aircraft.

D.4.1.6 Military Operations Area

MOAs are nonrulemaking airspace designated for nonhazardous military activity, established outside the PCA/Class A (below FL 180), and within United States territorial airspace. Activities conducted in MOAs include, but are not limited to, aerobatics, air combat tactics, transition, and formation training. Most military flight training activities necessitate aerobatic and/or abrupt flight maneuvers. Military pilots conducting flight in DoD aircraft in an active MOA are exempt from the provisions of Federal Aviation Regulations prohibiting aerobatic flight within Federal Airways and control zones. This airspace serves to separate/segregate nonparticipating IFR aircraft from the activity and inform nonparticipating VFR aircraft where these activities are being conducted. Nonparticipating IFR traffic may be cleared through a MOA if IFR separation minimums can be provided by the air traffic control agency responsible for flight operations in and around the MOA. VFR aircraft are not restricted from transiting MOAs; however, pilots must exercise extreme caution since the status (active/inactive) of a MOA can change often during the day. Pilots operating under VFR are strongly encouraged to contact the controlling agency for traffic advisories prior to entering a potentially active MOA. MOAs are depicted on various en route and planning charts.

D.4.2 Airspace For Special Use

Over the years, due to unique military operations, training, and/or testing requirements of the military, other airspace for special use (not a part of the SUA program) was developed to meet those needs. For example, low level navigation training has been required ever since the military began flying aircraft. The Military Training Route (MTR) program was established in the late 1970s in a similar evolutionary manner as the SUA program to fill a legitimate military need while at the same time identifying to the public where those activities are located. MTRs replaced the previous Training Route (TR) program. Airspace for special use includes Military Training Routes (MTRs), Air Refueling (AR) routes, Air Traffic Control Assigned Airspace (ATCAA), Altitude Reservations (ALTRVs), Low Altitude Tactical Navigation (LATN) areas, Maneuver Areas, and Slow Speed Low Altitude Training Routes (SRs), and are described below. Proposals for airspace for special use are considered neither rulemaking or nonrulemaking actions by the FAA. Information on these airspace categories can be found in FAA Handbook 7610.4, and in various military regulations and documents. Some categories which are wholly contained within military documents do not require FAA coordination for establishment. (Airspace for special use categories are not affected by reclassification.)

D.4.2.1 Military Training Route

An MTR is established, in accordance with FAA Handbook 7610.4, to conduct low altitude navigation and tactical training. An MTR is not restrictive to the flying public and is charted (on FAA Sectionals and DoD Low IFR Charts) to provide the public with location awareness of the training area, thus enhancing safety. All activities conducted on an MTR are in accordance with applicable FARs unless waived or exempted by the FAA.

Routes above 1,500 feet above ground level (AGL) are developed to be flown under instrument flight rules (IFR), regardless of weather conditions. Those routes 1,500 feet AGL and below are generally flown under visual flight rules (VFR). Generally, an MTR is established below 10,000 feet MSL for operations at speeds above 250 knots (FAR Part 91.70 speed exemption applies). However, route segments may be defined at higher altitudes for purposes of route continuity (e.g., descent, climbout, and mountainous terrain). Route identifications help distinguish the altitude structure of the route segments. IFR Routes (IR) and VFR Routes (VR) with all segments at or below 1,500 feet AGL are identified by four digit numbers (e.g., IR-1106 or VR-1233). Routes that have at least one route segment above 1,500 feet AGL are identified by three digit numbers (e.g., IR-133 or VR-176). Route widths vary for each MTR, often varying from segment to segment, and can extend for several miles on either side of the charted centerline. Routes may be established as IFR routes (IR) or VFR routes (VR).

The FAA has approval authority for IR establishment, and, in the case of the Air Force, the appropriate Air Force Representative (AFREP) to the FAA approves VR establishment only after Major Command (MAJCOM) approval of unit proposals. VRs are processed through the FAA for charting and information purposes only. MTRs are published in FLIP AP/1B. Routes developed to allow terrain following radar (TFR) equipped aircraft to fly TFR operations will be specifically described in the MTR proposal and publication.

D.4.2.2 Maneuver Area

A maneuver area is a designated segment of an MTR and was originally designed when Strategic Air Command (SAC) and Military Airlift Command (MAC) aircraft were procedurally limited to point-to-point flight. Aircraft were restricted to the course line between each route definition point (centerline). In order to drop weapons, personnel, or equipment (simulated or actual), the aircraft had to have the ability to maneuver within the route segment in the target/drop zone area. Today, a maneuver area is a segment of an IR or VR where aircraft may perform various maneuvers dictated by operational requirements. Aircraft may freely maneuver within lateral and vertical confines of the route segment before resuming flight on the remainder of the route. Maneuver areas are not substitutes for MOAs. Details of maneuver area operations must be included in the IR/VR proposal.

D.4.2.3 Air Refueling Route

An air refueling route, developed according to FAA Handbook 7610.4, is designed to conduct air refueling operations. Permanent air refueling airspace is designated as either a track or an anchor, and established via a letter of agreement with the appropriate air traffic control facility responsible for the airspace. After coordination with air traffic control, ARs are processed through the AFREP for publication in FLIP. Temporary or special air refueling airspace also may be established by coordination/agreement with the air traffic control facility having authority over the airspace. Because permanent air refueling airspace is not published on aeronautical charts, any air refueling operations conducted below the PCA/Class A should be contained within SUA.

D.4.2.4 Air Traffic Control Assigned Airspace

ATCAAs are defined airspace normally within the PCA/Class A (FL 180 and above) and established in accordance with FAA Handbook 7610.4 by a letter of agreement with the air traffic control facility having responsibility for that airspace. Nonparticipating aircraft are separated from the military activity being conducted in the ATCAA by air traffic control. ATCAAs are not published on aeronautical charts, and are commonly associated with MOA airspace to allow increased vertical maneuvering.

D.4.2.5 Altitude Reservation

ALTRVs are temporary airspace established by approval request (APREQ) in accordance with FAA Handbook 7610.4. FAA Central Altitude Reservation Function (CARF) has approval authority over ALTRVs within airspace (territorial and international) over which the FAA has authority. The ICAO equivalent is an "airspace reservation" which is the responsibility of the European Central Altitude Reservation Function (EUCARF) and the Pacific Military Altitude Reservation Function (PACMARF). CARF coordinates ALTRVs with other appropriate facilities in airspace outside FAA purview. ALTRVs may be either moving or fixed and nonparticipating aircraft will be separated from the ALTRV activity by air traffic control. ALTRVs are commonly approved for air refueling operations and movement of large numbers of aircraft engaged in exercises or operations such as Desert Shield/Desert Storm.

D.4.2.6 Low Altitude Tactical Navigation Area

LATNs are usually large geographic areas established for random VFR, low altitude navigation training. Activities are in accordance with all applicable FARs and flown at airspeeds at or below 250 knots. MAJCOMs determine the criteria for establishing a LATN, and while coordination with the FAA is not required, it may be done in some instances. LATN areas are for local use only, not published on aeronautical charts, and are not restrictive to the flying public.

D.4.2.7 Slow Speed Low Altitude Training Route

SRs are low level training routes used for military air operations conducted under VFR at or below 1,500 feet AGL and at an airspeed of 250 knots or less. SRs are not a part of the MTR program. Guidance for developing SRs, weather minimums for flight on SRs, and publication criteria of SRs is provided in applicable military regulations. Coordination with the FAA is not required but may be done in some instances. SRs are published in FLIP AP/1B; however, they are not published on aeronautical charts, and, like MTRs, are not restrictive to the flying public.

Table D-1 Airspace for Military Operations

Category	Type	Rule Making	FAA Coordination Required	Governing Directive	Where Published	Charted	LOA	Environmental Compliance Required
Special Use Airspace (SUA)	Prohibited Area	YES	YES	FAAH 7400.2	FAAH 7400.8 FLIP AP/1A	YES	YES	YES
	Restricted Area	YES	YES	FAAH 7400.2	FAAH 7400.8 FLIP AP/1A	YES	YES	YES
	Military Operations Area (MOA)	NO	YES	FAAH 7400.2	FAAH 7400.8 FLIP AP/1A[6]	YES	YES	YES
	Alert Area	NO	YES	FAAH 7400.2	FAAH 7400.8 FLIP AP/1A	YES	YES[2]	YES
	Warning Area	NO	YES	FAAH 7400.2	FAAH 7400.8 FLIP AP/1A	YES	YES	YES
	Controlled Firing Area (CFA)	NO	YES	FAAH 7400.2	Not Published	NO	YES	YES
Other Airspace for Special Use	Low Altitude Tactical Navigation Area (LATN)	NO	NO[1]	AFI 13-201 and MAJCOM OIs/Regs	Not Published	NO	NO	YES
	Slow Route (SR)	NO	NO[1]	AFR 13-201 and MAJCOM OIs/Regs	FLIP AP/1B	YES[4]	NO	YES
	Air Traffic Control Assigned Airspace (ATCAA)	NO	YES	FAAH 7610.4	Not Published	NO	YES	YES
	Altitude Reservation (ALTRV)	NO	YES	FAA 7610.4 and Approved Flight Plan	Not Published	NO	NO	NO
	Military Training Route (MTR):							
	IFR (IR) Route	NO	YES	FAAH 7610.4	FLIP AP/1B	YES	YES	YES
	VFR (VR) Route	NO	YES	FAAH 7610.4	FLIP AP/1B	YES	YES[3]	YES
	Air Refueling (AR) Route / Track	NO	YES	FAAH 7610.4	FLIP AP/1B	NO	YES	YES
	Assault Zones:							
	Drop Zone (DZ)	NO	YES[5]	MACR 55-50	AZAR FLIP AP/1A[6]	NO	YES	YES
	Landing Zone (LZ)	NO	YES[5]	MACR 55-50	AZAR FLIP AP/1A[6]	NO	YES	YES

SOURCE: FAA/USAF 1994.

[1] Not required, but *highly* recommended.

[2] Letter of Agreement (LOA) required to...from the airspace.

[3] LOA required only to...from the VR Route.

[4] DoD Area Planning AP/1B Chart only ("Green Demon").

[5] When in controlled airspace.

[6] Some data published.

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APPENDIX E

AIR OPERATIONS

This appendix contains the following information used during the assessment of the Proposed and Alternative Actions in this EIS:

- **Aircraft Operations Data** such as MOA/RA usage rates, altitudes in the MOAs, and MFE flying rates in the MOAs
- **Noise Information** for selected aircraft including single event noise levels SEL and L_{max}
- **Sonic Boom Information** including the changes in peak overpressure and the C-Weighted SEL values for various levels of supersonic activity
- **Background Documentation** concerning operations today in the Alaska MOAs/TMOAs to include:
  - The current approval for the conduct of supersonic operations in the YUKON 1 and YUKON 2 MOAs during an MFE
  - 11 AF/DO Msg 061725Z Oct 93, Subj. FCIF Item: 11 AF Chaff and Flare Restrictions
  - Current Letter of Agreement between Anchorage ARTCC and 11 AF, Subj. Description of Alaskan Military Airspace, Amended Mar 28, 1994
  - 11 AF/DO Msg, Subj. Fire Index Restrictions on Weapons Delivery

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ROUTINE TRAINING MISSIONS DATA

The first set of worksheets in this package defines the routine training operations that are being analyzed as part of the Proposed Action.

ANNUAL MISSIONS Worksheet

This worksheet takes the annual training missions (sorties) flown for routine training by 11 AF units and distributes the sorties across the different mission areas. Take for example the F-16. The F-16s practice both Air-to-Air and Air-to-Ground missions. From the attached worksheet, the 7,392 annual F-16 missions are distributed 1,848 (25%) Air-to-Air and 5,544 (75%) Air-to-Ground. Deployed aircraft are assumed to be F-15s (Air-to-Air) and F-16s (Air-to-Ground).

ANNUAL ROUTINE MISSIONS (PROPOSED)				
AIRCRAFT		AIR-TO-AIR	AIR-TO-GROUND	TOTALS
F-15 C/D	#	9216	0	9216
	%	(100%)	(0%)	(100%)
F-15 E	#	1152	3456	4608
	%	(25%)	(75%)	(100%)
F-16 C/D	#	1848	5544	7392
	%	(25%)	(75%)	(100%)
OA-10 A	#	0	1920	1920
	%	(0%)	(100%)	(100%)
DEPLOYED	#	960	960	1920
	%	(50%)	(50%)	(100%)

DISTRIBUTION OF ANNUAL MISSIONS Worksheet

Annual missions are distributed between the MOAs, MTRs, Ranges, etc. For example, of the F-15E/A-G (Air-to-Ground) total missions (3,456 sorties); 2.074 (60%) were allocated to MOAs; 518 (15%) were allocated to MTRs; and of the total sorties, 1,728 were allocated to range operations.

DISTRIBUTION OF ANNUAL MISSIONS (PROPOSED)						
AIRCRAFT/MISSION		ANNUAL TOTAL OPS	ANNUAL MOA OPS	ANNUAL MTR OPS	ANNUAL LATN OPS	ANNUAL RANGE OPS
F-15 C/A-A	#	9,216	9,216	0	0	0
	%		(100%)	(0%)	(0%)	(0%)
F-15 E/A-A	#	1,152	1,152	0	0	0
	%		(100%)	(0%)	(0%)	(0%)
F-15 E/A-G	#	3,456	2,074	518	0	1,728
	%		(60%)	(15%)	(0%)	(50%)
F-16 C/A-A	#	1,848	1,848	0	0	0
	%		(100%)	(0%)	(0%)	(0%)
F-16 C/A-G	#	5,544	3,604	1,663	0	4,158
	%		(65%)	(30%)	(0%)	(75%)
OA-10 A/A-G	#	1,920	960	0	960	1,728
	%		(50%)	(0%)	(50%)	(90%)
DEPLOYED/A-A	#	960	960	0	0	0
	%		(100%)	(0%)	(0%)	(0%)
DEPLOYED/A-G	#	960	960	0	0	960
	%		(100%)	(0%)	(0%)	(100%)
TOTALS			20,779	2,182	961	8,576
A-A=Air-to-Air						
A-G=Air-to-Ground						

DISTRIBUTION OF ANNUAL SORTIES Worksheet

Routine training range operations for the based aircraft (and seasonal deployers) are distributed to the three air-to-ground weapons ranges as shown on this worksheet.

DISTRIBUTION OF RANGE OPS (PROPOSED)

AIRCRAFT		TOTAL RANGE OPS	R-2202	R-2205	R-2211	TOTALS
F-15 E	#	1,728	605	518	605	1,728
	%		(35%)	(30%)	(35%)	(100%)
F-16 C	#	4,158	1,248	1,663	1,247	4,158
	%		(30%)	(40%)	(30%)	(100%)
OA-10 A	#	1,728	605	691	432	1,728
	%		(35%)	(40%)	(25%)	(100%)
DEPLOYED	#	960	336	336	288	960
	%		(35%)	(35%)	(30%)	(100%)
TOTALS		8,574	2,794	3,208	2,572	8,574

DISTRIBUTION OF MOA AND MTR SORTIES BY ALTITUDE Worksheet

This worksheet takes all the MOA and MTR sorties and distributes then across an altitude structure starting as low as 100 feet AGL. For example, take the F-16 Air-to-Ground sorties (5,267). Five percent (5%) were allocated at 100 feet AGL, 20% at 300 feet AGL, and so forth. This can be interpreted as 5% of each sorties time in the MOA (or on an MTR) is flown as low as 100 feet AGL; or an equivalent 263 of the total 5,267 total annual sorties spent their entire mission at 100 feet AGL. This noise analysis it is assumed that 5% of each sorties mission is at the 100 foot altitude.

DISTRIBUTION OF ANNUAL MOA AND MTR MISSIONS BY ALTITUDE (PROPOSED)

		F-15 C/ A-A	F-15 E/ A-A	F-15 E/ A-G	F-16 C/ A-A	F-16 C/ A-G	OA-10 A/ A-G	DEPLOYED/ A-A	DEPLOYED/ A-G
	# of MOA & MTR	9,216	1,152	2,592	1,848	5,267	960	960	960
	# MOA	9,216	1,152	2,074	1,848	3,604	960	960	960
	% MOA	100.00%	100.00%	80.00%	100.00%	68.42%	100.00%	100.00%	100.00%
ALTITUDE									
100'	#	0	0	130	0	263	48	0	48
	%	(0%)	(0%)	(5%)	(0%)	(5%)	(5%)	(0%)	(5%)
300'	#	0	0	311	0	632	192	0	115
	%	(0%)	(0%)	(12%)	(0%)	(12%)	(20%)	(0%)	(12%)
500'	#	1,843	230	778	370	1,580	576	192	288
	%	(20%)	(20%)	(30%)	(20%)	(30%)	(60%)	(20%)	(30%)
750'	#	0	0	778	0	1,580	96	0	288
	%	(0%)	(0%)	(30%)	(0%)	(30%)	(10%)	(0%)	(30%)
1,000'	#	0	0	311	0	632	48	0	115
	%	(0%)	(0%)	(12%)	(0%)	(12%)	(5%)	(0%)	(12%)
1,500'	#	0	0	285	0	579	0	0	106
	%	(0%)	(0%)	(11%)	(0%)	(11%)	(0%)	(0%)	(11%)
3,000'	#	0	0	0	0	0	0	0	0
	%	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)
5,000'	#	7,373	922	0	1,478	0	0	768	0
	%	(80%)	(80%)	(0%)	(80%)	(0%)	(0%)	(80%)	(0%)

DISTRIBUTION OF MOA SORTIES BY AIRCRAFT/MISSION INTO THE PROPOSED MOA STRUCTURE Worksheet

Section 1

Annual Routine MOA sorties are first divided over 240 flying days per year (20 per month) and then the daily sorties are distributed across the proposed MOA structure. All the daily MOA sorties are distributed to the "PRIMARY MOAs" and the sum of "PRIMARY MOA" sorties should equal the number of Daily MOA Sorties. The "TRANSITION MOAs" are also used by Air-to-Ground sorties in addition to their use of the "PRIMARY MOAs". The numbers in the tow MOA categories are <u>not</u> additive. The line marked *Daily Routine Total* is the sum of all daily operations in a particular MOA. For this analysis these are 180 routine training days per year.

For the *TANANA ALTERNATIVE (Alt B.):* All the operations from YUKON 4 and 5 MOAs are transferred to the TANANA MOA.

For the "No" ***CLEAR CREEK ALTERNATIVE (Alt A.):*** All CLEAR CREEK operations are routed through BIRCH and/or EIELSON.

Section 2

The lower 2/3s of the worksheet displays the Routine MOA usage on an MFE flying day. If no MFEs were flown, daily MOA usage would be as reflected in Section 1 of the worksheet. For this analysis, there are up to 60 MFE flying days per year, and thus a slight reduction in Routine training sorties on those MFE flying days.

DISTRIBUTION OF MOA SORTIES BY AIRCRAFT/MISSION INTO THE PROPOSED MOA STRUCTURE (PROPOSED ACTION)																				
			"PRIMARY" MOA												"TRANSITION" MOA					
AIRCRAFT & MISSION	REFERENCE NUMBER OF ANNUAL MOA SORTIES	REFERENCE NUMBER OF DAILY MOA SORTIES	NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
							SECTION 1													
		(240 dys/yr)								ROUTINE FLYING DAY										
								DAILY..............		ROUTINE TRAINING SORTIES										
F-15 C/A-A	9,216	38.40	2.30	0.77	12.67	5.76	2.30	1.15		0.19	11.33	1.92								
F-15 E/A-A	1,152	4.80	1.34	1.20	0.48		0.10		1.20		0.48									
F-15 E/A-G	2,074	8.64			2.16			2.59	2.59			1.30			3.02	3.02	3.89	3.02	1.73	1.73
F-16 C/A-A	1,848	7.70					0.15	1.54	1.54		3.16	0.15	0.77	0.39						
F-16 C/A-G	3,604	15.02						7.51	4.65			1.50	1.35		6.76	4.50	6.01	5.26	3.00	3.00
OA-10 A/A-G	960	4.00						2.40	1.60						2.00	2.00	2.00	2.00		
DEPLOYED A-A	960	4.00	0.40	0.40	1.60	0.80					0.80									
DEPLOYED A-G	960	4.00						2.80	0.40			0.40	0.40		2.00	1.00	2.00	1.00		
DAILY ROUTINE TOTAL		86.56	4.05	2.37	16.91	6.56	2.55	17.99	11.99	0.19	15.77	5.27	2.62	0.39	13.78	10.53	13.89	11.28	4.73	4.73
							SECTION 2													
										MFE FLYING DAY										
										ROUTINE TRAINING SORTIES										
F-15 C/A-A			2.11	0.70	11.62	5.28	2.11	1.06		0.18	10.38	1.76								
F-15 E/A-A			1.23	1.10	0.44		0.09		1.10		0.44									
F-15 E/A-G					1.98			2.38	2.38			1.19			2.77	2.77	3.56	2.77	1.58	1.58
F-16 C/A-A							0.14	1.41	1.41		2.89	0.14	0.71	0.35						
F-16 C/A-G								6.88	4.27			1.38	1.24		6.19	4.13	6.61	4.82	2.76	2.76
OA-10 A/A-G								2.20	1.47						1.83	1.83	1.83	1.83		
DEPLOYED A-A			0.40	0.40	1.60	0.80					0.80									
DEPLOYED A-G								2.80	0.40			0.40	0.40		2.00	1.00	2.00	1.00		
DAILY ROUTINE TOTAL			3.74	2.20	15.64	6.08	2.34	16.73	11.02	0.18	14.62	4.87	2.34	0.35	12.80	9.73	12.90	10.42	4.34	4.34
										MFE FLYING DAY										
										MFE MOA OPERATIONS										
AIR-TO-GROUND								122	122			104	104	122	61	61	122	61	8	8
AIR-TO-AIR								63	63		63	54	54	38	32	32	6	12		
SUPPORT								4	4		2	3	3	9	2	2	4	2		
DAILY MFE TOTAL								189	189		65	161	161	169	95	95	132	75	8	8
DAILY COMPOSITE TOTAL for an MFE FLYING DAY			3.74	2.20	15.64	6.08	2.34	205.73	200.02	0.18	79.52	165.87	163.34	169.35	107.80	104.73	144.90	85.42	12.34	12.34
ANNUAL MFE only OPERATIONS								11340	11340		3900	9660	9660	10140	5700	5700	7920	4500	480	480
ANNUAL ROUTINE OPERATIONS			953	558	3982	1546	600	4242	2819	45	3709	1241	595	90	3248	2479	3275	2656	1112	1112

DISTRIBUTION OF MOA SORTIES BY AIRCRAFT/MISSION INTO THE PROPOSED MOA STRUCTURE (PROPOSED ACTION)																				
			"PRIMARY" MOA												"TRANSITION" MOA					
AIRCRAFT & MISSION	REFERENCE NUMBER OF ANNUAL MOA SORTIES	REFERENCE NUMBER OF DAILY MOA SORTIES	NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
							PERCENTAGE (%) TABLE BY AIRCRAFT/MISSION													
F-15 C/A-A			6%	2%	33%	15%	6%	3%		1%	30%	5%			0%	0%	0%	0%	0%	0%
F-15 E/A-A			28%	25%	10%		2%		25%		10%				0%	0%	0%	0%	0%	0%
F-15 E/A-G					25%			30%	30%			15%			35%	35%	45%	35%	20%	20%
F-16 C/A-A							2%	20%	20%		41%	2%	10%	5%	0%	0%	0%	0%	0%	0%
F-16 C/A-G								50%	31%			10%	9%		45%	30%	40%	35%	20%	20%
OA-10 A/A-G								60%	40%						60%	60%	50%	60%		
DEPLOYED A-A			10%	10%	40%	20%					20%				0%	0%	0%	0%	0%	0%
DEPLOYED A-G								70%	10%		0%	10%	10%		50%	25%	50%	25%		

DISTRIBUTION OF DAILY MOA SORTIES BY AIRCRAFT/MISSION/ALTITUDE/MOA

Worksheet

Once the daily MOA sorties are determined, and the altitude breakout of each sortie is known, the daily sorties were distributed by MOA--by altitude. Where the MOA floor was no low enough to accommodate lower altitudes, the percentage of those sorties was rolled into the higher altitudes until getting to the MOA floor. The solid black box in each MOA column (opposite the aircraft ID) denotes the daily routine sorties by aircraft/mission type for that MOA. The dashed box in each MOA column is associated with the lowest altitude an aircraft could operate in that MOA.

DISTRIBUTION OF DAILY ROUTINE MOA SORTIES BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION-NON MFE DAY)

[MOA FLOOR (AGL)]		3000	3000	100	100	5000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
		NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
F-15 C/A-A		2.304	0.768	12.67	5.76	2.304	1.152		0.192	11.33	1.92								
100'		0	0	0	0	0	0		0	0	0								
300'		0	0	0	0	0	0		0	0	0								
500'		0	0	2.534	1.152	0	0.23		0	0	0.384								
750'		0	0	0	0	0	0		0	0	0								
1,000'		0	0	0	0	0	0		0.038	0	0								
1,500'		0	0	0	0	0	0		0	0	0								
3,000'		0.461	0.154	0	0	0	0		0	2.266	0								
5,000'		1.843	0.614	10.14	4.608	2.304	0.922		0.154	9.062	1.536								
	Total	2.304	0.768	12.67	5.76	2.304	1.152		0.192	11.33	1.92								
F-15 E/A-A		1.344	1.2	0.48		0.096		1.2		0.48									
100'		0	0	0		0		0		0									
300'		0	0	0		0		0		0									
600'		0	0	0.096		0		0.24		0									
750'		0	0	0		0		0		0									
1,000'		0	0	0		0		0		0									
1,500'		0	0	0		0		0		0									
3,000'		0.269	0.24	0		0		0		0.096									
5,000'		1.076	0.96	0.384		0.096		0.96		0.384									
	Total	1.344	1.2	0.48		0.096		1.2		0.48									
F-15E/A-G				2.16			2.592	2.592			1.296			3.024	3.024	3.888	3.024	1.728	1.728
100'				0.108			0.13	0.13			0.065			0.151	0.151	0.194	0	0.086	0
300'				0.259			0.311	0.311			0.156			0.363	0.363	0.467	0.614	0.207	0
500'				0.648			0.778	0.778			0.389			0.907	0.907	1.166	0.907	0.618	0
750'				0.648			0.778	0.778			0.389			0.907	0.907	1.166	0.907	0.618	0
1,000'				0.259			0.311	0.311			0.156			0.363	0.363	0.467	0.363	0.207	0
1,500'				0.238			0.285	0.285			0.143			0.333	0.333	0.428	0.333	0.19	0
3,000'				0			0	0			0			0	0	0	0	0	1.728
5,000'				0			0	0			0			0	0	0	0	0	0
	Total	0	0	2.16	0	0	2.592	2.592	0	0	1.296	0		3.024	3.024	3.888	3.024	1.728	1.728

DISTRIBUTION OF DAILY ROUTINE MOA SORTIES BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION-NON MFE DAY)																			
[MOA FLOOR (AGL)]		3000	3000	100	100	6000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
		NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
F-16C/A-A						0.154	1.54	1.54		3.157	0.154	0.77	0.385						
100'						0	0	0		0	0	0	0						
300'						0	0	0		0	0	0	0						
500'						0	0.308	0.308		0	0.031	0.154	0						
750'						0	0	0		0	0	0	0						
1,000'						0	0	0		0	0	0	0						
1,500'						0	0	0		0	0	0	0						
3,000'						0	0	0		0.631	0	0	0.077						
5,000'						0.154	1.232	1.232		2.526	0.123	0.616	0.308						
	Total	0	0	0	0	0.154	1.54	1.54	0	3.157	0.154	0.77	0.385						
F-16C/A-G							7.508	4.655			1.502	1.351		6.767	4.505	6.006	6.255	3.003	3.003
100'							0.375	0.233			0.075	0.068		0.338	0.225	0.3	0	0.15	0
300'							0.901	0.559			0.18	0.162		0.811	0.541	0.721	0.893	0.36	0
500'							2.252	1.396			0.45	0.405		2.027	1.351	1.802	1.577	0.901	0
750'							2.252	1.396			0.45	0.405		2.027	1.351	1.802	1.577	0.901	0
1,000'							0.901	0.559			0.18	0.162		0.811	0.541	0.721	0.631	0.36	0
1,500'							0.826	0.512			0.165	0.149		0.743	0.495	0.661	0.578	0.33	0
3,000'							0	0			0	0		0	0	0	0	0	3.003
5,000'							0	0			0	0		0	0	0	0	0	0
	Total	0	0	0	0	0	7.508	4.655	0	0	1.502	1.351	0	6.757	4.505	6.006	6.255	3.003	3.003
OA-10A/A-G							2.4	1.6						2	2	2	2		
100'							0.12	0.08						0.1	0.1	0.1	0		
300'							0.48	0.32						0.4	0.4	0.4	0.5		
500'							1.44	0.96						1.2	1.2	1.2	1.2		
750'							0.24	0.16						0.2	0.2	0.2	0.2		
1,000'							0.12	0.08						0.1	0.1	0.1	0.1		
1,500'							0	0						0	0	0	0		
3,000'							0	0						0	0	0	0		
5,000'							0	0						0	0	0	0		
	Total	0	0	0	0	0	2.4	1.6	0	0	0	0	0	2	2	2	2		

DISTRIBUTION OF DAILY ROUTINE MOA SORTIES BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION-NON MFE DAY)																				
[MOA FLOOR (AGL)]			3000	3000	100	100	5000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
			NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
DEPLOYED/A-A			0.4	0.4	1.6	0.8					0.8									
100'			0	0	0	0					0									
300'			0	0	0	0					0									
500'			0	0	0.32	0.16					0									
750'			0	0	0	0					0									
1,000'			0	0	0	0					0									
1,500'			0	0	0	0					0									
3,000'			0.08	0.08	0	0					0.16									
5,000'			0.32	0.32	1.28	0.64					0.64									
		Total	0.4	0.4	1.6	0.8	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0
DEPLOYED/A-G								2.8	0.4			0.4	0.4		2	1	2	1		
100'								0.14	0.02			0.02	0.02		0.1	0.05	0.1	0		
300'								0.336	0.048			0.048	0.048		0.24	0.12	0.24	0.17		
600'								0.84	0.12			0.12	0.12		0.6	0.3	0.6	0.3		
750'								0.84	0.12			0.12	0.12		0.6	0.3	0.6	0.3		
1,000'								0.336	0.048			0.048	0.048		0.24	0.12	0.24	0.12		
1,500'								0.308	0.044			0.044	0.044		0.22	0.11	0.22	0.11		
3,000'								0	0			0	0		0	0	0	0		
5,000'								0	0			0	0		0	0	0	0		
		Total	0	0	0	0	0	2.8	0.4	0	0	0.4	0.4	0	2	1	2	1		

DISTRIBUTION OF DAILY MFE SORTIES BY AIRCRAFT/MISSION INTO THE PROPOSED MOA STRUCTURE Worksheet

The 200 daily MFE sorties (maximum) are distributed by aircraft type and mission into the proposed MOA structure. Most sorties would pass through YUKON 1 and 2 MOAs during an MFE period., hence the large number of operations in those MOAs. Totals are <u>not</u> additive, as MFE sorties may transition numerous MOAs on any individual MFE mission. The total numbers reflected are the estimated MAXIMUM number of MFE operations a particular MOA would experience on an MFE flying day.

DISTRIBUTION OF ANNUAL MFE SORTIES BY AIRCRAFT/MISSION INTO THE PROPOSED MOA STRUCTURE (PROPOSED ACTION)																				
			"PRIMARY" MOA												"TRANSITION" MOA					
AIRCRAFT & MISSION	REFERENCE NUMBER OF ANNUAL MFE SORTIES	REFERENCE NUMBER OF DAILY MFE SORTIES	NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
		(60 days/yr)								*MFE FLYING DAY*										
										MFE SORTIES										
F-15 C/A-A	3,000	60.00						60.00	60.00		60.00	42.50	42.50	35.00	25.00	25.00	5.00	10.00		
F-14/A-A	300	5.00						5.00	5.00		5.00	4.25	4.25	3.50	2.50	2.50	0.50	1.00		
CF-18/A-A	300	5.00						5.00	5.00		5.00	4.25	4.25	3.50	2.50	2.50	0.50	1.00		
F-4 E/A-A	180	3.00						3.00	3.00		3.00	2.55	2.55	2.10	1.50	1.50	0.30	0.50		
F-15 E/A-G (or TORNADO)	960	16.00						16.00	16.00			13.60	13.60	16.00	8.00	8.00	16.00	8.00	1.60	
F-16 C/A-G	4,020	67.00						67.00	67.00			56.95	56.95	67.00	33.50	33.50	67.00	33.50	6.70	
OA-10 A/A-G	480	8.00						8.00	8.00			6.80	6.80	8.00	4.00	4.00	8.00	4.00		
F-18 A/A-G	960	16.00						16.00	16.00			13.60	13.60	16.00	8.00	8.00	16.00	8.00		
EA-6B/A-G	180	3.00						3.00	3.00			2.55	2.55	3.00	1.50	1.50	3.00	1.50		
A-7 D/A-G	180	3.00						3.00	3.00			2.55	2.55	3.00	1.50	1.50	3.00	1.50		
F-111 F/A-G	180	3.00						3.00	3.00			2.55	2.55	3.00	1.50	1.50	3.00	1.50		
F-5 E/A-G	60	1.00						1.00	1.00			0.85	0.85	1.00	0.50	0.50	1.00	0.50		
B-52 G/A-G	180	3.00						3.00	3.00			2.55	2.55	3.00	1.50	1.50	3.00	1.50		
B-1 B/A-G	120	2.00						2.00	2.00			1.70	1.70	2.00	1.00	1.00	2.00	1.00		
C-130/AL	60	1.00						1.00	1.00			0.85	0.85	1.00	0.50	0.50	1.00	0.50		
C-141/AL	60	1.00						1.00	1.00			0.85	0.85	1.00	0.50	0.50	1.00	0.50		
E-3	120	2.00										2.00	2.00	2.00						
E-2	60	1.00										1.00	1.00	1.00						
KC-10A	60	1.00										1.00	1.00	1.00						
KC-135E/R	300	5.00									2.00	3.00	3.00	3.00						
EF-111	120	2.00										1.70	1.70	2.00	1.00	1.00	2.00	1.00		
EC-117	60	1.00						1.00	1.00			1.00	1.00	1.00						
NKC-135	60	1.00						1.00	1.00			1.00	1.00	1.00						
DAILY MFE TOTAL	12000	200.00						189.00	189.00		65.00	169.65	169.65	179.10	94.50	94.50	132.30	75.60	8.30	0.00

DISTRIBUTION OF DAILY MFE SORTIES BY AIRCRAFT/MISSION/ALTITUDE/MOA

Worksheet

Same as the distribution by altitude for Routine training, except these are the primary MFE - participants operating at the lower altitudes in the MOAs. Some of the command and control and other support aircraft are not on this list as they would be at higher altitudes, 20,000 feet and above, and not a factor for noise computations.

DISTRIBUTION OF DAILY MFE OPERATIONS BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION)

[MOA FLOOR (AGL)]		3000	3000	100	100	5000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
		NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
F-15 C/A-A							50	50		50	42.5	42.5	35	25	25	5	10		
100'							0	0		0	0	0	0	0	0	0	0		
300'							0	0		0	0	0	0	0	0	0	0		
500'							10	10		0	8.5	8.5	0	5	5	1	2		
750'							0	0		0	0	0	0	0	0	0	0		
1,000'							0	0		0	0	0	0	0	0	0	0		
1,500'							0	0		0	0	0	0	0	0	0	0		
3,000'							0	0		10	0	0	7	0	0	0	0		
5,000'							40	40		40	34	34	28	20	20	4	8		
	Total	0	0	0	0	0	50	50	0	50	42.5	42.5	35	25	25	5	10		
F-14 C/A-A							5	5		5	4.25	4.25	3.5	2.5	2.5	0.5	1		
100'							0	0		0	0	0	0	0	0	0	0		
300'							0	0		0	0	0	0	0	0	0	0		
500'							1	1		0	0.85	0.85	0	0.5	0.5	0.1	0.2		
750'							0	0		0	0	0	0	0	0	0	0		
1,000'							0	0		0	0	0	0	0	0	0	0		
1,500'							0	0		0	0	0	0	0	0	0	0		
3,000'							0	0		1	0	0	0.7	0	0	0	0		
5,000'							4	4		4	3.4	3.4	2.8	2	2	0.4	0.8		
	Total	0	0	0	0	0	5	5	0	5	4.25	4.25	3.5	2.5	2.5	0.5	1		
CF-18 /A-A							5	5		5	4.25	4.25	3.5	2.5	2.5	0.5	1		
100'							0	0		0	0	0	0	0	0	0	0		
300'							0	0		0	0	0	0	0	0	0	0		
500'							1	1		0	0.85	0.85	0	0.5	0.5	0.1	0.2		
750'							0	0		0	0	0	0	0	0	0	0		
1,000'							0	0		0	0	0	0	0	0	0	0		
1,500'							0	0		0	0	0	0	0	0	0	0		
3,000'							0	0		1	0	0	0.7	0	0	0	0		
5,000'							4	4		4	3.4	3.4	2.8	2	2	0.4	0.8		
	Total	0	0	0	0	0	5	5	0	5	4.25	4.25	3.5	2.5	2.5	0.5	1		

DISTRIBUTION OF DAILY MFE SORTIES BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION)																				
[MOA FLOOR (AGL)]			3000	3000	100	100	5000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
			NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
F-4 E/A-A								3	3		3	2.66	2.66	2.1	1.5	1.5	0.3	0.6		
100'								0	0		0	0	0	0	0	0	0	0		
300'								0	0		0	0	0	0	0	0	0	0		
500'								0.6	0.6		0	0.51	0.51	0	0.3	0.3	0.06	0.12		
750'								0	0		0	0	0	0	0	0	0	0		
1,000'								0	0		0	0	0	0	0	0	0	0		
1,500'								0	0		0	0	0	0	0	0	0	0		
3,000'								0	0		0.6	0	0	0.42	0	0	0	0		
5,000'								2.4	2.4		2.4	2.04	2.04	1.68	1.2	1.2	0.24	0.48		
		Total	0	0	0	0	0	3	3	0	3	2.66	2.66	2.1	1.5	1.5	0.3	0.6	0	0
F-16 E/A-G or TORNADO								16	16			13.6	13.6	16	8	8	16	8	1.6	
100'								0	0			0	0	0	0	0	0	0	0	
300'								3.2	3.2			2.72	2.72	0	1.6	1.6	3.2	1.6	0.32	
500'								6.4	6.4			5.44	5.44	0	3.2	3.2	6.4	3.2	0.64	
750'								0	0			0	0	0	0	0	0	0	0	
1,000'								3.2	3.2			2.72	2.72	0	1.6	1.6	3.2	1.6	0.32	
1,500'								0	0			0	0	0	0	0	0	0	0	
3,000'								0	0			0	0	12.8	0	0	0	0	0	
5,000'								3.2	3.2			2.72	2.72	3.2	1.6	1.6	3.2	1.6	0.32	
		Total	0	0	0	0	0	16	16	0	0	13.6	13.6	16	8	8	16	8	1.6	0
F-15C/A-G								67	67			56.95	56.95	67	33.5	33.5	67	33.5	6.7	
100'								0	0			0	0	0	0	0	0	0	0	
300'								13.4	13.4			11.39	11.39	0	6.7	6.7	13.4	6.7	1.34	
500'								26.8	26.8			22.78	22.78	0	13.4	13.4	26.8	13.4	2.68	
750'								0	0			0	0	0	0	0	0	0	0	
1,000'								13.4	13.4			11.39	11.39	0	6.7	6.7	13.4	6.7	1.34	
1,500'								0	0			0	0	0	0	0	0	0	0	
3,000'								0	0			0	0	53.6	0	0	0	0	0	
5,000'								13.4	13.4			11.39	11.39	13.4	6.7	6.7	13.4	6.7	1.34	
		Total	0	0	0	0	0	67	67	0	0	56.95	56.95	67	33.5	33.5	67	33.5	6.7	0

DISTRIBUTION OF DAILY MFE OPERATIONS BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION)																			
[MOA FLOOR (AGL)]		3000	3000	100	100	6000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
		NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
OA-10A/A-G							8	8			6.8	6.8	8	4	4	8	4		
100'							2	2			1.7	1.7	0	1	1	2	0		
300'							4.8	4.8			4.08	4.08	0	2.4	2.4	4.8	3.4		
500'							1.2	1.2			1.02	1.02	0	0.6	0.6	1.2	0.6		
750'							0	0			0	0	0	0	0	0	0		
1,000'							0	0			0	0	0	0	0	0	0		
1,500'							0	0			0	0	0	0	0	0	0		
3,000'							0	0			0	0	8	0	0	0	0		
5,000'							0	0			0	0	0	0	0	0	0		
	Total	0	0	0	0	0	8	8	0	0	6.8	6.8	8	4	4	8	4		
F-18 A/A-G							16	16			13.6	13.6	16	8	8	16	8		
100'							0	0			0	0	0	0	0	0	0		
300'							3.2	3.2			2.72	2.72	0	1.6	1.6	3.2	1.6		
500'							6.4	6.4			5.44	5.44	0	3.2	3.2	6.4	3.2		
750'							0	0			0	0	0	0	0	0	0		
1,000'							3.2	3.2			2.72	2.72	0	1.6	1.6	3.2	1.6		
1,500'							0	0			0	0	0	0	0	0	0		
3,000'							0	0			0	0	12.8	0	0	0	0		
5,000'							3.2	3.2			2.72	2.72	3.2	1.6	1.6	3.2	1.6		
	Total	0	0	0	0	0	16	16	0	0	13.6	13.6	16	8	8	16	8		
A/EA-6 /A-G							3	3			2.55	2.55	3	1.5	1.5	3	1.5		
100'							0	0			0	0	0	0	0	0	0		
300'							0	0			0	0	0	0	0	0	0		
500'							0.9	0.9			0.765	0.765	0	0.45	0.45	0.9	0.45		
750'							0	0			0	0	0	0	0	0	0		
1,000'							0	0			0	0	0	0	0	0	0		
1,500'							0	0			0	0	0	0	0	0	0		
3,000'							0	0			0	0	0.9	0	0	0	0		
5,000'							2.1	2.1			1.785	1.785	2.1	1.05	1.05	2.1	1.05		
	Total	0	0	0	0	0	3	3	0	0	2.55	2.55	3	1.5	1.5	3	1.5		

DISTRIBUTION OF DAILY MFE OPERATIONS BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION)																				
[MOA FLOOR (AGL)]			3000	3000	100	100	5000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
			NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
A-7 D/A-G								3	3			2.55	2.55	3	1.5	1.5	3	1.5		
100'								0.75	0.75			0.638	0.638	0	0.375	0.375	0.75	0		
300'								1.8	1.8			1.53	1.53	0	0.9	0.9	1.8	1.275		
500'								0.45	0.45			0.383	0.383	0	0.225	0.225	0.45	0.225		
750'								0	0			0	0	0	0	0	0	0		
1,000'								0	0			0	0	0	0	0	0	0		
1,500'								0	0			0	0	0	0	0	0	0		
3,000'								0	0			0	0	3	0	0	0	0		
5,000'								0	0			0	0	0	0	0	0	0		
		Total	0	0	0	0	0	3	3	0	0	2.55	2.55	3	1.5	1.5	3	1.5		
F-111 F/A-G								3	3			2.55	2.55	3	1.5	1.5	3	1.5		
100'								0	0			0	0	0	0	0	0	0		
300'								0.6	0.6			0.51	0.51	0	0.3	0.3	0.6	0.3		
500'								1.2	1.2			1.02	1.02	0	0.6	0.6	1.2	0.6		
750'								0	0			0	0	0	0	0	0	0		
1,000'								0.6	0.6			0.51	0.51	0	0.3	0.3	0.6	0.3		
1,500'								0	0			0	0	0	0	0	0	0		
3,000'								0	0			0	0	2.4	0	0	0	0		
5,000'								0.6	0.6			0.51	0.51	0.6	0.3	0.3	0.6	0.3		
		Total	0	0	0	0	0	3	3	0	0	2.55	2.55	3	1.5	1.5	3	1.5		
F-5 E/A-G								1	1			0.85	0.85	1	0.5	0.5	1	0.5		
100'								0	0			0	0	0	0	0	0	0		
300'								0	0			0	0	0	0	0	0	0		
500'								0.3	0.3			0.255	0.255	0	0.15	0.15	0.3	0.15		
750'								0	0			0	0	0	0	0	0	0		
1,000'								0	0			0	0	0	0	0	0	0		
1,500'								0	0			0	0	0	0	0	0	0		
3,000'								0	0			0	0	0.3	0	0	0	0		
5,000'								0.7	0.7			0.695	0.595	0.7	0.35	0.36	0.7	0.36		
		Total	0	0	0	0	0	1	1	0	0	0.85	0.86	1	0.5	0.5	1	0.5		

DISTRIBUTION OF DAILY MFE OPERATIONS BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION)																			
[MOA FLOOR (AGL)]			3000	3000	100	100	5000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
			NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
B-52 G/A-G								3	3			2.55	2.55	3	1.5	1.5	3	1.5		
100'								0	0			0	0	0	0	0	0	0		
300'								0	0			0	0	0	0	0	0	0		
500'								1.2	1.2			1.02	1.02	0	0.6	0.6	1.2	0.6		
750'								0	0			0	0	0	0	0	0	0		
1,000'								0.9	0.9			0.765	0.765	0	0.45	0.45	0.9	0.45		
1,500'								0	0			0	0	0	0	0	0	0		
3,000'								0	0			0	0	2.1	0	0	0	0		
5,000'								0.9	0.9			0.765	0.765	0.9	0.45	0.45	0.9	0.45		
		Total	0	0	0	0	0	3	3	0	0	2.55	2.55	3	1.5	1.5	3	1.5		
B-1 B/A-G								2	2			1.7	1.7	2	1	1	2	1		
100'								0	0			0	0	0	0	0	0	0		
300'								0	0			0	0	0	0	0	0	0		
500'								0.8	0.8			0.68	0.68	0	0.4	0.4	0.8	0.4		
750'								0	0			0	0	0	0	0	0	0		
1,000'								0.6	0.6			0.51	0.51	0	0.3	0.3	0.6	0.3		
1,500'								0	0			0	0	0	0	0	0	0		
3,000'								0	0			0	0	1.4	0	0	0	0		
5,000'								0.6	0.6			0.51	0.51	0.6	0.3	0.3	0.6	0.3		
		Total	0	0	0	0	0	2	2	0	0	1.7	1.7	2	1	1	2	1		
C-130 /A-L								1	1			0.85	0.85	1	0.5	0.5	1	0.5		
100'								0	0			0	0	0	0	0	0	0		
300'								0.6	0.6			0.51	0.51	0	0.3	0.3	0.6	0.3		
500'								0.25	0.25			0.213	0.213	0	0.125	0.125	0.25	0.125		
750'								0	0			0	0	0	0	0	0	0		
1,000'								0.15	0.15			0.128	0.128	0	0.075	0.075	0.15	0.075		
1,500'								0	0			0	0	0	0	0	0	0		
3,000'								0	0			0	0	1	0	0	0	0		
5,000'								0	0			0	0	0	0	0	0	0		
		Total	0	0	0	0	0	1	1	0	0	0.85	0.85	1	0.5	0.5	1	0.5		

DISTRIBUTION OF DAILY MFE OPERATIONS BY AIRCRAFT/MISSION/ALTITUDE/MOA (PROPOSED ACTION)																				
[MOA FLOOR (AGL)]			3000	3000	100	100	5000	100	100	1000	3000	100	100	2000	100	100	100	300	100	3000
			NAKNEK 1	NAKNEK 2	STONY A	STONY B	SUSITNA	YUKON 1	YUKON 2	GALENA	FOX	YUKON 3	YUKON 4	YUKON 5	YUKON 6	EIELSON	BIRCH	BUFFALO	FALCON	CLEAR CREEK
C-141 /A-L								1	1			0.85	0.85	1	0.5	0.5	1	0.5		
100'								0	0			0	0	0	0	0	0	0		
300'								0.6	0.6			0.51	0.51	0	0.3	0.3	0.6	0.3		
500'								0.25	0.25			0.213	0.213	0	0.125	0.125	0.25	0.125		
750'								0	0			0	0	0	0	0	0	0		
1,000'								0.15	0.15			0.128	0.128	0	0.075	0.075	0.15	0.075		
1,500'								0	0			0	0	0	0	0	0	0		
3,000'								0	0			0	0	1	0	0	0	0		
5,000'								0	0			0	0	0	0	0	0	0		
		Total	0	0	0	0	0	1	1	0	0	0.85	0.85	1	0.5	0.5	1	0.5		

SEL and L_{max} Information

for

Selected Aircraft Used in the Analysis

Source: US AF OMEGA10R model, 30 Mar 1994

SINGLE EVENT NOISE AS A FUNCTION OF SLANT RANGE						
Slant Distance (feet)	F-15		F-16		A-10A	
	85% RPM 450 Knots		84% RPM 500 Knots		5333 NF 325 Knots	
	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)
100	121.4	120.5	113.4	118.2	107.1	110.5
125	119.7	118.3	111.9	116.1	105.5	108.4
160	118.1	116.0	110.4	114.0	103.9	106.2
200	116.3	113.7	108.8	111.8	102.3	104.0
250	114.6	111.3	107.2	109.7	100.6	101.7
315	112.8	108.9	105.6	107.4	98.9	99.4
400	111.0	106.5	104.0	105.2	97.1	97.0
500	109.1	104.1	102.2	102.9	95.2	94.5
630	107.3	101.7	100.5	100.5	93.3	92.0
800	105.5	99.3	98.6	98.0	91.2	89.3
1,000	103.7	96.9	96.7	95.5	89.1	86.6
1,250	101.8	94.4	94.7	92.9	86.9	< 85
1,600	99.9	91.8	92.6	90.2	84.6	< 85
2,000	97.9	89.2	90.3	87.4	82.2	< 85
2,500	95.7	86.5	88.0	< 85	79.7	< 85
3,150	93.5	< 85	85.4	< 85	77.1	< 85
4,000	91.2	< 85	82.7	< 85	74.5	< 85
5,000	88.8	< 85	79.7	< 85	71.7	< 85
6,300	86.2	< 85	76.5	< 85	68.9	< 85
8,000	83.5	< 85	72.9	< 85	66.0	< 85
10,000	80.6	< 85	69.1	< 85	< 65	< 85
12,500	77.6	< 85	< 65	< 85	< 65	< 85
16,000	74.3	< 85	< 65	< 85	<65	< 85
20,000	70.7	< 85	< 65	< 85	< 65	< 85
25,000	66.8	< 85	< 65	< 85	< 65	< 85

SINGLE EVENT NOISE AS A FUNCTION OF SLANT RANGE						
Slant Distance (feet)	F-14		F-18		A-6	
	85% RPM 420 Knots		86% RPM 450 Knots		89% 450 Knots	
	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)
100	114.2	118.5	122.4	125.2	114.8	117.7
125	112.5	116.2	120.9	123.0	113.4	115.6
160	110.8	113.9	119.3	120.9	111.9	113.6
200	109.0	111.5	117.7	118.7	110.5	111.5
250	107.1	109.0	116.0	116.4	109.0	109.5
315	105.1	106.4	114.4	114.2	107.5	107.4
400	103.0	103.7	112.7	111.9	106.0	105.3
500	100.7	100.8	110.9	109.5	104.5	103.2
630	98.2	97.7	109.2	107.2	102.9	101.0
800	95.4	94.3	107.3	104.7	101.4	98.8
1,000	92.4	90.7	105.4	102.2	99.7	96.6
1,250	89.2	86.9	103.5	99.7	98.1	94.4
1,600	85.7	< 85	101.5	97.1	96.4	92.1
2,000	82.1	< 85	99.4	94.4	94.7	89.8
2,500	78.4	< 85	97.2	91.6	93.0	87.4
3,150	75.0	< 85	94.9	88.7	91.2	85.1
4,000	71.7	< 85	92.5	85.6	89.4	< 85
5,000	68.4	< 85	89.9	< 85	87.5	< 85
6,300	65.2	< 85	87.1	< 85	85.7	< 85
8,000	< 65	< 85	84.2	< 85	83.8	< 85
10,000	< 65	< 85	81.1	< 85	81.8	< 85
12,500	< 65	< 85	77.8	< 85	79.8	< 85
16,000	< 65	< 85	74.2	< 85	77.7	< 85
20,000	< 65	< 85	70.4	< 85	75.3	< 85
25,000	< 65	< 85	66.3	< 85	72.5	< 85

SINGLE EVENT NOISE AS A FUNCTION OF SLANT RANGE						
Slant Distance (feet)	A-7		B-1		B-52G	
	90% RPM 420 Knots		98% RPM 540 Knots		88% RPM 340 Knots	
	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)
100	112.2	115.2	125.8	131.5	117.8	120.1
125	110.6	113.0	124.3	129.4	116.3	118.0
160	109.0	110.8	122.8	127.3	114.8	115.8
200	107.2	108.5	121.3	125.2	113.2	113.7
250	105.5	106.1	119.8	123.1	111.6	111.5
315	103.7	103.7	118.2	120.9	110.0	109.2
400	101.9	101.3	116.7	118.7	108.3	106.9
500	100.0	98.8	115.1	116.5	106.6	104.6
630	98.1	96.3	113.4	114.3	104.6	102.2
800	96.1	93.7	111.7	112.0	102.9	99.8
1,000	94.1	91.1	110.0	109.7	101.0	97.3
1,250	92.0	88.4	108.2	107.3	99.0	94.7
1,600	89.7	85.5	106.3	104.8	96.8	92.0
2,000	87.4	< 85	104.4	102.2	94.7	89.2
2,500	85.0	< 85	102.3	99.6	92.4	86.3
3,150	82.4	< 85	100.1	96.8	90.0	< 85
4,000	79.7	< 85	97.7	93.8	87.5	< 85
5,000	76.8	< 85	95.2	90.7	84.8	< 85
6,300	73.8	< 85	92.4	87.3	81.9	< 85
8,000	70.6	< 85	89.4	< 85	78.9	< 85
10,000	67.1	< 85	86.1	< 85	75.6	< 85
12,500	< 65	< 85	82.3	< 85	72.2	< 85
16,000	< 65	< 85	78.1	< 85	68.5	< 85
20,000	< 65	< 85	73.4	< 85	< 65	< 85
25,000	< 65	< 85	68.1	< 85	< 65	< 85

SINGLE EVENT NOISE AS A FUNCTION OF SLANT RANGE						
Slant Distance (feet)	C-130		C-141		F-111F	
	850 TIT 210 Knots		85% RPM 300 Knots		95% RPM 450 Knots	
	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)
100	105.5	106.1	109.3	109.9	124.6	125.2
125	104.0	104.0	107.7	107.8	123.1	123.1
160	102.5	101.9	106.1	105.6	121.5	120.9
200	101.0	99.8	104.5	103.4	119.9	118.7
250	99.5	97.7	102.8	101.1	118.2	116.4
315	97.9	95.5	101.1	98.7	116.5	114.1
400	96.3	93.3	99.2	96.3	114.8	111.8
500	94.7	91.1	97.3	93.8	113.0	109.4
630	93.0	88.8	95.3	91.2	111.1	106.9
800	91.3	86.5	93.2	88.5	109.2	104.3
1,000	89.5	< 85	90.9	85.6	107.1	101.7
1,250	87.7	< 85	88.6	< 85	105.0	99.0
1,600	85.8	< 85	86.0	< 85	102.8	96.1
2,000	83.8	< 85	83.3	< 85	100.4	93.2
2,500	81.7	< 85	80.5	< 85	97.9	90.1
3,150	79.6	< 85	77.5	< 85	95.3	86.9
4,000	77.3	< 85	74.4	< 85	92.5	< 85
5,000	75.0	< 85	71.1	< 85	89.6	< 85
6,300	72.5	< 85	67.8	< 85	86.6	< 85
8,000	69.9	< 85	< 65	< 85	83.3	< 85
10,000	67.2	< 85	< 65	< 85	79.9	< 85
12,500	< 65	< 85	< 65	< 85	76.3	< 85
16,000	< 65	< 85	< 65	< 85	72.4	< 85
20,000	< 65	< 85	< 65	< 85	68.2	< 85
25,000	< 65	< 85	< 65	< 85	< 65	< 85

SINGLE EVENT NOISE AS A FUNCTION OF SLANT RANGE						
Slant Distance (feet)	F-4		F-5		TORNADO	
	90% RPM 420 Knots		90% RPM 420 Knots		94% 445 Knots	
	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)	SEL (dB)	L_{max} (dB)
100	123.5	125.1	109.5	110.9	120.0	122.0
125	121.9	122.9	108.0	108.8	118.4	119.8
160	120.3	120.7	106.4	106.6	116.8	117.7
200	118.7	118.5	104.9	104.5	115.2	115.4
250	117.0	116.2	103.3	102.3	113.6	113.2
315	115.3	113.9	101.7	100.0	111.9	110.9
400	113.6	111.6	100.0	97.8	110.1	108.6
500	111.8	109.2	98.3	95.5	108.4	106.2
630	110.0	106.8	96.5	93.1	106.5	103.8
800	108.2	104.4	94.6	90.6	104.7	101.3
1,000	106.3	102.0	92.7	88.1	102.7	98.7
1,250	111.4	99.4	90.6	85.4	100.7	96.1
1,600	102.4	96.9	88.4	< 85	98.6	93.4
2,000	100.4	94.2	86.1	< 85	96.3	90.5
2,500	98.2	91.4	83.6	< 85	94.0	87.6
3,150	95.8	88.5	80.8	< 85	91.5	< 85
4,000	93.4	85.4	77.9	< 85	88.9	< 85
5,000	90.7	< 85	74.8	< 85	86.2	< 85
6,300	87.8	< 85	71.4	< 85	83.3	< 85
8,000	84.7	< 85	67.8	< 85	80.3	< 85
10,000	81.3	< 85	< 65	< 85	77.0	< 85
12,500	77.6	< 85	< 65	< 85	73.6	< 85
16,000	73.6	< 85	< 65	< 85	69.8	< 85
20,000	69.4	< 85	< 65	< 85	65.8	< 85
25,000	65.0	< 85	< 65	< 85	< 65	< 85

SUPERSONIC INFORMATION

The first sets of charts provide information on the magnitude of individual single event sonic booms in terms of the change in Peak Overpressure and the C-weighted SELs. Information on the duration of each event is also included. C-weighting is used for impulsive noises like sonic booms, explosions, gunfire, etc. Data is provided for five aircraft types ar various Mach numbers, altitudes above the ground level, and flight attitude (level flight or diving). Some information is shown for theoretical comparison purposes, e.g. an aircraft in a 30 degree dive, Mach 1.20 at 5,000 feet AGL. Such an occurrence would be highly unlikely to occur.

The second worksheet describes the estimated breakout of supersonic occurrences by altitude, MACH number, and type of mission being flown. These air-to-air training missions are described in Appendix C, Section C.2 *Tactical Flying Training in Alaska.*

SUPERSONIC INFORMATION (MACH 1.05)

MACH # 1.05
HEIGHT ABOVE TERRAIN: 5,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	7.93	119.6	0.121
F-15C	7.85	119.5	0.121
F-15E	7.94	119.6	0.122
F-16C	6.25	117.5	0.095
F-18	7.16	118.7	0.110

MACH # 1.05
HEIGHT ABOVE TERRAIN: 10,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	4.86	115.3	0.149
F-15C	4.83	115.3	0.149
F-15E	4.89	115.4	0.151
F-16C	3.79	113.2	0.117
F-18	4.38	114.4	0.136

MACH # 1.05
HEIGHT ABOVE TERRAIN: 15,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.05
HEIGHT ABOVE TERRAIN: 5,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	14.81	126.0	0.096
F-15C	14.63	124.9	0.096
F-15E	14.79	126.0	0.096
F-16C	11.73	123.0	0.076
F-18	13.37	124.1	0.087

MACH # 1.05
HEIGHT ABOVE TERRAIN: 10,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	9.37	121.0	0.117
F-15C	9.33	121.0	0.117
F-15E	9.43	121.1	0.118
F-16C	7.36	118.9	0.092
F-18	8.46	120.1	0.106

MACH # 1.05
HEIGHT ABOVE TERRAIN: 15,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

SUPERSONIC INFORMATION (MACH 1.05)

MACH # 1.05
HEIGHT ABOVE TERRAIN: 20,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.05
HEIGHT ABOVE TERRAIN: 25,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.05
HEIGHT ABOVE TERRAIN: 30,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.05
HEIGHT ABOVE TERRAIN: 20,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.05
HEIGHT ABOVE TERRAIN: 25,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.05
HEIGHT ABOVE TERRAIN: 30,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

SUPERSONIC INFORMATION (MACH 1.10)

MACH # 1.10
HEIGHT ABOVE TERRAIN: 5,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	8.49	120.2	0.098
F-15C	8.39	120.1	0.098
F-15E	8.52	120.1	0.099
F-16C	6.66	118.1	0.077
F-18	7.66	119.3	0.088

MACH # 1.10
HEIGHT ABOVE TERRAIN: 5,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	13.43	124.2	0.082
F-15C	13.24	124.0	0.082
F-15E	13.43	124.2	0.082
F-16C	10.58	122.1	0.064
F-18	12.12	123.3	0.074

MACH # 1.10
HEIGHT ABOVE TERRAIN: 10,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	5.26	116.0	0.120
F-15C	5.24	116.0	0.120
F-15E	5.32	116.1	0.122
F-16C	4.09	113.8	0.094
F-18	4.75	115.1	0.109

MACH # 1.10
HEIGHT ABOVE TERRAIN: 10,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	8.70	120.4	0.100
F-15C	8.66	120.3	0.100
F-15E	8.78	120.5	0.101
F-16C	6.78	118.2	0.078
F-18	7.85	119.5	0.090

MACH # 1.10
HEIGHT ABOVE TERRAIN: 15,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	3.62	112.8	0.138
F-15C	3.60	112.7	0.138
F-15E	3.67	112.9	0.140
F-16C	2.79	110.5	0.107
F-18	3.27	111.9	0.125

MACH # 1.10
HEIGHT ABOVE TERRAIN: 15,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	5.94	117.1	0.114
F-15C	5.91	117.0	0.114
F-15E	6.01	117.2	0.116
F-16C	4.60	114.9	0.089
F-18	5.36	116.2	0.103

SUPERSONIC INFORMATION (MACH 1.10)

MACH # 1.10
HEIGHT ABOVE TERRAIN: 20,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	2.80	110.5	0.155
F-15C	2.78	110.6	0.164
F-15E	2.84	110.7	0.158
F-16C	2.14	108.2	0.119
F-18	2.52	109.6	0.140

MACH # 1.10
HEIGHT ABOVE TERRAIN: 20,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	4.46	114.6	0.127
F-15C	4.43	114.5	0.127
F-15E	4.52	114.7	0.129
F-16C	3.43	112.3	0.098
F-18	4.02	113.7	0.115

MACH # 1.10
HEIGHT ABOVE TERRAIN: 25,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.10
HEIGHT ABOVE TERRAIN: 25,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.10
HEIGHT ABOVE TERRAIN: 30,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

MACH # 1.10
HEIGHT ABOVE TERRAIN: 30,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14			
F-15C			
F-15E	BOOM WILL NOT PROPOGATE TO THE GND		
F-16C			
F-18			

SUPERSONIC INFORMATION (MACH 1.20)

MACH # 1.20
HEIGHT ABOVE TERRAIN: 5,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	9.22	120.9	0.082
F-15C	9.10	120.8	0.081
F-15E	9.27	120.9	0.082
F-16C	7.19	118.7	0.063
F-18	8.32	120.0	0.074

MACH # 1.20
HEIGHT ABOVE TERRAIN: 5,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	12.68	123.7	0.071
F-15C	12.49	123.6	0.071
F-15E	12.70	123.7	0.072
F-16C	9.93	121.6	0.056
F-18	11.43	122.8	0.064

MACH # 1.20
HEIGHT ABOVE TERRAIN: 10,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	6.84	116.9	0.100
F-15C	5.81	116.9	0.100
F-15E	5.91	117.0	0.101
F-16C	4.61	114.7	0.077
F-18	5.26	116.0	0.090

MACH # 1.20
HEIGHT ABOVE TERRAIN: 10,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	8.31	120.0	0.087
F-16C	8.28	120.0	0.087
F-15E	8.41	120.1	0.088
F-16C	6.46	117.8	0.068
F-18	7.60	119.1	0.079

MACH # 1.20
HEIGHT ABOVE TERRAIN: 15,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	3.99	113.6	0.116
F-15C	3.97	113.6	0.114
F-15E	4.06	113.8	0.117
F-16C	3.06	111.3	0.088
F-18	3.60	112.7	0.104

MACH # 1.20
HEIGHT ABOVE TERRAIN: 15,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	5.67	116.7	0.100
F-15C	5.64	116.6	0.099
F-15E	5.75	116.8	0.101
F-16C	4.36	114.4	0.077
F-18	5.11	116.8	0.090

SUPERSONIC INFORMATION (MACH 1.20)

MACH # 1.20
HEIGHT ABOVE TERRAIN: 20,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	3.01	111.2	0.129
F-15C	2.99	111.1	0.128
F-15E	3.08	111.4	0.132
F-16C	2.28	108.8	0.098
F-18	2.71	110.2	0.116

MACH # 1.20
HEIGHT ABOVE TERRAIN: 20,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	4.24	114.1	0.111
F-15C	4.22	114.1	0.111
F-15E	4.32	114.3	0.113
F-16C	3.24	111.8	0.086
F-18	3.82	113.2	0.100

MACH # 1.20
HEIGHT ABOVE TERRAIN: 25,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	2.40	109.2	0.143
F-15C	2.40	109.2	0.143
F-15E	2.49	109.6	0.148
F-16C	1.80	106.7	0.107
F-18	2.17	108.3	0.129

MACH # 1.20
HEIGHT ABOVE TERRAIN: 25,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	3.36	112.1	0.123
F-15C	3.34	112.1	0.122
F-15E	3.46	112.4	0.126
F-16C	2.63	109.7	0.093
F-18	3.02	111.2	0.110

MACH # 1.20
HEIGHT ABOVE TERRAIN: 30,000 ft AGL
LEVEL FLIGHT

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	2.01	107.7	0.168
F-16C	2.02	107.7	0.169
F-15E	2.12	108.1	0.166
F-16C	1.49	105.1	0.117
F-18	1.83	106.9	0.144

MACH # 1.20
HEIGHT ABOVE TERRAIN: 30,000 ft AGL
30 degree DIVE

AIRCRAFT	Peak Overpressure (psf)	C-Weighted SEL (dB)	Duration (sec)
F-14	2.75	110.4	0.135
F-15C	2.76	110.4	0.135
F-15E	2.87	110.8	0.140
F-16C	2.05	107.9	0.100
F-18	2.60	109.6	0.122

ESTIMATION OF THE NUMBER OF MONTHLY SORTIES ENGAGED IN SUPERSONIC ACTIVITY AND THE POTENTIAL NUMBER OF DAILY SONIC BOOMS IN THE AREAS

	ALTERNATIVE											
	Baseline				Proposed Action				Alternative A			
	Routine Tng Month		MFE Month		Routine Tng Month		MFE Month		Routine Tng Month		MFE Month	
MOA	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month
Northern Interior Region												
YUKON 1			480	11.52	54	1.30	613	14.71	54	1.30	613	14.71
YUKON 2	147	3.53	612	14.69	55	1.32	614	14.74	55	1.32	614	14.74
YUKON 3					42	1.01	36	0.86	42	1.01	36	0.86
YUKON 4					15	0.36	13	0.31	15	0.36	13	0.31
YUKON 5					8	0.19	8	0.19	8	0.19	8	0.19
YUKON 1/2 (Combo)							378	9.07			378	9.07
Subtotal	*147*	*3.53*	*1092*	*26.21*	*174*	*4.18*	*1662*	*39.88*	*174*	*4.18*	*1662*	*39.88*
Southcentral Region												
FOX					316	7.58	647	15.53	316	7.58	647	15.53
FOX (Modified)												
TANANA												
SUSITNA	148	3.55	148	3.55	52	1.25	52	1.25	52	1.25	52	1.25
Subtotal	*148*	*3.55*	*148*	*3.55*	*368*	*8.83*	*699*	*16.78*	*368*	*8.83*	*699*	*16.78*
Western Region												
STONY A/B	501	12.02	811	19.46	426	10.22	811	19.46	426	10.22	811	19.46
STONY A (Modified)/B												
Subtotal	*501*	*12.02*	*811*	*19.46*	*426*	*10.22*	*811*	*19.46*	*426*	*10.22*	*811*	*19.46*
Total	798	19.10	2,051	49.22	968	23.23	3,172	76.12	968	23.23	3,172	76.12

ESTIMATION OF THE NUMBER OF MONTHLY SORTIES ENGAGED IN SUPERSONIC ACTIVITY AND THE POTENTIAL NUMBER OF DAILY SONIC BOOMS IN THE AREAS

	ALTERNATIVE											
	Alternative B				Mitigated Alternative A				Mitigated Alternative B			
	Routine Tng Month		MFE Month		Routine Tng Month		MFE Month		Routine Tng Month		MFE Month	
MOA	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month	Monthly Sorties	Avg. # of Booms per Month
Northern Interior Region												
YUKON 1	54	1.30	613	14.71	54	1.30	613	14.71	54	1.30	613	14.71
YUKON 2	55	1.32	614	14.74	55	1.32	614	14.74	55	1.32	614	14.74
YUKON 3	42	1.01	36	0.86	42	1.01	36	0.86	42	1.01	36	0.86
YUKON 4					23	0.55	13	0.31				
YUKON 5							8	0.19				
YUKON 1/2 (Combo)							378	9.07				
Subtotal	*151*	*3.63*	*1263*	*30.31*	*174*	*4.18*	*1662*	*39.88*	*151*	*3.63*	*1263*	*30.31*
Southcentral Region												
FOX	316	7.58	647	15.53					316	7.58	647	15.53
FOX (Modified)					316	7.58	647	15.53				
TANANA	23	0.55	399	9.58					23	0.55	399	9.58
SUSITNA	52	1.25	52	1.25	52	1.25	52	1.25	52	1.25	52	1.25
Subtotal	*391*	*9.38*	*1098*	*26.36*	*368*	*8.83*	*699*	*16.78*	*391*	*9.38*	*1098*	*26.36*
Western Region												
STONY A/B	426	10.22	811	19.46								
STONY A (Modified)/B					426	10.22	811	19.46	426	10.22	811	19.46
Subtotal	*426*	*10.22*	*811*	*19.46*	*426*	*10.22*	*811*	*19.46*	*426*	*10.22*	*811*	*19.46*
Total	968	23.23	3,172	76.13	968	23.23	3,172	76.12	968	23.23	3,172	76.13

Summary of the Distribution of Cumulative Peak Overpressures

Percentage of Time the Peak Overpressures Observed were BELOW the level Identified

Percentage (Approx.)	L_{PK} (psf)
50.0%	< 0.50
79.0%	< 1.00
88.0%	< 1.50
93.0%	< 2.00
96.0%	< 2.50
98.0%	< 3.00
98.5%	< 3.50
99.2%	< 4.00

Source: Wyle Research Report, WR 89-18, September 1989
Title: *Measurements of Sonic Booms Due to ACM Training at White Sands Missile Range*

Mach Number-Time Distribution

SUMMARY

F-15

Mach Number	*% of Time*
<=1.00	17.75%
1.01 to 1.10	75.02%
1.11 to 1.20	5.41%
1.21 to 1.30	1.81%

F-16

Mach Number	*% of Time*
<=1.00	14.41%
1.01 to 1.10	70.04%
1.11 to 1.20	5.88%
1.21 to 1.30	6.43%
1.31 to 1.40	3.01%
1.41 to 1.45	0.23%

Supersonic Operations with a Floor of 12,000' MSL (10,000' MSL in STONY MOAs)

Altitude Band (Ft AGL)		YUKON SUMMARY %	YUKON Area (Sq Miles)	STONY SUMMARY %	STONY Area (Sq Miles)	FOX/SUSITNA SUMMARY %	FOX/SUSITNA Area (Sq Miles)	EIS SUMMARY %	EIS Area (Sq Miles)
Less than 5000		0.00	0.00	0.00	0.00	0.00	0.00	0	0.00
5,000	*5,999*	0.02	4.75	9.77	835.38	7.39	721.15	3.71	1,561.28
6,000	*6,999*	0.94	224.21	3.50	299.16	8.20	800.26	3.14	1,323.63
7,000	*7,999*	7.53	1,794.83	6.40	547.43	16.00	1,561.32	9.26	3,903.58
8,000	*8,999*	20.04	4,773.12	22.29	1,907.11	25.51	2,490.09	21.76	9,170.32
9,000	*9,999*	25.22	6,007.96	58.04	4,964.92	24.31	2,373.37	31.67	13,346.25
10,000	*10,999*	31.95	7,611.34	0.00	0.00	8.73	852.60	20.09	8,463.94
11,000	*11,999*	14.30	3,406.79	0.00	0.00	9.86	962.20	10.37	4,368.99
12,000	*12,999*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Totals	100	23,823	100	8,554	100	9,761	100	42,138

Note: These estimations are based on the MOA boundaries ***AFTER*** adjustments to the boundaries are applied in FOX and STONY A.

With a supersonic floor of 12,000' MSL: **69.54%** of the area would be below 10,000' AGL and **30.46%** would be at or above 10,000'AGL.

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Background Documentation

- HQ USAF/CEVP Ltr, 11 Mar 1993: Approval for the conduct of supersonic operations in the YUKON 1 and YUKON 2 MOAs during an MFE
- 11 AF/DO Msg 061725Z Oct 93, Subj. FCIF Item: 11 AF Chaff and Flare Restrictions
- Current Letter of Agreement between Anchorage ARTCC and 11 AF, Subj. Description of Alaskan Military Airspace, Amended Mar 28, 1994
- 11 AF/DO Msg, Subj. Fire Index Restrictions on Weapons Delivery

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON DC

18 MAR 1993

REPLY TO ATTN OF: AF/CEVP

SUBJECT: Permanent Approval for Major Flying Exercises (MFE) Supersonic Operations in Yukon 1 and 2 Military Operation Areas (MOAs)

TO: HQ PACAF/DOO

Reference: HQ PACAF/DOO letter to HQ USAF/CEVP of 19 Feb 93

1. Permanent approval is granted to conduct short duration, supersonic flight operations, as assessed, down to 5,000 feet above ground level (AGL)/10,000 feet MSL in Military Operation Areas (MOA) Yukon 1 and 2 for Major Flying Exercises (MFE) in Alaska.

2. Currently approved supersonic operations below FL 300 over land in the U.S. are considered permanent. However, reevaluations are required at three year intervals in accordance with AFR 55-34, as revised by HQ USAF/LEEV msg 101330Z Jul 90. Reevaluations will determine consistency between actual conditions (operations, the affected environs and impacts) and the estimated assessed conditions which were the basis of supersonic approvals. All adopted mitigation measures and commitments which were made in approving the supersonic flying operations must be evaluated and compliance ensured. In addition, reevaluations permit the Air Force to reconsider its decisions using the latest scientific information regarding impacts to humans, animals, and structures.

3. HQ PACAF operational offices, in coordination with HQ PACAF airspace and environmental offices, shall develop and maintain a management system for retaining supporting environmental documents (ten years) and ensuring periodic monitoring, compliance, and approval renewal. Promptly advise HQ USAF/CEVP of any environmental or operational condition that warrants reconsideration of the decision that approved the supersonic flight operations, e.g. a change in weapon system, tactics, endangered species.

4. MFE supersonic operations will require renewal approval by HQ AF/CEVP by 1 April 96. Your request for renewal must be

accompanied by an updated environmental analysis and processed in accordance with AFR 55-34, as revised.

5. HQ AF/CEVP point of contact is Mr. Herb Dean, DSN 227-2797, fax: DSN 225-8943.

JERRY D. COLE, LT COL, USAF
Acting Chief, Environmental Planning Division
Directorate of Environmental Quality

01 02 0617252 OCT 93 RR RR UUUU D00W201536

NO

11AF ELMENDORF AFB AK//DO//

354WG EIELSON AFB AK//CC//

354OG EIELSON AFB AK//CC//

353FS EIELSON AFB AK//CC//

ZEN 3WG ELMENDORF AFB AK//CC//

ZEN 3OG ELMENDORF AFB AK//CC//

INFO HQ PACAF HICKAM AFB HI//DO/DOO/DOX//

UNCLAS

QQQQ

MSGID/SYS-RRM/11AF ELMENDORF AFB AK/DO//

AMPN/SUBJ: FCIF ITEM: 11AF CHAFF/FLARE RESTRICTIONS//

REF/A/11AF-DO MSG/071905Z MAY 93/SAME SUBJ//

RMKS/1. THIS MESSAGE SUPERCEDES REFERENCE MESSAGE WHICH CONSOLIDATED ALL RESTRICTIONS ON THE USE OF CHAFF AND FLARES IN 11AF. POLICY ON FLARE USAGE HAS CHANGED.

2. CHAFF AND FLARES WILL ONLY BE DISPENSED IN RESTRICTED AREAS, PERMANENT MOAS, AND WARNING AREAS. CHAFF AND FLARE USE IN TEMPORARY MOAS OR TEMPORARY EXERCISE AIRSPACE IS PROHIBITED.

3. WITHIN SUSITNA MOA, CHAFF MAY ONLY BE DISPENSED UP TO 10,000 FT AGL WHEN SOUTH OF LATITUDE 62-30N AND UP TO 20,000 FT AGL WHEN

MAJ MCCARTHY, DOOW, 2-5125

MICHAEL S. TILLMAN
Lt Col USAF
Asst Chief, Operations Division

02 02 OCT 93 RR RR UUUU DOOW301536

NO

NORTH OF THAT LINE.

4. USE OF FLARES IS AUTHORIZED IN PERMANENT MOAS AND RESTRICTED AREAS WITH THE FOLLOWING RESTRICTIONS:

A. OVERLAND, FROM 1 JUN THROUGH 30 SEP, FLARES MAY ONLY BE EMPLOYED ABOVE 5000 FT AGL.

B. OVERLAND, FROM 1 OCT THROUGH 31 MAY, MINIMUM ALTITUDE FOR FLARE USE IN PERMANENT MOAS IS 2000 FT AGL. MINIMUM ALTITUDE FOR FLARES IN RESTRICTED AREAS IS THE MOST RESTRICTIVE OF JR 55-79 CHAP 7, AFR 50-46/11AF SUP 1, OR UNIT REGULATIONS.

C. FLARES ARE PROHIBITED FOR MAJOR FLYING EXERCISES.

D. UNITS NOT ASSIGNED TO 11AF REQUIRE 11AF/DO APPROVAL TO EXPEND CHAFF AND FLARES.

5. IAW JR 55-79, FLARES/EXPLOSIVE CHAFF WILL NOT BE DISPENSED WITH AN ATTACKER INSIDE 3000 FT.

6. ELEVENTH AIR FORCE POCS ARE LT COL PERME AND MAJ MCCARTHY, DSN 552-2416/5128.//

NNNN

MAJ MCCARTHY, DOOW, 2-5128

MST

US Department of Transportation
Federal Aviation Administration

Anchorage Center
5400 Davis Highway
Anchorage, AK 99506

C. B. Phillips, Colonel, USAF
Chief, Operations Division
11th Air Force
5800 G street
Suite 102
Elmendorf AFB, AK 99506

Dear Colonel Phillips,

Attached is an amendment to the current Anchorage ARTCC and 11th Air Force Letter of Agreement (LOA), Subject: Description of Alaskan Military Airspace.

This amendment corrects errors to the existing LOA which reflects inappropriate coordinates for the Air Traffic Control Assigned Airspace (ATCAA) AAA1.

This amendment also institutes coordinates for AAA1B, a new and permanent ATCAA which has been designed to facilitate high altitude missions in conjunction with the ranges in R2205. Whereas AAA1B has been implemented to accommodate high altitude ordinance delivery into R2205, it should be reemphasized that at no time is a weapons release authorized within AAA1B or any ATCAA.

A review of airspace utilization has resulted in a determination to decommission the following ATCAA's: AAA5, AAA7, AAA9, AAA10, AAA11, and AAA13. This decision was based on the following criteria:

1. Non-usage.

2. Reduction in controller chart congestion.

3. Reduction in training requirements.

4. All of the stated ATCAA's have overlying ADX areas, which would remain available for military use.

The following entry/exit gates would also be eliminated along with the associated ATCAA's: Dilee; 59°18'N 159°42'W (AAA7), Koyuk; 62°47'N 161°25'W Bethl; 61°24'N 161°10'W (AAA9), and Grany; 65°05'N 161° W (AAA10).

The descriptions for the decommissioned ATCAA's and gates have been removed from the existing Description of Alaskan Military Airspace LOA (reflected in this amendment); however, they will be retained indefinitely at Anchorage Center should the need arise to reinstitute any or all of this airspace.

Although the attached document is an amendment to an existing LOA, the nature of the changes contained within require reproduction of the LOA in it's entirety. The data shown in bold reflects applicable changes.

Please ensure that notification of this amendment is distributed to appropriate agencies within the 11th Air Force.

If you have any questions, please contact Dave Connett, Military Operations Specialist, ZAN-560 at Anchorage Center, (907) 269-1121, DSN 552-8225.

Sincerely,

Edward J. Smith

Edward J. Smith
Air Traffic Manager
Anchorage Center

Attachment

Anchorage ARTCC
AND
11th Air Force
LETTER OF AGREEMENT

Effective Date: JAN 3 1993
Amended Date: MAR 28 1994

SUBJECT: Description of Alaskan Military Airspace.

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1. PURPOSE: This Letter Of Agreement (LOA) provides graphic descriptions of Air Traffic Control Assigned Airspace (ATCAA), Military Operation Areas (MOA), Air Defense Exercise Areas (ADX Area) and a Warning Area.

2. CANCELLATION: This LOA cancels Annex 8 "Military Operations Area (MOA) Descriptions" of the FAA Alaskan Region and the Alaskan Air Command/Alaskan Norad Region LOA dated November 22, 1988.

3. SCOPE: This LOA is applicable to all signatory agencies.

4. MILITARY OPERATIONS AREA - CONTROLLING AGENCY: The controlling agency for all MOA's is the Federal Aviation Administration (FAA) represented by Anchorage Air Route Traffic Control Center (ZAN).

-. MOA DESCRIPTIONS:

A. GALENA

Point	Lat./Long.	Fix/Radial/Distance
(1)	64°34'05''N 155°16'36''W to	GAL 081/040
(2)	64°33'N 153°W to	GAL 072/098
(3)	64°N 153°W to	GAL 090/108
(4)	63°17'N 154°45'W to	MCG 026/031
(5)	64°09'55''N 155°59'52''W	GAL 126/040
	Thence:	

Counterclockwise via a 40 NM radius arc from the Galena VORTAC to the point of beginning.

Entry/Exit Gates

Latna:64°28'N 155°22'W (GAL 091/040)
Minna:64°N 153°W (GAL 090/108)
Amtee:64°33'N 153°30'W (GAL 073/085)

ALTITUDES: 1000' AGL to but not including FL 180.
USING AGENCY: 3rd Wing (3 WG), Elmendorf AFB
TIMES: By NOTAM Only

1

B. NAKNEK

Point	Lat./Long.	Fix/Radial/Distance
(1)	60°30'N 159°W to	AKN 307/126
(2)	60°50'N 156°W to	AKN 349/128
(3)	60°53'N 154°28'W to	EDF 239/138
(4)	60°26'N 154°13'W to	AKN 015/127
(5)	59°30'N 158°W to	AKN 300/060
(6)	59°55'N 159°W to	AKN 296/099
	Point of beginning	

Entry/Exit Gates

Nakne:59°41'N 157°20'W (AKN 322/060)
Ethan:60°44'N 156°54'W (AKN 337/121)
Spair:60°37'13''N 154°19'35''W (ANC 232/125)
Muhle:60°53'N 154°39'W (EDF 238/144)

ALTITUDES: 3000'AGL to but not including FL180.
USING AGENCY: 3 WG, Elmendorf AFB
TIME: By NOTAM Only

NAKNEK MOA is subdivided as NAKNEK 1 and NAKNEK 2. NAKNEK 1 is West of the AKN 340° (magnetic radial). Naknek 2 is East of this radial. The radial divides the area approximately from 59°49'N 156°45'W to 60°46'N 156°43'W.

C. STONY A

Point	Lat./Long.	Fix/Radial/Distance
(1)	62°31'30''N 155°48'W to	MCG 169/026
(2)	61°40'N 152°34'W to	EDF 263/084
(3)	61°25'N 152°48'W to	EDF 253/088
(4)	61°24'N 155°35'W	MCG 157/093
	Thence:	

Northward along the east bank of the Stoney River until it joins the Kuskokwim River, thence northward along the east bank of the Kuskokwim River until it joins the point of beginning.

Entry/Exit Gates

Carou:62°18'N 154°54'W (MCG 130/044)
Stoon:61°35'52''N 152°37'53''W (EDF 260/085)
Gerde:61°54'N 153°23'W (EDF 267/111)
Skinr:61°25'N 153°59'W (EDF 251/123)

ALTITUDES: 100' AGL to, but not including FL180.
USING AGENCY: 3 WG, Elmendorf AFB, AK.
TIMES: Mon-Fri, 0800-1800 (local time), other times by NOTAM.

D. STONY B

›int	Lat./Long.	Fix/Radical/Distance
(1)	61°24'N 155°35'W to	MCG 157/093
(2)	61°23'N 156°25'W to	MCG 171/097
(3)	61°37'15''N 158°14'W to	MCG 201/109
(4)	61°53'N 158°06'W to	MCG 205/095
(5)	62°35'N 156°W to	MCG 183/025
(6)	62°31'30''N 155°48'W Thence:	MCG 169/026

Southward along the east bank of the Kuskokwim River until it joins the Stony River thence southward along the east bank of the Stony River until it joins the point of beginning.

Entry/Exit Gates

Slete:61°23'N 156°14'W (MCG 168/096)

ALTITUDES: 3000 feet AGL up to, but not including FL180.
USING AGENCY: 3 WG, Elmendorf AFB, AK.
TIMES: By NOTAM only.

E. SUSITNA MOA/ATCAA

int	Lat./Long.	Fix/Radial/Distance
(1)	62°18'36''N 152°40'06''W thence clockwise via a 89 DME ARC of BGQ VORTAC to	BGQ 276/089
(2)	63°00'45''N 150°41'30''W to	BGQ 322/089
(3)	62°14'10''N 150°18'12''W thence counterclockwise via a 41 DME ARC of BGQ VORTAC to	BGQ 322/041
(4)	61°55'N 151°12'45''W to Point of beginning	BGQ 276/041

Entry/Exit Gates

Skwen:62°01'30''N 151°03'W (BGQ 287/041)
Memry:61°57'03''N 151°20'08''W (BGQ 276/045)
Vonny:62°37'45''N 152°11'W (BGQ 291/089)
Kiana:62°38'22''N 150°30'W (BGQ 322/066)

ALTITUDES: 10,000' MSL or 5000' AGL (whichever is higher) and above.
USING AGENCY: 3 WG, Elmendorf AFB
TIMES: Mon. - Fri. 1700-0300Z, other times by NOTAM.

The area directly overlying the Susitna MOA is procedurally established as an ATCAA and is normally released with the Susitna MOA.

F. YUKON 1

Point	Lat./Long.	Fix/Radial/Distance
(1)	64°46'12''N 146°46'40''W to	FAI 065/032
(2)	64°50'N 146°23'W to	FAI 059/042
(3)	64°50'N 146°W to	FAI 059/051
(4)	65°N 146°W to	FAI 048/053
(5)	65°N 143°W to	FAI 054/129
(6)	64°N 144°W to	FAI 085/114
(7)	64°33'24''N 146°18'30''W to	FAI 080/046
(8)	64°33'24''N 146°46'W to	FAI 086/035
(9)	64°34'25''N 146°47'20''W to	FAI 085/034

Point of beginning (excluding that portion wholly contained by R-2205 when active).

Entry/Exit Gates

Buflo:64°10'N 144°38'W (BIG 040/030)
Mizzi:64°22'08''N 145°30'19''W (BIG 345/023)
Piney:64°31.5'N 146°10.3'W (EIL 083/026)

ALTITUDES: Surface up to, but not including FL180.
USING AGENCY: 343rd Wing (343 WG), Eielson AFB, AK.
TIMES: Mon-Fri. 0800-1800 (local time), other times by NOTAM.

G. YUKON 2

Point	Lat./Long.	Fix/Radial/Distance
(1)	66°10'N 145°05'W to	FAI 012/110
(2)	66°10'N 143°W to	FAI 040/054
(3)	65°N 143°W to	FAI 040/054
(4)	65°N 146°W to	FAI 048/053
(5)	65°23'N 146°W to	FAI 027/062

Point of beginning

Entry/Exit Gates

Yukan:65°07'N 146°W (FAI 040/054)
Cabin:65°45'46''N 145°33'48''W (EIL 002/075)
Appel:65°23'N 146°W (EIL 005/050)

ALTITUDES: 100 feet AGL to but not including FL180, excluding surface to 2,000 feet AGL in the area beginning:

Point	Lat./Long.	Fix/Radial/Distance
(1)	65°27'04''N 145°55'23''W to	EIL 004/055
(2)	65°35'N 145°30'W to	EIL 008/068
(3)	65°40'N 144°35'W to	EIL 017/087
(4)	65°52'N 144°05'W to	EIL 017/104

4

(5)	65°52'N 144°W to	EIL 018/106
)	65°45'N 144°W to	EIL 021/101
)	65°21'N 144°40'W to	EIL 027/074
(8)	65°21'N 146°W to	EIL 006/049
(9)	65°23'N 146°W to	EIL 005/050
	Point of beginning	

SCHEDULING AGENCY: 343rd WG, Eielson AFB, AK.
TIMES: Mon-Fri. 0800-1800 (local time), other times by NOTAM.

6. ATC ASSIGNED AIRSPACE (ATCAA) DESCRIPTIONS

NOTE: USABLE FLIGHT LEVELS - All ATCAA's are FL180 and above.

A. AAA - 1

Point	Lat./Long.	Fix/Radial/Distance
(1)	66°10'N 145°05'W to	FAI 012/110
(2)	66°10'N 141°W to	FAI 034/193
(3)	64°N 141°W to	FAI 074/188
(4)	64°N 144°W to	FAI 085/114
(5)	64 30'N 146 W	FAI 080/055
(6)	65°23'N 146°W to	FAI 027/062
	Point of beginning	

ry/Exit Gates
ukan:65°07'N 146°W (FAI 040/054)
Buflo:64°10'N 144°38'W (BIG 040/030)
Mizzi:64°22'08''N 145°30'19''W (BIG 345/023)
Cabin:65°45'46''N 145°33'48''W (EIL 002/075)
Appel:65°23'N 146°W (EIL 005/050)

B. AAA - 1A

Point	Lat./Long.	Fix/Radial/Distance
(1)	67°N 143°57'W to	FYU 020/040
(2)	67°N 141°W to	FYU 043/104
(3)	66°10'N 141°W to	FYU 071/108
(4)	66°10'N 145°05'W to	FYU 012/110
	Point of beginning	

C. AAA - 1B

Point	Lat./Long.	Fix/Radial/Distance
(1)	64 30'N 146W to	FAI 085/055
(2)	64 33'24"N 146 18'30"W to	FAI 080/046
(3)	64 33'24"N 146 46'W to	FAI 086/035
(4)	64 46'12"N 146 46'40"W to	FAI 065/032
(5)	64 50'N 146 23' to	FAI 059/042
	64 50'N 146 W to	FAI 059/051
	Point of beginning	

5

Entry/Exit Gates

Piney: 64 31.5'N 146 10.3W (EIL 083/026)

D. AAA - 2

Point	Lat./Long.	Fix/Radial/Distance
(1)	63°58'N 148°W to	BIG 240/060
(2)	63°56'N 147°02'W to	BIG 235/035
(3)	63°44'N 146°30'W to	BIG 203/026
(4)	63°42'N 146°13'W to	BIG 187/023
(5)	63°43'N 145°54'W to	BIG 167/018
(6)	62°27'N 145°54'W to	BIG 154/093
(7)	62°30'N 146°45'W to	BIG 168/094
(8)	62°33'N 148°48'W to	BIG 200/112
	Point of beginning	

Entry/Exit Gates

Beyar:63°57'N 147°45'W (FAI 144/050)
Midwa:62°32'30''N 148°13'W (ANC 008/101)
Donor:62°31'30''N 147°18'W (ANC 019/116)
Dikee:63°35'N 145°54'W (BIG 162/026)
Welle:63°33'N 148°15'W (FAI 157/075)

E. AAA - 2A

Point	Lat./Long.	Fix/Radial/Distance
(1)	63°43'N 145°54'W to	BIG 167/018
(2)	63°43'N 145°W to	BIG 103/026
(3)	62°33'N 145°W to	BIG 138/089
(4)	62°25'N 145°30'W to	BIG 147/095
(5)	62°27'N 145°54'W to	BIG 154/093
	Point of beginning	

Entry/Exit Gate

Steak:63°43'N 145°18'24''W (BIG 118/020)

F. AAA - 2B

Point	Lat./Long.	Fix/radial/distance
(1)	62°33'N 148°48'W to	EDF 354/087
(2)	62°30'N 146°45'W to	GKN 272/042
(3)	62°27'N 145°54'W to	GKN 297/022
(4)	62°17'N 145°54'W to	GKN 274/015
(5)	61°55'N 148°50'W to	EDF 009/048
	Point of beginning	

Entry/Exit Gates

.aya:62°N 148°49'05''W (EDF 006/052)
Hootr:62°15'48.5''N 146°04'22.7''W (GKN 263/019)
Note: AAA-2B is to be used only upon activation or requested use of Anchor Refueling Track AR-720.

G. AAA - 3

Point	Lat./Long.	Fix/Radial/Distance
(1)	60°30'N 159°W to	AKN 307/126
(2)	60°50'N 156°W to	AKN 349/128
(3)	60°53'N 154°28'W to	EDF 239/138
(4)	60°26'N 154°13'W to	AKN 015/127
(5)	59°30'N 158°W to	AKN 300/060
(6)	59°55'N 159°W to	AKN 296/099
	Point of beginning	

Entry/Exit Gates

Spair:60°37'13''N 154°19'35''W (ANC 232/125)
Nakne:59°41'N 157°20'W (AKN 322/060)
Ethan:60°44'N 156°54'W (AKN 337/121)
Muhle:60°53'N 154°39'W (EDF 238/144)

TE: NAKNE corridor is defined as 5 nautical miles either side of the AKN R-322 from the AKN VORTAC to the boundary of AAA3. The altitude shall be at and below FL290 northwestward to the boundry of AKN RAPCON and then FL190 to FL290 to the boundry of AAA-3.

H. AAA - 3A

Point	Lat./Long.	Fix/Radial/Distance
(1)	61°16'N 159°W to	MCG 202/137
(2)	61°37'N 158°15'W to	MCG 201/109
(3)	61°23'N 156°24'W to	MCG 171/097
(4)	61°24'N 155°10'W to	MCG 149/094
(5)	60°52'N 155°10'W to	MCG 151/126
(6)	60°50'N 156°W to	MCG 162/128
(7)	60°30'N 159°W to	MCG 192/176
	Point of beginning	

ENTRY/EXIT GATE
Busrr:61°19'N 155°10'W (MCG 150/099)

I. AAA - 4

Point	Lat./Long.	Fix/Radial/Distance
)	55°43'N 161°33'W to	CDB 040/049
2)	56°56'N 159°28'W to	CDB 030/149
(3)	56°05'N 158°10'W to	CDB 054/163

(4)	55°05'N 160°34'W to Point of beginning	CDB 080/076

Entry/Exit Gate

Kayef:56°45'N 159°11'W (AKN 193/142)

J. AAA - 8A

Point	Lat./Long.	Fix/Radial/Distance
(1)	62°31'30''N 155°48'W to	MCG 169/026
(2)	61°40'N 152°34'W to	EDF 263/084
(3)	61°25'N 152°48'W to	EDF 253/088
(4)	61°24'N 155°35'W to	MCG 157/093
(5)	61°29'N 156°05'W to	MCG 166/089
(6)	61°39'N 156°15'W to	MCG 170/080
(7)	61°45'N 156°35'W to	MCG 178/077
(8)	61°55'N 156°14'W to	MCG 173/065
(9)	62°12'N 156°14'W to	MCG 182/048
(10)	62°24'N 156°05'W to Point of beginning	MCG 179/036

Entry/Exit Gates

Carou:62°18'N 154°54'W (MCG 130/044)
Stoon:61°35'52''N 152°37'53''W (EDF 260/085)
Skinr:61°25'N 153°59'W (EDF 251/123)
Gerde:61°54'N 153°23'W (EDF 267/111)

K. AAA - 8B

Point	Lat./Long.	Fix/Radial/Distance
(1)	61°24'N 155°35'W to	MCG 157/093
(2)	61°23'N 156°25'W to	MCG 171/097
(3)	61°37'N 158°15'W to	MCG 201/109
(4)	61°53'N 158°06'W to	MCG 205/095
(5)	62°35'N 156°W to	MCG 183/025
(6)	62°31'30''N 155°48'W to	MCG 169/026
(7)	62°24'N 156°05'W to	MCG 179/036
(8)	62°12'N 156°14'W to	MCG 182/048
(9)	61°55'N 156°14'W to	MCG 173/065
(10)	61°45'N 156°35'W to	MCG 178/077
(11)	61°39'N 156°15'W to	MCG 170/080
(12)	61°29'N 156°05'W to Point of beginning	MCG 166/089

Entry/Exit Gate

Sleve:61°23'N 156°14'W (MCG 168/096)

L. AAA - 12

Point	Lat./Long.	Fix/Radial/Distance
(1)	66°53'N 156°W to	GAL 345/130
(2)	66°32'N 151°45'W to	ENN 304/134
(3)	65°20'N 150°W to	ENN 305/050
(4)	65°N 150°05'W to	ENN 286/036
(5)	64°58'N 155°19'W to	GAL 046/040
	along a 40NM ARC	FAI 285/089
	of GAL VORTAC to	
(6)	65°19'N 156°W to	GAL 006/040
	Point of beginning	

Entry/Exit Gates

Rojam:65°20'N 150°W (FAI 275/060)
Rubby:65°08'N 155°30'W (GAL 030/040)
Laree:65°48'N 150°39'W (FAI 285/089)

M. AAA - 14

Point	Lat./Long.	Fix/Radial/Distance
(1)	64°34'N 155°16'W to	GAL 081/040
)	64°33'N 153°W to	GAL 072/098
)	64°N 153°W to	GAL 090/108
(4)	63°12'N 151°31'W to	FAI 197/133
(5)	63°N 153°W to	MCG 064/071
(6)	63°N 154°20'W to	MCG 062/035
(7)	64°10'N 156°W to	GAL 126/040
	along a 40NM ARC	
	of GAL VORTAC to	
	Point of beginning	

Entry/Exit Gates

Bevan:63°02'N 152°44'W (MCG 062/079)
Latna:64°28'N 155°22'W (GAL 091/040)
Minna:64°N 153°W (GAL 090/108)
Vedda:63°04'N 154°25W (MCG 054/033)
Amtee:64°33'N 153°30'W (GAL 073/085)

N. AAA - 15

Point	Lat./Long.	Fix/Radial/Distance
(1)	64°32'N 152°24'W to	GAL 072/113
(2)	64°28'N 150°08'W to	FAI 223/058
(3)	63°22'N 150°18'W to	FAI 188/105
4)	63°12'N 151°31'W to	FAI 197/133
)	64°N 153°W to	GAL 090/108
6)	64°20'N 153°W to	GAL 080/100
	Point of beginning	

Entrv/Exit Gates

Mckin:63°20'N 150°37'W (FAI 191/111)
Clere:64°02'N 150°12'W (FAI 204/073)
Minna:64°N 153°W (GAL 090/108)
Hilum:64°32'N 152°W (GAL 071/124)

7. ATC ASSIGNED AIRSPACE FOR PLANNED AIR DEFENSE/TACTICAL EXERCISES (ADX)

A. ADX "A"

Point	Lat./Long.	FIX/Radial/Distance
(1)	55°43'N 161°33'W to	CDB 040/049
(2)	58°11'N 157°09'W to along a 35NM ARC of AKN VORTAC to	AKN 180/035
(3)	58°48'N 155°38'W to	AKN 061/035
(4)	59°40'N 153°30'W to	AKN 039/114
(5)	59°20'N 152°20'W to	EDF 191/138
(6)	57°57'N 152°55'W to	ODK 277/021
(7)	56°05'N 158°10'W to	CDB 054/163
(8)	55°05'N 160°34'W to	CDB 080/076
	Point of beginning	

Entry/Exit Gates

Snips:58°10'N 156°28'W (AKN 144/035)
Eless:57°04'N 159°21'W (ANC 200/130)

Altitudes: As negotiated (normally FL180-FL290)

B. ADX "B"

Point	Lat./Long.	Fix/Radial/Distance
(1)	60°04'N 163°W to	BET 201/055
(2)	60°30'N 159°W to	AKN 307/126
(3)	60°50'N 156°W to	AKN 349/128
(4)	60°53'N 154°28'W to	EDF 239/138
(5)	60°26'N 154°13'W to	AKN 015/127
(6)	59°30'N 158°W to	AKN 300/060
(7)	59°11'N 159°35'W to	DLG 270/034
(8)	59°10'N 163°W to	BET 182/103
	Point of beginning	

Entry/Exit Gates

Spair:60°37'13''N 154°19'35''W (ANC 232/125)
Nakne:59°41'N 157°20'W (AKN 322/060)
Ethan:60°44'N 156°54'W (AKN 337/121)
Muhle:60°53'N 154°39'W (EDF 238/144)

Altitudes: As negotiated (Normally FL180 and above)

C. ADX "C"

,int	Lat./Long.	Fix/Radial/Distance
(1)	63°N 164°10'W to	OME 145/094
(2)	62°35'N 156°W to	MCG 183/025
(3)	61°40'N 152°34'W to	EDF 264/083
(4)	61°25'N 152°48'W to	EDF 254/087
(5)	61°23'N 156°25'W to	MCG 171/097
(6)	61°N 163°W to	BET 272/037
	Point of beginning	

Entry/Exit Gates

Stoon:61°35'52''N 152°37'53''W (EDF 260/085)
Slete:61°23'N 156°14'W (MCG 168/096)
Carou:62°18'N 154°54'W (MCG 130/044)
Gerde:61°54'N 153°23'W (EDF 267/111)
Skinr:61°25'N 153°59'W (EDF 251/123)

Altitudes: As negotiated (Normally FL180 and above)

D. ADX "D"

Point	Lat./Long.	Fix/Radial/Distance
)	64°20'N 164°10'W to	OME 091/030
(2)	64°34'N 158°17'W to along a 40NM ARC of GAL VORTAC to	GAL 233/040
(3)	64°34'N 155°16'W to	GAL 081/040
(4)	64°33'N 153°W to	GAL 072/098
(5)	64°N 153°W to	GAL 090/108
(6)	63°12'N 151°31'W to	MCG 060/092
(7)	63°N 153°W to	MCG 064/071
(8)	61°53'N 153°21'W to	MCG 112/090
(9)	62°35'N 156°W to	MCG 183/025
(10)	63°N 164°10'W to	OME 145/094
	Point of beginning	

Entry/Exit Gates

Bevan:63°02'N 152°44'W (MCG 062/079)
Latna:64°28'N 155°22'W (GAL 091/040)
Burky:62°14'N 153°16'W (EDF 277/114)
Minna:64°N 153°W (GAL 090/108)
Lucor:64°15'N 157°48'W (GAL 200/040)

Altitudes: As negotiated (Normally FL180 and above, except in "Delta" corridor.)

E. "Delta" Corridor within ADX "D"

Point	Lat./Long.	Fix/Radial/Distance
(1)	64°20'N 164°10'W to	OME 091/030
(2)	64°25'N 163°08'W to	OME 076/055
(3)	64°03'N 160°29'W to	UNK 009/011
(4)	63°16'N 156°12'W to	MCG 297/025
(5)	64°04'N 156°45'W to along a 40NM ARC of GAL VORTAC to	GAL 156/040
(6)	64°10'N 156°W to	GAL 126/040
(7)	63°04'N 155°17'W to	MCG 029/011
(8)	62°25'N 153°12'W to	MCG 092/074
(9)	62°02'N 153°20'W to	MCG 107/084
(10)	62°50'N 155°53'W to	MCG 204/010
(11)	63°41'N 160°31'W to	UNK 141/013
(12)	64°11'N 164°10'W to Point of beginning	OME 105/034

Altitudes: FL290 and above.

F. ADX "E"

Point	Lat./Long.	Fix/Radial/Distance
(1)	67°10'N 161°48'W to	OTZ 026/024
(2)	67°15'N 161°W to	OTZ 039/042
(3)	66°32'N 151°45'W to	ENN 304/134
(4)	65°20'N 150°W to	ENN 305/050
(5)	65°N 150°05'W to	ENN 286/036
(6)	64°58'N 155°19'W to along a 40NM ARC of GAL VORTAC to	GAL 046/040
(7)	65°20'N 157°30'W to Point of beginning	GAL 310/040

Entry/Exit Gates

Dodee:65°24'N 157°W (GAL 329/040)
Rojam:65°20'N 150°W (FAI 275/060)
Rubby:65°08'N 155°30'W (GAL 030/040)
Laree:65°48'N 150°39'W (FAI 285/089)

Altitudes: As negotiated (Normally FL180 and above)

G. ADX "F"

Point	Lat./Long.	Fix/Radial/Distance
(1)	69°30'N 162°W to	BRW 202/149
(2)	69°30'N 161°W to	BRW 196/136
(3)	67°15'N 161°W to	OTZ 039/042
(4)	67°10'N 161°48'W to	OTZ 026/024

(5)	64°45'N 164°10'W to	OME 043/032
(6)	64°50'N 166°W to	OME 301/028
(7)	67°N 166°W to	OTZ 257/082
(8)	68°40'N 164°W to	OTZ 324/112
	Point of beginning	

Entry/Exit Gate

Bluee:67°13'N 161°13'W (GAL 303/185)

Altitudes: As negotiated (Normally FL280 and above)

H. ADX "G"

Point	Lat./Long.	Fix/Radial/Distance
(1)	67°10'N 161°48'W to	OTZ 026/024
(2)	65°20'N 157°30'W to along a 40NM ARC of GAL VORTAC to	GAL 310/040
(3)	64°55'N 158°17'W to	GAL 263/040
(4)	64°45'N 164°10'W to	OME 043/032
	Point of beginning	

Altitudes: As negotiated (Normally FL180 and above, except in "GOLF" corridor.)

I. "GOLF" Corridor Within ADX "G"

Point	Lat./Long.	Fix/Radial/Distance
(1)	67°10'N 161°48'W to	OTZ 026/024
(2)	65°20'N 157°30'W to along a 40NM ARC of GAL VORTAC to	GAL 310/040
(3)	65°04'N 158°09'W to	GAL 277/040
(4)	66°38'N 162°23'W to	OTZ 147/016
	Point of beginning	

Altitudes: FL280 and above

J. ADX "H"

Point	Lat./Long.	Fix/Radial/Distance
(1)	69°30'N 161°W to	BRW 196/136
(2)	69°30'N 154°55'W to	BRW 135/113
(3)	66°32'N 151°45'W to	ENN 304/134
(4)	67°15'N 161°W to	OTZ 039/042
	Point of beginning	

Altitudes: As negotiated (Normally FL180 and above)

K. ADX "J"

Point	Lat./Long.	Fix/Radial/Distance
(1)	69°30'N 154°55'W to	BRW 135/113
(2)	69°30'N 149°W to	SCC 165/044
(3)	67°30'N 149°W to	BTT 031/069
(4)	65°48'N 148°37'W to	FAI 318/062
(5)	65°20'N 150°W to	ENN 305/050
(6)	66°32'N 151°45'W to	ENN 304/134
	Point of beginning	

Entry/Exit Gate

Laree:65°48'N 150°39'W (FAI 285/089)

Altitudes: As negotiated (Normally FL180 and above)

L. "JULIET" Corridor Within ADX "J"

Point	Lat./Long.	Fix/Radial/Distance
(1)	69°30'N 154°55'W to	BRW 133/115
(2)	69°30'N 153°48'W to	BRW 123/123
(3)	66°55'54''N 151°10'35''W to	BTT 027/009
(4)	65°40'N 149°05'W to	FAI 306/059
(5)	65°20'N 150°W to	BTT 128/101
(6)	66°32'N 151°45'W to	BTT 167/023
	Point of beginning	

Altitudes: FL290 and above

M. ADX "K"

Point	Lat./Long.	Fix/Radial/Distance
(1)	69°30'N 149°W to	SCC 165/044
(2)	69°30'N 145°40'W to	SCC 094/071
(3)	68°N 142°30'W to	FYU 005/107
(4)	66°10'N 145°05'W to	FAI 012/110
(5)	65°23'N 146°W to	FAI 027/062
(6)	65°48'N 148°37'W to	FAI 318/062
(7)	67°30'N 149°W to	BTT 031/069
	Point of beginning	

Altitudes: As negotiated (Normally FL350 and above)

N. "KILO" Corridor Within ADX "K"

Point	Lat./Long.	Fix/Radial/Distance
(1)	69°30'N 149°W to	SCC 167/045

)	69°30'N 148°W to	SCC 135/044
)	66°25'48''N 148°W to	BTT 082/089
(4)	65°40'54''N 147°51'25''W to	FAI 336/053
(5)	65°48'N 148°37'W to	FAI 317/062
(6)	67°30'N 149°W to	BTT 033/069
	Point of beginning	

Altitudes: FL290 and above

O. ADX "L"

Point	Lat./Long.	Fix/Radial/Distance
(1)	68°N 142°30'W to	FYU 005/107
(2)	68°N 141°W to	FYU 016/131
(3)	64°N 141°W tc	FAI 074/188
(4)	64°N 144°W to	FAI 085/114
(5)	64°30'N 146°W to	FAI 080/055
(6)	65°23'N 146°W to	FAI 027/062
(7)	66°10'N 145°05'W to	FAI 012/110
	Point of beginning	

Altitudes: As negotiated (Normally FL180 and above)

·try/Exit Gates

..izzi:64°22'08''N 145°30'19''W (BIG 345/023)
Buflo:64°10'N 144°38'W (BIG040/030)
Yukan:65°07'N 146°W (FAI 040/054)
Cabin:65°45'46''N 145°33'48''W (EIL 002/075)
Appel:65°23'N 146°W (EIL 005/050)
Piney:64°31.5'N 146°10.3'W (EIL 083/026)

P. ADX "M"

Point	Lat./Long.	Fix/Radial/Distance
(1)	65°20'N 150°W to	ENN 305/050
(2)	65°48'N 148°37'W to	FAI 318/062
(3)	65°23'N 146°W to	FAI 026/053
(4)	64°30'N 146°W to	FAI 080/055
(5)	64°N 144°W to	FAI 085/114
(6)	63°43'N 145°54'W to	BIG 167/018
(7)	63°22'N 150°18'W to	FAI 188/105
(8)	64°28'N 150°08'W to	FAI 223/058
(9)	65°N 150°05'W to	ENN 286/036
	Point of beginning	

Entry/Exit Gates

jam:65°20'N 150°W (FAI 275/006)
.ere:64°02'N 150°12'N (FAI 204/073)
Welle:63°33'N 148°15'W (FAI 157/075)

7. WARNING AREA DESCRIPTION.

A. W-612 (Blying Sound).

Point	Lat./Long.	Fix/Radial/Distance
(1)	59°45'N 148°54'W to	HOM 063/078
(2)	59°22'N 147°05'W to	HOM 073/135
(3)	58°48'N 148°W to	HOM 092/120
(4)	59°09'N 149°47'W to	HOM 099/061
	Point of beginning.	

Entry/Exit Gates

MONGO:59°43'N 148°40'W (HOM 065/088)
KISSA:59°38'N 148°20'W (HOM 068/095)

ALTITUDES: Surface to FL290.
CONTROLLING AGENCY: ANC Center.
USING AGENCY: 3 WG, Elmendorf AFB, AK.
TIMES: By NOTAM Only.

Joseph F. Woodford
Air Traffic Manager
Anchorage Center

David W. Jenny, Col, USAF
11th AF/Director of Operations

UNCLASSIFIED

Ø1 Ø3 RR RR UUUU ZYUW DOOQ

NO

11AF ELMENDORF AFB AK//DO//

ZEN 3WG ELMENDORF AFB AK//CC//

343WG EIELSON AFB AK//CC//

INFO 11AF ELMENDORF AFB AK//DOO//

UNCLAS

QQQQ

AMPN/SUBJ: FIRE INDEX RESTRICTIONS ON WEAPONS DELIVERY//

RMKS/1. THIS MESSAGE SUMMARIZES THE ORDNANCE DELIVERY RESTRICTIONS FOR ALASKA AIR TO GROUND RANGES USING THE FINE FUEL MOISTURE CONTENT(FFMC) INDEX. THIS MESSAGE ESTABLISHES POLICY FOR WEAPONS EXPENDITURES ON R-22Ø2, R-22Ø5, R-2211, AND DELTA CREEK IMPACT AREA. GUIDANCE IN THIS MESSAGE REGARDING CHAFF/FLARE USAGE SUPPLEMENTS THE PREVIOUS MESSAGE DTG Ø719SØZ MAY 93, SUBJECT: 11AF CHAFF/FLARE RESTRICTIONS. THE MOST RESTRICTIVE GUIDANCE WILL APPLY.

2. THE FOLLOWING RESTRICTIONS APPLY:

A. R-22Ø5: NO RESTRICTIONS. THIS RANGE HAS BEEN DECLARED " FIRE SAFE" BY THE BUREAU OF LAND MANAGEMENT(BLM) DUE TO THE CONSTRUCTION OF FIRE BREAKS.

B. R-22Ø2: EXCEPT FOR DELTA CREEK IMPACT AREA:

(1.) FFMC INDEX OF 8Ø OR LOWER--NO ORDNANCE RESTRICTION

CAPT TABOR
DOOQ, 2-223Ø

CRC:

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02 03 RR RR UUUU ZYUW DOOQ

NO

(2.) FFMC INDEX OF 80-82--ONLY INERT ORDNANCE MAY BE USED. ONLY COLD SPOT BDUS WILL BE USED. CHAFF MAY BE USED, BUT FLARES, EITHER M-206 OR MJU-7, WILL NOT BE USED BELOW 1,000' AGL.

(3.) FFMC INDEX OF 83 OR GREATER--NO ORDNANCE WILL BE EXPENDED. CHAFF/FLARE WILL BE USED AT 5,000' AGL OR ABOVE.

C. DELTA CREEK IMPACT AREA: DECLARED FIRE SAFE. THERE ARE NO ORDNANCE RESTRICTIONS. BECAUSE OF THE SMALL SIZE OF THE AREA, THE SAME CHAFF/FLARE GUIDELINES IN PARAGRAPHS 2.B.(2.) AND 2.B.(3.) APPLY.

D. R-2211: SAME FFMC INDEX GUIDANCE THAT APPLIES FOR R-2202 IN PARAGRAPH 2B.

3. IF A FIRE STARTS WHILE EXPENDING ORDNANCE (EXCEPT ON R-2205 OR DELTA CREEK IMPACT AREA) WEAPONS DELIVERY ON THAT RANGE WILL BE HALTED. RANGE CONTROL WILL BE NOTIFIED OF ALL RANGE FIRES IMMEDIATELY WITH THE COORDINATES OF THE FIRE. ADDITIONALLY, IF A FIRE IS OBSERVED AT ANY TIME DURING THAT RANGE PERIOD, THEN ONLY DRY PASSES WILL BE MADE.

4. THERE MAY BE TIMES WHEN THE FIRE INDEX FALLS WITHIN THE ACCEPTABLE CRITERIA, BUT ALL WEAPONS EXPENDITURES MAY BE SUSPENDED BECAUSE OF SUBSURFACE DROUGHT CONDITIONS. THIS IS DUE TO THE POSSIBILITY OF FIRE BY MUNITIONS PENETRATING INTO THE LARGE LAYER OF MOSS WHICH LIES

CAPT TABOR
DOOQ, 2-2230

CRC:

Ø3 Ø3 RR RR UUUU ZYUW DOOQ

NO

BELOW THE SURFACE ON SOME OF THE RANGES. THIS DETERMINATION WILL BE MADE BY THE BLM AND PASSED THROUGH RANGE CONTROL. THIS WILL ONLY HAPPEN ON RARE OCCASIONS, AND IT WILL NOT AFFECT R-2205 OR DELTA CREEK IMPACT AREA.

5. THIS GUIDANCE APPLIES TO ALL AIRCRAFT IN 11AF AND TO ALL AIRCRAFT DEPLOYED TO ALASKA. THE 3RD WING AND THE 343RD WING WILL ENSURE ALL AIRCRAFT WORKING FROM THEIR BASES ARE AWARE OF THESE RESTRICTIONS. THIS MESSAGE SUPERSEDES ALL APPLICABLE GUIDANCE IN AFR 5Ø-46/11AF SUP 1,15 MAY 92. THESE CHANGES WILL BE INCORPORATED IN THE NEXT RELEASE OF THE 11AF SUP 1 TO AFR 5Ø-46. GUIDANCE IN AFR 5Ø-46/11AF SUP 1 ON RUN-IN RESTRICTIONS AND MUNITIONS RESTRICTIONS ON SPECIFIC TARGETS STILL APPLIES.

6. ELEVENTH AIR FORCE POC IS CAPTAIN TABOR, DOOQ, DSN 317-552-223Ø, 317-552-565Ø.//

NNNN

CAPT TABOR
DOOQ, 2-223Ø

CRC:

APPENDIX F

SOUND BASICS

F.1 Properties Of Sound

F.1.1 Sound Wave Properties

To gain an understanding of the principles applied to the analysis of sound effects, it may first be beneficial to examine the characteristics of "sound" and how they relate to "noise." The definitions of sound and noise are bound up in human perceptions of each. Sound is a complex vibration transmitted through the air that, upon reaching the ears, may be perceived as desirable or unwanted. Noise can be defined simply as unwanted sound or, more specifically, as any sound that is undesirable because it interferes with speech and hearing, is intense enough to damage hearing, or is otherwise annoying (U.S. EPA 1976).

Sound can be defined as an auditory sensation evoked by an oscillation (vibratory disturbance) in the pressure and density of a fluid, such as air, or in the elastic strain of a solid, with the frequency in the approximate range of 20 to 20,000 Hz. In air, sound propagation occurs as momentum is transferred through molecular displacement from the displaced molecule to an adjacent one. An object's vibrations stimulate the air surrounding it, and cause a series of compression and rarefaction cycles as it moves outward and inward. The number of times per second the wave passes from a period of compression, through a period of rarefaction, and back to the start of another compression is referred to as the *frequency* of the wave and is expressed in cycles per second, or hertz (Hz). The distance traveled by the wave through one complete cycle is referred to as the *wavelength*. The higher the frequency, the shorter the wavelength and vice versa.

F.1.2 Sound Intensity and Loudness

As sound propagates from a single source, it radiates more or less uniformly in all directions, forming a sphere of acoustic energy. Although the total amount of acoustic energy remains constant as the spherical wave expands, the intensity of the energy [amount of energy per unit of area on the surface of the sphere, normally expressed in watts per square meter (watts/m^2)] decreases in proportion to the square of the distance (because the same amount of energy must be distributed over the surface area of the sphere which increases in proportion to the square of the distance from the source).

The intensity of the acoustic energy cannot be measured conveniently; however, as the sound waves propagate through the air, they create changes in pressure which can be measured conveniently and provide a meaningful measure of the acoustic power intensity (loudness). The sound intensity is proportional to the square of the fluctuations of the pressure above and below normal atmospheric pressure. Measurements of sound pressure (defined as the root mean square of the fluctuations in pressure relative to atmospheric pressure) is the most common measure of the strength of sound or noise.

F.1.3 The Decibel

The faintest sound audible to the normal human ear has an intensity of approximately 10^{-12} watts/m^2. In contrast, the sound intensity produced by a Saturn rocket at liftoff is approximately 10^8 watts/m^2. The ratio of these two sound intensities is 10^{20} (1 followed by 20 zeros), a range that is difficult to comprehend or use.

To permit comparison of values which vary so greatly in magnitude, it is most convenient to express them in terms of their logarithms - the power to which 10 must be raised to equal the number. The logarithms of the sound intensities indicated above would vary from -12 to 8, a range of 20 units. To avoid the use of negative numbers, it is convenient to express the values in terms of the logarithm of their ratio to a standardized reference value, most frequently the lowest value expected to be encountered. On this logarithmic scale, an increase of 1 unit represents a ten-fold increase in the ratio. On this scale, the values for the sound intensities would vary from 0 to 20.

The unit of measurement on a logarithmic scale is the *Bel*, named in honor of Alexander Graham Bell. The bel is a rather large unit and since each unit represents a 10-fold increase relative to the previous value, it is convenient to divide each unit into 10 subunits known as decibels and abbreviated as *dB*. Using the decibel scale, our range of intensity ratios now expands to 0.0 to 200.0 rather than 0 to 20. The decibel scale is commonly used for the measurement of values which vary over extremely large ranges. Because the values are the logarithms of ratios, they are dimensionless (have no units of measurement such as length, mass or time) and are normally referred to as *levels*. By definition:

$$L=10\ \log\left(\frac{MeasuredQuantity}{ReferenceQuantity}\right) \qquad \text{(Eq. F-1)}$$

Because decibels are logarithmic, they are not arithmetically additive. If two similar sound sources produce the same amount of sound (for example 100 dB each), the total sound level will be 103 dB, not 200 dB. The greater the difference between the two sound levels, the less impact the smaller number will have on the larger. As an example, if 70 dB and 50 dB are logarithmically added, the result is less than 0.05 of a decibel increase, to 70.04 dB. Likewise, when summing multiple events of the same magnitude, the heaviest penalty is paid for the first two or three events, with each successive event having a lesser impact. For example, if five 100 dB events are added, the result is approximately 107 dB. Sound levels can be added using the following equation:

$$10\ \log\left[\sum_{i=1}^{n}\ 10^{\frac{x_i}{10}}\right] \qquad \text{(Eq. F-2)}$$

F.1.4 Measurement of Sound Intensity

As stated previously, sound pressure can be measured more conveniently and accurately than sound intensity (although measurement techniques are available for measuring sound intensity directly). The sound intensity (power per unit area) varies in proportion to the square of the sound pressure. For example in a plane progressive wave in air, the sound intensity (I) is defined by the equation:

$$I = \frac{P^2}{dC} \qquad \text{(Eq. F-3)}$$

Where: d = *Density of the air*
C = *Velocity of sound in air*

The change in sound intensity can be measured in terms of the change in *sound pressure level (SPL)* expressed in decibels:

$$SPL = 10 \log \left[\frac{SP^2_{Meas}}{SP^2_{Ref}} \right] \qquad \text{(Eq. F-4)}$$

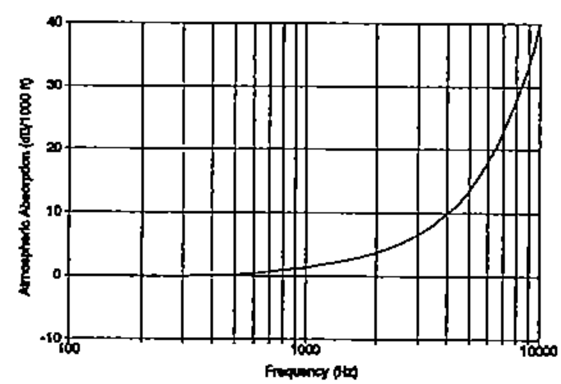
Where: SP_{Meas} = *Measured sound pressure*
SP_{Ref} = *Refernce pressure* (20 μP)

F.1.5 Sound Propagation and Attenuation

As stated previously, sound intensity decreases with increasing distance from the source due to the dissipation of the sound energy over an increasing area. The sound intensity varies inversely with the square of distance from the source. For each time the distance from the source doubles, the sound pressure is reduced by a factor of two, and the sound level, which is proportional to the square of the pressure, is reduced by a factor of 4. As illustrated by the equation below (Eq. F-5), this is equivalent to a decrease of approximately 6 dB in the sound pressure level for each doubling of distance.

$$L = 10 \log \left(\frac{(0.5P)^2}{P^2_{Ref}} \right) = 10 \log (0.5^2) + 10 \log \left(\frac{P^2}{P^2_{Ref}} \right) = -6 + 10 \log \left(\frac{P^2}{P^2_{Ref}} \right) \qquad \text{(Eq. F-5)}$$

In addition to the decrease in sound level which results from the spreading of the sound waves and distribution of the sound energy over an increasingly large area, interaction with the molecules of the atmosphere results in absorption of some of the sound energy. The amount of energy absorbed is dependent on the atmospheric conditions (temperature and humidity) and on the frequency characteristics of the sound. Figure F-1 illustrates the effect of frequency on the absorption of sound under typical weather conditions of 60° F and 49% relative humidity.



Source: U.S. DOT, *Transportation Noise and Its Control*, 1972

Figure F-1 .Typical effect of frequency on atmospheric absorption of sound

As shown in Figure F-1, atmospheric absorption can have a significant influence on the attenuation of sounds with a high frequency. For complex noise signals with a significant high frequency component, such as aircraft noise, atmospheric attenuation can result in significant reduction in sound levels as the distance from the source increases. Figure F-2 illustrates typical noise level variation as a function of distance *with* and *without* atmospheric absorption effects. As shown in Figure F-2, the effect of atmospheric attenuation is significant for high frequency sound (1000 Hz and above) at essentially all distance and becomes significant for mid-frequency sound (around 500 Hz) at large distances.

In addition to molecular absorption, there are a variety of atmospheric phenomena, such as wind and temperature gradients, which affect the propagation of sound through the air. Sound propagating from sources on or near the ground (such as aircraft ground runups and flight at low altitudes) is also influenced by terrain, vegetation, and structures which may either absorb or reflect sound, depending upon their characteristics and location and orientation relative to the source.

F.1.6 Sound Energy Dose Response

Observations that attempt to describe the environmental consequences of discrete events must weigh the characteristics of the individual sound events by the number of those events. These measurements describe an empirical dosage-effect relationship, and are one of the few quantitative tools available for predicting sound-induced annoyance. These metrics are often referred to as dose-response metrics, and will be discussed later in this appendix.

F.2 Human Hearing

F.2.1 How the Human Ear Works

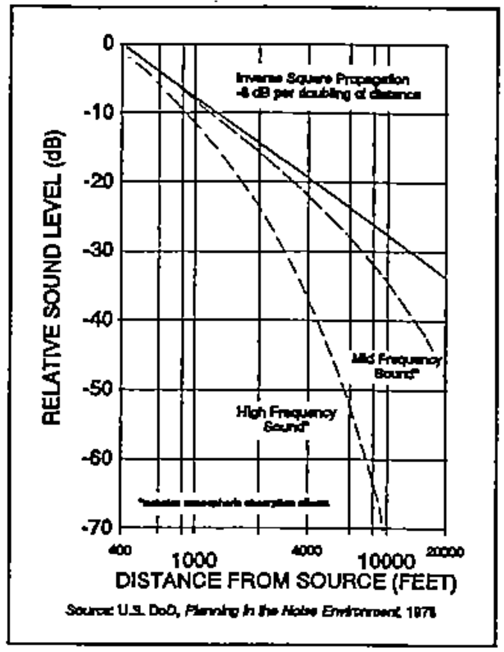


Figure F-2 Typical attenuation of sound with distance from a point source

Sound waves entering the ear are enhanced by the resonant characteristics of the auditory canal. Sound waves travel up the ear canal and set up vibrations in the eardrum. Behind the eardrum is a cavity called the middle ear. The middle ear functions as an impedance matcher. It is comprised of three tiny bones that provide frictional resistance, mass, and stiffness, and thus act in opposition to the incoming sound wave and transmit vibrations to the inner ear. More specifically, sound pressure from waves traveling through the air (low impedance) is amplified about 21 times so that it may efficiently travel into the high impedance fluid medium in the inner ear. This is accomplished by the leverage action of the three middle ear bones. The footplate of the stapes, the bone closest to the inner ear, in turn moves in and out of the oval window in the inner ear. The movement of the oval window sets up motion in the fluid that fills the inner ear. The movement of this fluid causes the hairs immersed in the fluid to move. The movement of these hairs stimulates the cells attached to them to send impulses along the fibers of the auditory nerve to the brain. The brain translates these impulses into the sensation of *sound*.

F.2.2 Human Response to Sounds

F.2.2.1 Human Hearing Thresholds

Laboratory experiments have found that the "absolute" threshold of hearing in young adults corresponds to a pressure of about 0.0002 dyne/centimeter^2 (cm^2) or 0.00002 Pascal. This reference level was determined in a quiet noise environment and at the most acute frequency range of human hearing, between 1,000 and 4,000 Hz. The general range of human hearing is usually defined as being between 20 and 20,000 Hz. Frequencies below 20 Hz are called infrasonic, while those above 20,000 Hz are called ultrasonic. Frequencies in the range of 20 to 20,000 Hz are called sonic, and are referred to as the audible frequency area.

F.2.2.2 Loudness

On the decibel scale, an increase in Sound Pressure Level (SPL) of 3 dB represents a doubling of sound energy, but an increase in SPL on the order of 10 dB represents a subjective doubling of "loudness" (U.S. DoD 1978). Table F-1 depicts the relative loudness of typical noises encountered in the indoor and outdoor environments.

Table F-1 Decibel levels (dB) and relative loudness of typical noise sources in indoor and outdoor environments

dB(A)	Overall level	Community Noise Levels (Outdoor)	Home and Industry Noise Levels (Indoor)	Subjective Loudness (Relative to 70 dB)
120	Uncomfortably loud	Military jet aircraft take-off from aircraft carrier with afterburner at 50 ft . 130 dB	Oxygen torch . . . . 121 dB	32 times as loud
110		Turbo-fan aircraft at takeoff power at 200 ft . . . . 118 dB	Riveting machine . . . . 110 dB Rock band . . . . 108-114 dB	16 times as loud
100	Very loud	Boeing 707 or DC-8 aircraft at 1 nautical mile (6080 ft) before landing . . . 106 dB Jet flyover at 1000 ft . . . . 103 dB Bell J-2A helicopter at 100 ft . . . 100 dB		8 times as loud
90		Boeing 737 or DC-9 aircraft at 1 nautical mile (6080 ft) before landing . . . . 97 dB Power mower . . . . 96 dB Motorcycle at 25 ft . . . . 90 dB	Newspaper press . . . . 97 dB	4 times as loud
80		Car wash at 20 ft . . . . 89 dB Propeller plane flyover at 1000 ft . . . . 88 dB Diesel truck 40 mph at 50 ft . . . . 84 dB Diesel train 45 mph at 100 ft . . . . 83 dB	Food blender. . . . . 88 dB Milling machine . . . . 85 dB Garbage disposal . . . . 80 dB	2 times as loud
70	Moderately loud	High urban ambient sound . . . . . 80 dB Passenger car 65 mph at 25 ft . . . 77 dB Freeway at 50 ft from pavement edge at 10 a.m. . . . . 76 dB	Living room music . . . . 76 dB Radio or TV-audio, vacuum cleaner . . . . 70 dB	70 dB(A)
60		Air conditioning unit at 100 ft . . . . 60 dB	Cash register at 10 ft . . . . . . 65-70 dB Electric typewriter at 10 ft . . . . 64 dB Dishwasher (Rinse) at 10 ft . . . . 60 dB Conversation . . . . 60 dB	1/2 as loud
50	Quiet	Large transformers at 100 ft . . . . 50 dB		1/4 as loud
40		Bird calls . . . . 44 dB Lowest limit of urban ambient sound . . . . 40 dB		
		dB Scale Interrupted		
10	Just audible			
0	Threshold of Hearing			

Source: M.C. Branch, et al. 1970.

The loudness of sound (sensation) depends on its intensity, and on the frequency of the sound and the characteristics of the human ear. The intensity of sound is a purely physical property, whereas the loudness depends also upon the characteristics of the receptor ear. In other words, the intensity of a given sound striking the ear of a normal hearing person and of a hard-of-hearing person might be the same, but the perceived loudness would be quite different.

F.2.2.3 Effect of Frequency on Loudness

The response of the human ear to frequency and intensity is *not* linear, but varies with sensation level. Figure F-3 depicts this response characteristic. The equal loudness levels depicted in the figure were defined as the intensity required to make a given test tone seem equally as loud as the reference tone of 1,000 Hz. The unit of loudness level that is used to plot the data is called the *phon*. Thus, the loudness level in phons of any sound is equal to the intensity level in decibels of a 1,000 Hz tone which is perceived as equal in loudness to the sound under evaluation.

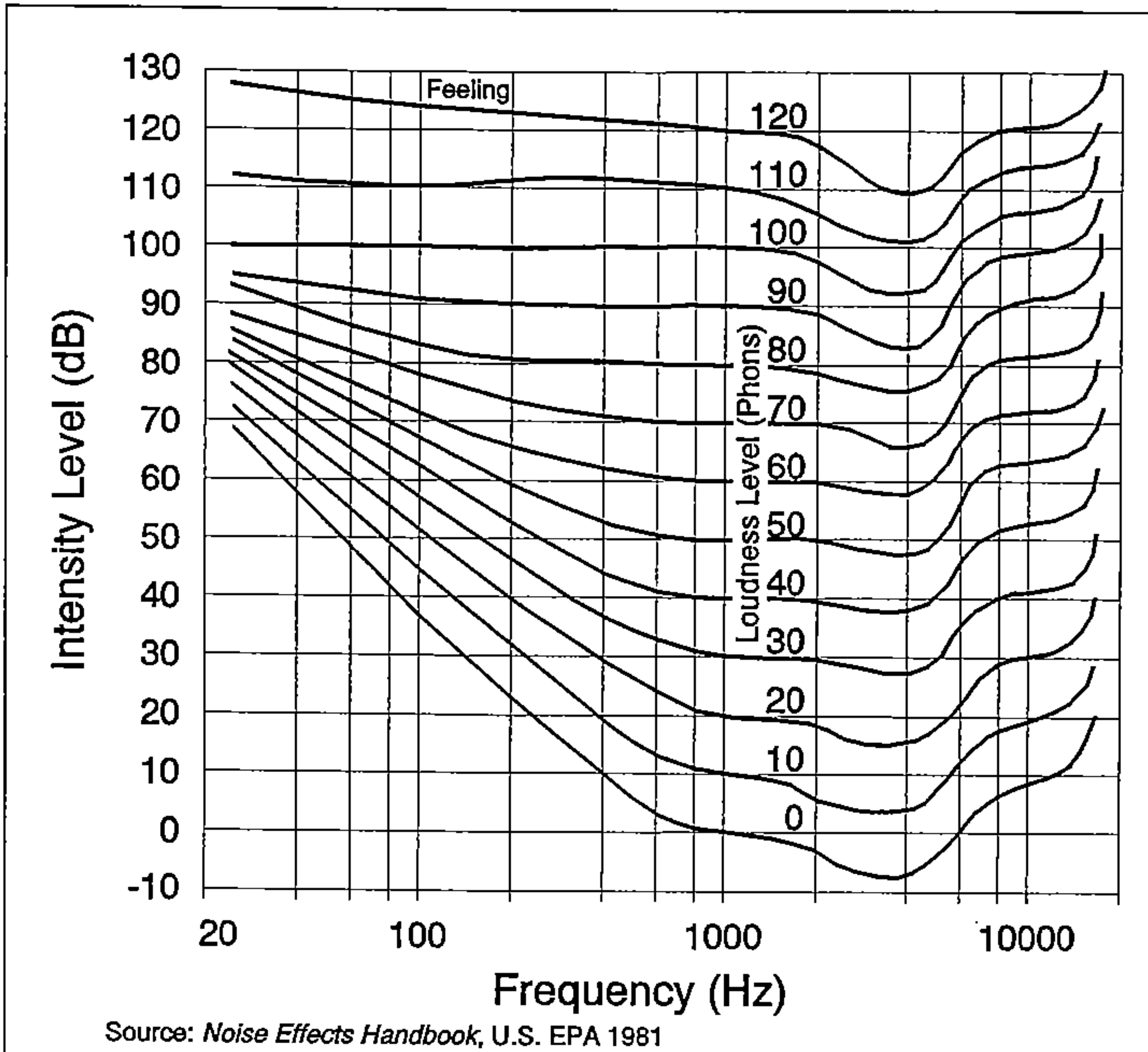


Figure F-3 Equal Loudness Contours

The data in Figure F-3 can be used to illustrate the effects of both frequency and energy level on the sensation of loudness. The effect of frequency on the perceived loudness is most pronounced at frequencies below 1000 Hz and low sound levels. Although 100 Hz and 1000 Hz tones with intensity levels of approximately 37 dB and

0 dB, respectively, are perceived as equally loud (i.e., barely detectable — 0 phons), the 100 Hz tone has 5000 times the sound energy of the 1000 Hz tone. In contrast, 100 Hz and 1000 Hz tones with intensities of 100 dB would sound equally loud — approximately 100 phons. The relationship between frequency, intensity, and loudness is quite complex. However, humans do have a sense of relative loudness, and a fair measure of agreement can be reached on when a sound is one-third as loud as another, one-half as loud, etc.

F.2.2.4 Frequency weighted sound levels

Because the human ear does not respond to sounds of varying frequency and intensity in a linear fashion, various "weighting" factors are applied to noise measurements in an effort to produce results which correspond to human response. These weighting factors are applied to the levels of sound in specific frequency intervals and added or subtracted based on the average human response to sounds in that frequency range; the resultant values are then summed to determine the overall "weighted" level. The most commonly used weighting systems are the "A" and "C" scales.

The A-scale de-emphasizes the low- and high-frequency portions of the sound spectrum. This weighting provides a good approximation of the response of the average human ear and correlates well with the average person's judgement of the relative loudness of a noise event. In contrast, the C-weighting scale gives nearly equal emphasis to sounds of all frequencies and approximates the actual (unweighted) sound level. The C-weighted sound level is used for large amplitude impulse sounds such as sonic booms, explosions, and weapons noise in which the total amount of energy is an important factor. Figure F-4 shows how A-weighting and C-weighting in a sound meter are applied to sounds of various frequencies.

F.2.2.5 Supersonic Aircraft and Sonic Booms

An aircraft in supersonic flight (faster than the speed of sound) creates a wave of compressed air out in front of the aircraft. This wave is known as a "sonic boom" and is heard, and felt, as a sudden, loud impulse noise. A sonic boom may be defined as "an acoustic phenomenon heard when an object exceeds the speed of sound"(U.S. DoD AF 1986a). Individuals on the ground experiencing a sonic boom actually hear the change in pressure when air molecules are first compressed and then returned to a more normal state. This pressure differential across the shock wave is relatively large and is very sudden. The human ear perceives this rapid change in pressure as an impulsive sound not unlike a firecracker, a rifle shot, of the crack of a whip.

Supersonic aircraft create two categories of sonic booms: the carpet boom and the focused (or super) boom. An aircraft traveling straight and level at supersonic speeds would create a continuous boom that can be likened to a moving carpet across the ground. Focused booms, on the other hand, are a result of maneuvering flight and most often occur during rapid acceleration, tight turns, and pushover operations with a small curvature or arc of the flight track. The surface area affected by focused booms is usually substantially smaller than that impacted by a carpet boom. The intensity and overpressures created by a focused boom may be two to five times higher, while the duration would be about the same.

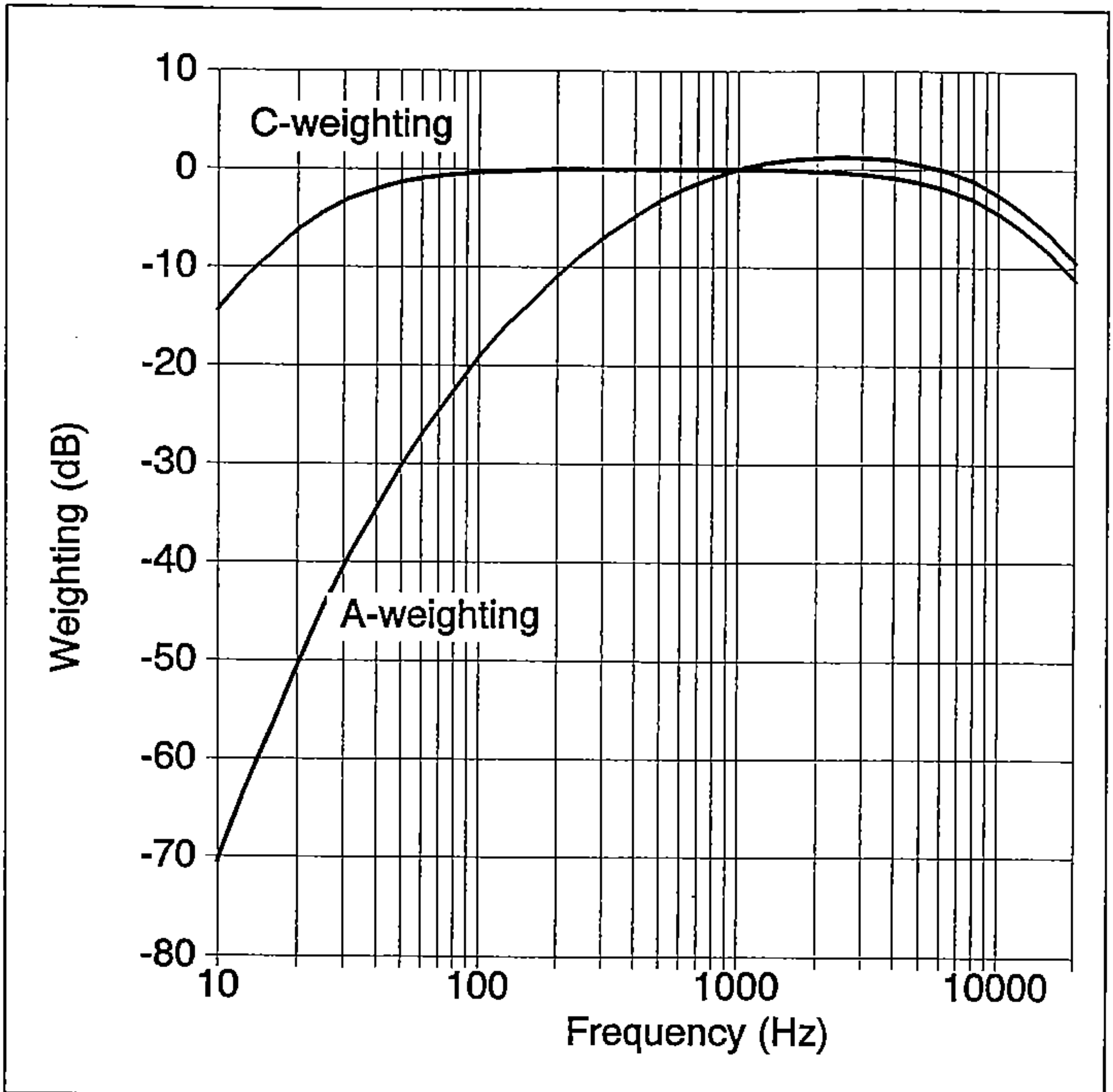


Figure F-4 Frequency Responses for Sound Level Weighting Characteristics

Not all booms created by aircraft are heard at ground level. Variations in atmospheric temperature (decreasing temperature gradients as altitude increases) tend to bend the sound waves upward. Depending on the altitude and Mach number of an aircraft, the paths of many sonic booms are deflected upward and never reach the earth. Likewise, the width of the area impacted by a sonic boom can also be decreased. Of those sonic booms that reach the surface, the intensity of the sound overpressure is largely dependent on the aircraft altitude, airspeed, size (length), and attitude (straight and level, turning, climbing, diving, etc.). This peak sound overpressure is expressed in terms of dBC (C-weighted decibel) or pounds per square foot (psf) of pressure. Maximum peak overpressure (L_{pk}) normally occurs directly under the flight track of the aircraft and decreases laterally at a rate proportional to -(3/4) power of the slant range between the aircraft and the observer. As an example, if an F-16 aircraft flying at supersonic speed and at 15,000 feet above the ground produced a sonic boom that generated an overpressure of 2.4 psf directly beneath the aircraft, the overpressure would decay laterally from the flight path.

At 1 mile laterally, L_{pk} would equal 2.30 psf; at 2 miles, L_{pk} would equal 2.06 psf, at 3 miles, L_{pk} would equal 1.81 psf, and by about 4.25 miles, L_{pk} would equal 0.50 psf.

F.3 Sound Metrics

To assess the impacts of sound on a diverse spectrum of receptors, a variety of metrics may be used. Depending on the specific situation, appropriate metrics may include instantaneous levels, single event, or cumulative metrics. Single event metrics are used to assess the potential impacts of sound on structures and animals, and may be employed for informational purposes in the assessment of some human effects. Cumulative metrics are most useful in characterizing the overall noise environment and are the primary metrics used in development of community (exposed population) dose-response relationships.

F.3.1 Single Event Metrics

Metrics used to characterize a single sound event include the instantaneous sound level as a function of time, the maximum sound level, the equivalent (average) level, and the Sound Exposure Level (SEL), a single number metric which incorporates both level and duration. The relationship between these metrics is illustrated in Figure F-5.

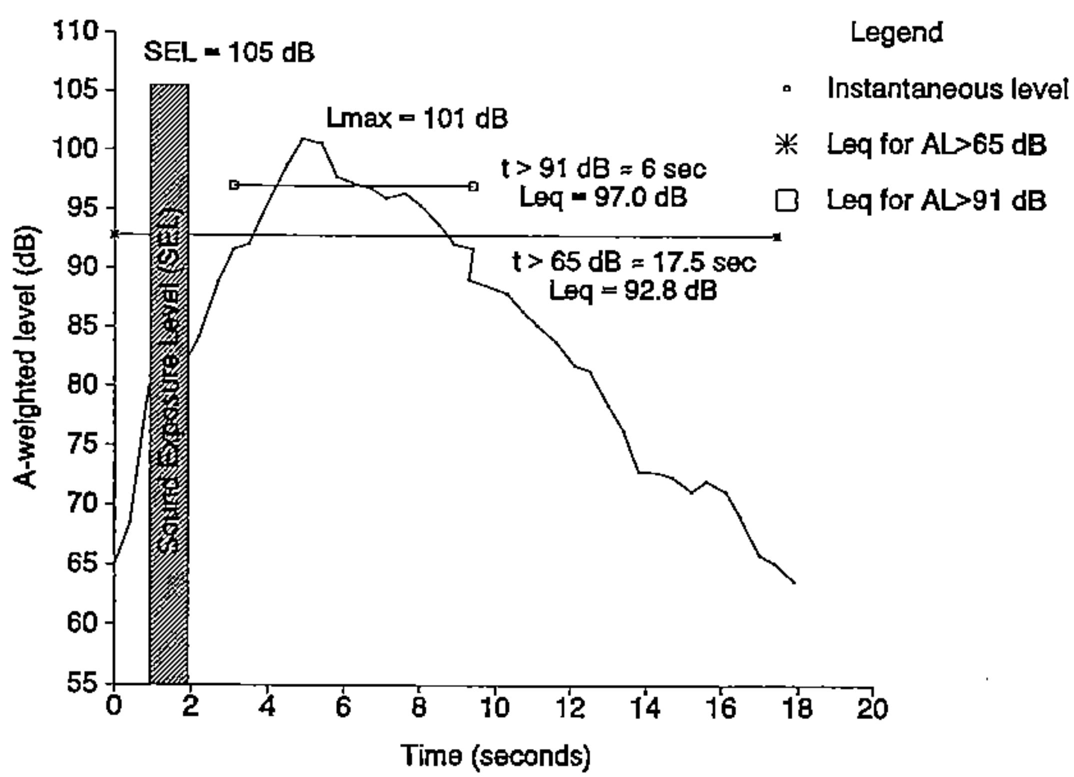


Figure F-5 Relationship between single event sound metrics

F.3.1.1 Single Event Instantaneous Sound Levels

The Sound Pressure Level (SPL) and the A-weighted sound level, both expressed in decibels (dB), may be used to characterize single event maximum sound levels for general audible noise. Figure F-5 indicates the variation in the A-weighted sound level (L) for the time during a typical aircraft flyover event when the level exceeds 65 dB. For this event (which is representative of a flyover by a military fighter aircraft at a distance of approximately 1,000 feet and a speed of 350 knots), the sound level increases rapidly to a level of approximately 101 dB in approximately 5.5 seconds and then decreases back to less than 65 dB in a period of approximately 12 seconds.

F.3.1.2 Single Event Maximum Sound Level (L_{max})

The single event maximum sound level metric (L_{max}) is simply the highest A-weighted sound level measured during an event. In the example in Figure F-5, L_{max} is approximately 101 dB. Although the instantaneous maximum value is the most easily understood descriptor for a noise event, it provides no information concerning either the duration of the event or the amount of sound energy. This metric is currently used for noise certification of small propeller-driven aircraft and to assess potential effects on animals.

F.3.1.3 Duration

The "duration" of a sound event can be determined in terms of the total time during which the sound level exceeds some specified threshold value. In the example in Figure F-5, the level exceeds 65 dB for approximately 17.5 seconds. Major limitations on the usefulness of this metric is the absence of a standardized threshold value and the inability to quantify the amount of sound energy associated with the event.

F.3.1.4 Equivalent Level (L_{eq})

For any specified period, the equivalent sound level, i.e., the level of a steady tone which provides an equivalent amount of sound energy, may be calculated using the relationship:

$$L_{eq(T)}=10\log\left[\frac{1}{T}\int_0^T 10^{\frac{L_A(t)}{10}}dt\right] \qquad \text{(Eq. F-6)}$$

Where: $L_{eq(T)}$ is the equivalent sound level for the period T
T is the length of the time interval during which the average is taken, and
$L_A(t)$ is the time varying value of the A-weighted sound level in the interval 0 to T.

Although the equivalent sound level metric includes all of the sound energy during an event, the absence of a standardized averaging period makes it difficult to compare data for events of different duration. In the example in Figure F-5, the equivalent level for the 17.5 second duration of the event above 65 dB ($L_{eq(17.5sec)}$) is approximately 92.8 dB; if the L_{eq} is calculated for the approximately 6 seconds during which the sound level exceeds 90 dB, the result is approximately 97.0 dB.

F.3.1.5 Single Event Energy (Sound Exposure Level)

Subjective tests indicate that human response to noise is a function not only of the maximum level, but also of the duration of the event and its variation with respect to time. Evidence indicates that two noise events with equal sound energy will produce the same response. For example, a noise with a constant level of SPL 85 dB lasting for 10 seconds would be judged to be equally as annoying as a noise event with an SPL 82 dB and a duration of 20 seconds. (i.e., one-half the energy lasting twice as long). This is known as the "equal energy principle."

The Sound Exposure Level (SEL) is a measure of the physical energy of the noise event which takes into account both intensity and duration. The SEL is based on the integral of the A-weighted sound level during the period it is above a specified threshold (that is at least 10 dB below the maximum value measured during the noise event) with reference to a standardized duration of 1 second. Thus, the SEL is the level of a constant sound with a duration of 1 second which would provide an amount of sound energy equal to the energy of the event under consideration. It may be calculated using the equation for the equivalent level (Eq. F-7) with the duration (T) replaced by the referenced time (T_{ref}) of 1 second.

$$SEL = 10\log\left[\frac{1}{T_{Ref}}\int_{t_1}^{t_2} 10^{\frac{L_A(t)}{10}}\,dt\right] = 10\log\left[\int_{t_1}^{t_2} 10^{\frac{L_A(t)}{10}}\,dt\right] \qquad \text{(Eq. F-7)}$$

Where: T_{Ref} is equal to 1 second
t_1 is the time at which the level exceeds 10 dB below the maximum value; and
t_2 is the time at which the level drops below 10 dB below the maximum value.

In the example in Figure F-5, the SEL is approximately 105 dB. The value of considering both total energy and duration is illustrated by comparison of the calculated SEL values based on the time above 65 dB and the time above 91 dB (10 dB less than the maximum recorded value of 101 dB). The SEL calculated on the basis of the levels during the approximately 17.5 seconds when the sound level is above 65 dB is 105.3 dB; based on the approximately 6 seconds when the level exceeds 91 dB, the calculated SEL is 105.0 dB, a difference of only 0.3 dB. By comparison, the L_{eq} values for the same periods were 92.8 and 97.0 dB, respectively, a difference of 4.2 dB. This comparison illustrates the value of SEL as a single number metric which considers both total energy and duration.

Table F-2 and Table F-3 provide SEL and L_{max} values for military and commercial aircraft operating at takeoff thrust and airspeed, and measured at a slant distance of 1000 ft. By definition, SEL values are referenced to a duration of 1 second and should not be confused with either the average or maximum noise levels associated with a specific event. As noted in Figure F-5, the SEL value for the flyover event was approximately 105 dB while the equivalent level based on a duration of approximately 17 seconds was 92.8, a difference of 12.2 dB. By definition, noise levels that exceed the SEL value must have durations of less than one second. For aircraft overflights, maximum noise levels would typically be 5 to 10 dB below the SEL value.

Table F-2 Sound Exposure Level (SEL) and Maximum A-Weighted Level (L_{max}) Data for Military Aircraft

Aircraft Type	Sound Exposure Level (SEL)[a]	Maximum Sound Level (L_{max})
Jet Bomber/Tanker/Transport		
B-1B	123.5	118.3
B-52G	121.5	113.9
B-52H	112.2	105.2
C-17	100.0	94.5
C-5	113.5	106.3
C-135B	106.6	101.9
C-141	105.8	99.7
KC-135A	117.8	109.1
KC-135R	92.2	87.1
Other Jet Aircraft with Afterburners		
F-4	115.7	109.7
F-14	109.7	106.4
F-15	112.0	104.3
F-16	106.7	101.0
F-18	116.9	108.0
FB-111	108.1	102.3
T-38	105.5	98.3
Other Jet Aircraft without Afterburners		
A-6	112.5	108.3
A-7	111.3	107.7
A-10	96.9	93.2
C-21	91.1	84.6
T-1A	99.4	90.3
T-37	97.7	91.0
T-39	103.3	96.8
T-43	100.8	94.1
Propeller Aircraft		
C-12	79.3	73.2
C-130	90.5	83.7
P-3	96.8	91.0

[a] At nominal takeoff thrust and airspeed and at a slant distance of 1,000 ft from the aircraft.

Source: U.S. Air Force, AL/OEBN 1992.

Table F-3 Sound Exposure Level (SEL) and Maximum A-Weighted Level (L_{max}) Data for Civilian Aircraft

Aircraft Type	Sound Exposure Level (SEL)[a]	Maximum Sound Level (L_{max})
Civil Jet Aircraft		
707, DC-8	113.5	104.4
727	112.5	106.5
737, DC-9	110.0	104.0
747	102.5	96.3
757	97.0	91.5
767	96.7	91.2
DC-10, L-1011	100.0	92.3
Learjet	97.1	89.4

[a] At nominal takeoff thrust and airspeed and at a slant distance of 1,000 ft from the aircraft.

Source: U.S. Air Force, AL/OEBN 1992.

SEL is a measure of the total energy associated with a single noise event, and is useful for making calculations involving aircraft flyovers. The frequency characteristics, sound level, and duration of aircraft flyover noise events vary according to aircraft type and model (engine type), aircraft configuration (i.e., flaps, landing gear, etc.), engine power setting, aircraft speed, and the distance between the observer and the aircraft flight track. SEL versus slant range values are derived from noise measurements made according to a source noise data acquisition plan developed by Bolt, Beranek, and Newman, Inc., in conjunction with the U.S. Air Force's Armstrong Laboratory[1] (AL) and carried out by AL. Extensive noise data were collected for various types of aircraft/engines at different power settings and phases of flight. This extensive database of aircraft noise data provides the basis for calculating average individual-event sound descriptors for specific aircraft operations at any location under varying meteorological conditions. These reference values are adjusted to a location by correcting for temperature, humidity, altitude, and variations from standard aircraft operating conditions (power settings and speed).

F.3.2 Application of Single Event Metrics

Single event analysis is sometimes conducted to evaluate sleep disturbances at nighttime and less frequently, some speech interference issues, primarily at locations where the cumulative, A-weighted sound is below DNL 65 dB. However, there is no accepted methodology for aggregating effects into some form of cumulative impact metric; and single event metrics do not describe the overall noise environment. As described below, the day-night cumulative methodology includes a 10 dB nighttime penalty that reflects the potential for added annoyance due to sleep disturbance, speech interference, and other effects (U.S. Air Force, AAMRL 1991).

Single event prediction methods have limited application to land use planning. One should not infer that an area is simultaneously exposed to a given noise level, since sound decays with increasing distance from the flight track.

[1] The U.S. Air Force Armstrong Laboratory was formerly known as the Armstrong Aerospace Medical Research Laboratory (AAMRL) and the majority of the work discussed in this section was conducted under that designation.

The databases used in noise models are based on the average of numerous SEL values collected under carefully controlled conditions and normalized to standard acoustic conditions and aircraft operating parameters. Although these values may be adjusted to reflect specific meteorological conditions (temperature and humidity) and aircraft operating parameters (power setting and speed), they represent average values for that type of aircraft operating under the specified conditions. However, for a variety of reasons including daily/seasonal weather changes, wind speed and direction, variations in aircraft power settings and speed due to weight or weather conditions, etc., SEL values measured for specific events under field conditions may vary significantly from the average values predicted on the basis of the standardized values. Consequently, the single event metric has limited use in evaluating sound impacts. When SEL is used to supplement cumulative metrics, it serves only to provide additional information. SEL has been used to evaluate sleep interference, but does not predict long-term human health effects. Sleep interference evaluation using SEL does not presently account for habituation.

F.3.3 Cumulative energy average metrics

Urban traffic is by far the most pervasive outdoor residential sound source, although aircraft sound is a significant source as well. Over 96 million persons are estimated to be exposed, in and around their homes, to high traffic noise levels. Figure F-6 depicts the typical daily sound exposure found in various settings.
Cumulative energy average metrics correlate well with aggregate community response to the sound environment. They may be derived from single event sound levels or computed from measured data. Although they were not designed as single event measures, they use single event data averaged over a specified time period. Thus single event measures or cumulative measures can relate to speech and sleep disturbance, although the relationship with sleep disturbance is not clearly established (Dean 1992).

F.3.3.1 Equivalent Sound Level

The Equivalent Sound Level (L_{eq}) is the Energy-Averaged Sound Level (usually A-weighted) integrated over a specified time period. The term "equivalent" indicates that the total acoustical energy associated with a varying sound (measured during the specified period) is equal to the acoustical energy of a steady state level of L_{eq} for the same period of time. The purpose of the L_{eq} is to provide a single number measure of sound averaged over a specified time period (Newman and Beattie 1985).

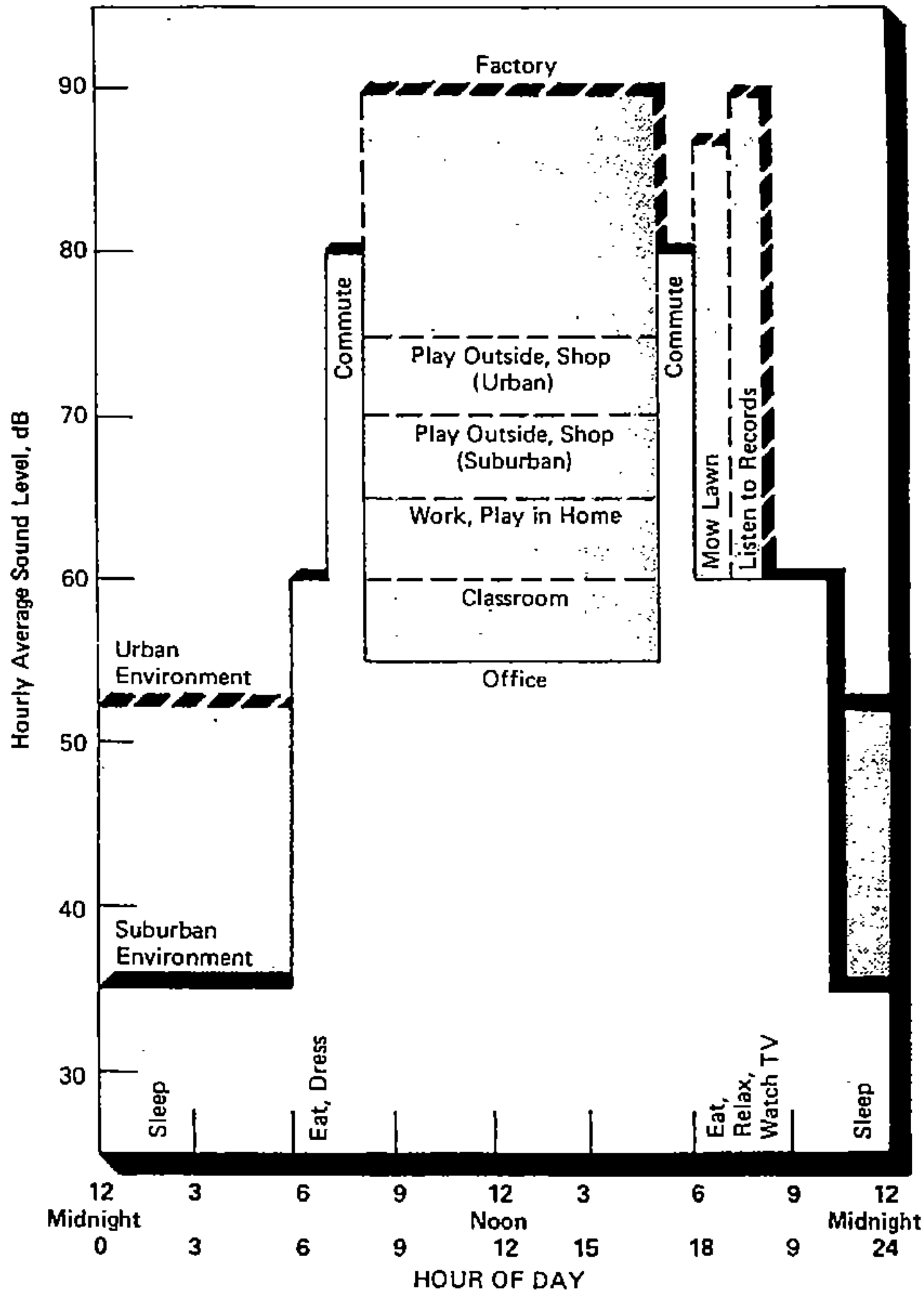
F.3.3.2 Day-Night Average Sound Level

The Day-Night Average Sound Level (DNL) is the Energy-Averaged Sound Level (L_{eq}) measured over a period of 24 hours, with a 10 dB penalty applied to nighttime (10 p.m. to 7 a.m.) sound levels to account for increased annoyance by sound during the night hours. The annual average DNL (DNL y-avg.) is the value specified in the FAA Federal Aviation Regulation (FAR) Part 150 noise compatibility planning process, and provides the basis for the land use compatibility planning guidelines in the Air Force Air Installation Compatible Use Zone (AICUZ) program (Newman and Beattie 1985; U.S. Air Force 1984). The typical range of outdoor DNL levels is illustrated in Figure F-7.

F.3.4 Basis for Use of DNL as the Single Environmental Descriptor

DNL (L_{eq} with a 10 dB penalty for nighttime exposure) was selected by EPA as the uniform descriptor of cumulative sound exposure to correlate with health and welfare effects (U.S. EPA 1974, 1982). Subsequently, all Federal agencies adopted YDNL (L_{dny}) as the basis for describing community noise exposure. DNL methodology has given consistent results in the national and international literature under a wide range of noise conditions (including loud and soft noise levels, and frequent and infrequent numbers of discrete aircraft events). Although seasonal corrections are not included in the definition of the DNL metric, the methodology does not preclude its use in any analysis of a special, well-defined noise exposure scenario.

Sound predictions are less reliable at lower levels (as low as 2 events per day) and at increasing distances from the airport, where the ability to determine the contribution of different sound sources is diminished. Since



Source: *Noise Effects Handbook*, U.S. EPA 1981

Figure F-6 Hypothesized life style sound exposure patterns

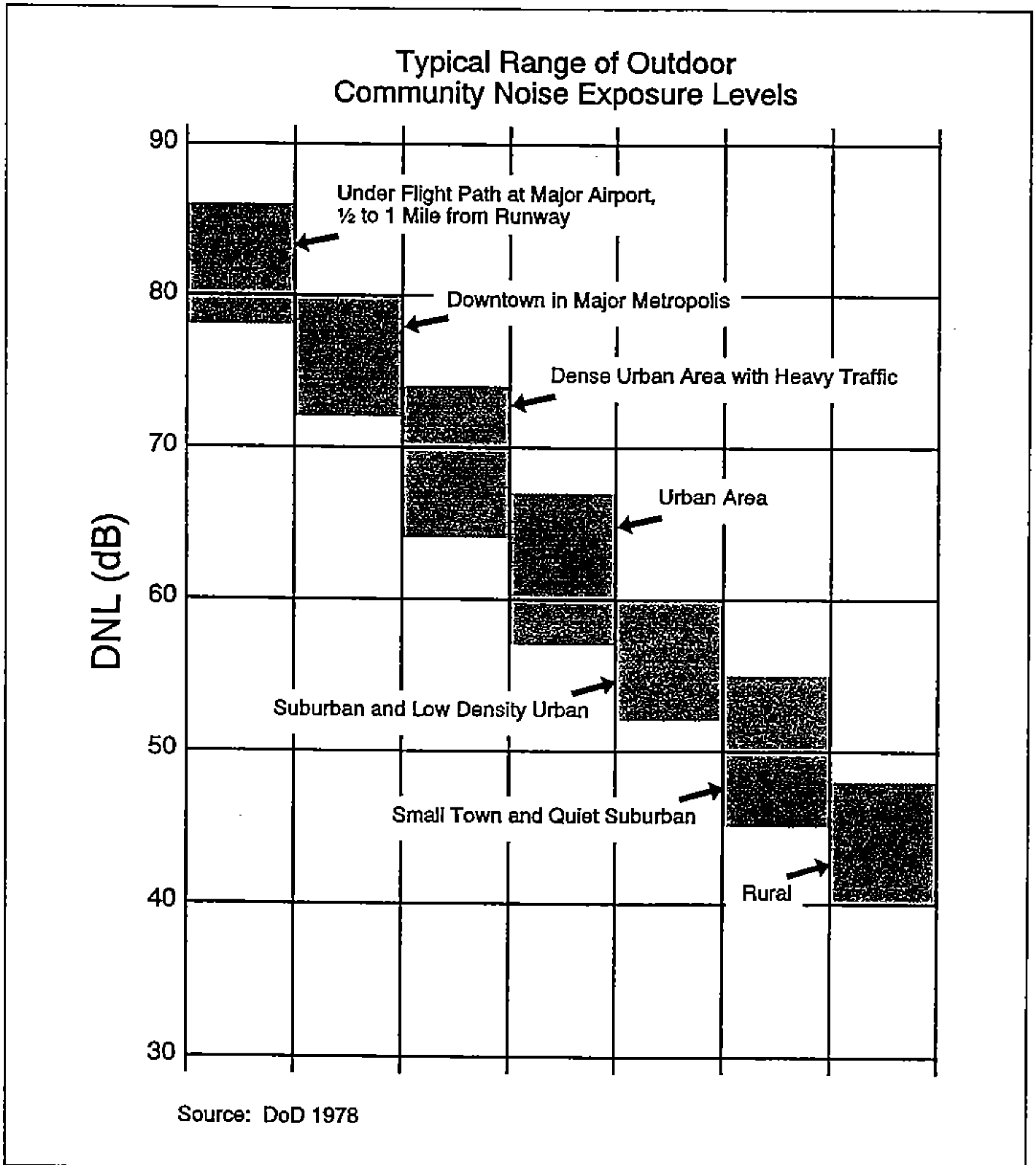


Figure F-7 Typical Range of Outdoor Community Day-Night Average Noise Levels (DNL)

public health and welfare effects have not been established at these lower levels, there are problems in interpreting predictions below DNL 60 dB (DNL 55 dB plus a 5 dB margin of safety). Much of the criticism of the use of YDNL for community annoyance and land use compatibility around airports may stem from a failure to understand the metric. Another factor may be that some persons exposed to aircraft noise do not accept DNL 65 dB as the appropriate lower limit of noise exposure for noise impact. However, an average sound metric such as DNL takes into account the sound levels of all individual events that occur during a 24-hour period, and the number of times those events occur. The averaging of sound over a 24-hour period does not ignore the louder single events, but actually tends to emphasize both the sound level and number of those events. This is the basic concept of a time-averaged sound metric, and specifically DNL. The logarithmic nature of the dB unit causes sound levels of the loudest events to control the 24-hour average.

F.3.5 Day-Night Average Sound Level (C-Weighted)

While peak sound pressure level may be satisfactory for assessing impulses in a restricted range of peak pressures and durations, it is not sufficient as a general descriptor for use in measurement or prediction of the combined environmental effects of impulses having different pressure-time characteristics (U.S. Air Force 1984). The noise measures recommended for assessing these impulsive sound events is the C-Weighted Day-Night Average Sound Level, symbolized L_{cdn}. C-weighting does not discount the low frequency components of the sound event which are a major part of impulsive noise (see Figure F-4). Further, estimates of impulsive noise magnitude conform with magnitude estimates of other noises when the high-energy impulsive noise is measured by C-weighting. L_{cdn} is computed in the same manner as L_{dn}, except the Energy Averaged Sound Level used would be referenced to the C-weighting scale rather than the A-weighting. L_{cdn} has been found to correlate well with average human responses to impulsive noise and is the acoustical measure recommended by the National Research Council and the Environmental Protection Agency for assessing the environmental impacts of impulsive noise (U.S. Air Force 1984).

F.3.6 Onset Rate Adjusted Monthly Day-Night Average A-Weighted Sound Level (L_{dnmr})

Aircraft operations along low-altitude military training routes (MTRs) create noise effects that are not described well using the metrics that have been identified so far in this appendix. Most MTRs are used intermittently, from five to ten times per day along the most heavily travelled routes to less than ten times per one or two weeks. Average usage is in the range of two to five times per day. MTRS are typically several miles wide and aircraft can use any portion of the route, thus even points under the centerline of the route will probably not be directly overflown by each sortie. Use of MTRs results in noise exposure that is "well below threshold limits for hearing damage or other physiological effects" (U.S. Air Force, AAMRL 1987). However, aircraft flying at maneuvering speeds and at a minimum of 500 feet above ground level generate high level, short duration noise events that tend to create annoyance due to a startling effect on people overflown by these aircraft. L_{dnmr} modifies the DNL metric with a penalty for the onset rate of an aircraft, based on its airspeed, altitude, and number and type of engines. The penalty is a logarithmic ratio of onset rates with the following equation:

$$\text{Onset Penalty} = 16.6 \log [\text{Onset Rate (dB/sec)}/(15 \text{ dB/sec})]$$

The onset penalty is applied to DNL values computed for low-altitude flight operations. This metric applies for onset rates from 15 dB per second to 30 dB per second. Onset rates below the threshold of 15 dB do not require adjustments to the DNL, while onset rates greater than 30 dB per second are assigned a maximum penalty of a 5 dB increase to the computed DNL.

F.3.7 Supplemental Sound Metrics

DNL is sometimes supplemented by other metrics to characterize specific effects. These analyses are accomplished on a case-by-case basis, as required, and may include L_{eq} (Equivalent Sound Level), composite one-third octave band SPL (Sound Pressure Level), SEL (Sound Exposure Level), and L_{max} (Maximum Sound Level). Sound pressure levels are the starting points for all other metrics. Composite one-third octave band SPL is used to analyze sound impacts on structures; L_{max} is used to assess impacts on animals. SPL and L_{max} are expressed in units of decibels (dB).

F.4 Sound Analysis Methodology

F.4.1 NOISEMAP Computer Program

The NOISEMAP program is actually a group of computer programs developed by the U.S. Air Force to predict noise exposures in the vicinity of an air base due to aircraft flight, maintenance, and ground run-up operations. These programs can also be used for noise exposure prediction at civilian or joint-use (military-civilian) airfields if appropriate noise reference files are available. The NOISEMAP programs utilize a database of aircraft noise emission characteristics (NOISEFILE) that is accessed by the OMEGA10 and OMEGA11 subprograms to produce SEL versus slant range values specific to the aircraft operating parameters and meteorological conditions.

Data describing flight tracks, flight profiles, power settings, flight paths and profile utilization, and ground run-up information by type of aircraft/engine are assembled and processed for input into a central computer. The NOISEMAP program uses this information to calculate DNL values at points on a regularly spaced 100x100 grid surrounding the airfield. This information is then input to another subprogram that generates contour lines connecting points of equal DNL values in a manner similar to elevation contours shown on topographic maps. Contours are normally generated at 5 dB intervals beginning at a lower limit of DNL 65 dB, the maximum level considered acceptable for unrestricted residential use.

F.4.2 MOAMAP Computer Program

MOAMAP is a noise model that uses a Monte Carlo simulation of aircraft operations to create a multidimensional probability density function (PDF). This PDF determines the likelihood that an aircraft will be found at a particular spot inside a predefined polygon (like a MOA) inscribed on the surface of the earth. The model does not assume any particular map projection and is simply based on a rectangular grid.

MOAMAP can generate several metrics including L_{eq}, L_{dn}, and L_{dnmr}. The L_{dnmr} calculations are accomplished using the validated Air Force algorithm. The statistical model developed by Plotkin et.al. (1989) can be used to estimate L_{cdn} values of sonic booms. The elliptical contours from this model are turned in a raster file by MOAMAP and referenced to a ground datum. All the raster files created by MOAMAP can be displayed on a standard VGA computer screen, output to an ASCII file containing a grid of equally spaced numbers, and output to a Geographic Information System compatible raster file.

F.4.3 ROUTEMAP Computer Program

ROUTEMAP calculates ground level noise exposure along an MTR corridor. ROUTEMAP treats an individual flight track as a point source moving along a line, which, when time-averaged, becomes a line source. Vertical plane dispersion is modeled by using an equivalent acoustical altitude that is determined from an altitude distribution of time spent at selected altitude ranges. Algorithms used in ROUTEMAP are either the same as or closely resemble those used by NOISEMAP, with the difference being ROUTEMAP's adaptation for low-altitude, high speed flyovers (Cook n.d.). ROUTEMAP generates its adjusted SEL values from the ROUTEFILE dataset, OMEGA10R. Input variables required are aircraft type, number of day and night operations per month, airspeed, power setting, altitude, and whether the flight is VFR or IFR. L_{dnmr} is computed for ground positions within 13 miles of the route centerline. ROUTEMAP can also compute L_{eq}, the monthly A-weighted noise level without onset or night penalty and the population expected to be highly annoyed as a function of L_{dnmr} (Cook n.d.).

F.4.4 Integrated Noise Model (INM) Computer Program

The INM program was initially released in January 1978 by the Federal Aviation Administration (FAA). The model has been substantially updated since that time, and is the recommended tool for site analysis for Airport Noise Control and Land Use Compatibility (ANCLUC) planning studies. INM contains computer models for determining the impact of aircraft noise in and around airports. This noise impact can be given in terms of contours of equal noise exposure for Noise Exposure Forecast (NEF), Equivalent Sound Level (L_{eq}), Day-Night Average Sound Level (DNL), and Time Above a specified threshold of A-weighted sound (TA).

The contours are presented in the form of a printout of the contour coordinates and area impacted, and as a plot of the contours. In addition, a printout report of populations within the contour areas may be produced. The model also allows for the calculation of several noise measures at specific points (grid) in the airport vicinity. The output from this type of calculation is a printout report. The model also produces a number of supporting reports.

F.5 Effects Of Sound Exposure On Humans

Undesired sound may interfere with a broad range of human activities, degrading public health and welfare. Affected activities may include speech, sleep, learning, relaxation, listening, and other human endeavors. The level of sound that interferes with human activity depends on the activity and its contextual frame of reference. The effect of activity interference is often described in terms of annoyance. However, various other factors, such as attitude towards the sound source and local conditions, may influence an individual's reaction to activity interferences (U.S. EPA, Office of Noise Abatement and Control 1974).

F.5.1 Annoyance

Annoyance is a summary measure of the general adverse reaction of people to noise that produces speech interference; sleep disturbance; induces a desire for a tranquil environment; or interferes with the ability to use the telephone, radio or television satisfactorily. The measure of this adverse reaction is the percentage of area population that feels highly annoyed by sound of a specified level.

Sound can be defined as an auditory sensation evoked by an oscillation (vibratory disturbance) in the pressure and density of a fluid (including air), or in the elastic strain in a solid, with frequency in the approximate range of 20 to 20,000 Hz. Noise can be defined simply as any unwanted sound; or, more specifically, as any sound that is undesirable because it interferes with speech and hearing, is intense enough to damage hearing, or is otherwise annoying (U.S. EPA, Office of Noise Assessment and Control 1976). In practice, the definitions of sound and noise are bound up in the subjective human perceptions of each. Annoyance is a psychological response to a given noise exposure. It may result from speech or sleep interference, but it can arise in a variety of other circumstances. The perceived unpleasantness of the noise is a factor of annoyance, as is any anxiety or apprehension that the noise may cause (Frankel 1986). Community response is a term used to describe the annoyance of groups of people exposed to environmental noise in residential settings.

The preponderance of case histories and social surveys indicate that the response of a community to aircraft noise is affected not only by how loud the sound is, but also by how often sound events occur (e.g., the total sound exposure in a specified time period). This is consistent with the results of psychoacoustic laboratory experiments that show that the magnitude of sound and its duration are exchanges on an energy summation basis. On the assumption that community response is related to the total sound energy in a specified time period, events of equal magnitude are summed on the basis of 10 Log N where N is the number of events. Recent studies have shown that 10 Log N can be used to accurately predict community annoyance for sound events as low as 2 per day; other studies had previously shown that 10 Log N worked well for cumulative sound exposure of several hundred events per day (Schomer 1981, Fields and Powell 1987).

The effect of noise on people derives from complex relationships between numerous factors; and separating the effects of these often confounding factors is impractical, if not impossible. The variability in the way individuals react to sound makes it impossible to accurately predict how any one individual will respond to a given sound. However, when the community is considered as a whole, trends emerge which relate noise to annoyance. DNL alone provides an adequate indicator of community annoyance to aircraft noise. EPA's "Levels" document states "This formula of equivalent level [DNL] is used here to relate noise in residential environments to chronic annoyance by speech interference and in some part by sleep and activity interference" (U.S. EPA, Office of Noise Abatement and Control 1974).

In 1978, Schultz synthesized a relationship between transportation noise exposure and the prevalence of annoyance in communities from the findings of a number of social surveys. These assessments have become the model for assessing the effects of long-term sound exposure on communities. Schultz developed methods for converting sound exposures measured in different units to a common set of units (DNL) and devised ways of comparing annoyance judgements measured on very different response scales. The independent variable Schultz chose for the dosage-effect relationship was a cumulative measure of the time integral of sound intensity to which the communities are exposed. The dependent variable was a measure of the upper portion of the distribution of self-reported annoyance. The resulting metric, "Percent Highly Annoyed," is symbolically illustrated as (%HA). The logistic fits by Armstrong Laboratory to Schultz (161 points) and an update of 400 data points are expressed by the following relationship:

Fit to 400 points: %HA = 100/[1 + EXP(11.13 - .141 LDN)]

Schultz Fit: %HA = 100/[1 + EXP(10.43 - .132 LDN)]

This approximation was adopted in preference to a third order polynomial least squares fit as recommended by Fidell and Green (1989) to ensure the dose-response relationship predicts no annoyance at an exposure level of DNL 45 dB, and conforms with the EPA *Levels* document. Results derived from a recent analysis by Armstrong Laboratory of the update of 400 data points to the Schultz curve validate the continued accuracy of the Schultz relationship between DNL and %HA. Further, %HA remains the best approach since the updated curve differs less than one percent in the DNL range of 45 dB to 75 dB from the original logistics fit. Finally, the review also concluded that the DNL-%HA relationship is valid for all types of transportation noise. The new curve is shown in Figure F-8.

Thus, the "Schultz Curve" is the best available source of empirical dosage-effect information for predicting

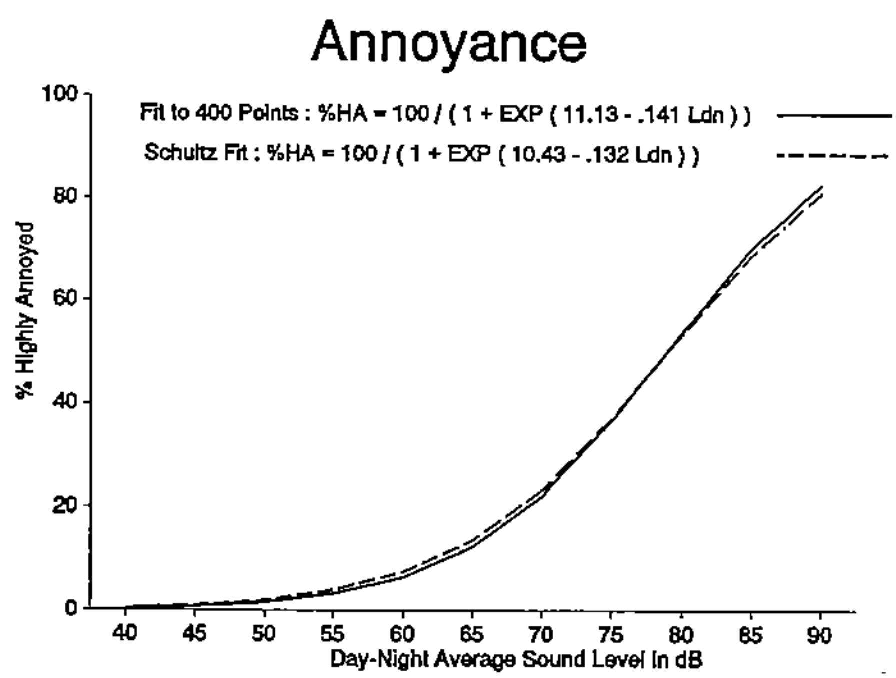


Figure F-8 Comparison of Logistic Fits for Prediction of Percent Highly Annoyed–Schultz Data (161 points) and Update of 400 Data Points

community response to transportation noise; and annoyance is the characterization of the community response. On the other hand, complaints are not a measure of community impact. An analysis of complaints by Luz, Raspet and Schomer (1985) supports noise abatement (reduction) policies based on an assessment of the level of annoyance rather than the number of complaints. Annoyance can exist without complaints and, conversely, complaints may exist without adverse sound levels. The current body of evidence indicates that complaints are an inadequate indicator of the full extent of noise effects on a population (Fields and Hall 1987). The estimates of annoyance presented in this document are based on the average Percent Highly Annoyed for each DNL interval indicated in Table F-5.

Table F-5 Average Percent Highly Annoyed (%HA) by DNL Level

DNL	% Highly Annoyed	DNL	% Highly Annoyed	DNL	% Highly Annoyed
50	1.6626	64	10.8515	78	46.7048
51	1.9096	65	12.2927	79	50.225
52	2.1924	66	13.8955	80	53.743
53	2.516	67	15.6699	81	57.2241
54	2.886	68	17.6245	82	60.6351
55	3.3086	69	19.7657	83	63.9455
56	3.7906	70	22.0974	84	67.1284
57	4.3397	71	24.6197	85	70.1615
58	4.9642	72	27.3289	86	73.0271
59	5.6733	73	30.2167	87	75.7128
60	6.4767	74	33.27	88	78.2109
61	7.385	75	36.4705	89	80.5182
62	8.4092	76	39.7953	90	82.6353
63	9.5609	77	43.2171		

Note: Fit to 400 data points.

F.5.2 Speech Interference

Speech interference associated with aircraft noise is a primary source of annoyance to individuals on the ground. The disruption of leisure activities (such as listening to the radio, television, and music), and conversation gives rise to frustration and irritation. Quality speech communication is obviously also important in the classroom, office, and industrial settings. Researchers have found that aircraft noise at the 75 dB level annoyed the highest percentage of the population when it interfered with television sound, with eighty percent of the test population reporting annoyance. Also high on the list of annoyances for the surveyed population was flickering of the television picture and interference with casual conversation by aircraft noise (Newman and Beattie 1985).

Noise levels that interfere with listening to a desired sound such as speech or music can be defined in terms of the level of interfering sound required to mask the desired sound. Such levels have been quantified for speech communication by directly measuring the interference with speech intelligibility as a function of the level of the intruding sound relative to the level of speech sounds (U.S. EPA, Office of Noise Abatement and Control 1974). In general, it was found that intelligibility is related to the amount by which the levels of speech signals exceed steady state noise levels. The difference between speech and noise levels is usually referred to as the speech-to-noise ratio. However, since no quantitative relationship has been established between speech interference and learning, no additional criteria have been developed for determining speech interference effects on learning.

F.5.3 Hearing Loss

Hearing loss can be either temporary or permanent. A noise-induced temporary threshold shift is a temporary loss of hearing experienced after a relatively short exposure to excessive noise. A Noise-Induced Temporary Threshold Shift (NITTS) means that the detection level of sound has been increased. Recovery is fairly rapid after cessation of the noise. A Noise-Induced Permanent Threshold Shift (NIPTS) is an irreversible loss of hearing caused by prolonged exposure to excessive noise. This loss is essentially indistinguishable from the normal hearing loss associated with aging. Permanent hearing loss is generally associated with destruction of the hair cells of the inner ear. Based on EPA criteria, hearing loss is not expected for people living in areas with DNL < 75 dB. Further, as stated in the EPA *Levels* document, changes in hearing levels of 5 dB are generally not considered noticeable or significant (U.S. EPA, Office of Noise Abatement and Control 1974).

An outdoor DNL of 75 dB is considered the threshold above which the risk of hearing loss is evaluated. Following guidelines recommended by the Committee on Hearing, Bioacoustics, and Biomechanics, the average change in the threshold of hearing for people exposed to DNL ≥ 75 dB was evaluated (National Research Council 1977). Results indicated that an average of 1 dB hearing loss could be expected for people exposed to DNL ≥ 75 dB. For the most sensitive 10% of the exposed population, the maximum anticipated hearing loss would be 4 dB. These hearing loss projections must be considered high as the calculations are based on an average daily outdoor exposure of 16 hr (7:00 a.m. to 10:00 p.m.) over a 40 year period. It is doubtful that any individual would spend this amount of time outdoors within the DNL ≥ 75 dB contours.

F.5.4 Sleep Disturbance

The effects of noise on sleep have long been a concern of parties interested in assessing residential noise environments. Early studies, conducted mainly in the 1970s, measured noise levels in bedrooms in which sleep was apparently undisturbed by noise. Tests were conducted mainly in laboratory environments in which sleep disturbance was measured in a variety of ways. Most frequently, awakening was measured either by a verbal response, or a button push; in some instances, sleep disturbance, as well as awakening, was determined by electroencephalograph (EEG) recordings of brain activity which indicated stages of sleep and awakening. Various types of noise were presented to the sleeping subjects throughout the night. These noises consisted primarily of transportation noises, including those produced by aircraft, trucks, cars and trains. The aircraft noises included both subsonic aircraft flyover noises as well as sonic booms. Synthetic noises, including laboratory-generated sounds consisting of shaped noises and tones, were also studied.

Reviews by Lukas (1975), Griefahn and Muzet (1978), and Pearsons et al. (1989) provide an overview of data available in the 1970s on the effects of different levels of noise on sleep-state changes and waking. Various A-weighted levels between 25 and 50 dB were observed to be associated with an absence of sleep disturbance. Because of the large variability of the data in these reviews, there is some question as to the reliability of the results. Consequently, the dose-response curve developed by Lukas, which plots the probability of awakening as a function of SEL, provides a guide only to the most extreme limits of the potential effects of noise on sleep.

The 10-dB nighttime "penalty" added to noise levels for the period 10 PM to 7 AM in computing DNL is intended to account for the intrusiveness of noise at night, partly due to the lower nighttime ambient, and therefore tends to reflect to some extent the potential for wakeups. However, some agencies believe that if there are an unusual number of nighttime noise events, supplemental analysis to indicate sleep disturbance semi-quantitatively, in terms of the putative number of wakeups, is desirable. Such an analysis is generally based on a "single-event" parameter, such as SEL or L_{max}.

Based on the literature reviewed in a recent Air Force-sponsored study of sleep disturbance (Pearsons et al. 1989), no specific adverse health effects have been clearly associated with sleep disturbance, either awakening or sleep-state changes. Nevertheless, sleep disturbance, particularly awakening, is generally considered undesirable, and may be considered an impact caused by noise exposure (consequently, awakening has been selected as the parameter recommended for evaluating the effects of noise on sleep). The U.S. Air Force plans to conduct a field study of sleep disturbance, using awakening as the dependent variable, in the near future (1993/1995) (Finegold et al. 1990).

As reported in the 1989 study by Pearsons et al, the effort to develop sleep disturbance prediction curve identified the need for substantially more research in this area. Of concern were:

- large discrepancies between laboratory and field studies;
- highly variable and incomplete data bases;
- lack of appropriate field studies;
- the study's methodologies;
- the need to consider non-acoustic effects; and
- the role of habituation.

In cases where supplemental analysis of potential sleep disturbance is considered necessary, the USAF has developed an interim dose-response curve to predict the percent of exposed population expected to be awakened (% awakening) as a function of exposure to single event noise levels expressed as SEL (Finegold et al. 1992). This interim prediction curve is based on statistical adjustment of the most recent, inclusive analysis of published sleep disturbance studies conducted by Pearson et al. (1989). The recommended dose-response relationship is expressed by the equation:

$$\%Awaking = (7.079\times10^{-}6)\times SEL^{3.496}$$

This recommended interim dose-response relationship is shown by the curve in Figure F-9, and the individual points shown in the figure represent groupings of recorded data.

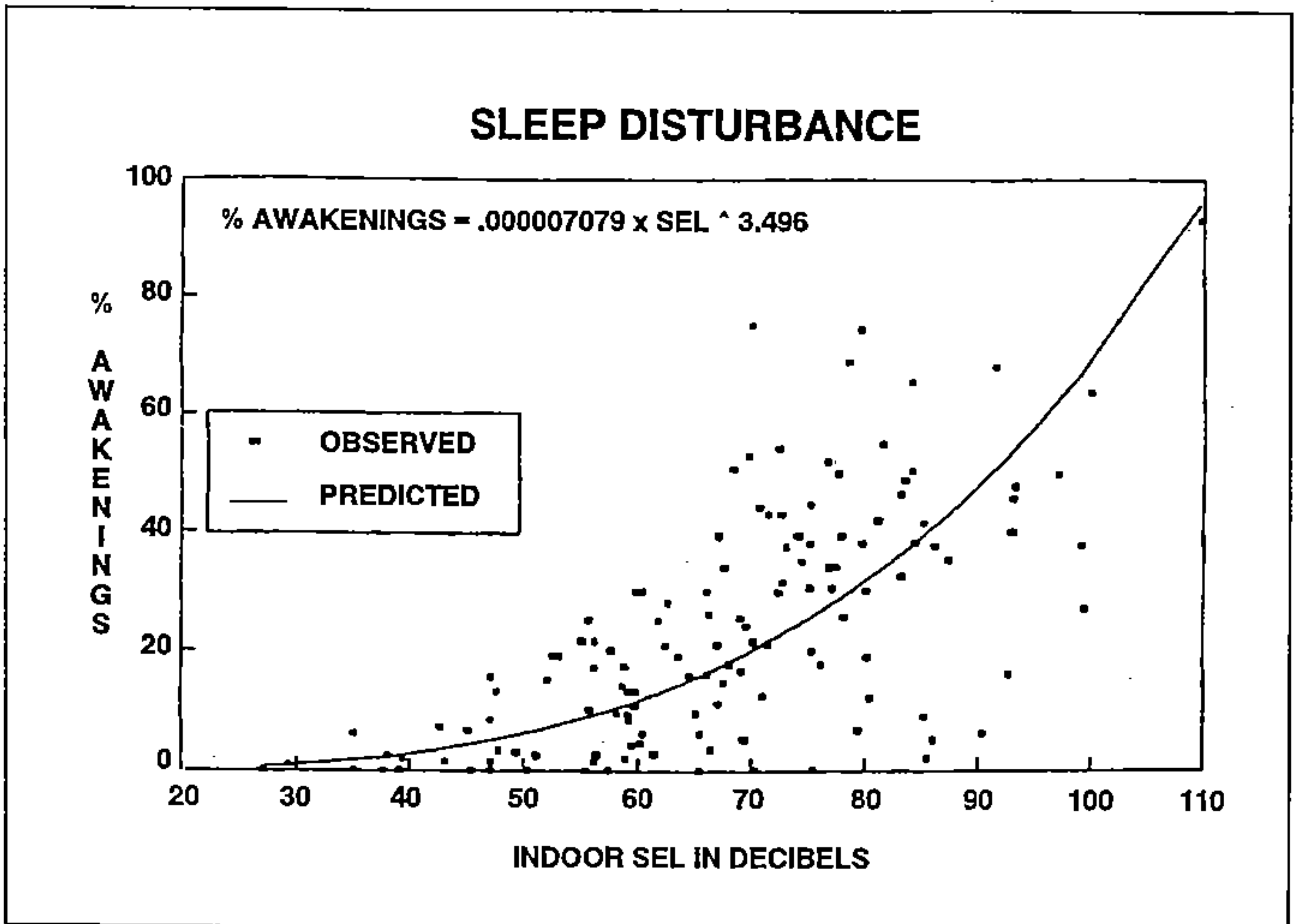


Figure F-9 Sleep disturbance as a function of single event noise exposure (Finegold et al. 1992)

In December 1992, the first report of a comprehensive field study conducted by the Civil Aviation Authority of the British Department of Transport was released (Ollerhead it al, 1992). This study was conducted under carefully controlled field conditions and used devices known as *actimeters* to measure fine limb movements, usually of the wrist, which are indicative of sleep disturbance. Field work was conducted during the summer of 1991 at locations surrounding major British airports. In all, 400 subjects were monitored for a total of 5,742 subject-nights resulting in a total of some 40,000 subject-hours of sleep data which were subsequently analyzed and broken down into more than 4.5 million 30-second *epochs*. A total of 4,823 aircraft noise events were logged during the 120 measurement nights and outdoor noise levels ranged from 60 dBA to more than 100 dBA l_{max}. Actimetry data were correlated with sleep-EEG records for 178 subject nights and showed good agreement between actimetrically determined *arousals* and EEG determined *awakenings*.

The mean arousal rate (i.e., the proportion of epochs with movement arousals) for all subjects, all causes, all nights and all epochs was 5.3 percent. For the average sleeping period of 7.25 hours, this is equivalent to about 45 arousals per night. Of these, some 40 percent, (i.e., about 18±4) were considered likely to be awakenings of 10-15 seconds or more, the remainder being considered minor perturbations.

Based on the data obtained during this study, the authors reached the following conclusions concerning the effects of aircraft noise on sleep:

- All subjective reactions vary greatly from person to person and from time to time and sleep disturbance is no exception; deviations from the average can be very large. Even so, this study indicates that, once asleep, very few people living near airports are at risk of any substantial sleep disturbance due to aircraft noise, even at the highest event noise levels.

- At outdoor event levels below 90 dBA (80 dBA L_{max}), average sleep disturbance rates are unlikely to be affected by aircraft noise. At higher levels, and most of the events upon which these conclusions are based were in the range 90 to 100 dBA SEL (90 to 95 dBA L_{max}), the chance of the average person being awakened is about 1 in 75 [1.33 percent]. Compared to the overall average of about 18 nightly awakenings, this probability indicates that even large numbers of noisy nighttime aircraft movements will cause very little increase in the average person's nightly awakenings. Therefore, based on expert opinion on the consequences of sleep disturbance, the results of this study provide no evidence to suggest that aircraft noise is likely to cause harmful after effects.
- At the same time, it must be emphasized that these are estimates of *average* effects; clearly, more susceptible people exist. At one extreme, 2-3 percent of people are over 60 percent more sensitive than average;some maybe twice as sensitive to noise disturbance. There may also be particular times of the night, perhaps during periods of sleep lightening, when individuals could be more sensitive to noise. Although the relationship cannot be verified statistically, the data do indicate that aircraft events with noise levels greater than 100 dBA SEL (95 dBA L_{max}) out of doors, will have a greater chance of disturbing sleep. The most sensitive people may also react to aircraft noise events with levels below 90 dBA SEL (80 dBA L_{max}), approximating to 95 EPNdB on the noise scale used internationally for the noise certification of aircraft.

The results of this study are consistent with the results of the laboratory studies reviewed by Pearsons et al (1989) which indicated much lower levels of sleep disturbance under field conditions than under laboratory conditions. As noted above, Ollerhead concludes that sleep disturbance rates are unlikely to affected by aircraft noise below 90 dB SEL and that for events with SELs in the range of 90 to 100 dB, the chance of an average persons being awakened are about 1 in 75 (about 1.33 percent). Although the authors concluded that events with SEL > 100 dB are more likely to result in sleep disturbance, no specific dose-response relationship between SEL and percent awaking was suggested. To provide an estimate of the percent awaking for SELs between 100 and 110 dB data on unadjusted arousal rates (i.e., not adjusted for the varying sensitivity of individuals) were used. For this analysis, 50 percent of the actimetrically measured arousals were assumed to result in awaking. Table F-6 provides a comparison of the predicted percent awaking based on the Air Force interim model and the data in Ollerhead et al (1992). This document provides comparisons of predicted awaking based on both the air Force interim model and the data in Ollerhead et al. (1992)[1].

There should be continued research into community reactions to aircraft noise, including both sleep disturbance and non-auditory health effects of noise.

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[1] Since the data in Ollerhead et al. (1992) does not include SEL > 110 dB, the predicted awaking based on the Air Force interim model for SEL > 95 was used in both estimates.

Table F-6 Comparison of predicted awakening based on Air Force interim model and data from Ollerhead et al (1992)

Outdoor SEL (dB)	Predicted Awaking (percent)	
	Air Force Interim Model	Ollerhead et.al. (1992)
> 110	41.0	Not Estimated
105-110	33.3	2.8
100-105	26.6	2.1
95-100	21.0	1.3
90-95	16.3	1.1
85-90	12.3	0

F.5.5 Nonauditory Health Effects

Based on summaries of previous research in the field, (Thompson 1981; Thompson et al. 1989; CHABA 1981; CHABA 1982; Hattis et al. 1980; and U.S. EPA 1981) predictions of nonauditory health effects as a result of exposure to aircraft noise (both subsonic and supersonic) in a residential environment have not been conclusively demonstrated. One of the earliest of these projects (CHABA 1981) reported that while the available evidence was suggestive, it did not provide definitive answers to the question of health effects of long-term exposure to noise, other than to the auditory system. The committee recommended that in the absence of adequate knowledge as to whether or not noise can produce effects upon health, other than damage to the auditory system, an attempt should be made to obtain more critical evidence. A valid predictive procedure requires: (1) evidence for a causal relationship between aircraft noise exposure and adverse nonauditory health consequences, and (2) knowledge of a quantitative (dose-response) relationship between the amount of noise exposure and specific health effects. Because the results of studies of aircraft noise on health are highly equivocal, there is currently no scientific basis for making valid risk assessments.

Alleged nonauditory health consequences of aircraft noise exposure which have been studied include birth defects, low birth weight, mental problems, cancer, stroke, hypertension, sudden cardiac death, myocardial infarction, and cardiac arrhythmias. Of these, hypertension is the most biologically plausible effect of noise exposure. Noise appears to elicit many of the same biochemical and physiological reactions, including temporary elevation of blood pressure, as do many other everyday stressors. These temporary increases in blood pressure are believed to lead to a gradual resetting of the body's blood pressure control system. Over a period of years, some researchers hypothesize that permanent hypertension may develop (e.g. Peterson et al., 1984).

One mechanism hypothesized is that continuous stimulation of the central nervous system by noise induces changes in cardiac function and peripheral vascular resistance, which in turn raises blood pressure and gradually resets the baro-receptor (blood pressure) control system. Although inconclusive, studies of the prevalence of elevated blood pressure in noise-exposed populations suggest that long-term exposure to high levels of occupational noise may be associated with an increase in hypertension in the later decades of life. These studies, coupled with increases in flight operations around civilian airports and military airbases plus an increase in low altitude overflights in military training areas, have increased public concern about potential health hazards of aircraft noise exposure in recent years.

Studies in residential areas exposed to aircraft noise have produced contradictory results that are difficult to interpret. Early investigations indicated that incidence of hypertension was from two to four times higher in areas near airport than in areas away from airports (Karagodina et al., 1969). Although Meechan and Shaw (1988) continue to report excessive cardiovascular mortality among individuals, 75 years or older, living near the Los Angles International Airport, their findings cannot be replicated (Frerichs et al., 1980). In fact, noise exposure increased over the years while there was a decline in all cause, age-adjusted death rates and inconsistent changes in age-adjusted cardiovascular, hypertension, and cerebrovascular disease rates. Some European research (Ising et al., 1991; Ising and Spreng 1988) has shown more positive association between exposure to aircraft noise and adverse health effects, including a result that showed more pronounced effects in females than males. The adequacy of the methodology and the consistency of the conclusions, however are still being debated. The major problem that requires further consideration is that the methodology of these studies does not lend itself to conclusive proof of significant nonauditory health effects in residential areas exposed to aircraft noise.

Most studies which have controlled for multiple factors have shown no, or a very weak association between noise exposure and nonauditory health effects. This observation holds for studies of occupational and traffic noise as well as for aircraft noise exposure. In contrast to the reports of two- to six-fold increases in incidence of hypertension due to high industrial noise (see review by Thompson et al., 1989), the more rigorously controlled studies (Talbott et al., 1985; and van Dijk et al. 1987) showed equivocal associations between hypertension and prolonged exposure to high levels of occupational noise. In the Talbott et al. (1985) study a significant relationship was shown between noise-induced hearing loss and high blood pressure in the 56 plus age group.

The critical question is whether observed positive associations are causal ones. In the aggregate, studies indicated that the association between street traffic noise and blood pressure or other cardiovascular changes are arguable. Two large prospective collaborative studies (Babish and Gallacher 1990) of heart disease are of particular interest. To date, cross-sectional data from these cohorts offer contradictory results. Data from one cohort show a slight increase in mean systolic blood pressure [2.4 millimeters of mercury (mmHg)] in the noisiest compared to the quietest area; while data from the second cohort show the lowest mean systolic blood pressure and highest high-density lipoprotein cholesterol (lipoprotein protective of heart disease) for men in the noisiest area. These effects of traffic noise on blood pressure and blood lipids were more pronounced in men who were also exposed to high levels of noise at work.

More rigorous epidemiologic study designs for investigating causal and dose-response relationships depend upon assignment of noise dose and health status to individuals. The best established environmental noise descriptor, yearly DNL, is inherently place-oriented and may bear little specifiable relationship to personal exposure. Because health consequences of environmental noise exposure are unlikely to appear in less than five to ten years, individual dosimetry may not be practicable. There are three problems with using dosimetry in epidemiologic studies: (1) wearing may be burdensome, (2) irritating, and (3) tedious to the participants.

It is clear from the foregoing that the current state of technical knowledge cannot support inference of a causal or consistent relationship, or a quantitative dose-response model, between residential aircraft noise exposure and health consequences. Thus, no technical means are available for predicting extra-auditory health effects of noise exposure. This conclusion cannot be construed as evidence of no effect of residential aircraft noise exposure on nonauditory health. Current findings, taken in sum, indicate that further rigorous studies, such as an appropriately designed prospective epidemiologic study, are urgently needed.

F.6 EFFECTS OF SOUND ON STRUCTURES

The structural effects of sound generated by industrial activities and ground transportation have been a concern of civil engineers for many years. In the 1960's, the need for reliable statistical models to predict the effects of sonic booms produced a body of knowledge on how sound energy from aircraft affects structures. The potential effects of sound vibrations on buildings from subsonic aircraft overflights did not become a concern until the advent of larger planes. During the 1970's, extensive research prompted by development of the Concorde aircraft probed the effects of sound vibrations on a variety of modern and historic structures. Increased environmental awareness in the 1980s has further spurred research to investigate potential damage to structures from overflights by smaller aircraft and by helicopters.

Potential damage to a structure from aircraft overflights is the result of increased air pressure on the structure and from vibrations transmitted in the structure. As a jet aircraft flies at subsonic speeds, it generates (1) pressure from the airflow in the vicinity of the engines and airframe; (2) a lift pulse pressure field, or momentary pressure increase on the ground from air flow over the wings; and (3) wake and trailing vortex pressure fields.

The effect of engine noise is a function of the type of engine, the speed or power condition, the sound frequency, and the slant distance. For a given aircraft, the speed or power condition and slant distance are variables that may be manipulated to mitigate potential effects on structures.

Lift pulse pressure field varies with gross weight of the aircraft, the height of the aircraft above the ground, the slant range (a function of height and horizontal distances along the flight path and at right angles to the flight path), and time (Bedard and Cook 1987). Peak pressure increases with increasing weight of the aircraft and its proximity to the ground, and is reduced by the cube of the slant range. Thus the area of greatest potential pressure lies directly under the flight track of large planes at low altitudes; however, measurements and calculations have shown that for realistic operational scenarios these pressures are relatively low compared to those occurring naturally (e.g. winds of 10-20 mph). Since the pressure load attenuates rapidly with increased distance from the center of the flight track, even the very small potential for damage to structures can be mitigated by lateral adjustment of the flight track. For most jet aircraft these pressures are less than 1 PSF. For heavy helicopters at very low altitudes (50 feet AGL), the pressures can be an order of magnitude higher.

The dynamic pressures on a structure from the wake and trailing vortices shed by the air flow over the aircraft increase with the plane's speed and wing area and decrease with the slant range. Again, adjusting the slant range, especially through lateral displacement of the flight track, is a mitigation option.

All structures are subjected to many sources of stress or pressure. Inherent natural stresses include those from changes in temperature and humidity, wind pressure, thunder, snow load, and seismic disturbances. Human activities that induce stress include blasting, operating heavy machinery, and passing ground transportation vehicles. On a smaller scale, normal household activities such as the use of vacuum cleaners and washing machines, and the slamming of doors generate vibrations. Buildings are designed to withstand these natural environmental stresses and normal uses. In addition, buildings may have special design modifications to accommodate expected stresses from industrial uses or unusual environmental conditions, such as snow load or high winds.

Some building materials are more sensitive than others to external pressures and induced vibrations. Windows with large panes of glass are most vulnerable. Plaster walls in frame buildings are susceptible to cracking. Components that are least likely to experience damage are masonry walls of stone, concrete block, adobe, or brick. In addition, the design of some buildings provides greater damping of induced vibrations than others. Research data have not categorically proven old buildings to be more vulnerable to vibrations than newer buildings, but prudence dictates that unique structures of historic significance be given special consideration.

In order to assess the potential for possible damage to structures from flight operations, the Air Force has historically reviewed existing literature, conducted experiments, and employed statistical models. A common procedure is to evaluate the potential effect of a "worst case" scenario for subsonic flight activity. If the effects of the worst case are negligible, time and money are not spent in evaluating cases of lesser magnitude. In the case of low altitude operations such as along a military training route (MTR), the potential effects to sites directly under the track of bombers at 200 feet above ground level (AGL) have been measured. Bombers, along with the C-5, have been chosen as "worst case" models because of their large size.

However, peak overpressures caused by subsonic flight tend to be of a relative low magnitude when compared to the overpressures created by flight in the supersonic regime. As discussed previously in Appendix D, for those sonic booms that reach the surface, the intensity of the sound overpressure is largely dependent on the aircraft altitude, airspeed, size, and attitude. These peak overpressures occur directly under the aircraft and diminish laterally. Worthy of mention, is a 1977 test on an adobe house in southern Arizona. The house was instrumented and exposed to supersonic training overhead. The evaluation concluded that the adobe structure reacted similar to a conventional style structure—there was no difference in the probability of damage to an adobe structure as compared to a conventional structure. It is estimated that the "probability of a structure being hit by a 6 psf carpet boom is less than one in 20,000 chances; for an 11 psf carpet boom the probability is beyond four standard deviations of the mean boom strength and is considered to be below any level of significance" (U.S. DoD AF 1984). For focus booms greater than twice the nominal carpet boom pressure, the probability of a structure being hit is less than the range of one in 3,400 chances; and a superboom is less than one in 16,700 chances. With this low probability, the chances of a boom causing structural damage is very small.

By far, the largest percentage of sonic boom damage claims stem from broken or cracked glass. Further tests have shown that glass that has been sandblasted, scratched, or nicked will not exhibit the same strength as a new, properly installed pane of glass. By using a data base of unpublished static results provided by Libbey-Owens-Ford Company , a statistical analysis was performed to determine the probability of glass breakage for various overpressures. If an aircraft were to approach head-on or perpendicular to the plane of the window the probabilities of breakage would be as depicted below in Table F-7.

Table F-7 Probability of Glass Breakage from Sonic Booms

Estimate of the Impacts of Sonic Boom Overpressures on Glass Window Panes	
Overpressures (psf)	**Broken Panes per Million**
1	23
2	75
3	300
4	1,200
5	2,300
6	4,000
7	6,500
8	10,000
9	14,000
10	20,000
11	26,000
12	33,000
13	40,000
14	49,000
15	59,000

Source: U.S. DoT FAA 1973.

In summary, subsonic aircraft operations generate dynamic pressures that are much lower than those normally experienced by surface structures. Supersonic flight has the potential to create substantially greater overpressures than those generated by subsonic flight; however, the chance of those small areas of sonic boom impacts affecting a structure are quite remote. The magnitude of the pressures experienced by surface structures is determined by characteristics of the aircraft and the nature of the operation being performed by the aircraft. Three highly influential factors are the size of the aircraft, its height above the surface, and the proximity of the structure to the center of the flight path. The magnitude of the pressures exerted on buildings from overflight by aircraft has been found to be less than the pressure from natural events, such as wind, and less than the design load for most buildings. Table F-8 summarizes the predicted effects of sound, expressed in one-third octave band sound pressure levels, on structures.

Table F-8 Effects of Sound on Structures

<table>
<tr><th colspan="4">Noise Effects on Structures</th></tr>
<tr><th colspan="2">Peak Overpressure</th><th colspan="2" rowspan="2">Effects
Summary</th></tr>
<tr><th>dB</th><th>PSF[1]</th></tr>
<tr><td>0-127</td><td>0-1</td><td rowspan="2">Typical Community Exposures (Generally Below 2 PSF</td><td>No Damage to structures
No Significant Reaction</td></tr>
<tr><td>127-131</td><td>1.0-1.5</td><td>Rare Minor Damage
Some Public Reaction</td></tr>
<tr><td>131-140</td><td>1.5-4.0</td><td colspan="2">Window damage possible, increasing public reaction, particularly at night</td></tr>
<tr><td>140-146</td><td>4.0-8.0[2]</td><td colspan="2">Incipient damage to structures</td></tr>
<tr><td>146-171</td><td>8.0-144</td><td colspan="2">Measured booms at minimum altitudes experienced by humans: no injury</td></tr>
<tr><td>185</td><td>720</td><td colspan="2">Estimated threshold for eardrum rupture (maximum overpressure)</td></tr>
<tr><td>194</td><td>2160</td><td colspan="2">Estimated threshold for lung damage (maximum overpressure)</td></tr>
</table>

Notes: [1] PSF = Pounds per Square Foot

[2] With the exception of window glass breakage, booms less than 11 psf should not damage "building structures in good repair." B.L. Clarkson and W.H. Mayes,"Sonic Boom Building Structure Responses Including Damages," J. Acoust. Soc. 51, 742-757, 1972.

Source: Speakman 1992.

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APPENDIX G

MOA-by-MOA COMPILATION OF POTENTIALLY AFFECTED BIOLOGICAL RESOURCES

This Appendix is comprised of five tables presenting the quantified data on species and habitats of concern potentially affected under each alternative considered in this analysis. For the No Action Alternative, both the MFE and Routine Operations scenarios are included. The "inventories" of biological resources are based on the maps of known biological resources in Chapter 3 (section 3.5). The units of airspace affected under each alternative are listed, and counts or measures, as appropriate, of the resources physically underlying each are shown. Flight floors and whether or not supersonic flight is permitted--the two impact variables considered in this analysis--are also indicated.

The information in this appendix is summarized in the text in Table 4-7 to provide comparison of the alternatives. To prepare Table 4-7, the flight altitudes and speeds at which noise thresholds identified for each resource are surpassed were determined and compared to floors and supersonic stipulations noted in this appendix. Each resource in each airspace unit was then determined to be affected or not on the basis of anticipated noise level. Finally, figures for each resource were summed across airspace unit under each alternative, and the totals are presented in Table 4-7.

The maps in section 3.5 on which this appendix and the alternatives comparison in section 4.5.2.4 are based, have been prepared from the best overall information currently available on the resources in question. However, due to the size of the area in question and the limitations of survey coverage, information--while the best available--is undoubtedly incomplete. Therefore, this appendix and the analysis based upon it must be viewed as an attempt to gauge impacts and compare alternatives, not as an accurate and comprehensive resource inventory.

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SUMMARY OF BIOLOGICAL RESOURCES BY MOA

		Nest Sites (no.)			Waterfowl				Bird Migration Routes (no.)		Caribou (mi^2)				
	Area	Peregrine Falcon	Bald Eagle	Golden Eagle	Trumpeter Swan	Concentration Areas (mi^2)	Breeding Areas (mi^2)	Raptor Breeding Area (mi^2)	Major Routes	Minor Routes	General Distribution Area	Calving Area	Summer Area	Rutting Area	Winter Use Area
NORTHERN INTERIOR REGION															
YUKON 1 MOA	4,560	4	3	1	0	0	0	0	0	0	4,229	1,530	0	0	4,229
YUKON 2 MOA	6,260	16	5	4	12	0	218	371	1	0	4,131	1,862	0	0	3,959
YUKON 1A MOA	750	0	1	0	0	0	0	0	0	0	486	48	0	0	485
YUKON 3 TMOA	9,480	0	0	0	0	0	0	0	1	0	0	0	0	0	0
YUKON 4 TMOA	3,570	0	0	0	0	0	0	0	1	0	2,775	0	0	0	0
YUKON 3 MOA	5,020	38	13	2	2	0	0	34	1	0	4,966	2,117	0	0	4,966
YUKON 4 MOA	4,460	8	3	1	2	0	0	311	1	0	1,390	33	0	0	1,339
YUKON 5 MOA	3,570	6	0	0	2	2	1,138	0	1	0	2,782	0	0	0	0
YUKON 6 MOA	700	0	1	0	0	0	0	0	0	0	475	46	0	0	475
SOUTHERN INTERIOR REGION															
EIELSON A TMOA	810	12	20	1	0	0	0	303	1	0	342	6	0	0	342
EIELSON B TMOA	960	1	0	1	0	0	3	22	1	0	960	198	0	0	960
BUFLO TMOA	1,300	7	33	0	8	746	0	547	1	0	530	2	0	0	381
BIRCH MOA	810	12	20	1	0	0	0	303	1	0	335	6	0	0	336
BIRCH MOA (Modified)	610	12	20	1	0	0	0	303	1	0	275	6	0	0	275
EIELSON MOA	960	1	0	1	0	0	3	22	1	0	960	198	0	0	960
BUFFALO MOA	2,180	22	33	3	6	604	0	719	1	0	1,268	138	0	0	966
CLEAR CREEK MOA	400	0	0	0	0	0	0	0	1	0	154	0	0	0	46
FALCON MOA	100	2	0	0	0	0	0	14	1	0	0	0	0	0	0
SOUTHCENTRAL REGION															
FOX 1 TMOA	7,350	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FOX 2 TMOA	2,460	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FOX MOA	7,460	1	50	10	548	0	782	287	0	0	6,335	1,239	3,182	319	3,795
FOX A&B MOAs (Modified)	6,550	1	30	10	400	0	396	287	0	0	5,505	129	3,182	103	3,041
SUSITNA MOA	3,290	0	25	0	113	0	834	0	0	1	0	0	0	0	0
TANANA MOA	6,810	13	112	8	80	0	297	0	1	0	5,595	1,337	0	0	4,254
WESTERN REGION															
STONY A MOA	6,070	7	1	1	5	0	323	0	1	2	2,280	76	0	0	0
STONY A MOA (Modified)	5,400	7	1	1	5	0	323	0	1	2	2,086	61	0	0	0
STONY B MOA	3,150	10	0	0	0	0	554	0	1	3	2,049	0	0	0	21
STONY C TMOA	6,530	6	0	0	0	0	1,161	0	2	2	3,551	0	73	0	774
NAKNEK 1 MOA	5,160	0	0	0	0	0	0	0	1	0	0	0	0	0	0
NAKNEK 2 MOA	4,100	0	0	0	0	0	0	0	1	0	0	0	0	0	0
NAKNEK 2 MOA (Modified)	3,640	0	0	0	0	0	0	0	1	0	0	0	0	0	0
GALENA MOA	5,170	0	0	0	35	0	0		0	1	531	31	0	0	427

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SUMMARY OF BIOLOGICAL RESOURCES BY MOA

		Moose (mi^2)				Dall Sheep			Brown Bear
	Area	General Distribution Area	Calving Concentration Areas	Rutting Concentration Areas	Winter Concentration Areas	General Distribution Area (mi^2)	Winter & Lambing Area (mi^2)	Mineral Licks (no.)	General Distribution (mi^2)
NORTHERN INTERIOR REGION									
YUKON 1 MOA	4,560	4,560	649	424	1,543	1,049	317	0	4,560
YUKON 2 MOA	6,260	6,260	7	163	1,256	940	112	2	6,260
YUKON 1A MOA	750	750	369	368	515	0	0	0	750
YUKON 3 TMOA	9,480	0	0	0	0	880	16	0	0
YUKON 4 TMOA	3,570	3,570	680	676	1,695	0	0	0	3,570
YUKON 3 MOA	5,020	5,020	468	581	488	730	11	0	5,020
YUKON 4 MOA	4,460	4,460	933	933	1,327	150	5	0	4,460
YUKON 5 MOA	3,570	3,570	721	715	1,738	0	0	0	3,570
YUKON 6 MOA	700	700	343	343	466	0	0	0	700
SOUTHERN INTERIOR REGION									
EIELSON A TMOA	810	810	179	203	334	0	0	0	810
EIELSON B TMOA	960	938	19	938	938	112	0	15	960
BUFLO TMOA	1,300	1,300	0	0	170	61	0	3	1,300
BIRCH MOA	810	810	174	203	334	0	0	0	810
BIRCH MOA (Modified)	610	610	36	64	180	0	0	0	610
EIELSON MOA	960	938	19	938	938	112	0	15	960
BUFFALO MOA	2,180	2,149	102	204	633	223	0	20	2,180
CLEAR CREEK MOA	400	400	329	329	400	0	0	0	400
FALCON MOA	100	100	34	33	100	0	0	0	100
SOUTHCENTRAL REGION									
FOX 1 TMOA	7,350	0	0	0	0	1,538	52	14	0
FOX 2 TMOA	2,460	0	0	0	0	803	0	9	0
FOX MOA	7,460	5,496	1,672	1,561	2,600	1,568	52	33	7,460
FOX A&B MOAs (Modified)	6,550	4,643	1,500	1,415	2,255	1,540	52	0	6,550
SUSITNA MOA	3,290	2,180	3	1,112	843	143	0	0	3,290
TANANA MOA	6,810	5,590	2,698	2,614	2,920	1,483	0	30	6,810
WESTERN REGION									
STONY A MOA	6,070	4,799	182	411	680	1,613	0	0	6,070
STONY A MOA (Modified)	5,400	4,560	182	411	680	1,121	0	0	5,400
STONY B MOA	3,150	3,150	289	446	954	0	0	0	3,150
STONY C TMOA	6,530	6,530	299	1,123	470	0	0	0	6,530
NAKNEK 1 MOA	5,160	0	0	0	0	0	0	0	0
NAKNEK 2 MOA	4,100	0	0	0	0	0	0	0	0
NAKNEK 2 MOA (Modified)	3,640	0	0	0	0	0	0	0	0
GALENA MOA	5,170	5,170	464	123	484	0	0	0	5,170

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SUMMARY OF BIOLOGICAL RESOURCES BY ALTERNATIVE

		Nest Sites (no.)				Waterfowl			Bird Migration Routes (no.)		Caribou (mi^2)				
	Area	Peregrine Falcon	Bald Eagle	Golden Eagle	Trumpeter Swan	Concentration Areas (mi^2)	Breeding Areas (mi^2)	Raptor Breeding Area (mi^2)	Major Routes	Minor Routes	General Distribution Area	Calving Area	Summer Area	Rutting Area	Winter Use Area
No Action Alternative (Routine & MFE)	70,970	63	88	8	173	746	3,093	1,243	12	9	21,864	3,753	73	0	11,578
No Action Alternative (Routine only)	37,760	37	34	6	165	0	1,929	371	5	7	13,220	3,499	0	0	8,636
Proposed Action	63,420	127	154	24	725	606	3,852	2,061	13	7	31,885	7,276	3,182	319	21,519
Alternative A	63,020	127	154	24	725	606	3,852	2,061	12	7	31,731	7,276	3,182	319	21,473
Alternative B	62,200	126	263	31	801	604	3,011	1,750	12	7	33,308	8,580	3,182	319	24,434
Alternative A-Modified	60,780	127	134	24	577	606	3,466	2,061	12	7	30,647	6,151	3,182	103	20,658

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SUMMARY OF BIOLOGICAL RESOURCES BY ALTERNATIVE

		Moose (mi^2)				Dall Sheep			Brown Bear
	Area	General Distribution Area	Calving Concentration Areas	Rutting Concentration Areas	Winter Concentration Areas	General Distribution Area (mi^2)	Winter & Lambing Area (mi^2)	Mineral Licks (no.)	General Distribution (mi^2)
No Action Alternative (Routine & MFE)	70,970	40,017	3,140	5,987	9,862	7,139	497	43	42,420
No Action Alternative (Routine only)	37,760	26,119	1,594	2,678	5,740	3,745	429	2	28,500
Proposed Action	63,420	49,762	6,389	8,519	14,764	6,528	497	70	54,160
Alternative A	63,020	49,362	6,060	8,190	14,364	6,528	497	70	53,760
Alternative B	62,200	47,322	7,433	9,485	14,619	7,861	492	100	52,940
Alternative A-Modified	60,760	48,070	5,750	7,905	13,865	6,008	497	37	51,980

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APPENDIX H

BIRD AIRCRAFT STRIKE HAZARD (BASH)

This appendix contains the low-altitude Bird Aircraft Strike Hazard Assessments for the Military Operations Areas (MOAs)/Restricted Areas (RAs) that would be utilized during flying operations in Alaska under the Proposed and alternative actions (including the No Action Alternative). These evaluations identify specific bird hazards and provide associated recommendations; however, two general recommendations apply to all low-altitude flight areas and will also help to reduce the chances of a dangerous and damaging bird strike mishap:

1. During the migratory periods, Apr-May and Aug-Oct, raising flight altitude above cloud layer in inclement weather and lowering altitude to 500' AGL in good weather may reduce the hazard associated with migratory birds (except during flight transition periods, which vary by bird type/species). The majority of migratory birds will be at altitudes greater than 500' AGL, while breeding and foraging birds will spend much of their time below 500' AGL.

Weather has been identified as a major factor influencing the timing, extent, and altitudes of bird migration. This is especially important for the State of Alaska, due to its harsh climatic conditions. Spring movements of birds to their northern breeding grounds are restricted by the onset of ice breakup in wetland areas. Severe weather can cause a delay in migration, while favorable conditions, such as 24 hours post-frontal passage, results in thermal generation and stronger winds to aid mass movement migration. Weather also impacts the flight altitudes of migrating birds. On migration, birds use rivers as visual directional cues and will adjust flight altitudes in relation to the cloud layer to maintain visual contact with the river.

2. Avoid flight over or parallel to rivers within 2 NM either side, Apr-Oct, (especially 1 Apr-15 May and 15 Aug-15 Oct) to reduce bird strike hazards associated with migratory and breeding waterfowl, raptors, and Sandhill Cranes. Actual width of migratory corridors will vary, but may easily extend 15 NM each side of river systems.

Mountains and river valleys are the most important geographic factors influencing migration in interior Alaska. Migratory birds will use rivers and mountain passes to avoid flight over mountainous areas, and use rivers as directional cues and stopover areas during migration. River systems also provide excellent cliff or forest nesting habitat for a variety of raptors including Golden Eagles, Bald Eagles, Red-tailed Hawks, and Peregrine Falcons. Many Alaskan river deltas combine to form a vast wetlands complex, ideally suited for breeding waterfowl.

The following are general operational guidelines which may further reduce the BASH risk:

1. Avoid flight directly above terrain creating thermals, such as ridgelines, rolling terrain, and near water.

2. Avoid flight one hour before and after dawn/dusk whenever there is a known increase in bird activity, and when in coastal or wetland areas to avoid waterfowl, gulls, wading birds and shorebirds.

3. Avoid flight over north-south rivers and ridgelines during migration periods. Flight over wildlife refuges, landfills, stockyards, and food processing plants should be avoided year round.

4. Consider the following operational changes to reduce threats from bird strikes (mission requirements permitting):

-- Alter ground track	-- Reduce airspeed
-- Alter time of mission	-- Reduce formation operations
-- Alter altitude	-- Select a less hazardous route

Pilot advisories (recommendations) are added to the BASH evaluations to mitigate bird hazards within the proposed MOAs. These recommendations are presented according to their bird strike hazard intensities in the form of Warnings, Cautions, and Notes. A blank area on the chart indicates the safest flight period rather than the absence of risk. Bird hazard intensities are defined:

1. Warning: Extreme bird strike hazard present; high resident and/or migratory bird populations. High probability of bird strike mishap if associated recommendations are not followed.
2. Caution: Moderate bird strike hazard. Resident/migratory bird threat present.
3. Note: Hazardous bird species may be active in the specified route segment(s).

General time periods were used in the evaluations. These are defined:
1. Dawn/Dusk: Sunrise/Sunset $\pm$ one hour. Dawn and Dusk are combined into one period based on flights between feeding areas and roosting sites.
2. Mid-day: One hour after official sunrise to one hour prior to official sunset.
3. Night: One hour after official sunset to one hour prior to official sunrise.

Northern Interior Region

Proposed Action: The Proposed Action includes the following Military Operations Areas (MOAs) and Restricted Area (RA):

- YUKON 1 MOA
- YUKON 2 MOA
- YUKON 3 MOA
- YUKON 4 MOA
- YUKON 5 MOA
- YUKON 6 MOA
- R-2205

Alternative A: Alternative A includes the same MOAs/RA as in the Proposed Action.
Alternative B: Alternative B includes the same MOAs/RA as in the Proposed Action except for YUKON 4 MOA and YUKON 5 MOA.
No Action Alternative: The No Action Alternative includes the following MOAs:

- YUKON 1 MOA
- YUKON 2 MOA
- YUKON 1A TMOA
- YUKON 3 TMOA
- YUKON 4 TMOA
- R-2205

Bird Aircraft Strike Hazard Evaluation			
YUKON 1 MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA	Note: Sandhill Crane migration SFC to 5000 AGL, extreme southern portion of MOA Note: raptor migration SFC to 5000 AGL, southern quarter of MOA	Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA
MAY	Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA	Note: Sandhill Crane migration SFC to 5000 AGL, extreme southern portion of MOA Note: raptor migration SFC to 5000 AGL, southern quarter of MOA	Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA
JUN		Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL		Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA	Note: Sandhill Crane migration SFC to 5000 AGL, extreme southern portion of MOA Note: raptor migration SFC to 5000 AGL, southern quarter of MOA	Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA
SEP	Note: waterfowl migration SFC to 5000 AGL, southern half of MOA	Note: Sandhill Crane migration SFC to 5000 AGL, extreme southern portion of MOA Note: raptor migration SFC to 5000 AGL, southern quarter of MOA	Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA
OCT			
NOV			
DEC			

Comments

Exercise caution in the vicinity of the Yukon River, 20 Apr-15 May and 20 Aug-1 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Yukon River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (1 May-1 Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Yukon River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation

YUKON 2 MOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, northeastern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, northeastern half of MOA Caution: raptor migration SFC to 5000 AGL, northeastern half of MOA	Warning: waterfowl migration, northeastern half of MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, northeastern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, northeastern half of MOA Caution: raptor migration SFC to 5000 AGL, northeastern half of MOA	Warning: waterfowl migration, northeastern half of MOA Recommendation: avoid flight SFC to 5000 AGL
JUN	Note: breeding waterfowl SFC to 500 AGL, northwestern corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL	Note: breeding waterfowl SFC to 500 AGL, northwestern corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, northeastern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, northeastern half of MOA Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, northeastern half of MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, northeastern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, northeastern half of MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, northeastern half of MOA Recommendation: avoid flight SFC to 5000 AGL
OCT			
NOV			
DEC			

Comments

Avoid overflight of and exercise extreme caution in the vicinity of the Yukon River, 10 Apr-20 May and 1 Aug-1 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Yukon River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (1 May-1 Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL.

Bird Aircraft Strike Hazard Evaluation			
YUKON 3 MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, northeastern quarter of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, northeastern quarter of MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, northeastern quarter of MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, northeastern quarter of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, northeastern quarter of MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, northeastern quarter of MOA Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL		Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, northeastern quarter of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, northeastern quarter of MOA Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, northeastern quarter of MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, northeastern quarter of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, northeastern quarter of MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, northeastern quarter of MOA Recommendation: avoid flight SFC to 5000 AGL
OCT			
NOV			
DEC			

Comments

Avoid overflight of and exercise extreme caution in the vicinity of the Yukon River, 10 Apr-20 May and 1 Aug-1 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Yukon River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (1 May-1 Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Yukon River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
YUKON 4 MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, southern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, southern half of MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, southern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, southern half of MOA Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL		Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, southern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, southern half of MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, southern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, southern half of MOA Recommendation: avoid flight SFC to 5000 AGL
OCT			
NOV			
DEC			

Comments

Avoid overflight of and exercise extreme caution in the vicinity of the Yukon River, 10 Apr-20 May and 1 Aug-1 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Yukon River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (1 May-1 Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Yukon River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
YUKON 5 MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: raptor migration SFC to 5000 AGL, entire MOA Caution: Sandhill Crane migration SFC to 5000 AGL, Yukon River valley	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: raptor migration SFC to 5000 AGL, entire MOA Caution: Sandhill Crane migration SFC to 5000 AGL, Yukon River valley	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL
JUN	Caution: breeding waterfowl SFC to 500 AGL, western third of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL	Caution: breeding waterfowl SFC to 500 AGL, western third of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL	Note: soaring raptors SFC to 2000 AGL, entire MOA Caution: Sandhill Crane migration SFC to 5000 AGL, Yukon River valley	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: raptor migration SFC to 5000 AGL, entire MOA Caution: Sandhill Crane migration SFC to 5000 AGL, Yukon River valley	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL
OCT			
NOV			
DEC			

Comments

Exercise caution in the vicinity of the Yukon River, 20 Apr-15 May and 20 Aug-1 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Yukon River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of waterfowl (10 Jun-1 Aug) and raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Yukon River Apr-Oct to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation

YUKON 6 MOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
MAY	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
JUN		Note: soaring raptors SFC to 2000 AGL, entire area	
JUL		Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
SEP	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
OCT	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL,southern half of MOA	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
NOV			
DEC			

Comments

Severe hazard exists, 15 Apr-10 May and 20 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
R-2205			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration SFC to 5000 AGL, entire area	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire area
MAY	Note: waterfowl migration SFC to 5000 AGL, entire area	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire area
JUN		Note: soaring raptors SFC to 2000 AGL, entire area	
JUL		Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Note: waterfowl migration SFC to 5000 AGL, entire area	Note: soaring raptors SFC to 2000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire area
SEP	Note: waterfowl migration SFC to 5000 AGL, entire area	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire area
OCT			
NOV			
DEC			

Comments

Exercise caution in the vicinity of the Tanana River (12 NM from R-2205), 15 Apr-15 May and 20 Aug-15 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory Sandhill Cranes, Canada and White-fronted Geese, ducks, and swans, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL.

Bird Aircraft Strike Hazard Evaluation

YUKON 1A TMOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
MAY	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
JUN		Note: soaring raptors SFC to 2000 AGL, entire area	
JUL		Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
SEP	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, southern half of MOA Caution: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
OCT	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL,southern half of MOA	Caution: waterfowl migration SFC to 5000 AGL, southern half of MOA
NOV			
DEC			

Comments

Severe hazard exists, 15 Apr-10 May and 20 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
YUKON 3 TMOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, central MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, central MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, central MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, central MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, central MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, central MOA Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL		Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, central MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, central MOA Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, central MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, central MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: Sandhill Crane migration SFC to 5000 AGL, central MOA Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, central MOA Recommendation: avoid flight SFC to 5000 AGL
OCT			
NOV			
DEC			

Comments

Avoid overflight of and exercise extreme caution in the vicinity of the Yukon River, 10 Apr-20 May and 1 Aug-1 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Yukon River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (1 May-1 Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Yukon River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation

YUKON 4 TMOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: raptor migration SFC to 5000 AGL, entire MOA Caution: Sandhill Crane migration SFC to 5000 AGL, Yukon River valley	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: raptor migration SFC to 5000 AGL, entire MOA Caution: Sandhill Crane migration SFC to 5000 AGL, Yukon River valley	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL
JUN	Caution: breeding waterfowl SFC to 500 AGL, western third of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL	Caution: breeding waterfowl SFC to 500 AGL, western third of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL	Note: soaring raptors SFC to 2000 AGL, entire MOA Caution: Sandhill Crane migration SFC to 5000 AGL, Yukon River valley	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL	Caution: raptor migration SFC to 5000 AGL, entire MOA Caution: Sandhill Crane migration SFC to 5000 AGL, Yukon River valley	Warning: waterfowl migration, southwestern corner of MOA Recommendation: avoid flight SFC to 5000 AGL
OCT			
NOV			
DEC			

Comments

Exercise caution in the vicinity of the Yukon River, 20 Apr-15 May and 20 Aug-1 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Yukon River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of waterfowl (10 Jun-1 Aug) and raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Yukon River Apr-Oct to reduce the hazard associated with migratory and breeding bird concentrations.

Southern Interior Region

Proposed Action: The Proposed Action includes the following Military Operations Areas (MOAs) and Restricted Areas (RAs):

- BIRCH MOA
- EIELSON MOA
- BUFFALO MOA
- CLEAR CREEK
- FALCON
- R-2202
- R-2211

Alternative A: Alternative A includes the same MOAs/RAs as in the Proposed Action except for CLEAR CREEK MOA.

Alternative B: Alternative B includes the same MOAs/RAs as in the Proposed Action.

No Action Alternative: The No Action Alternative includes the following Temporary MOAs (TMOAs)/RAs:

- EIELSON A TMOA
- EIESLON B TMOA
- BUFLO TMOA
- R-2202
- R-2211

Bird Aircraft Strike Hazard Evaluation

BIRCH MOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL		Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			

Comments

Severe hazard exists, 15 Apr-10 May and 20 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migrating birds, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River Apr-Oct to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
EIELSON MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of MOA	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of MOA	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
JUN	Note: breeding waterfowl SFC to 500 AGL, northwestern corner of MOA	Note: soaring raptors SFC to 2000 AGL, northern half of MOA	
JUL	Note: breeding waterfowl SFC to 500 AGL, northwestern corner of MOA	Note: soaring raptors SFC to 2000 AGL, northern half of MOA	
AUG	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Note: soaring raptors SFC to 2000 AGL, northern half of MOA	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of MOA	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			

Comments

Severe hazard exists, 10 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migrating birds, as well as a breeding area for a variety of waterfowl (10 Jun-1 Aug) and raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River drainage, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
BUFFALO MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL		Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			

Comments

Severe hazard exists, 15 Apr-10 May and 20 Aug-10 Oct, due to concentrations of migratory and staging waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory Sandhill Cranes, Canada and White-fronted Geese, ducks, and swans, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River Apr-Oct to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
CLEAR CREEK MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
JUN	Note: breeding waterfowl SFC to 500 AGL, southwest corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL	Note: breeding waterfowl SFC to 500 AGL, southwest corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			
Comments			
Severe hazard exists, 15 Apr-10 May and 20 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migrating birds, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River Apr-Oct to reduce the hazard associated with migratory and breeding bird concentrations.			

Bird Aircraft Strike Hazard Evaluation

FALCON MOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL Note: raptor migration SFC to 5000 AGL, entire area	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL Note: raptor migration SFC to 5000 AGL, entire area	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, entire area	
JUL		Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Note: soaring raptors SFC to 2000 AGL, entire area	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL Note: raptor migration SFC to 5000 AGL, entire area	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
NOV		Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL	
DEC			

Comments

Exercise caution in the vicinity of the Tanana River, 15 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory Sandhill Cranes, Canada and White-fronted Geese, ducks, and swans, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River drainage, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation

R-2202

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of area	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of area	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, northern half of area	
JUL		Note: soaring raptors SFC to 2000 AGL, northern half of area	
AUG	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL Note: soaring raptors SFC to 2000 AGL, northern half of area	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of area	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL		Warning: waterfowl migration, northern half of area Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			

Comments

Severe hazard exists, 10 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory Sandhill Cranes, Canada and White-fronted Geese, ducks, and swans, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
R-2211			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire area	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire area	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
JUN	Note: breeding waterfowl SFC to 500 AGL, entire area	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, entire area	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Note: soaring raptors SFC to 2000 AGL, entire area	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire area	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration; entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, entire area Recommendation: avoid flight SFC to 5000 AGL	Warning: waterfowl migration, entire area Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			

Comments

Severe hazard exists, 10 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory Sandhill Cranes, Canada and White-fronted Geese, ducks, and swans, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
EIELSON A TMOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL		Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			

Comments

Severe hazard exists, 15 Apr-10 May and 20 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migrating birds, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River Apr-Oct to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
EIELSON B TMOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of MOA	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of MOA	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
JUN	Note: breeding waterfowl SFC to 500 AGL, northwestern corner of MOA	Note: soaring raptors SFC to 2000 AGL, northern half of MOA	
JUL	Note: breeding waterfowl SFC to 500 AGL, northwestern corner of MOA	Note: soaring raptors SFC to 2000 AGL, northern half of MOA	
AUG	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Note: soaring raptors SFC to 2000 AGL, northern half of MOA	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, northern half of MOA	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL	Warning: waterfowl migration, northern half of MOA Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			
Comments			
Severe hazard exists, 10 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migrating birds, as well as a breeding area for a variety of waterfowl (10 Jun-1 Aug) and raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River drainage, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.			

Bird Aircraft Strike Hazard Evaluation			
BUFLO TMOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
JUN		Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL		Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, staging, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration, entire MOA Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			

Comments

Severe hazard exists, 15 Apr-10 May and 20 Aug-10 Oct, due to concentrations of migratory and staging waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory Sandhill Cranes, Canada and White-fronted Geese, ducks, and swans, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River Apr-Oct to reduce the hazard associated with migratory and breeding bird concentrations.

Southcentral Region

Proposed Action: The Proposed Action includes the following Military Operations Areas (MOAs) and Restricted Areas (RAs):

- SUSITNA MOA
- FOX MOA

Alternative A: Alternative A includes the same MOAs as in the Proposed Action.
Alternative B: Alternative B includes the same MOAs as in the Proposed Action plus the addition of TANANA MOA.
No Action Alternative: The No Action Alternative includes the following MOAs/Temporary MOAs (TMOAs):

- SUSITNA MOA
- FOX 1 TMOA
- FOX 2 TMOA

Bird Aircraft Strike Hazard Evaluation

SUSITNA MOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration, SFC to 5000 AGL, eastern border of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, eastern border of MOA
MAY	Note: breeding waterfowl SFC to 500 AGL, southcentral half of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, eastern border of MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, southcentral half of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, southcentral half of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Note: waterfowl migration SFC to 5000 AGL, eastern border of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, eastern border of MOA
SEP	Note: waterfowl migration SFC to 5000 AGL, eastern border of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, eastern border of MOA
OCT			
NOV			
DEC			

Comments

Exercise caution in the vicinity of the Nenana and other river drainages, Apr-Sep, due to concentrations of migratory and breeding waterfowl. Waterfowl migrate predominantly at night from SFC to 5000' AGL. Waterfowl concentrations breed in the southeast and central portions of the MOA, 15 May-15 Aug, and will make feeding flights that will generally remain below 500' AGL.

Bird Aircraft Strike Hazard Evaluation			
FOX MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
MAY	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, southeastern corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, southeastern corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
SEP	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
OCT	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
NOV			
DEC			

Comments

Exercise caution in the northern portion of Fox MOA in the vicinity of the Tanana River migratory corridor, 10 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL.

Bird Aircraft Strike Hazard Evaluation

TANANA MOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Warning: waterfowl migration, feeding flights, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration SFC to 5000 AGL, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL
MAY	Warning: waterfowl migration, feeding flights, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration SFC to 5000 AGL, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL
JUN	Note: breeding waterfowl SFC to 500 AGL, Tanana River valley and southwest corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL	Note: breeding waterfowl SFC to 500 AGL, Tanana River valley and southwest corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Warning: waterfowl migration, feeding flights, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Note: soaring raptors SFC to 2000 AGL, entire MOA	Warning: waterfowl migration SFC to 5000 AGL, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL
SEP	Warning: waterfowl migration, feeding flights, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL	Warning: Sandhill Crane migration, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL Caution: raptor migration SFC to 5000 AGL, entire MOA	Warning: waterfowl migration SFC to 5000 AGL, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL
OCT	Warning: waterfowl migration, feeding flights, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL		Warning: waterfowl migration SFC to 5000 AGL, Tanana River valley Recommendation: avoid flight SFC to 5000 AGL
NOV			
DEC			

Comments

Severe hazard exists, 10 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory Sandhill Cranes, Canada and White-fronted Geese, ducks, and swans, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL. Avoid flight along the Tanana River, Apr-Oct, to reduce the hazard associated with migratory and breeding bird concentrations.

Bird Aircraft Strike Hazard Evaluation			
FOX 1 TMOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
MAY	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, southeastern corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, southeastern corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
SEP	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
OCT	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
NOV			
DEC			

Comments

Exercise caution in the northern portion of Fox MOA in the vicinity of the Tanana River migratory corridor, 10 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL.

Bird Aircraft Strike Hazard Evaluation			
FOX 2 TMOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
MAY	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, southeastern corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, southeastern corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
SEP	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
OCT	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern quarter of MOA	Note: waterfowl migration SFC to 5000 AGL, northern quarter of MOA
NOV			
DEC			
Comments			
Exercise caution in the northern portion of Fox 2 MOA in the vicinity of the Tanana River migratory corridor, 10 Apr-20 May and 1 Aug-10 Oct, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. The Tanana River valley serves as a directional cue and stopover area for great numbers of migratory birds, as well as a breeding area for a variety of raptors (May-Sep). Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and cranes are diurnal migrants from SFC to 5000' AGL.			

Western Region

Proposed Action: The Proposed Action includes the following Military Operations Areas (MOAs) and Restricted Areas (RAs):

- GALENA MOA
- NAKNEK 1 MOA
- NAKNEK 2 MOA
- STONY A MOA
- STONY B MOA

Alternative A: Alternative A includes the same MOAs as in the Proposed Action.
Alternative B: Alternative B includes the same MOAs as in the Proposed Action.
No Action Alternative: The No Action Alternative includes the same MOAs as in the Proposed Action plus the following TMOA:

- STONY C TMOA

Bird Aircraft Strike Hazard Evaluation			
GALENA MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration, SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, northern half of MOA
MAY	Note: breeding waterfowl SFC to 500 AGL, entire MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern half of MOA Note: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, northern half of MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, entire MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, entire MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Note: waterfowl migration SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, northern half of MOA
SEP	Note: waterfowl migration SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, northern half of MOA
OCT			
NOV			
DEC			

Comments

Avoid flight along and exercise caution in the vicinity of the Nowitna and other river drainages, 5 May-20 May and 15 Aug-10 Sep, due to concentrations of migratory waterfowl, raptors, and Sandhill Cranes. Waterfowl migrate predominantly at night while raptors and cranes are diurnal migrants from SFC to 5000' AGL.

Bird Aircraft Strike Hazard Evaluation

NAKNEK 1 MOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration, feeding flights SFC to 5000 AGL, eastern two-thirds of MOA	Note: raptor migration SFC to 5000 AGL, entire MOA	Caution: waterfowl migration SFC to 5000 AGL, eastern two-thirds of MOA
MAY	Note: breeding waterfowl SFC to 500 AGL, eastern two-thirds of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	Caution: waterfowl migration SFC to 5000 AGL, eastern two-thirds of MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, eastern two-thirds of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL	Note: breeding waterfowl SFC to 500 AGL, eastern two-thirds of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Note: breeding waterfowl SFC to 500 AGL, eastern two-thirds of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
SEP	Note: waterfowl migration, feeding flights SFC to 5000 AGL, eastern two-thirds of MOA	Note: raptor migration SFC to 5000 AGL, entire MOA	Caution: waterfowl migration SFC to 5000 AGL, eastern two-thirds of MOA
OCT	Note: waterfowl migration, feeding flights SFC to 5000 AGL, eastern two-thirds of MOA		Caution: waterfowl migration SFC to 5000 AGL, eastern two-thirds of MOA
NOV			
DEC			

Comments

Avoid overflight of and exercise caution in the vicinity of all river drainages, 1 Apr-15 May and 1 Aug-1 Nov, due to concentrations of migratory waterfowl, raptors, and gulls. Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and Sandhill Cranes are diurnal migrants from SFC to 5000' AGL, and gulls from SFC to 2000' AGL. Large concentrations of waterfowl breed in the eastern two-thirds of the MOA, 10 Jun-1 Aug, and will make dawn/dusk feeding flights that will generally remain below 500' AGL.

Bird Aircraft Strike Hazard Evaluation

NAKNEK 2 MOA

Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration, feeding flights SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire MOA	Caution: waterfowl migration SFC to 5000 AGL, entire MOA
MAY	Note: breeding waterfowl SFC to 500 AGL, western half of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	Caution: waterfowl migration SFC to 5000 AGL, entire MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, western half of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
JUL	Note: breeding waterfowl SFC to 500 AGL, western half of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
AUG	Note: breeding waterfowl SFC to 500 AGL, western half of MOA	Note: soaring raptors SFC to 2000 AGL, entire MOA	
SEP	Note: waterfowl migration, feeding flights SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire MOA	Caution: waterfowl migration SFC to 5000 AGL, entire MOA
OCT	Note: waterfowl migration, feeding flights SFC to 5000 AGL, entire MOA		Caution: waterfowl migration SFC to 5000 AGL, entire MOA
NOV			
DEC			

Comments

Avoid overflight of the Mulchatna River and exercise caution in the vicinity of all river drainages, 1 Apr-15 May and 1 Aug-1 Nov, due to concentrations of migratory waterfowl, raptors, and gulls. Waterfowl migrate predominantly at night from SFC to 5000' AGL, while raptors and Sandhill Cranes are diurnal migrants from SFC to 5000' AGL, and gulls from SFC to 2000' AGL. Large concentrations of waterfowl breed in the western half of the MOA, 10 Jun-1 Aug, and will make dawn/dusk feeding flights that will generally remain below 500' AGL.

Bird Aircraft Strike Hazard Evaluation			
STONY A MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration, SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
MAY	Note: breeding waterfowl SFC to 500 AGL, southwest corner of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, southwest corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, southwest corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Note: waterfowl migration SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
SEP	Note: waterfowl migration SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
OCT			
NOV			
DEC			

Comments

Avoid flight along and exercise caution in the vicinity of all river drainages, 1 Apr-15 May and 1 Aug-1 Nov, due to concentrations of migratory waterfowl and raptors. Raptors will use cliff and forest habitat along these rivers to nest, 1 May-1 Sep, and will make soaring foraging flights during daylight hours from SFC to 2000' AGL. Waterfowl concentrations breed in the southwest corner of the MOA, 10 Jun-1 Aug, and will make dawn/dusk feeding flights that will generally remain below 500' AGL.

Bird Aircraft Strike Hazard Evaluation			
STONY B MOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration, SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
MAY	Note: breeding waterfowl SFC to 500 AGL, southeast corner of MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, southeast corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, southeast corner of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Note: waterfowl migration SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
SEP	Note: waterfowl migration SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
OCT			
NOV			
DEC			
Comments			
Avoid flight along and exercise caution in the vicinity of the Kuskokwim and Stony River valleys and other river drainages, 1 Apr-15 May and 1 Aug-1 Nov, due to concentrations of migratory waterfowl and raptors. Raptors will use cliff and forest habitat along these rivers to nest, 1 May-1 Sep, and will make soaring foraging flights during daylight hours from SFC to 2000' AGL. Waterfowl concentrations breed in the southeast corner of the MOA, 10 Jun-1 Aug, and will make dawn/dusk feeding flights that will generally remain below 500' AGL.			

Bird Aircraft Strike Hazard Evaluation			
STONY C TMOA			
Month	Dawn / Dusk	Mid-day	Night
JAN			
FEB			
MAR			
APR	Note: waterfowl migration, SFC to 5000 AGL, entire MOA	Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
MAY	Note: waterfowl migration SFC to 5000 AGL, entire MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern half of MOA Note: raptor migration SFC to 5000 AGL, entire area	Note: waterfowl migration SFC to 5000 AGL, entire MOA
JUN	Note: breeding waterfowl SFC to 500 AGL, northern half of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
JUL	Note: breeding waterfowl SFC to 500 AGL, northern half of MOA	Note: soaring raptors SFC to 2000 AGL, entire area	
AUG	Caution: waterfowl migration SFC to 5000 AGL, northern half of MOA Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern half of MOA Note: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, northern half of MOA Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA
SEP	Caution: waterfowl migration SFC to 5000 AGL, northern half of MOA Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA	Caution: Sandhill Crane migration SFC to 5000 AGL, northern half of MOA Note: raptor migration SFC to 5000 AGL, entire area	Caution: waterfowl migration SFC to 5000 AGL, northern half of MOA Note: waterfowl migration SFC to 5000 AGL, southern quarter of MOA
OCT			
NOV			
DEC			

Comments

Avoid flight along the Kuskokwim, Yukon, and Innoka River valleys, and exercise caution along other river drainages, 1 Apr-20 May and 1 Aug-1 Nov, due to concentrations of migratory waterfowl and Sandhill Cranes. Waterfowl migrate predominantly at night from SFC to 5000' AGL, while cranes are diurnal migrants from SFC to 5000' AGL. Breeding raptors will use cliff and forest habitat along these rivers to nest, 1 May-1 Sep, and will make soaring foraging flights during daylight hours from SFC to 2000' AGL. Waterfowl concentrations breed in the northern half of the MOA, 10 Jun-1 Aug, and will make dawn/dusk feeding flights from SFC to 500' AGL.

APPENDIX I

ENDANGERED SPECIES:USFWS SECTION 7 CONSULTATION

This appendix contains all correspondence (to date) regarding consultation with the U.S. Fish & Wildlife Service, Endangered Species Office per requirements of Section 7 of the Endangered Species Act.

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DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

10 SEP 1992

REPLY TO: ATTN OF: 11 AF/DO
5800 G ST STE 102
ELMENDORF AFB AK 99506-2130

SUBJECT: Request to Reinitiate Section 7 Consultation Under the Endangered Species Act (Your Ltr, 29 Jun 92)

TO: Mr Patrick Sousa
US Fish and Wildlife Service
Northern Alaska Ecological Services
101 12th Ave, Box 20, Room 232
Fairbanks, Alaska

1. Further to General Ralston's letter of 24 Aug 92, Eleventh Air Force formally requests reinitiation of Section 7 Consultation under the Threatened and Endangered Species Act 1973 with regard to the Peregrine Falcon and low-level aircraft activity.

2. As General Ralston's new Director of Operations, I am extremely interested in a mutual resolution to critical military training needs and important wildlife concerns. We can begin consultations as early as 15 September. Please advise us of the place and time you would like for this consultation and the information you require us to provide. Please address any questions to Maj Ron Stevenson, 11 AF/DOOF, 552-5348.

Richard P. Van Rees
RICHARD P. VAN REES
Colonel, USAF
DCS, Operations

/1 LJU

United States Department of the Interior

TAKE PRIDE IN AMERICA

N REPLY REFER TO:

FISH AND WILDLIFE SERVICE

NORTHERN ALASKA ECOLOGICAL SERVICES
101 12th Ave., Box 20, Room 232
Fairbanks, AK 99701
October 19, 1992

Colonel Richard P. Van Rees
11 AF/DO
5800 G ST STE 102
Elemendorf Air Force Base, AK 99506-2130

Dear Colonel Van Rees:

This responds to your letter of September 10, 1992, requesting reinitiation of Section 7 consultation with regard to low-level aircraft activity. As part of any request for initiation or reinitiation of consultation, an action agency, in this case the Air Force, is to provide to the Fish and Wildlife Service all relevant information pertaining to the activity under consideration. In this case, that includes, to the fullest extent possible, information on all planned and anticipated low-level military aircraft activity, including location of activities, number of flights, dates and times of flights, types of aircraft involved and associated noise levels (including sonic booms), and any other information which may prove useful to the Fish and Wildlife Service in assessing the impacts of the proposed activities on endangered species. Once such information is provided to the Fish and Wildlife Service, we will prepare a biological opinion within 90 days on the effects of the proposed activities on any listed species. The biological opinion may include appropriate reasonable and prudent alternatives and conservation measures, such as the restricted zones currently in place around peregrine falcon nest sites.

Thank you for your concern for endangered species and your attention to this issue. Please call Skip Ambrose at 907-456-0239 if you have any questions.

Sincerely,

Patrick Sousa

Patrick Sousa
Field Supervisor

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

02 DEC 1992

REPLY TO ATTN OF: HQ 11 AF/DO
5800 G ST STE 102
ELMENDORF AFB AK 99506-2130

SUBJECT: Section 7 Consultation Under the Endangered Species Act 1973

TO: Mr Patrick Sousa
United States Department of the Interior
Fish and Wildlife Service
Northern Alaska Ecological Services
101 12th Avenue, Box 20, Room 232
Fairbanks AK 99701

1. As requested in your letter of 19 Oct 92, please find enclosed the best information we have available, on planned and anticipated low-level military aircraft activity, for your use in the subject consultation process.

2. The future potential assigned aircraft numbers are based on the maximum number supportable at both Elmendorf and Eielson AFBs and the Air Force's generic wing concept. However, these numbers should not be taken as a statement of Air Force future policy or intentions regarding Alaska. Similarly, and as you are aware, the proposed restructuring of military use airspace will be determined by the recently commenced Environmental Impact Statement. The sortie rates, type and disposition represent a review of historical data and projections based on Air Force policy for aircraft utilization and training requirements.

3. The Military Training Routes (MTRs), Alaska, Environmental Assessment (EA) is provided to enable you to utilize the various analysis it contains. However, since this EA has yet to be finalized, it is provided in good faith on the understanding that it is not to be copied and its contents are not to be disclosed to any third party. You might also wish to refer to other environmental documentation previously provided to you, such as the F-15E and F-16 C/D beddown EAs.

4. I trust the enclosed information meets your needs and now await your assessment. However, should you have any questions or require additional information, please call my POC, Wg Cdr Phil Leadbetter, 11 AF/ADOO, 552-2419.

MICHAEL T. PROBASCO
Lt Col, USAF
Asst DCS, Operations

3 Atch
1. Low-level Military Aircraft Activity
2. MOA & TMOA Coordinates
3. MTR EA

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

NORTHERN ALASKA ECOLOGICAL SERVICES
101 12th Ave., Box 20, Room 232
Fairbanks, Alaska 99701-6267
March 31, 1993

Lieutenant Colonel Michael T. Probasco
Assistant DCS, Operations
HG 11 AF/DO
5800 G Street, Suite 102
Elmendorf Air Force Base, Alaska 99506-2130

Dear Lieutenant Colonel Probasco:

This responds to the Air Force's December 2, 1992, request for reinitiation of formal consultation pursuant to Section 7(a) of the Endangered Species Act (Act) of 1973, as amended. On January 25, 1993, the Fish and Wildlife Service (Service) provided to the Air Force a draft assessment of protection measures around peregrine falcon nest sites (attached) likely to be included in the final Biological Opinion. The Air Force responded on February 9, 1993, stating that compliance with those measures around all known nest sites would hamper the Air Force's ability to adequately conduct realistic training exercises (attached). The Air Force suggested that protection measures be applied only to specific river corridors where high concentrations of nesting peregrine falcons occur. On February 28, 1993, the Service requested information on a proposed activity related to military aircraft training, and also requested an extension to March 31, 1993, to complete the Biological Opinion. The Air Force concurred with that extension and provided the requested information on March 2, 1993. This letter constitutes the Service's Biological Opinion on activities related to the Air Force's aircraft training operations in Alaska, and includes the following activities:

1. Conversion from A-10 to F-16 C/D Squadron at Eielson Air Force Base (and potential increases);
2. Conversion to F-15 aircraft at Elmendorf Air Force Base (and potential increases);
3. Expanding and upgrading Military Training Routes (MTR) in Alaska;
4. Initiation of Major Flying Exercises (MFE) in Alaska;
5. Installation and maintenance of the Yukon Measurement and Debriefing System (YMDS) in Alaska; and
6. Restructuring Military Operating Areas (MOA) in Alaska, including converting temporary MOAs to permanent MOAs and establishing several new MOAs.

Environmental Assessments (EA) were prepared for the first five actions listed above. Neither an EA nor an Environmental Impact Statement (EIS) has been completed for restructuring the MOAs; preparation of an EIS is underway. The Air Force provided the Service with an outline of the proposed restructured MOAs, and this consultation includes aircraft activity as currently proposed in permanent, temporary and proposed (as of March 31, 1993) MOAs. References to MOAs hereafter in this document include all current, temporary and proposed MOAs.

CONSULTATION HISTORY

For your information, a brief sequence of events relative to this consultation and an earlier related consultation is provided in Appendix A.

SPECIES CONSIDERED IN THIS BIOLOGICAL OPINION

The only endangered species considered in this consultation is the American peregrine falcon (*Falco peregrinus anatum*), which nests throughout interior Alaska. The life history, decline, and reasons for the decline of the peregrine falcon are well-documented in the literature and a discussion is not provided here.

DESCRIPTION OF THE PROPOSED ACTIVITY

The purpose of military aircraft training operations is to develop and maintain proficiency of Air Force pilots. The MOAs, MTRs, and all other related activities (YMDS, target facilities, etc.) are essential components of the training operations. Major flying exercises, such as Cope Thunder, simulate battle-field conditions and provide an opportunity for coordinated exercises with other Air Force pilots, other Services, and forces from other countries. Training includes air combat training, low altitude training, and intercept training. MOAs and MTRs are required by Federal Aviation Regulations because they improve aviation safety by separating military aircraft from civilian traffic.

A typical F-16 mission was described in the Environmental Assessment for the "Proposed Conversion to F-16 C/D Squadron, Eielson Air Force Base, Alaska" published in March 1991, and is reproduced below:

> "A typical F-16 mission would begin with takeoff and include 15 to 35 nautical miles of lower altitude flight at around 1,000 to 2,500 feet for calibration of the LANTIRN system. After this check, the F-16 would typically climb to a medium altitude (approximately 10,000 ft), cruise to an MTR, and descend onto this route for low altitude navigation. The route would be flown to a MOA or weapons delivery range for simulated (on a MOA or range) or actual (on a range only) weapons delivery. After the range or MOA work, the F-16 would return to the base at medium cruise altitude or descend to an MTR for additional low altitude navigation. Upon arrival at the base, the crew might practice instrument approaches or landings.

"Some missions would include air combat tactics (ACT) flown against aircraft simulating adversaries. ACT, flown in MOAs, could be flown in addition to weapons delivery practice, but the two are generally not flown on the same mission."

Training at other bases would be similar with exceptions for different types of aircraft, different missions, and different distances to MOAs and MTRs. Current and potential number and type of aircraft in Alaska are as follows:

Location:	Type of Aircraft	Current Number	Potential Number
Eielson A.F.B.:	F-16 C/D	24	72
	OA-10	6	6
Elmendorf A.F.B.:	F-15 C	36	48
	F-15 E	18	24
Totals:		84	150

A summary of the number of normal and routine training flights follows. The Service believes that only low-level flying could adversely affect peregrine falcons, hence this summary is limited to low-level fights. Low-level flying is considered that below 5000 feet above ground level (AGL) or below 10000 feet above mean sea level (MSL), whichever is higher. The Air Force anticipates 240 flying days per year, and plans for one "surge" day per week for 48 weeks per year (a "surge" day equals twice the normal daily rate). Planned routine low-level flying, including "surge" days, by currently assigned aircraft type and by MOA are as follows:

Aircraft:	MOA:	Weekly:	Annual:
F-15 C	STONY SUSITNA NAKNEK	38	1824
F-15 E	YUKON 1,2 STONY SUSITNA	57	2736
F-16 C/D	YUKON 1,2 STONY SUSITNA	108	5184
OA-10	(Statewide)	28	1344

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Total Routine Low-level Flights by currently assigned aircraft:	231	11,088

Total Routine Low-level Flights
by currently and potentially assigned aircraft: 16,850

Major Flying Exercises

Currently planned annual MFEs, based on 1992 experience and 1993 projections, call for 6 MFEs per year. Each exercise lasts for two weeks, with 10 flying days planned for each exercise. Each exercise has a total of 75 aircraft, 50 of which are fighter aircraft and 25 of which are a variety of all other types of aircraft within the Department of Defense. Each fighter will fly 2 missions per day, which equals 20 missions per fighter per exercise; 60 percent, or 12 of these flights, will be low-level missions. This will result in a total of 12 low-level missions per fighter per exercise, equalling 600 low-level fights per exercise and a total of 3600 low-level flights per year associated with the MFEs. These exercises will be conducted in the YUKON 1 and 2 and STONY permanent MOAs and in the YUKON 1A, 3 and 4, FOX 1 and 2, EIELSON A and B, and BUFFALO temporary MOAs. The 1993 MFEs are planned for April, June, July, August, September, and October. Each MFE could potentially have as many as 75 fighter aircraft which would result in a total of 5400 low-level flights per year associated with MFEs (assuming 6 exercises per year).

Military Operating Areas

As mentioned earlier, the Air Force is in the process of preparing an Environmental Impact Statement for restructuring MOAs in Alaska. Although that document is not complete, this opinion includes assessments of flights planned in all current, temporary and proposed MOAs. Currently planned restructuring of MOAs in Alaska will result in a three-fold increase in the total area of permanent MOAs in Alaska. Flight and speed restrictions in the MOAs (current, temporary and proposed) are as follows:

MOA:	AUTHORIZED ALTITUDES:	SUPERSONIC:
GALENA	1000 FT To 8000 FT AGL	Not Approved
NAKNEK 1	Above 100 FT AGL	Above 5000 FT AGL
NAKNEK 2	Above 100 FT AGL	Above 5000 FT AGL
STONY A	Above 100 FT AGL	Above 5000 FT AGL
STONY B	Above 100 FT AGL	Above 5000 FT AGL
SUSITNA	5000 FT To 10000 FT AGL	Above 5000 FT AGL
YUKON 1	Surface and up	Above 5000 FT AGL
YUKON 2	Above 100 FT AGL	Above 5000 FT AGL
BIRCH	Surface to 4000 FT MSL	Not Approved
BUFFALO	Surface TO 8000 FT MSL	Not Approved

EIELSON	Above 100 FT AGL	Not Approved
FOX	Above 3000 FT AGL	Above 5000 FT AGL
YUKON 1A	Above 100 FT AGL	Above 5000 FT AGL
YUKON 3	Above 100 FT AGL	Above 5000 FT AGL
YUKON 4	Above 100 FT AGL	Above 5000 FT AGL
YUKON 5	Above 100 FT AGL	Above 5000 FT AGL
YUKON 6	Above 100 FT AGL	Above 5000 FT AGL
BEAR	Above 100 FT AGL	Above 5000 FT AGL
TOKLAT	Above 100 FT AGL	Above 5000 FT AGL

Military Training Routes

The Air Force is proposing to expand and upgrade the existing network of MTRs in Alaska. The approximately 1860 miles of current MTRs would be expanded to about 2400 miles, and widths on most routes would be expanded to 10 miles (most are currently 5 miles wide). Almost all routes would be capable of flight operations at up to sonic speed, at low altitude (as low as 100 feet AGL), in daylight or darkness, in all weather conditions, and would support flights in either direction. Use of the MTRs are generally in conjunction with normal training activity described above. That is, the number of flights in the MTRs will depend on the number of normal and routine training flights in addition to any Major Flying Exercises. Those numbers are discussed above and will not be repeated here.

Aircraft speed "up to sonic" is allowed as low as 100 AGL in the MTRs. Therefore, supersonic speed is not authorized in the MTRs. Supersonic flight is not allowed in the MOAs below 5000 feet AGL. Therefore, no supersonic flight below 5000 AGL is authorized in Alaska.

Yukon Measurement and Debriefing System

The Air Force is proposing to install an Air Combat Maneuvering Instrumentation system to support military training operations in interior Alaska. This system is necessary to improve the training of Air Force pilots. This proposal consists of the installation and operation of the Yukon Measurement and Debriefing System (YMDS) for Eielson Air Force Base, Alaska. This action would require the construction and operation of Tracking Instrumentation Subsystem equipment on 24 hilltops in the vicinity of Eielson Air Force Base and the YUKON MOAs in interior Alaska. One of these YMDS sites is within 1 mile (~0.6 miles) of a peregrine falcon nest site, but access to this site will be on an existing road which eliminates the need for aircraft access, and effectively keeps traffic away from the nest site. Additionally, the proposed YMDS system at this site would use an existing tower and power source, so there would be minimal construction activity. There are no other known peregrine falcon nest sites within 2 miles of the 24 locations being considered for the YMDS system. One YMDS site is just over 2 miles from a known nest site, but the Air Force will direct helicopter flights to avoid the nest site when constructing and servicing the YMDS equipment. Therefore, there should be no adverse effects on peregrine falcons from the construction, operation and maintenance of the Yukon Measurement and Debriefing System. The YMDS is not considered hereafter in this Biological Opinion.

EFFECTS OF THE PROPOSED ACTION

Documented nest sites occur in the following current and proposed Military Operating Areas (MOA): YUKON 1, 2, 3, 4, 5, and 6; BUFFALO; BIRCH; BEAR; and STONY A, B, and C. There are also known nest sites in the following Military Training Routes (MTR): 935, 940, 952, 954, and 1902. There are several peregrine falcon nest sites outside the MOAs and MTRs mentioned here, but most nest sites are along major rivers and tributaries. Since some military aircraft (A-10) occasionally operate outside the MOAs and MTRs at low altitudes, nest sites outside MOAs and MTRs are considered in this consultation.

The Service is aware of approximately 185 peregrine falcon nest sites in current, temporary and proposed (as of this date) MOAs and MTRs. The majority of these nest sites (110) are along the following major rivers in the YUKON MOAs (1-6) in east-central Alaska: upper Yukon, Charley, Kandik, and Porcupine rivers. There are numerous scattered nest sites in most of the other MOAs, but none of the other MOAs have concentrations comparable to these rivers.

Based on the number of currently assigned aircraft and planned MFEs, the Service estimates that approximately 14,688 low-level flights by military aircraft will occur in Alaska annually. This figure could increase significantly (up to 22,250 low-level flights annually) if either more aircraft are permanently assigned to Alaska or if more or larger Major Flying Exercises are planned in Alaska.

Noise levels for military aircraft at 100 feet AGL range from 103 dB for an F-15 fighter to 131 dB for a B-1 bomber. The dB level for an F-16 at 100 feet AGL was not presented in any EA; however, for comparative purposes, the F-15 generates 85 dB at about 675 feet while the F-16 generates 85 dB at about 2000 feet. The F-16 is clearly a much louder aircraft and will be the most common aircraft in the MOAs and MTRs with dense peregrine falcon nest sites. It is important to remember that these noise discussions are based on "normal" airspeeds and power settings. For the F-16, these normal levels were given as 420-480 knots with a power setting of 85 percent (U.S. Air Force 1991). Full military power with afterburner would increase these noise levels significantly, and such increases to the higher power levels would be common during some phases of the training exercises. Other military aircraft could be expected to use higher power during some phases of training as well. The Service, therefore, expects noise levels to exceed 95 dB frequently.

The Service's primary concern is the "startle effect" that occurs when peregrine falcons are surprised by sudden, unexpected loud noises. Some loss of eggs or young could be expected from startle effect (Awbrey and Bowles 1990).

Observable effects in wildlife generally begin to appear at 85 to 90 decibels (dB) (Kull 1992). Startle or panic responses by most wildlife species occur at noise levels greater than 95 dB (Eleventh Air Force 1992). The Environmental Assessment (Eleventh Air Force 1992: p. 3-27) for the MTRs states:

> "... wildlife under or near an overflight are unlikely to detect the aircraft until it is above or past them. This type of event generally activates the sympathetic nervous system (Moller 1978) causing an instinctive 'startle reflex.' Researchers have found that some animals do not always habituate to this type of event (Harrington and Veitch 1991)."

Low-level flights that disturb birds may have a disproportionally large impact because the animals may sensitize rather than habituate to the disturbance. Quoting again from the EA for the MTRs: "When an animal habituates, it becomes familiar with a stimulus and reacts less to it; when an animal sensitizes, it becomes familiar with a stimulus but reacts more to it" (Eleventh Air Force 1992; p. 3-28). Although habituation appears to occur in some species, habituation to unpredictable and dramatic changes in sound level is unlikely. The EA also states that birds are typically most sensitive during nesting, rearing and migration.

The noise levels associated with military aircraft flying low-level are sufficient to cause startle behavior in peregrine falcons. When startled, peregrine falcons frequently jump or fly from their perch or nest to flee from the object causing the surprise. Peregrine falcons do not build nests but lay eggs on a flat ledge of a cliff, and incubate eggs and brood small young in such a way that their large toes and talons are often under the eggs or young. A bird startled from such a position could expel eggs or young from the nest ledge. Startle effect can also cause young birds to leave the nest before they are fully capable of flight which could result in mortality.

The cumulative effects of low-flying, high speed aircraft on nesting peregrine falcons are difficult to predict, particularly when precise information on the timing, number, and nature of the flights and aircraft in relation to specific peregrine falcon nest sites is not available. The very high number of low-level flights by aircraft generating noise levels well above those associated with disturbance to wildlife, in areas with numerous peregrine falcon nest sites, will very likely result in some take of American peregrine falcons.

BIOLOGICAL OPINION

The Service considered the following components of military aircraft activity in Alaska in reaching a Biological Opinion: (1) number and type of aircraft currently assigned in

Alaska; (2) normal and routine training activities of those aircraft; (3) potential increase in the number of permanently assigned aircraft and related increase in normal and routine training activity; (4) proposed Major Flying Exercises in Alaska; and (5) proposed restructuring of Military Operating Areas and Military Training Routes in Alaska. It is the opinion of the Service that these activities could adversely affect peregrine falcons in interior Alaska. Although adverse effects are likely, the status of the American peregrine falcon in Alaska has improved to the point that we believe adverse effects due to this activity are not likely to jeopardize the continued existence and recovery of the Alaskan population of this species. This non-jeopardy opinion is contingent upon implementation of the Reasonable and Prudent Measures discussed later in this Biological Opinion. We do not have the ability to accurately predict long-term effects of low-level military aircraft on peregrine falcons nesting in the Alaskan MOAs and MTRs. However, it is our best judgement that although some take is expected at those nest sites without protective measures, the continued existence and recovery of the species in Alaska will not be jeopardized.

INCIDENTAL TAKE

Section 9 of the Endangered Species Act prohibits the taking of an endangered species within the United States by any person subject to the jurisdiction of the United States. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Section 7 (b)(4) allows for incidental take if such take does not jeopardize the species. Such take must be incidental to an otherwise lawful activity and is permitted by the Service through the formal consultation process.

We anticipate that the proposed low-level military aircraft activity will result in incidental take at nest sites without protective measures. Take may occur in the form of harassment, nest abandonment, premature fledging, or accidental displacement of young or eggs from the nest by startled adults. When incidental take is authorized, the level of that take must be monitored to insure that the authorized level of take is not exceeded. If the authorized level of take is exceeded, the Air Force and the Fish and Wildlife Service must reinitiate consultation.

Level of Incidental Take

Approximately 4,000 to 5,000 low-level flights are planned in areas with numerous nest sites during the nesting season. Seventy-five known nest sites will not be protected by the protective measures discussed below under Reasonable and Prudent Measures. Our best judgement is that the proposed activity could result in the loss of eggs or young, primarily through direct mortality associated with the startle effect. The precise level of this take is impossible to predict because the intensity, timing, duration, direction, and other factors of low-level flights vary daily. In addition, the effects of low-level flights could be different for different nest situations. Since the Service cannot accurately predict the amount of take, we must make the best reasonable estimate of anticipated take, and subsequently develop and implement a monitoring plan to insure that the level of take does not jeopardize the continued existence and recovery of American peregrine falcons in Alaska. A reasonable estimate of anticipated take at the 75 unprotected nest sites is 5 young per year. The Service will work with the Air Force to further evaluate the level and impacts of incidental take through a monitoring plan. No take is expected or authorized in protected areas.

Reasonable and Prudent Measures

Section 7 (b)(4) also requires that reasonable and prudent measures, if available, be specified in the incidental take statement to minimize the impact of take. Implementation by the consulting agency of such measures is mandatory as long as the measures do not significantly modify the original intent of the project. The reasonable and prudent measures discussed below will reduce the take of peregrine falcons.

A previous Biological Opinion between the Air Force and the Service (April 15, 1987) regarding low-level military aircraft used protective measures around peregrine falcon nest sites described in the Peregrine Falcon Recovery Plan, Alaska Population (U.S. Fish and Wildlife Service 1982). That Recovery Plan recommended protective areas of 1 mile horizontal distance and 1500 feet AGL around peregrine falcon nest sites between April 15 and August 31. These measures were developed to insure that aircraft activity did not negatively impact breeding falcons. The restrictions were intended to address general aviation aircraft, not super-sonic or near super-sonic, low-level military aircraft. The faster and noisier aircraft now using the MOAs and MTRs in Alaska and the increase in training activity proposed for Alaska dictate that the protected zone around peregrine falcon nest sites be increased.

The need for a larger protected zone originates from observations of military aircraft flying within restricted areas. A very large increase in the number of these observations occurred when the Air Force first began flying F-16s in Alaska. This suggests that a larger protection zone is required for these newer aircraft. Pilots and operations officers have frequently commented on the large turning radius required by the F-16 and similar aircraft at high speed. Due to the large turning radius, it seems unlikely that a pilot who entered a 1-mile/1500-foot restricted area could easily avoid impacting the protected nest site. Therefore, the zone should be large enough to allow a pilot the time (distance) to turn before impacting a nest. For this reason, the Service considered the following Reasonable and Prudent Measure:

> Between April 15 and August 31, avoid all known peregrine falcon nest sites by 2 miles horizontal distance or by 2000 feet AGL.

Ideally, this protection would be implemented for all known peregrine falcon nest sites. However, as discussed in correspondence between the Air Force and the Service, the scattered nature of many of the nest sites throughout interior Alaska makes incorporating such measures at every nest site difficult without significantly altering the training requirements of the Air Force. In correspondence and discussions between the Air Force and the Service regarding these conservation recommendations, we agreed that the majority of known peregrine falcon nest sites could be protected without significantly altering the Air Force's training needs. This could be accomplished by implementing the protective measures along specific river corridors with very high concentrations of nest sites as follows:

> Between April 15 and August 31, maintain a minimum of 2 miles horizontal distance from or 2000 feet AGL along the following river corridors: upper Yukon River (between Circle, Alaska and the Alaska-Yukon Territory border); Charley River; Kandik River; and Porcupine River (between John Herberts village and the Alaska-Yukon Territory border)(See Appendix B).

In so doing, the majority of the known nest sites would be protected. No take is expected at these nest sites unless pilots do not adhere to the protective measures.

Rivers and tributaries in east-central Alaska average between 700 feet and 1200 feet above mean sea level. Cliffs that border these rivers are used for nesting by peregrine falcons, and are often 1,000 feet above the river. It is important, therefore, that pilots adhere strictly to the 2000 feet AGL guidance. This frequently translates to a protection zone that is 3,000 feet above the river.

In correspondence with the Service (February 9, 1993, attached), the Air Force concurred with the 2000 feet AGL/2 mile protective zone along four river corridors: upper Yukon, Charley, Kandik and Porcupine rivers. The Air Force further proposed that protective measures of 2000 feet AGL/2 miles (in the four areas mentioned above) were acceptable except for routine flying by permanently assigned aircraft when weather conditions are such that to do so would preclude or restrict safe flight operations. In such cases, the Air Force agreed to a 1500 feet AGL protective zone to permit crossing of the protected areas. The Air Force reasoned that Major Flying Exercises would not be conducted on days when weather necessitated flying below 2000 feet AGL in restricted areas. The Service concurs with this proposal, but assumes such events will be infrequent. Given the noise level of F-16s (85 dB at 2000 feet at normal power settings and much greater at higher power), if flights at 1500 feet AGL over protected areas occur regularly, the Service will reinitiate discussions on this topic.

<u>Terms and Conditions</u>

Since incidental take is being authorized in this Biological Opinion, the Air Force is required to monitor and report all such take so that the extent of incidental take cannot result in jeopardy to the species. Monitoring of all 75 nest sites and documenting all peregrine falcon responses to low-level military aircraft activities would be impractical.

Therefore, the Service recommends development of a monitoring plan in which a sample number of these 75 nests are checked annually and nest success and productivity are compared with nest sites where protective measures have been implemented and where no impacts are expected to occur. The Service will begin immediately to work with the Air Force to develop a plan to monitor take. As we develop and implement such a plan, it is imperative that protected areas not be subjected to low-level flights. Clearly, if low-level flights occur in protected areas, then comparisons with non-protected areas will be meaningless.

In addition to the monitoring effort described above, the Air Force will continue the intensive information and education program recently initiated to educate pilots about peregrine falcons, their nesting areas, and the Air Force's responsibilities under the Endangered Species Act. Although this program appears to be generally successful for pilots assigned permanently in Alaska, pilots that come to Alaska for Major Flying Exercises are apparently less aware of peregrine falcons and their nesting areas. Although the Air Force is striving to educate these transient pilots, most observations of aircraft flying within protected areas have occurred during the Major Flying Exercises. The Service is aware that the Air Force is constantly trying to inform and educate all pilots, and we urge that this effort continue.

While improved educational programs will hopefully reduce flights within protected areas, some violations may occur. In these cases, the Service expects the Air Force to take appropriate action with offending pilots and report those actions to the Service. It is important that the Service and other concerned agencies understand the steps the Air Force is taking to insure compliance with conditions in this Biological Opinion. The Service will work with the Air Force to develop a reporting system for field biologists who observe low-level flights in restricted areas.

These provisions for the incidental take of peregrine falcons constitute an exemption from provisions of Section 9 of the Endangered Species Act, provided the above terms and conditions are met. If take associated with low-level military training in Alaska results in a significant decrease in average nest success or productivity at those sites not afforded protective measures, or if protective measures along the four areas discussed above are not adhered to, formal consultation should be reinitiated.

This concludes formal consultation regarding military aircraft training operations in Alaska and the American peregrine falcon. If the project design changes, new information on the status of peregrines becomes available, or new species are listed that may be affected by the project, informal consultation should be initiated to determine if formal consultation should be reinitiated. Thank you for your cooperation and interest in meeting our joint responsibilities under the Endangered Species Act.

Sincerely,

Patrick Sousa

Patrick J. Sousa
Field Supervisor

Attachments

cc: Commander, 11th Air Force, Anchorage, AK
Commander, 3rd Wing, Elmendorf Air Force Base, AK
Commander, 343rd Wing, Eielson Air Force Base, AK
Regional Director, National Park Service, Anchorage, AK
Superintendent, Yukon-Charley Rivers National Preserve, Eagle, AK
Refuge Manager, Arctic National Wildlife Refuge, Fairbanks, AK
Division of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C.
Field Supervisor, Ecological Services, Anchorage.

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APPENDIX A.	Section 7 Consultation History Regarding Air Force Military Aircraft Training Operations in Alaska
Dec. 12, 1986	The Air Force requested consultation on operations in existing MOAs in Alaska.
Feb. 3, 1987	The Fish and Wildlife Service (Service) requested additional information on operations.
April 15, 1987	The Service prepared a Biological Opinion on military aircraft training activities in MOAs in Alaska. The Service concluded that take of peregrine falcons could occur and an incidental take statement was included.
	The Air Force and the Service discussed implementing conservation measures (protective zones of 1 mile/1500 AGL around peregrine falcon nest sites). The Air Force agreed to implement conservation measures.
June 8, 1987	The Service wrote to the Air Force with locations (latitude and longitude) to avoid in MOAs, insuring no effect and hence no incidental take.
	The Air Force and the Service discussed problems in conducting training missions while avoiding all nest sites in MOAs.
April 21, 1988	The Air Force wrote to the Service agreeing to avoid nest sites in the Yukon-Charley rivers area (because few were in the other MOAs).
April 17, 1991	The Air Force released "Finding of No Significant Impact" on conversion to F-16 aircraft at Eielson Air Force Base.
Jan. 31, 1992	The Service disagreed with Air Force's conclusion of "No Significant Impact" and requested re-initiation of consultation.
April 30, 1992	The Air Force wrote the Service stating their intent to continue to comply with protective measures but did not request reinitiation of Section 7 consultation.
June 29, 1992	The Service wrote to the Air Force reiterating the Service's concerns and again requested reinitiation of Section 7 consultation.

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August 24, 1992	The Air Force wrote the Service stating their intention to comply with their obligations under Section 7 of the Endangered Species Act.
Sept. 10, 1992	The Air Force formally requested reinitiation of Section 7 consultation but provided no specific information on the proposed activities.
October 19, 1992	The Service requested information necessary to complete the consultation.
December 2, 1992	Air Force provided requested information and reinitiated formal consultation.
January 25, 1993	The Service provided to the Air Force a draft assessment of protection measures around peregrine falcon nest sites likely to be included in the final Biological Opinion.
February 9, 1993	The Air Force responded and stated that compliance with measures around all known nest sites would hamper their ability to conduct realistic training exercises. The Air Force suggested that protection measures be applied only to nest sites along certain rivers known to be areas of high concentration.
February 28, 1993	The Service requested information on a proposed activity related to the military training (YMDS), and also requested an extension to March 31, 1993, to complete the Biological Opinion.
March 2, 1993	The Air Force concurred with that extension and provided the requested information.
March 31, 1993	The Service completed the Biological Opinion and provided it to the Air Force.

APPENDIX B. River Corridors with Protective Measures

1.	Upper Yukon River:	Between 6441N 14100W and 6546N 14400W
2.	Charley River:	Between 6441N 14338W and 6519N 14246W
3.	Kandik River:	Between 6544N 14117W and 6522N 14230W
4.	Porcupine River:	Between 6724N 14100W and 6659N 14308W

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HQ, ELEVENTH AIR FORCE (PACAF)
ELMENDORF AFB AK 99506-2150

30 March 1994

11 AF/LGV
5800 G Street Suite 203
Elmendorf AFB AK 99506-2150

Mr Skip Ambrose
U.S. Fish & Wildlife Service
1412 Airport Way
Fairbanks, Alaska 99701

Dear Mr Ambrose

In accordance with the requirements of Section 7 of the Endangered Species Act of 1973, as amended, the Eleventh Air Force is requesting re-initiation/continuation of the consultation process for threatened and endangered species. The area to be included in the revised biological opinion is the area covered by the proposed TANANA Military Operating Area and the areas included in the Biological Opinion of 31 March 1993. The coordinates of the proposed TANANA MOA are given in the listing attached to this request. The activities are identical to those proposed for the Improvements to the Military Operating Areas in Alaska and assessed in the Biological Opinion of 31 March 1993. This proposed TANANA MOA is one of the alternatives being evaluated as part of the ongoing comprehensive Alaska MOA Environmental Impact Statement (AK MOA EIS). We request your reply as expeditiously as possible as we are in the writing stage of the project and would like to include the results of the consultation in our document before it is released to the public in the Draft EIS. If there are any questions, please contact Mr James W. Hostman, 11 AF/LGV, at 907-552-4151.

SIGNED

G. VIRGIL HANSON, Major, USAF
Chief, Environmental Management

Enclosures:
TANANA MOA Coordinates

TANANA MOA COORDINATES

MOA NAME	LATITUDE Deg Min Sec	LONGITUDE Deg Min Sec	ALTITUDES Floor/Ceiling	SUPERSONIC yes/no conditions
TANANA	Beginning at		300 ft AGL to	Authorized at
	62 30 00 N	145 54 00 W	but not	or above
	63 30 00 N	145 54 07 W	including	5,000 ft AGL.
	63 37 00 N	145 33 00 W	FL 180	
	63 37 00 N	144 13 00 W	EXCEPT West	
	64 00 00 N	143 00 00 W	of the line:	
	64 00 00 N	141 05 00 W	63 37 00 N	145 00 00 W
	63 30 00 N	141 05 00 W	62 47 33 N	145 00 00 W
	63 23 00 N	143 05 00 W	3,000 ft AGL to	
	to point of beginning.		but not	
			including	
			FL 180.	

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

NORTHERN ALASKA ECOLOGICAL SERVICES
Endangered Species
1412 Airport Way
Fairbanks, AK 99701
April 18, 1994

received

Major G. Virgil Hanson
11th AF/LGV
5800 G. Street, Suite 203
Elmendorf Air Force Base, AK 99506-2150

Dear Major Hanson:

This responds to your March 30, 1994, letter requesting re-initiation of Section 7 consultation on additional proposed changes in the Air Force's Military Operations Areas (MOA) in Alaska. The Air Force and the Fish and Wildlife Service (Service) earlier concluded consultation on proposed changes in MOAs, Military Training Routes (MTR), and Major Flying Exercises (MFE) in Alaska. In a March 31, 1993, Biological Opinion, the Service concluded that the continued existence and recovery of American Peregrine Falcons (*Falco peregrinus anatum*) in Alaska would not likely be jeopardized by the proposed changes. The Service also concluded that some incidental take was likely.

As described in your March 30, 1994, letter, the Air Force is now considering one additional MOA, the TANANA MOA near Tok, Alaska. Coordinates for the MOA were included in your letter. Flight rules for the proposed MOA include authorized flights as low as 300 feet above ground level (AGL) in most of the MOA, with portions of the MOA limited to 3,000 feet AGL. Supersonic flight is authorized above 5,000 feet AGL. This letter addresses potential impacts to threatened and endangered species in the area of the proposed TANANA MOA, and can be considered a supplement to the March 31, 1993, Biological Opinion. The only species considered in this document is the endangered American Peregrine Falcon (*Falco peregrinus anatum*).

A detailed review of potential impacts of low-level military aircraft on nesting American Peregrine Falcons was presented in the March 31, 1993, Biological Opinion. The Service's primary concern was, and remains, that low-level aircraft may startle incubating or brooding adult falcons, and cause eggs or young to be expelled from the nest. Additionally, premature fledging may occur if young are startled from the nest before they are flight capable.

In the March 31, 1993, Biological Opinion, the Service estimated an incidental take of 5 American Peregrine Falcons annually due to increases in the number of low-level flights and increases in the size of MOAs and MTRs in Alaska. Low-level flights in the TANANA MOA would likely result in some addition take. However, as described in the

Corrected Copy

March 31, 1993, Biological Opinion, the precise level of incidental take is impossible to accurately predict because the intensity, timing, duration, direction, and other factors of low-level flights vary daily. In addition, the effects of low-level flights could be different for different nesting situations and for different birds. Since the Service cannot accurately predict the amount of take, we must make the best reasonable estimate of anticipated take, and subsequently develop and implement, in cooperation with the Air Force, a monitoring plan to insure that the level of anticipated incidental take is not exceeded and that incidental take does not jeopardize the continued existence and recovery of American Peregrine Falcons in Alaska. There are seven known American Peregrine Falcon nest sites in the proposed TANANA MOA, and others may occur in areas which have not been surveyed. A reasonable estimate of incidental take in the TANANA MOA is one American Peregrine Falcon per year. Therefore, the new level of anticipated incidental take of American Peregrine Falcons due to all proposed changes in MOAs and MTRs in Alaska, and proposed increases in the number of low-level flights, is six per year. All other aspects of the March 31, 1993, Biological Opinion remain in effect.

The Service will continue to work with the Air Force to develop and implement a monitoring plan to insure that the level of anticipated incidental take is not exceeded. As you know, the Service, the 11th Air Force, and the Air Force's Noise and Sonic Boom Impact Technology office at Wright-Paterson Air Force Base are developing a program to determine and document the impacts of low-level military aircraft on nesting raptors, including peregrine falcons. Research and monitoring proposals are being reviewed at this time, and I will be contacting you in the near future regarding this effort. Thank you again for your continued concern for endangered species. Please call me at 907-456-0239 if you have any questions.

Sincerely,

Skip Ambrose

Skip Ambrose
Project Leader

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

NORTHERN ALASKA ECOLOGICAL SERVICES
Endangered Species
1412 Airport Way
Fairbanks, AK 99701
June 1, 1995

Capt. Greg Tures
11th AF/LGV
5800 G Street, Suite 203
Elmendorf Air Force Base, AK 99506-2150

Dear Capt. Tures:

This letter constitutes an amendment to the March 31, 1993 Biological Opinion on the Air Force's proposed changes in Military Operations Areas (MOAs), Military Training Routes (MTRs), and Major Flying Exercises (MFEs) in Alaska. The Fish and Wildlife Service (Service) has received verbal communication from the Air Force regarding proposed increases in the number of low level flights over the Tanana River associated with a study on disturbance to American peregrine falcons.

In the March 31, 1993 Biological Opinion, the Service concluded that the continued survival and recovery of American peregrine falcons in Alaska was not likely to be jeopardized by the proposed changes in MOAs, MTRs, and MFEs, but that some incidental take was likely to occur. On April 18, 1994, the Service issued an amendment to the consultation which addressed the additional proposed changes in MOAs, MTRs, and MFEs associated with the addition of the TANANA MOA near Tok, Alaska. The purpose of this letter is to further amend the original Biological Opinion to incorporate potential effects of the additional flights which will be conducted as part of the study of American peregrine falcon behavior in response to overflights on the Tanana River.

It is our understanding that for the purposes of the disturbance study, the Air Force will conduct test flights over four to six known nest sites, that between six and twelve flights will take place over one nest site in a given day, and that test flights will be conducted on no more than six days per year for each nest site. These flights will take place during the 1995 and 1996 breeding seasons, along the Tanana River between Delta and Tok.

A detailed review of potential impacts of low-level military aircraft on nesting American peregrine falcons was presented in the March 31, 1993 Biological Opinion. The Service's primary concern was, and remains, that low-level aircraft may startle incubating or brooding adult falcons, and cause eggs or young to be expelled from the nest. Additionally, premature fledging may occur in young are startled from the nest before they are flight capable.

In the March 31, 1993 Biological Opinion, the Service estimated an incidental take of 5 American peregrine falcons annually due to increases in the number of low-level flights and increases in the size of MOAs and MTRs in Alaska. In the April 18, 1994 amendment, estimated annual take was increased to 6 American peregrine falcons as a result of the addition of the TANANA MOA.

The Service concludes that the additional flights proposed as part of the disturbance study will not result in a change in the original determination that the continued survival and recovery of American peregrine falcons is not likely to be jeopardized by the activities. However, these additional flights may result in some additional take of American peregrine falcons. As described in the March 31, 1993 Biological Opinion, the precise level of incidental take is impossible to accurately predict. The Service must therefore make a reasonable estimate of the amount of take that may result from the disturbance study. Unlike other military flights in Alaska, the flights in this study will target known nest sites. Therefore, the likelihood of take at a given nest site is higher for this study than for other flight activities. The Service concludes that a maximum of four American peregrine falcons may be taken as a result of the disturbance study. Therefore, as a result of this amendment, the Air Force is authorized to take up to four American peregrine falcons along the Tanana River during flights associated with the disturbance study. All other aspects of the March 31, 1993 Biological Opinion and the April 18, 1994 Amendment to that Biological Opinion remain in effect.

Thank you for your continued concern for endangered species. We look forward to the results of the disturbance study. Please call me at 907-456-0239 if you have any questions.

Sincerely,

Skip Ambrose

Skip Ambrose
Project Leader

cc: Dr. Daniel Roby, NBS/UAF

APPENDIX J

VILLAGE SUBSISTENCE PROFILES

J.1 Background

The information presented in this appendix was prepared from several sources. Maps of the MOAs were overlaid onto maps of Alaskan communities under the proposed MOAs, and those with subsistence use areas under the proposed MOAs were identified. Next, sources of relevant information pertaining to subsistence activities and characteristics were identified, including ADF&G Technical Reports and Regional Habitat Guides; the Department of Community and Regional Affairs Community Database; Alaska Department of Labor statistics; management plans from state and federal agencies; and other pertinent studies. This review included contacts with state and federal agency staff, and with regional and local Native organizations. For each community identified, the following characteristics were described to the extent that data were available:

- location and setting
- population characteristics
- estimated subsistence participation of population
- employment
- general patterns of subsistence use
- harvest totals
- sources of information

No field data was collected as part of this analysis.

J.2 Northern Interior Region

J.2.1 YUKON 1 MOA

No subsistence communities were identified under the YUKON 1 MOA. Some Fairbanks area residents possibly pursue personal use or subsistence activities within this MOA. Patterns are likely to follow sport hunting regulations and seasons for moose, caribou, Dall sheep and bear.

J.2.2 YUKON 2 MOA

CIRCLE

Location and Setting - Circle is located on the Yukon River at the end of the Steese Highway, 130 miles northeast of Fairbanks.

Population Characteristics - In 1990 the population of Circle was 73 people living in 23 households. The population was composed of 9 Whites, 63 Native American, primarily of Gwich'in Athapaskan descent, 1 person of unknown origin and 4 people of Hispanic descent. In 1980 the population was 81. The 1992 provisional population estimate is 95.

Estimated Subsistence Participation of Population - Circle residents rely heavily on subsistence hunting of moose, caribou, black bear, salmon, and waterfowl but no data on participation or use is available. Moose are of primary importance.

Employment - Many Circle residents rely on seasonal jobs since full time and part time year-round employment is limited. No statistical data is available.

General Patterns of Subsistence Use - Like most residents of Yukon River communities, the people of Circle rely primarily on salmon and moose, which are hunted late August. People also hunt ducks during the fall and black bear. Although caribou are available, apparently no significant numbers have been taken by Circle residents since 1969.

No data is available on exact use areas. The subsistence area used by Circle residents is within the northern section of the YUKON MOA (YUKON 2 MOA floor, 100 feet AGL) and includes the areas both north and south of the Yukon River.

Harvest Totals - No current data available.

Sources - Alaska Department of Labor 1991; Caulfield 1979; ADF&G State Hunting Regulations No. 32 n.d.

CENTRAL

Location and Setting - Central is located on the Steese Highway 28 miles southwest of Circle and approximately 100 miles northeast of Fairbanks.

Population Characteristics - In 1990 the population of Central was 52 people living in 27 households. The population was composed of 49 Whites, 1 Native American, 2 people of unknown origin and 2 people of Hispanic origin. In 1980 the population was 36. The 1992 provisional population estimate is 48.

Estimated Subsistence Participation of Population - Central residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use is available. Moose are of primary importance.

Employment - Many Central residents rely on seasonal jobs since full time and part time year-round employment is limited. No statistical data are available.

General Patterns of Subsistence Use - Virtually no data are available on the seasonal round of the residents of Central. Like other communities in the region, late summer and early fall are prime times for harvesting a winter supply of meat, either moose or caribou. Central residents hunt moose and caribou in September using the Steese Highway corridor. Caribou are also harvested from December through February. Trapping for fur bearing animals occurs from November through March.

No data is available on exact use areas. The subsistence area used by Central residents is within the northern section of the Yukon MOA.

Harvest Totals - No current data is available.

Sources - Alaska Department of Labor 1991; ADF&G State Hunting Regulations No. 32 n.d.

J.2.3 YUKON 3 MOA

EAGLE CITY

Location and Setting - The town of Eagle is located on the Yukon River 66 miles from the Alaska-Canada border and approximately 175 air miles east of Fairbanks.

Population Characteristics - The population of Eagle in 1990 was 168 people living in 66 households. According to the 1990 census the population of Eagle was comprised of 163 White, 5 Native American, and 2 Hispanic. In 1980 the population was 110. The 1992 provisional population estimate is 149.

Estimated Subsistence Participation of Population - Eagle residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use available. Moose are of primary importance. The August-September moose hunt is one of the single most important activities of the entire year as a household's livelihood depends heavily on a large supply of moose meat to see them through the winter.

Employment - Employment opportunities are limited in Eagle to part-time work for the school and community administration and seasonal employment in the trades, and various government agencies such as the National Park Service.

General Pattern of Subsistence Use - Subsistence activities for Eagle center around three major activities: the salmon harvest; a fall moose, caribou, and sheep season; and trapping for fur bearing animals during the winter months. Salmon, moose and caribou are the most important resources.

The residents of Eagle City use the area under YUKON 3 TMOA for subsistence purposes. Moose hunting occurs primarily along the Yukon River and tributaries large enough to accommodate a boat, although moose are occasionally taken in upland areas as well. Caribou hunting, on the other hand, takes place in the Tanana Hills located south of the Yukon, particularly along the Taylor Highway around American Summit. Traplines follow various tributaries of the Yukon.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Caulfield 1979; ADF&G State Hunting Regulations No. 32 n.d.

EAGLE VILLAGE

Location and Setting - Eagle Village is located on the Yukon River 3 miles east of the town of Eagle and approximately 175 air miles east of Fairbanks.

Population Characteristics - In 1990 the population of the village was 35 people living in 20 households. The population of Eagle Village was composed of 7 Whites and 28 Native Americans, predominately of Han Athapaskan descent. In 1980 the population was 54. The 1992 provisional population estimate is 31.

Estimated Subsistence Participation of Population - Eagle residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl but no data on participation or use are available. Moose are of primary importance. The August-September moose hunt is one of the single most important activities of the entire year as a household's livelihood depends heavily on a large supply of moose meat to see them through the winter.

Employment - Employment opportunities are limited in Eagle Village to part-time work for the school and community administration and seasonal employment in the trades. No statistical data are available.

General Patterns of Subsistence Use - Subsistence activities for Eagle Village center around three major activities: the salmon harvest, a fall moose, caribou and sheep season; and trapping for fur bearing animals during the winter months. Salmon, moose and caribou are the most important resources. Moose hunting occurs primarily along the Yukon River and tributaries large enough to accommodate a boat, although moose are occasionally taken in upland areas as well. Caribou hunting, on the other hand, takes place in the Tanana Hills located south of the Yukon, particularly along the Taylor Highway around American Summit

The residents of Eagle Village use the area under YUKON 3 TMOA for subsistence purposes. The primary use areas for harvesting big game are located along the Yukon River and the Taylor Highway corridor. The majority of fishing takes place in the Yukon River. Traplines follow various tributaries of the Yukon on either side of the river.

Harvest Totals - No data current data are available:

Sources - Alaska Department of Labor 1991; Caulfield 1979; ADF&G State Hunting Regulations No. 32 n.d.

CHICKEN

Location and Setting - Chicken is located on the Taylor Highway 58 miles southwest of Eagle and approximately 165 air miles east of Fairbanks.

Population Characteristics - No population data exists.

Estimated Subsistence Participation of Population - The residents of Chicken rely on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use is available.

Employment - The majority of the population is involved in mining activity.

General Patterns of Subsistence Use - There is no mapped data or seasonal round (seasonal harvest calendar) for this area. It could be assumed that people adhere to the seasons stipulated by the Alaska Department of Fish and Game. For all of Game Management Unit (GMU) 20E, moose hunting occurs from late August to mid-September. For the entire GMU, caribou hunting occurs from early August to the end of September and again from December 1 to February 28.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; ADF&G State Hunting Regulations No. 32 n.d.

J.2.4 YUKON 4 MOA

No subsistence communities were identified underneath the YUKON 4 MOA. It is possible that some Eagle or Circle residents pursue subsistence activities within this MOA, but this area is less likely to be used than areas closer to those communities (see YUKON 2 and YUKON 3 MOA descriptions).

J.2.5 YUKON 5 MOA

CHALKYITSIK

Location and Setting - Chalkyitsik is located on the Black River, 45 air miles northeast of Fort Yukon and approximately 175 air miles northeast of Fairbanks.

Population Characteristics - In 1990 the population of Chalkyitsik was 90 people living in 33 households. The population was composed of 7 Whites and 83 Natives Americans, primarily of Gwich'in Athapaskan descent. In 1980 the population was 100. The 1992 provisional population estimate is 83.

Estimated Subsistence Participation of Population - Chalkyitsik residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use are available. Moose and caribou are of primary importance.

Employment - Full time and part time year-round employment is limited. There are jobs connected with the school, the administration of the village and as health aide. Summer fire fighting and construction jobs provide seasonal income.

General Patterns of Subsistence Use - Chalkyitsik people hunt waterfowl in the spring and summer, moose, waterfowl and black bear during the fall; and moose and the occasional caribou during the winter. Moose hunting is particularly intensive during the fall along the Black River and Salmon Fork.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Caulfield 1983; ADF&G State Hunting Regulations No. 32 n.d.

FORT YUKON

Location and Setting - Fort Yukon is located on the Yukon River at its junction with the Porcupine River and approximately 125 air miles north-northeast of Fairbanks.

Population Characteristics - In 1990 the population of Fort Yukon was 580 people living in 205 households. The population was composed of 493 Native Americans, mostly of Gwich'in Athapaskan descent, 85 Whites, 2 people of unknown origin and 2 people of Hispanic origin. In 1980 the population was 619. The 1992 provisional population estimate is 612.

Estimated Subsistence Participation of Population - All Fort Yukon households used some type of wild resources during the year data was collected by the Alaska Department of Fish and Game (1986-87). Of all households, 87 percent successfully harvested at least one resource. Mammals were used by 100 percent of the households and birds by 90 percent. The most widely used resources were moose (99 percent), and ducks (86 percent).

Employment - A 1986-87 ADF&G survey found that 70 percent of 273 adults surveyed were employed during the study year. But only 25 percent of the jobs were full-time and year-round. Fifty-five percent of all jobs were seasonal. Of all Fort Yukon households reporting, 10 percent had no income from employment wages. The median income was $17,856 with a mean of $28,010.

General Patterns of Subsistence Use - Moose are hunted primarily in September, and occasionally in late July, and the months August, December, January and February. Black bear are primarily hunted in the late summer and early fall and occasionally in the spring. Caribou are occasionally hunted in mid-winter, and intensively in March and April and again in September and October. Waterfowl are hunted in the spring and occasionally throughout the summer and in late August and September.

Harvest Totals - One hundred and fifty moose were harvested in 1986-87, 155 caribou, 149 black bears, 2,945 ducks, and 7,111 geese. The per capita harvest for moose was 180 pounds and comprised 17 percent of the harvest. The per capita harvest for all species was 1,071 pounds.

Sources - Alaska Department of Labor 1991; Sumida and Anderson 1990.

BIRCH CREEK

Location and Setting - Birch Creek is located on the Lower Mouth of the Birch Creek, 26 miles from southwest of Fort Yukon and approximately 125 air miles north of Fairbanks.

Population Characteristics - In 1990 the population of Birch Creek in 1990 was 42 people living in 15 households. The population was composed of 38 Native Americans, mostly of Gwich'in Athapaskan descent, and 4 Whites. In 1980 the population was 32. The 1992 provisional population estimate is 39.

Estimated Subsistence Participation of Population - Birch Creek residents rely heavily on subsistence hunting of moose and waterfowl, but no data on participation or use are available. Moose are of primary importance.

Employment - Full time and part time year-round employment is limited. There are jobs connected with the school, the administration of the village and as health aide. Summer fire fighting and construction jobs provide seasonal income. The median household income for Birch Creek was $4,821 in 1979.

General Patterns of Subsistence Use - Waterfowl are hunted in the spring, occasionally during the summer and intensively in the fall. Moose are hunted intensively in late summer and early fall, occasionally in the late fall and early winter and intensively in late winter. Black bear is hunted intensively in the fall.

Harvest Totals - Between 1983 and 1985 a total of 3 moose were reported taken through the permit system.

Sources - Alaska Department of Labor 1991; Sumida and Alexander 1985; Caulfield 1983; ADF&G State Hunting Regulations No. 32 n.d.

VENETIE

Location and Setting - Venetie is located on the Chandalar River approximately 45 air miles northwest of Fort Yukon and 170 air miles north of Fairbanks.

Population Characteristics - In 1990 the population of Venetie was 182 people living in 50 households. The population was composed of 171 Native Americans, mostly of Gwich'in Athapaskan descent, and 11 Whites. In 1980 the population was 132. The 1992 provisional population estimate is 231.

Estimated Subsistence Participation of Population - Venetie residents rely heavily on subsistence hunting of moose and waterfowl but no data on participation or use is available. Moose are of primary importance.

Employment - Wage employment opportunities in Venetie are limited and often seasonal in nature. Full-time wage employment opportunities include two bilingual teaching aides, a school maintenance worker, a health aide, a school cook, postmaster and store manager.

General Patterns of Subsistence Use - Waterfowl are hunted in the spring, along with the occasional black bear. Moose hunting is a major fall activity, as is waterfowl hunting. Black bears are also occasionally taken during this time. During the winter moose are occasionally harvested along with caribou.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Caulfield 1983; ADF&G State Hunting Regulations No. 32 n.d.

ARCTIC VILLAGE

Location and Setting - Arctic Village is located on the East Fork of the Chandalar River approximately 100 air miles north of Fort Yukon and 425 air miles northeast of Fairbanks.

Population Composition - In 1990 the population of Arctic Village was 96 people living in 36 households. The population was composed of 90 Native Americans, mostly of Gwich'in Athapaskan descent, 5 Whites, 1 person of unknown origin, and 2 people of Hispanic origin. In 1980 the population was 111. The 1992 provisional population estimate is 113.

Estimated Subsistence Participation of Population - Arctic Village residents rely heavily on subsistence hunting of moose, caribou, Dall sheep, and waterfowl, but no data on participation or use is available. Moose and caribou are of primary importance.

Employment - Wage employment opportunities in Arctic Village are limited and often seasonal in nature. Full-time wage employment opportunities include bilingual teaching aides, council office manager, a school maintenance worker, a health aide, a school cook, postmaster and store manager.

General Patterns of Subsistence Use - Waterfowl are hunted in early summer. Caribou are available and harvested beginning in the middle of August. During the fall the primary activities are moose, caribou and Dall sheep hunting, with occasional waterfowl harvested. Caribou are hunted throughout the winter.

Harvest Totals - Current data are unavailable.

Sources - Alaska Department of Labor 1991; Caulfield 1983; ADF&G State Hunting Regulations No. 32 n.d.

J.2.6 YUKON 6 MOA

No majority subsistence use areas were identified underneath the YUKON 6 MOA. It is possible that some Fairbanks area residents pursue personal use or subsistence activities within this MOA. Patterns are likely to follow sport hunting regulations and seasons for moose, caribou, Dall sheep, and bear.

J.3 Southern Interior Region

J.3.1 BUFFALO MOA

DELTA JUNCTION

Location and Setting - Delta Junction is located on the right bank of the Delta River at the junction of the Alaska and Richardson Highways, 100 miles southeast of Fairbanks.

Population Characteristics - The population of Delta Junction in 1990 was 652 people living in 245 households. There were 381 Whites and 16 Native Americans, 1 black, 2 Asian/Pacific Islanders, 2 unknowns and 13 Hispanics living in Delta Junction. In 1980 the population was 945. The 1992 provisional population estimate is 757.

Estimated Subsistence Participation of Population - No data are available.

Employment - No data available. Employment opportunities for local residents exist at Fort Greely, Alyeska Pipeline facilities in the area, and local businesses.

General Patterns of Subsistence Use - No data available.

Harvest Totals - No data are available.

Sources - Alaska Department of Labor 1991.

HEALY LAKE

Location and Setting - Healy Lake village is located on Healy Lake 30 miles east of Delta Junction and 130 miles east of Fairbanks.

Population Characteristics - The population of Healy Lake in 1990 was 47 people living in 14 households. There were 7 Whites and 40 Native Americans, principally of Athapaskan descent, living in Healy Lake. In 1980 the population was 33. The 1992 provisional population estimate is 51.

Estimated Subsistence Participation of Population - Healy Lake residents rely heavily on subsistence hunting of moose and to a lesser degree on caribou, black bear, and waterfowl. Data are unavailable on participation or use.

Employment - No data are available. It would be reasonable to assume that the employment situation in Healy Lake is similar to other small, predominately Native communities located in the Tanana River valley. Full time employment is limited, people rely on a combination of seasonal labor, government transfer payments and subsistence.

General Patterns of Subsistence Use - No data are available. It can be assumed that the seasonal patterns of Healy Lake hunters is comparable to those of Dot Lake and Tanacross. Moose are hunted extensively in September and occasionally throughout the year. Caribou are hunted primarily in August and September and again December, January and February. Black bear are hunted primarily in the fall as are waterfowl.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991.

DOT LAKE (note: Residents of Dot Lake use areas under both the BUFFALO and TANANA MOAs.)

Location and Setting - Dot Lake is located along the Alaska Highway 40 miles northwest of Tok Junction and approximately 160 miles southeast of Fairbanks.

Population Characteristics - The population of Dot Lake village in 1990 was 53 people living in 18 households. There were 22 Whites and 31 Native Americans, mainly of Athapaskan descent living in Dot Lake. In 1980 the population was 67. The 1992 provisional population estimate is 75.

Estimated Subsistence Participation of Population - Of 20 households surveyed as part of a 1988 ADF&G subsistence study, 100 percent participated in subsistence activities. Seventy-three percent used moose, 66 percent used caribou, 27 percent used black bear, and 47 percent used ducks. The average per-capita harvest in 1987-88 was about 107 pounds.

Employment - Wage employment is very limited in Dot Lake. In a 1987-88 survey the ADF&G found that 58 percent of Dot Lake adults were employed and the same number worked year-round and the average number of months employed was 9.5. In 1987-88 the average household income was $20,300.

General Patterns of Subsistence Use - Moose are hunted extensively in September and occasionally throughout the year. Caribou are hunted primarily in August and September, and again in December, January and February. Black bear are hunted primarily in the fall as are waterfowl.

Harvest Totals - 1987 ADF&G survey (estimated): 4 moose, 1 bear, 4 caribou, 0 sheep, 51 migratory birds.

Sources - Alaska Department of Labor 1991; Martin 1983; McMillan and Cuccarese 1988; Marcotte et al. 1991.

J.4 Southcentral Region

J.4.1 SUSITNA MOA

SKWENTNA

Location and Setting - Skwentna is located on the south bank of the Skwentna River at its junction with Eightmile Creek, approximately 70 miles north west of Anchorage.

Population Characteristics - According to the 1990 census 85 people occupied 31 households in Skwentna. There were 82 White, 1 Native American and 2 Asian/Pacific islanders living in Skwentna. No 1980 population data are available. The 1992 provisional population estimate is 106.

Estimated Subsistence Participation of Population - In 1984 the ADF&G sampled 44 households in the Susitna Basin, of which Skwentna was a part. For that sample, big game comprised the largest portion of the harvest followed by salmon. The largest portion of the big game harvest was moose (14,000 pounds) followed by caribou (910 pounds), black bear (870 pounds) and sheep (65 pounds). Out of those households surveyed, 73 percent attempted to hunt moose, 9 percent attempted to harvest caribou, 5 percent attempted to harvest Dall sheep, 32 percent attempted to harvest black bear, 32 percent attempted to harvest ducks and 18 percent to harvest geese.

Employment - Employment data for Skwentna are unavailable. Of 16 households interviewed in a 1984 ADF&G Survey, 30 percent derived all income from trapping while 17 percent received all income from fishing lodges and fishing guide services. The average household income in 1982 was $12,101.

General Patterns of Subsistence Use: - (see Talkeetna, Trapper Creek, and Upper Petersville Road)

Harvest Totals -For 1982, 30 moose, 1 caribou, 1 Dall sheep, 13 black bear, 138-148 ducks and 4 geese.

Sources - Alaska Department of Labor 1991; Stanek 1987; Fall et al. 1983.

TALKEETNA

Location and Setting - Talkeetna is located at mile 76 on the Alaska Railroad at the junction of the Talkeetna and Susitna Rivers, 80 miles north of Anchorage.

Population Characteristics - The 1990 census indicates 250 people living in 106 households. There were 246 whites and 4 Native Americans listed. In 1980 the population was 264. The 1992 provisional population estimate is 267.

Estimated Subsistence Participation of Population - In a 1985-86 ADF&G study, which polled 85 out of 130 households in Talkeetna, 94 percent of the households indicated they used wild foods. Plants (vegetables and berries) and salmon were the most common resources harvested, followed by freshwater fish and game. Out of the sample households, 48 percent used moose, 20 percent used caribou, 7 percent used black bear, and 4 percent used ducks.

Employment - Employment information for Upper Petersville Road, Trapper Creek and Talkeetna are available in 1985-86 Alaska Department of Fish and Game Survey. Of the 3 communities, Talkeetna had the highest rate of employment with 60 percent of those surveyed being employed, while 4 percent were unemployed. More than half of those employed held year-round jobs. The average household income was $21,147.

General Patterns of Subsistence Use - There is no mapped data or seasonal round for this area. It could be assumed that people adhere to the seasons stipulated by the Alaska Department of Fish and Game. For all of Game Management Unit (GMU) 16, which includes the Talkeetna Area, moose hunting occurs from late August to mid-September. In parts of the GMU an additional hunt occurs either in November or January through February. For the entire GMU, caribou hunting takes place from early August to early October and there is no closed season for black bear.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Fall and Foster 1987.

TRAPPER CREEK

Location and Setting - The Trapper Creek area includes a section of the Parks Highway from the Susitna River bridge to the Chulitna River bridge and the first seven miles of the Petersville Road to the Moose Creek Lodge. The area is approximately 80 miles north of Anchorage.

Population Characteristics - According to the 1990 census 296 people lived in 110 households. There were 276 whites, 18 Native Americans, 1 Black, 1 Unknown and 5 Hispanic. No 1980 data are available. The 1992 provisional population estimate is 293.

Estimated Subsistence Participation of Population - In a 1985-86 ADF&G study, which polled 23 out of 36 households, 100 percent indicated they attempted and were successful in harvesting wild foods. Plants (vegetables and berries) and salmon were the most common resources harvested, followed by freshwater fish and game. Out of the sample households, 52 percent used moose, 10 percent used caribou, 10 percent used Dall sheep, 5 percent used black bear, and 5 percent used ducks.

Employment - Employment information for Upper Petersville Road, Trapper Creek and Talkeetna are available in 1985-86 Alaska Department of Fish and Game Survey. In Trapper Creek 58 percent of those surveyed were employed, while 13.9 percent were unemployed. More than half of those employed had year-round employment. The average household income was $28,253.

General Patterns of Subsistence Use - There is no mapped data or seasonal round for this area. It could be assumed that people adhere to the seasons stipulated by the Alaska Department of Fish and Game. For all of GMU 16, moose hunting occurs from late August to mid-September. In parts of the GMU an additional hunt occurs either in November or January through February. For the entire unit caribou hunting occurs from early August to early October and there is no closed season for black bear.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Fall and Foster 1987.

UPPER PETERSVILLE ROAD

Location and Setting - The upper Petersville road area runs from milepost 7 of the Petersville Road (Moose Creek) to the Forks Roadhouse at Milepost 19. The Petersville road intersects with Parks Highway approximately 80 miles north of Anchorage.

Population Characteristics - The Alaska Department of Fish and Game estimates that in 1986 61 people lived in 24 households along the Upper Petersville Road. No other census data are available.

Estimated Subsistence Participation of Population - In a 1985-86 ADF&G study, which polled 17 out of 29 households on the upper Petersville Road, 100 percent of the households indicated they used wild resources during the study period. Plants and salmon were the most common resources harvested, followed by freshwater fish and game. Out of the sample households, 70 percent used moose, 6 percent used caribou, 11 percent used black bear, 18 percent used ducks and 12 percent used geese.

Employment - Employment information for the Upper Petersville Road, Trapper Creek and Talkeetna are available in a 1985-86 ADF&G Survey. Of the 3 communities surveyed, the Upper Petersville Road had the lowest rate of employment with 45 percent of the adults employed and 17 percent unemployed. Of those employed 58 percent held year-round jobs. The average household income was $14,933.

General Patterns of Subsistence Use - There is no mapped data or seasonal round for this area. It could be assumed that people adhere to the seasons stipulated by the Alaska Department of Fish and Game. For all of GMU 16, moose hunting occurs from late August to mid-September. In parts of the GMU an additional hunt occurs in either November or in January through February. For the entire GMU, caribou hunting occurs from early August to early October and there is no closed season for black bear.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Fall and Foster 1987.

J.4.2 FOX MOA

PAXSON

Location and Setting - Paxson is located on the Richardson Highway 62 miles north of Gulkana and approximately 210 air miles east of Anchorage.

Population Characteristics - In 1990 the population of Paxson was 30 people living in 17 households. No Native Americans were reported living in Paxson in the 1990 census. In 1980 the population was 30. The 1992 provisional population estimate is 29.

Estimated Subsistence Participation of Population - In a 1988 survey carried out by ADF&G, out of the 17 houses surveyed, 93 percent of the households used some wild resources. The mean per-capita harvest was 288 pounds. Game comprised 49 percent of the total harvest and birds about 5 percent. Sixty-four percent of those surveyed used moose, 57 percent caribou, and 29 percent Dall sheep.

Employment - Of the 17 houses surveyed in 1988 by ADF&G, 79 percent of the adults were employed during the period 1987-88. Of these, 64 percent worked year-round. The average household income was $41,375.

General Patterns of Subsistence Use - Moose are harvested primarily in late August and early September. Caribou are also harvested at that time and in January and February. Waterfowl are hunted in the fall.

Harvest Totals - 1987 ADF&G survey: 0 bear, 8 caribou, 6 moose, 4 sheep, 347 migrating birds.

Sources - Alaska Department of Labor 1991; McMillan and Cuccarese 1988.

GAKONA

Location and Setting - Gakona is located on the Glenn Highway at the junction of the Copper and Gakona Rivers, 15 miles northeast of Glennallen and approximately 170 air miles east of Anchorage.

Population Characteristics - In 1990 the population of Gakona was 25 people living in 7 households. The population was composed entirely of Whites. In 1980 the population was 87 people. The 1992 provisional population estimate is 102.

Estimated Subsistence Participation of Population - In a 1988 survey carried out by ADF&G, 93 percent of all households reported using some wild resources. The mean per-capita harvest was 94 pounds. Game comprised 51 percent of the total harvest and birds about 4 percent. Fifty-three percent of those surveyed used moose, 51 percent used caribou, 23 percent Dall sheep and 10 percent black bear.

Employment - Of all the houses surveyed in 1988 by ADF&G, 82 percent of the total number of adults in Gakona were employed during the period 1987-88. Of these, 59 percent worked year-round. The average household income was $28,132.

General Patterns of Subsistence Use - Moose are harvested primarily in late August and early September. Caribou are also harvested at that time and in January and February. Waterfowl are hunted in the fall.

Harvest Totals - 1987 ADF&G survey: 1 bear, 35 caribou, 10 moose, 11 sheep, 14 migrating birds.

Sources - Alaska Department of Labor 1991; McMillan and Cuccarese 1988.

GULKANA

Location and Setting - Gulkana is located on the Richardson Highway at the Gulkana River crossing, 1.6 miles southwest of the junction of the Glenn and Richardson Highways and approximately 165 air miles east of Anchorage.

Population Characteristics - In 1990 the population of Gulkana was 103 people living in 42 houses. The 1990 population was composed of 42 Whites, 61 Native Americans, mostly of Ahtna Athapaskan descent, and 1 person of Hispanic origin. In 1980 the population was 104. The 1992 provisional population estimate is 108.

Estimated Subsistence Participation of Population - In a 1988 survey carried out by ADF&G, 95 percent of all households reported using some wild resources. The mean per-capita harvest was 152 pounds. Of that, game comprised 31 percent of the harvest. Fifty-five percent of those surveyed used moose, 55 percent used caribou, and 5 percent black bear.

Employment - Of all the houses surveyed in 1988 by ADF&G, 59 percent of the total number of adults in Gulkana were employed during the period 1987-88. Of these, 44 percent worked year-round. The average household income was $18,158.

General Patterns of Subsistence Use - Moose are harvested primarily in late August and early September. Caribou are also harvested at that time and in January and February. Waterfowl are hunted in the fall.

Harvest Totals - 1987 ADF&G survey: 1 bear, 7 caribou, 0 sheep, 53 migrating birds.

Sources - Alaska Department of Labor 1991; McMillan and Cuccarese 1988.

J.4.3 TANANA MOA

TANACROSS

Location and Setting - Tanacross is located between the Tanana River and the Alaska Highway 12 miles northwest of Tok Junction and 190 miles southeast of Fairbanks.

Population Characteristics - The population of Tanacross in 1990 was 106 people living in 35 households. There were 6 Whites and 100 Native Americans, principally of Tanacross Athapaskan descent. In 1980 the population was 117. The 1992 provisional population estimate is 89.

Estimated Subsistence Participation of Population - Out of 27 households surveyed as part of a 1988 ADF&G subsistence study, 96 percent participated in subsistence activities. Eighty-one percent used moose, 63 percent used caribou, 4 percent used black bear, and 52 percent used ducks. The average per-capita harvest in 1987-88 was about 242 pounds.

Employment - Employment opportunities are limited to part-time work for the school and community administration and seasonal employment in the trades. Of the 27 households surveyed in 1987-88, 53 percent were employed during the study year, 14 percent of these worked year-round and the average number of months employed was 5. During the study year the average household income was $19,303.

General Patterns of Subsistence Use - Moose are hunted extensively in September and occasionally throughout the year. Caribou are hunted primarily in August and September, and again in December, January and February. Black bear are hunted primarily in the fall as are waterfowl.

Harvest Totals - 1987 ADF&G survey (estimated): 13 moose, 3 bear, 8 caribou, 0 sheep, 231 migrating waterfowl.

Sources - Alaska Department of Labor 1991; Marcotte 1991; McMillan and Cuccarese 1988.

TOK

Location and Setting - Tok is located at the junction of the Alaska and Glenn Highways, about 90 miles from the Canadian border and 200 miles from Fairbanks.

Population Characteristics - The population of Tok in 1990 was 935 residents living in 367 households. There were 801 whites, 117 Native Americans, and 17 of other groups. In 1980 the population was 589.

Estimated Subsistence Participation of Population - Out of 367 households surveyed as part of a 1988 ADF&G subsistence study, 94 percent participated in subsistence activities. Sixty-four percent used moose, 60 percent used caribou, 24 percent used black bear, and 20 percent used ducks. The average harvest per household in 1987-88 was about 440 pounds, or 149 pounds per capita. Moose hunting and sockeye salmon fishing accounted for about 44 percent of the total harvest by Tok residents.

Employment - Tok is the first major community on the Alaska Highway and is the regional transportation, business, service, and government center for the Upper Tanana area. Employment and business revenues peak in the summer months and include highway travelers, construction, and firefighting operations. Tok also provides a center for area mining-related services and supplies. The employment rate among adults surveyed in 93 households in 1987-88 was 70 percent, 60 percent of whom had been employed for 12 consecutive months at the time of the survey. Most jobs were in the professional, technical, managerial, and service categories. The average household income was $23,537.

General Patterns of Subsistence Use - Moose are hunted primarily in September and occasionally in August. Caribou are harvested mainly in August, September, November, and December, and occasionally in February. Dall sheep are hunted primarily in August, but occasionally in September. Black and brown bear are hunted chiefly in May and August, but are occasionally harvested in April, June, July, and September. September and October are the principal months for waterfowl harvest.

Harvest Totals - 1987 ADF&G survey (estimated): 81 moose, 112 caribou, 39 black bear, 6 brown bear, 12 sheep, and 2,180 migrating waterfowl.

Sources - Alaska Department of Labor 1991; Marcotte 1991.

CHISTOCHINA

Location and Setting - Chistochina is located on the Glenn Highway 42 miles northeast of Glennallen and approximately 180 air miles east of Anchorage.

Population Characteristics - In 1990 the population of Chistochina was 60 people living in 20 households. The population was composed of 23 Whites and 37 Native Americans, mainly of Ahtna Athapaskan descent. In 1980 the population was 55. The 1992 provisional population estimate is 63.

Estimated Subsistence Participation of Population - In a 1988 survey carried out by ADF&G, 96 percent of all households reported using some wild resources. The mean per-capita harvest was 262 pounds. Of that, game comprised 32 percent of the harvest. Fifty-four percent of those surveyed used moose, 50 percent used caribou, 7 percent Dall sheep and 11 percent black bear.

Employment - Of all the houses surveyed in 1988 by ADF&G, 80 percent of the adults contacted in Chistochina were employed during the period 1987-88. Of these, 35 percent worked year-round. The average household income was $23,655.

General Patterns of Subsistence Use - Moose are harvested primarily in late August and early September. Caribou are also harvested at that time and in January and February. Waterfowl are hunted in the fall.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; McMillan and Cuccarese 1988.

J.5 Western Region

J.5.1 NAKNEK MOAS

KOLIGANEK

Location and Setting - Koliganek is located on the Nushagak River, 65 miles northeast of Dillngham, 280 miles west of Anchorage.

Population Characteristics - In 1990 the population of Koliganek was 181 people living in 47 households. The population was composed of 7 Whites and 174 Native Americans. In 1980 the population was 117 people.

Estimated Subsistence Participation of Population - No data available.

Employment - Commercial salmon fishing is the primary source of cash income to Nushagak River residents. New Stuyahok median gross income from commercial salmon was $15,500 in 1982. Trapping is also important. Local wage employment for Koliganek in 1982 consisted of 11 full-time, 11 part-time positions.

General Patterns of Subsistence Use - Koliganek/Nushagak area: Most harvest activities occur on short-term trips from the permanent community, but many families move to summer fish camps in June and July. Caribou and moose are hunted by skiff in the fall. Moose are especially sought for use during the celebration of Russian Orthodox Christmas in mid-January. Trapping for furbearers takes place in winter. Salmon, moose, and caribou are most important species in this region. Extensive area covered for harvest activity. In the fall, most traffic is confined to rivers and lakes. Nushagak and Nuyakuk drainages have traditionally been used by Koliganek hunters. New Stuyahok hunters use the Mulchatna. Snowmachines permit a wider activity area in winter.

Harvest Totals - No data available.

Sources - Alaska Northwest Books 1991; Alaska Department of Labor 1991; Schroeder et al. 1987.

J.5.2 STONY MOAs

LIME VILLAGE

Location and Setting - Lime Village is located on the western slopes of the Alaska Range on the Stony River approximately 180 air miles west of Anchorage and 120 air miles south of McGrath, the regional center for the upper Kuskokwim area.

Population Characteristics - In 1990 the population of Lime Village was 42 people living in 14 households. There were 40 Native American, principally of Dena'ina Athapaskan descent and 2 Whites. In 1980 the population was 48. The 1992 provisional population estimate is 47.

Estimated Subsistence Participation of Population - Lime Village residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use is available. Lime Village residents probably spend more time hunting than in any other occupation. The period from late August until early October is extremely important to Lime Village people as they attempt to accumulate as many resources as possible. This is also the time when sport hunters invade the area. Lime Village residents have noted that increased air traffic from sports hunters has frightened game making it more difficult to hunt.

Employment - Employment is limited in Lime Village to part-time positions at the school and a few community positions such as village health aide. The tendency, especially for long term residents, has been to stay in the village and take short-term wage work, in part, because requirements for long-term positions interfere with local resource harvest.

General Patterns of Subsistence Use - The area used by Lime Village residents includes almost the entire lengths of the Stony and Swift Rivers. To the east it extends to the headwaters of the Stony and Swift Rivers, including the western slopes of the Alaska Range from the Stony River north to the Revelation Mountains. Lime Villagers also make occasional use of the uppermost portion of the Big River via the North Babel River.

Harvest Totals -No current data are available.

Sources - Alaska Department of Labor 1991; Kari 1983.

NAPAMIUTE

Location and Setting - Napamiute is located on the Kuskokwim River approximately 290 air miles west of Anchorage and 28 miles east of Aniak, the regional center for the central Kuskokwim area.

Population Characteristics - In 1990 the population of Napamiute was 3 people living in one household. The population is entirely Native American. In 1980 the population was 4. The 1992 provisional population estimate is 3.

Estimated Subsistence Participation of Population - No data are available. It would be reasonable to assume that harvest participation in Napamiute is similar to the surrounding communities.

Employment - No data are available.

General Patterns of Subsistence Use - No data are available. It would be reasonable to assume that general patterns of subsistence are similar to those in surrounding communities.

Harvest Totals - No data are available.

Sources - Alaska Department of Labor 1991.

RED DEVIL

Location and Setting - Red Devil is located on the Kuskokwim River at the mouth of Red Devil Creek approximately 266 air miles west of Anchorage and 135 air miles south of McGrath, the regional center for the upper Kuskokwim area.

Population Characteristics - In 1990 the population was 53 people living in 18 households. There were 26 Whites and 27 Native Americans. In 1980 the population was 39. The 1992 provisional population estimate is 72.

Estimated Subsistence Participation of Population - The residents of Red Devil rely on subsistence hunting of moose and caribou, but no data on participation or use are available (Brelsford et al. 1987).

Employment - No data are available. Red Devil is primarily a mining town and many of the residents work in the local mines. Other jobs are likely, available through municipal, school, and village Native corporation employment.

General Patterns of Subsistence Use - Residents of Red Devil fish for salmon during the summer months. Moose are hunted in September and again during the months of November and February. Caribou are taken in August and September, and again from November through March. August, September and February are also the months people hunt black and brown bear. Sheep, by contrast, are taken only during the month of August. Trapping for fur bearing animals occurs from November through March, with muskrat trapping continuing into June. As indicated from this brief description August and September are the primary harvest periods for the residents of Red Devil.

Harvest Totals - No data are available.

Sources - Alaska Department of Labor 1991; Brelsford et al. 1987.

SLEETMUTE

Location and Setting - Sleetmute is located on the east bank of the Kuskokwim River approximately 260 air miles west of Anchorage and 130 air miles south of McGrath, the regional center for the upper Kuskokwim area.

Population Characteristics - In 1990 the population of Sleetmute was 106 people living in 33 households. There were 92 Native American, primarily of Yup'ik and Athapaskan descent, and 14 Whites. In 1980 the population was 107. The 1992 provisional population estimate is 105.

Estimated Subsistence Participation of Population - Sleetmute residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use is available. Moose are considered a staple, comprising a major portion of the protein consumed by Sleetmute residents. Caribou and black bear are less abundant and hence of less significance. For this reason the fall moose harvest is critical as hunters attempt to secure enough meat before slush ice forms on the rivers making travel hazardous. This is also the time when sport hunters travel to the area, and Sleetmute residents have noted that numerous small aircraft have disturbed game in the area (Charnley 1984:207). Spring waterfowl hunting is significant for Sleetmute residents for replenishing dwindling supplies of moose and caribou meat (Charnley 1984, 1983).

Employment - In Sleetmute year-round full time and part time employment is available, but there are a limited number of jobs. Many people work only seasonally and some families leave the community entirely for different periods of time. In 1982-83, 64 percent of Sleetmute households had a member holding a wage-earning job in the community.

General Patterns of Subsistence Use - The area used by Sleetmute residents includes almost the entire lengths of the Stony and Swift Rivers as well as parts of the George River and the drainages of the Holitna and Hoholitna Rivers. The heaviest concentration of subsistence activities occurs in the lower reaches of these rivers. In late August Sleetmute people focus on hunting waterfowl and big game: bear, moose and caribou. At this time most hunting takes place along the Kuskokwim River and its tributaries. If conditions are favorable, current game regulations also allow hunters to hunt caribou and moose through the month of November and again in February.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Charnley 1984, 1983.

STONY RIVER VILLAGE

Location and Setting - Stony River is located on the central Kuskokwim River, approximately 240 air miles west of Anchorage and 100 air miles from Aniak, the regional service center for the central Kuskokwim area.

Population Characteristics - In 1990 the population of Stony River was 51 people living in 19 households. There were 45 Native Americans, mainly of mixed Yup'ik and Athapaskan ancestry, and 6 Whites. In 1980 the population was 62. The 1992 provisional population estimate is 58.

Estimated Subsistence Participation of Population - Stony River residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl but no data on participation or use is available. Moose are of primary importance. The August-September moose hunt is one of the single most important activities of the entire year, as a household's livelihood depends heavily on a large supply of moose meat to see them through the winter (Kari 1985:30)

Employment - In Stony River year-round full time and part time employment are available, but there are a limited number of jobs. Many people work only seasonally. In 1983-84 at least one member of most Stony River households worked for wages part-time, full-time or seasonally (Kari 1985).

General Patterns of Subsistence Use - The residents of Stony River use an area that includes the Central Kuskokwim River from Inowak and Moose Creeks to and including the Nunsatuk and Tatlawiksuk Rivers, the lower and mid-portions of the Swift River and its tributaries (the Gagaryah and Cheenentnuk Rivers), and the lower Stony River up to Black Creek near Tishimna Lake and west to Big Lake and Muskrat Creek.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Kari 1985.

CHUATHBALUK

Location and Setting - Located on the Kuskokwim River in western Alaska, approximately 100 miles upriver from Bethel. The village lies within the Kuskokwim River floodplain and is surrounded by the low-lying foothills of the Kuskokwim Mountains. Vegetation is mostly spruce and mixed deciduous forest. A variety of wildlife species are present in the area, including moose, caribou, bear, waterfowl, wolf, and five species of salmon.

Population Characteristics - In 1990 the population of Chuathbaluk was 97 people living in 28 households. There were 10 Whites and 87 Native Americans. In 1980 the population was 105. The 1992 provisional population estimate is 120.

Estimated Subsistence Participation of Population - Chuathbaluk is heavily dependent on subsistence activities. Specific information on subsistence use is not available, but it would be reasonable to assume that subsistence activities are similar to surrounding communities, which rely on moose, caribou, and waterfowl harvest.

Employment - Employment is primarily through seasonal summer work firefighting for BLM, working at the local sawmill, or commercial fishing. The school, City, and clinic provide some year-round employment.

General Patterns of Subsistence Use - Bear, moose, and caribou are generally taken in late summer and early fall. Caribou are also hunted in November and February. Waterfowl are generally harvested during their spring and fall migrations, and salmon are taken in the summer and early fall months.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Alaska Department of Community and Regional Affairs 1995; Charnley 1984.

J.5.3 GALENA MOA

LAKE MINCHUMINA

Location and Setting - The village of Lake Minchumina is located on the northwest shore of the lake approximately 180 air miles northwest of Anchorage and 120 miles northeast of McGrath, the regional center for the upper Kuskokwim area.

Population Characteristics - According to the 1990 census there are 32 people living in 12 households. There were 26 Whites and 6 Native American. In 1980 the population was 22. The 1992 provisional population estimate is 25.

Estimated Subsistence Participation of Population - No data available. It would be reasonable to assume that general patterns of subsistence use are similar to other small communities located in the Lake Minchumina basin.

Residents of Lake Minchumina rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation are available.

Employment - No data available. It would be reasonable to assume that the employment situation is similar to other small communities located in the Lake Minchumina basin. Full time employment is limited, people rely on a combination of seasonal labor, government transfer payments and subsistence.

General Patterns of Subsistence Use - No data are available. It would be reasonable to assume that general patterns of subsistence use are similar to other small communities located in the Kuskokwim River valley. See, for example, Takotna.

Harvest Totals - No data are available.

Sources - Alaska Department of Labor 1991.

MCGRATH

Location and Setting - McGrath, the regional center for the upper Kuskokwim area, is located on the Kuskokwim River 225 air miles northwest of Anchorage.

Population Characteristics - In 1990 the population of McGrath was 528 people living in 175 households. There were 271 people were listed as White, 248 as Native American, and 15 as either Black, Asian/Pacific Islands, unknown or Hispanic. In 1980 the population was 528. The 1992 provisional population estimate is 533.

Estimated Subsistence Participation of Population - McGrath residents hunt moose, caribou, Dall sheep, bear and migratory waterfowl, but no data on participation or use is available. Moose are of primary importance to McGrath hunters as regulatory restrictions reducing bag limits and season length severely limit caribou hunting activities.

Employment - Because McGrath is the regional center, a wide variety of employment opportunities are available. The Iditarod School district is the largest employer, followed by the State of Alaska and the Federal government. The average annual income in 1982 was $16,927.

General Patters of Subsistence Use - Moose occur throughout much of the area on a year-round basis. This species is most palatable or desirable to area residents during the fall when the meat is richest. Caribou are limited in number and hunted primarily during the winter and are considered a good substitute for moose meat. Black bear are preferred during the spring and fall, although hunted throughout the year. Dall sheep are hunted during the summer by some residents of McGrath. Geese and ducks are hunted in the spring, summer and early fall.

Harvest Totals - In 1984 McGrath residents averaged one moose per household annually.

Sources - Alaska Department of Labor 1991; Stokes 1985.

NIKOLAI

Location and Setting - Nikolai is located at the junction of the South Fork of the Kuskokwim River and Little Tonzona Rivers approximately 190 air miles northwest of Anchorage and 46 miles east of McGrath the regional center for the central Kuskokwim region. The village is located in an area of low biological carrying capacity and faces chronic subsistence resource problems. To alleviate these problems, the State Board of Game created the Upper Kuskokwim Controlled Use Area of Game Management (GMU) 19.

Population Characteristics - In 1990 the population of Nikolai was 109 people living 29 households. There were 97 American Indians were listed as living in Nikolai; the majority were of Upper Kuskokwim Athapaskan descent. In 1980 the population was 91. The 1992 provisional population estimate is 91.

Estimated Subsistence Participation of Population - Nikolai residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use are available. Moose are of primary importance.

Employment - Employment opportunities include jobs as teachers aides, cooks, and maintenance persons at the local school. There are two part time health aides. The Alaska Department of Fish and Game, Division of Subsistence, provides a full-time position and the U.S. postal service operates a contract station. The average annual household income in 1979 was $5,000 per year.

General Patterns of Subsistence Use - Moose occur throughout much of the area on a year-round basis. This species is hunted both during the fall and winter. Caribou are limited in number and hunted primarily during the winter and are considered a good substitute for moose meat. Black bear are preferred during the spring and fall, although hunted throughout the year. Because of cultural taboos on black and brown bears, the meat is most often used for potlatches or fed to the dogs. Dall sheep are hunted during the summer by some residents of Nikolai. Geese and ducks are hunted in the spring, summer and early fall.

Harvest Totals - Since the mid-1960s, between 50 and 70 moose have been taken each year by Nikolai residents.

Sources - Alaska Department of Labor 1991; Stokes 1985.

RUBY

Location and Setting - Ruby is located on the north bank of the Yukon River approximately 300 air miles northwest of Anchorage and 35 air miles from Galena, the regional service center for the lower middle Yukon region.

Population Characteristics - In 1990 the total population of Ruby was 170 people. There were 42 Whites, 126 Native Americans, primarily of Athapaskan descent, and 2 Asian/Pacific Islanders. In 1980 the population was 197. The 1992 provisional population estimate is 198.

Estimated Subsistence Participation of Population - No data are available. It would be reasonable to assume that general patterns of subsistence use are similar to other small, predominately Native communities located along the Yukon River. Ruby residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation are available.

Employment - No data are available. It would be reasonable to assume that the employment situation in Ruby is similar to other small, predominately Native communities located along the Yukon River. Full time employment is limited, people rely on a combination of seasonal labor, government transfer payments and subsistence.

General Patterns of Subsistence Use - No data available. It would be reasonable to assume that general patterns of subsistence use are similar to other small, predominately Native communities located along the Yukon River. See, for example, Fort Yukon.

Harvest Totals - No data are available.

Sources - Alaska Department of Labor 1991.

TAKOTNA

Location and Setting - Takotna is located on the north bank of the Takotna River approximately 235 air miles northwest of Anchorage and 14 miles west of McGrath, the regional service center for the upper Kuskokwim region.

Population Characteristics - In 1990, the population of Takotna was listed as 38 people living in 15 households. There were 20 White people, 17 Native Americans and 1 Asian/Pacific Islander. Of the Native American households, only one is of Upper Kuskokwim Athapaskan ancestry. In 1980, the population was 48. The 1992 provisional population estimate is 37.

Estimated Subsistence Participation of Population - Takotna residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use are available. Moose are of primary importance to Takotna hunters, as regulatory restrictions reducing bag limits and season length severely limit caribou hunting activities.

Employment - A number of Takotna households derive all or part of their income from employment at the Tatalina Air Force Station. Other community residents are employed at the school either in maintenance or as teachers aides.

General Patterns of Subsistence Use - Moose occur throughout much of the area on a year-round basis. This species is most palatable or desirable to area residents during the fall when the meat is richest. Caribou are limited in number, and hunted primarily during the winter as a substitute for moose meat. Black bear are preferred during the spring and fall although hunted throughout the year. Geese and ducks are hunted in the spring, summer and early fall.

Harvest Totals - In 1984 Takotna residents averaged one moose per household annually.

Sources - Alaska Department of Labor 1991; Stokes 1985.

TELIDA

Location and Setting - Telida is located on the Swift Fork of the Kuskokwim River approximately 200 air miles northwest of Anchorage and 80 miles from McGrath the regional center of the upper Kuskokwim area. The village is located in an area of low biological carrying capacity, and faces chronic subsistence resource problems. To alleviate these problems the State Board of Game created the Upper Kuskokwim Controlled Use Area of Game Management (GMU) 19.

Population Characteristics - In 1990, the population of Telida was 11 people living in three households. Of the 11 people, 10 were listed as Native Americans, all of Upper Kuskokwim Athapaskan ancestry. In 1980, the population was 33. The 1992 provisional population estimate is 11.

Estimated Subsistence Participation of Population - Telida residents rely heavily on subsistence hunting of moose, caribou, black bear and waterfowl, but no data on participation or use are available.

Employment - There are no businesses in Telida, groceries and fuel are purchased either in McGrath or Anchorage. Employment opportunists are limited. Some residents are employed at the school either as aides or in maintenance. The clinic employees a part-time health aide and the village council occasionally hires temporary workers during the winter. Several men in the community work as assistant hunting guides.

General Patterns of Subsistence Use - Moose are the most important animals for Telida hunters. This species is most palatable or desirable to area residents during the fall when the meat is richest, but the animals are hunted throughout the year. Caribou are limited in number and hunted primarily during the winter. Black bear are preferred during the spring and fall although hunted throughout the year. Because of cultural taboos bear meat is most often used for potlatches or fed to the dogs. Geese and ducks are hunted in the spring, summer and early fall.

Harvest Totals - No current data are available.

Sources - Alaska Department of Labor 1991; Stokes 1985.

APPENDIX K

AIR QUALITY

With passage of the Clean Air Act (CAA) in 1963, the United States formally committed to the prevention, control, and abatement of air pollution. The CAA, as subsequently amended, is the basic federal legislation addressing air quality; however, it assigns primary responsibility for control of air pollutant emissions to the states. Federal regulations provide a framework within which the states develop regulatory strategies for dealing with air pollution problems within their own boundaries. Under the CAA, the U.S. Environmental Protection Agency (EPA) develops and promulgates National Ambient Air Quality Standards (NAAQS) along with other guidance and regulations. These ambient air quality standards establish maximum allowable atmospheric levels (i.e., the levels below which pollutant effects are not considered harmful) for specific pollutants. At the federal level, primary air quality standards are established to protect human health; secondary standards are established to prevent negative effects on animals, plants, structures, and materials and to protect public welfare. EPA has established NAAQS for six atmospheric criteria pollutants: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter 10-microns or less in size (PM_{10}), and lead (Pb). The NAAQS for these pollutants are depicted in Table K-1.

Table K-1 National Ambient Air Quality Standards (NAAQS)[a]

POLLUTANT	AVERAGING PERIOD	PRIMARY NAAQS	SECONDARY NAAQS	PSD Class I Increments	PSD Class II Increments
Ozone (O_3)	Daily Maximum Hourly Average	235 $\mu g/m^3$	235 $\mu g/m^3$	-	-
Carbon Monoxide (CO)	1-hour Average 8-hour Average	40 mg/m^3 10 mg/m^3	- -	- -	- -
Sulfur Dioxide (SO_2)	3-hour Maximum 24-hour Maximum Annual Arithmetic Mean	- 365 $\mu g/m^3$ 80 $\mu g/m^3$	1,300 $\mu g/m^3$ - -	25 $\mu g/m^3$ 5 $\mu g/m^3$ 2 $\mu g/m^3$	512 $\mu g/m^3$ 91 $\mu g/m^3$ 20 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	100 $\mu g/m^3$	100 $\mu g/m^3$	2.5 $\mu g/m^3$	25 $\mu g/m^3$
Particulate Matter of 10 Microns or Less (PM_{10})	24-hour Average Annual Arithmetic Mean	150 $\mu g/m^3$ 50 $\mu g/m^3$	150 $\mu g/m^3$ 50 $\mu g/m^3$	8 $\mu g/m^3$ 4 $\mu g/m^3$	30 $\mu g/m^3$ 17 $\mu g/m^3$
Lead (Pb)	Annual Quarterly Average	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	-	-

Notes: [a] Standards, other than those for O_3 and PM_{10}, are not to be exceeded more than once per year. For O_3 and PM_{10}, compliance is determined by the number of days on which the respective standard is exceeded. The 3-year running average of the number of exceedances is not to exceed 1.0.

Sources: 40 CFR 50, 51; 18 AAC 50.

The states must develop State Implementation Plans (SIPs) for controlling emissions to meet the NAAQS. States may choose to implement standards that are more stringent than the NAAQS, but not less. Stricter standards are usually imposed when a state is experiencing a particularly severe air pollution problem not adequately addressed by the national standards. For practical reasons of enforcement, emission control standards are frequently established instead of or in addition to ambient air quality standards; but emission standards are enforced to achieve air quality standards. Emissions from both stationary (power plants and other industrial facilities) and mobile (vehicular) sources are regulated. States usually require permits for the construction, modification, and operation of stationary emission sources. These permits may require performance testing and periodic or continuous emission monitoring to ensure compliance with emission standards. Most states also attempt to control mobile source emissions through annual vehicle emission inspection and certification programs.

Air pollutants are categorized as either primary or secondary. Primary pollutants (e.g., sulfur dioxide, particulate matter, and nitrogen oxides) are emitted from an identifiable source. Secondary pollutants are formed in the atmosphere by chemical reactions involving primary pollutants (e.g., ozone, formed by photochemical reactions involving NO_2 and intense, short-wavelength, radiant energy from the sun). In the United States, the principle primary and secondary air pollutants are particulate matter, sulfur dioxide, carbon monoxide, nitrogen oxides, hydrocarbons, lead, and ozone. These are the pollutants most pervasive in urban centers, where the population is concentrated. Pollutant emissions come from the following sources:

- Natural sources (particulate matter, gases)
- Domestic sources (CO, CO_2, NO_x, SO_x, particulate matter)
- Commercial sources (hydrocarbons, chlorines)
- Agricultural sources (particulate matter, nitrogen oxides)
- Industrial sources (NO_x, SO_x, hydrocarbons, carbon monoxide, particulate matter, hydrogen sulfide, lead)
- Transportation-related sources (hydrocarbons, NO_x, carbon monoxide, SO_x, particulate matter, lead).

Under the CAA, areas with levels of criteria pollutants below the adopted maximum are considered to be "in attainment" with the air quality standards. If an area fails to meet any of the standards for more than three times (on separate days) at any point during a three calendar year period, it is classified as a "nonattainment" area for the pollutant or pollutants. An area is "unclassified" if there is insufficient data to determine its status. These areas are considered to be in compliance with NAAQS.

In addition to the standards developed for the nation's air quality as a whole, Prevention of Significant Deterioration (PSD) Class I air quality areas were designated under the CAA amendments of 1977. These areas were designated by Congress to protect wildernesses, national parks, and other areas by maintaining pristine air quality in those areas with more stringent air quality standards. New or modified emission sources may use up to approximately 10 percent of the NAAQS. Four PSD Class I areas have been designated within the state of Alaska: Denali National Park, Tuxedni National Wilderness Area, Bering Sea (St. Matthews Island) National Wilderness Area, and Simeonof National Wilderness Area. PSD Class I areas also are protected from visibility degradation. Fine particulate matter and sulfur dioxide (SO_2) in combination with humidity contribute to diminished visibility. Visibility concerns include degradation of contrast and visual range and increases in air coloration. In areas where air temperatures fall below minus 40 degrees Fahrenheit, the development of ice fog occurs as the result of the operation of combustion engines, including both aircraft and motor vehicles.

Areas not classified as Class I areas are classified as Class II or Class III areas, depending on a state's land management objectives. There are no Class III areas in Alaska. These classifications allow a higher degree of air quality degradation, and thus, more intensive land uses, than does Class I. Most of the country is classified as Class II, which permits urban development, including industry. PSD air pollutant limits and significant emissions levels are provided in Table K-1.

The 1990 amendments to the CAA include requirements for conformity of federal actions with the appropriate State Implementation Plan's "purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards." Section 176 of the CAA requires federal agencies proposing an action not specifically exempted from compliance must make a determination of conformity with the applicable SIP that "examines the impacts of the direct and indirect emissions from the federal action."

At the present time, these requirements are applicable only to federal actions proposed for nonattainment or maintenance areas. Actions are considered to be in conformity if they would not:

- Cause or contribute to any new violation of any standard in any area;
- Increase the frequency or severity of any existing violation of any standard in any area; or
- Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

REFERENCES

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APPENDIX L

CULTURAL RESOURCES: SECTION 106 (NHPA) CORRESPONDENCE

This appendix contains all correspondence regarding consultation with the Alaska State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation per Section 106 of the National Historic Preservation Act (NHPA).

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received

SPECTRUM
SCIENCES & SOFTWARE, INC.

February 4, 1994

Ms. Judith Bittner
Alaska State Historic Preservation Officer
Office of History and Archaeology
Division of Parks & Outdoor Recreation
Department of Natural Resources
P.O. Box 107001
Anchorage, AK 99510

Subject: Request for Concurrence with Determination of No Adverse Effect with Regard to the Air Force Military Operations Area Airspace Proposal

Dear Ms. Bittner:

Spectrum Sciences and Software, Inc., has been contracted by the U.S. Air Force to prepare an Environmental Impact Statement (EIS) for an action proposed by Headquarters, Pacific Air Forces, to be conducted in Alaska under the auspices of 11th Air Force. Susan Means and I (of Spectrum) met with you and Mr. Tim Smith on September 8, 1993, to discuss the potential effects of this proposal with regard to cultural resources.

Enclosed is a detailed description of the Proposed Action and Alternatives (Proposal). The heart of the Proposal is the conversion in Alaska of temporary Miliary Operations Area (MOA) airspace to permanent MOA airspace. The Proposal does not include any construction or other ground-disturbing activities (i.e., there would be no change to the existing ground activities at any of the ranges or bases). Please note the addition of Alternative B which would affect an area in vicinity of Tok, Alaska. This alternative has been added since our September meeting.

Also enclosed please find a Preliminary Determination of No Adverse Effect, per Section 106 of the National Historic Preservation Act, to Alaska's cultural resources due to the activities described in the Proposal. This letter requests your concurrence with the Determination. Unless the scope of the Proposal changes during the course of the EIS process, and per Section 106 of the National Historic Preservation Act, your concurrence will be considered final and no further analysis of the potential effects to cultural resources by the Proposal will be undertaken. In the event of change of scope or a response of nonconcurrence, consultation will continue. Please advise me if the Air Force should notify the Advisory Council on Historic Preservation of this determination.

All correspondence associated with this consultation will be included in the Administrative Record of the EIS. The Draft EIS is scheduled for release on September 2, 1994. In order to include in the Draft EIS this determination and your concurrence therewith (or resolution of non-concurrence with this determination, if necessary), receipt of your response is requested no later than April 1, 1994. If you have any questions regarding the proposed

242 Vicki Leigh Road
Ft. Walton Beach, FL 32547
(904) 862-3031
FAX (904) 862-8111

USU Research & Technology Park
1780 N. Research Parkway, Suite 106
Logan, UT 84321
(801) 753-8933
FAX (801) 753-8934

1827 Powers Ferry Rd.,
Building 20, Suite 225
Marietta, GA 30067
(404) 951-2181
FAX (404) 951-2187

1007 West 3rd Avenue
Suite 301
Anchorage, AK 99501
(907) 276-4408
FAX (907) 276-4453

535-A East Braddock Rd.,
Alexandria, VA 22314
(703) 684-2905
FAX (703) 684-2908

action or alternatives, or regarding this request, please feel free to contact me at (907) 276-4408. Your response may be directed to me at Spectrum's Anchorage office address, given below.

Sincerely,

Karen McKibbin

Karen McKibbin
Spectrum Sciences and Software, Inc.

Enclosures
Draft Description of the Proposed Action and Alternatives
Preliminary Determination of No Adverse Effect

cc: Major G. Virgil Hanson, 11AF/LGV
Mr. William Ham, Spectrum
Captain Buddy Briesmaster, AFCEE/ESEM

2

Environmental Impact Statement
for
Improvements to Military Operations Areas
in Alaska

PRELIMINARY DETERMINATION OF NO ADVERSE EFFECT TO CULTURAL RESOURCES

Pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 USC 470), and according to the regulations governing Section 106, 36 CFR Part 800 "Protection of Historic Properties," a preliminary determination is made of No Adverse Effect to cultural resources due to the implementation of the Pacific Air Forces' Proposal for Improvements to Military Operations Areas in Alaska (Proposal).

1. Description of the undertaking.

The undertaking consists of a proposal to restructure Military Operations Area (MOA) airspace in Alaska. *Please see attached Description of the Proposed Action and Alternatives (DOPAA) for a complete description of the Proposal.* The following items have been consolidated from the Proposal because of their relevancy to the subject Determination:

a) The Proposal is limited to structuring (location, dimensions, etc.) and Air Force use of MOA airspace. There would be no ground disturbance associated with the Proposal (i.e., no construction of new buildings or facilities, or alteration of existing buildings or facilities).
b) Supersonic activity would not occur below 5,000 feet AGL within any of the MOAs.
c) Intentional flare deployment would not occur below 2,000 feet AGL, an altitude designated to allow complete flare burnout prior to contact with the ground or vegetation.

2. Description of historic properties that may be affected by the undertaking.

Due to the extensive area affected by the Proposal, it would be infeasible to identify all historic properties in the Region of Influence. It is reasonable to conclude that the MOAs as described would overlay lands that contain a number of historic properties (cultural resources) already listed in or eligible for the Register of National Historic Places (Register). Such properties or resources may include surface and subsurface prehistoric sites; above-ground historic structures such as sod, log, and frame buildings and Cold War Era sites; and historic and prehistoric trails, including the Iditarod National Historic Trail. To date, there have been no traditional Native use sites identified.

3. **Description of the efforts used to identify historic properties.**

The range and extent of cultural resources that might be affected by the Proposal were determined through preliminary consultation with the State Historic Preservation Officer (SHPO) (September 8, 1993); agency, local government, and public scoping meetings for the Environmental Impact Statement; review of agencies' resource management and cultural resource management plans; and review of various literature that describes Alaska's cultural resources.

4. **How and why the Criteria of Adverse Effect were found inapplicable.**

a) There would be no direct physical destruction, damage, or alteration to any part of a property. The possibility for indirect damage is considered to be remote. It can be speculated that indirect damage such as window breakage or structural damage from sonic booms or noise vibration could occur. However, low-altitude [(below 5,000 feet above ground level (AGL)] supersonic flight would not occur under any Proposal alternatives, therefore minimizing the possibility for such damage. Air Force Regulation 60-16 also prohibits military aircraft from flying below 500 feet (AGL) over structures. It is highly improbable that a fire would be started by a flare and subsequently damage or destroy historic properties. Intentional deployment of flares would not occur below 2,000 thousand feet, an altitude designated to allow complete flare burnout prior to contact with the ground or vegetation.
b) There would be no isolation of a property from its setting or alteration of the character of the property's setting where that character contributes to the property's qualifications for the Register.
c) There would be introduction of audible and visual elements. However, these intrusions would be transitory in nature and would only momentarily alter the natural setting of a property or properties. Such temporary alteration of the noise environment would not harm the integrity of the resource setting.
d) Implementation of this Proposal or its alternatives would not result in the neglect of any properties, and therefore would not contribute to the deterioration or destruction of any properties;
e) There is no transfer, sale, or lease of any properties involved with this Proposal or any alternatives.

5. **Views of the SHPO, other agencies, governments, and the public and a description of the means employed to solicit these views.**

a) Views of the SHPO, other agencies, governments, and the public indicated a broad, general concern for cultural resources. However, no specific cultural resource or historic property was identified that was considered to be threatened by implementation of the

Proposed Action or Alternatives. It was the preliminary conclusion of scoping that the Proposal was unlikely to have significant adverse effects to cultural resources.

b) Pursuant to the National Environmental Policy Act (40 CFR 1501.7), views were solicited during the Environmental Impact Statement scoping process. Scoping meetings were held to inform agencies and the public of the Proposal and to solicit input and identify concerns. Federal and state agency scoping meetings were held with the Alaska Departments of Natural Resources, Fish and Game, and Community and Regional Affairs; and the United States Fish and Wildlife Service, National Park Service, Bureau of Land Management, and Bureau of Indian Affairs. Public scoping meetings were held in fourteen communities, and public input was solicited through a mail-out brochure and survey form. Meetings were also held with local governments, public interest organizations, and other groups, including the Alaska Congressional delegation, Tanana Chiefs Conference, and the Fairbanks North Star Borough. Additionally, the SHPO was consulted in a separate meeting to discuss the possible effects that might occur to cultural resources due to the Proposed Action or Alternatives.

Conclusion.

As outlined above, it is not anticipated that implementation of any alternative of the proposal to restructure military operations areas in Alaska would change in any way the characteristics that qualify properties in the Region of Influence for inclusion in the Register. The undertaking would not diminish the integrity of such characteristics. Therefore, this Preliminary Determination of No Adverse Effect is made.

This Preliminary Determination will be made final upon receipt of concurrence from the SHPO. If the SHPO does not concur with this finding, consultation with the SHPO will continue until resolution is achieved. If for any reason the nature of the Proposal changes during the regular course of the Environmental Impact Statement process, further consultation with the SHPO and with the public and other agencies would occur.

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS AND OUTDOOR RECREATION
Office of History and Archaeology

WALTER J. HICKEL, GOVERNOR

3601 C STREET, Suite 1278
ANCHORAGE, ALASKA 99503
PHONE: (907) 762-2622

MAILING ADDRESS:
P.O. Box 107001
ANCHORAGE, ALASKA 99510-7001

February 28, 1994

received
1 Mar 94

File No.: 3130-1R USAF

Subject: Improvements to Military Operations Areas in Alaska/EIS

Karen McKibbin, Project Manager
Spectrum Sciences & Software, Inc.
1007 W. 3rd Ave., Suite 301
Anchorage, AK 99501

Dear Ms. McKibbin;

Thank you for your letter and determination of effect for the referenced project. We concur with your finding that the undertaking will have no adverse effect on properties listed on or eligible for inclusion in the National Register of Historic Places.

The Advisory Council on Historic Preservation should be notified of this consultation pursuant to 36 CFR 800.5(d)(1)(i). Please contact Tim Smith at 762-2625 if there are any questions or if we can be of further assistance.

Sincerely,

Judith E. Bittner
State Historic Preservation Officer

JEB:tas

Environmental Impact Statement
for
Improvements to Military Operations Areas
in Alaska

DETERMINATION OF NO ADVERSE EFFECT TO CULTURAL RESOURCES

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c) Intentional flare deployment would not occur below 2,000 feet AGL, an altitude designated to allow complete flare burnout prior to contact with the ground or vegetation.

2. **Description of historic properties that may be affected by the undertaking.**

Due to the extensive area affected by the Proposal, it would be infeasible to identify all historic properties in the Region of Influence. It is reasonable to conclude that the MOAs as described would overlay lands that contain a number of historic properties (cultural resources) already listed in or eligible for the Register of National Historic Places (Register). Such properties or resources may include surface and subsurface prehistoric sites; above-ground historic structures such as sod, log, and frame buildings and Cold War Era sites; and historic and prehistoric trails, including the Iditarod National Historic Trail. To date, there have been no traditional Native use sites identified.

3. **Description of the efforts used to identify historic properties.**

The range and extent of cultural resources that might be affected by the Proposal were determined through preliminary consultation with the State Historic Preservation Officer

(SHPO) (September 8, 1993); agency, local government, and public scoping meetings for the Environmental Impact Statement; review of agencies' resource management and cultural resource management plans; and review of various literature that describes Alaska's cultural resources.

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c) There would be introduction of audible and visual elements. However, these intrusions would be transitory in nature and would only momentarily alter the natural setting of a property or properties. Such temporary alteration of the environment would not harm the integrity of the resource setting.
d) Implementation of this Proposal or its alternatives would not result in the neglect of any properties, and therefore would not contribute to the deterioration or destruction of any properties;
e) There would be no transfer, sale, or lease of any properties involved with this Proposal or any alternatives.

5. Views of the SHPO, other agencies, governments, and the public and a description of the means employed to solicit these views.

a) Views of the SHPO, other agencies, governments, and the public indicated a broad, general concern for cultural resources. However, no specific cultural resource or historic property was identified that was considered to be threatened by implementation of the Proposed Action or Alternatives. It was the preliminary conclusion of scoping that the Proposal was unlikely to have significant adverse effects to cultural resources.

b) Pursuant to the National Environmental Policy Act (40 CFR 1501.7), views were solicited during the Environmental Impact Statement scoping process. Scoping meetings were held to inform agencies and the public of the Proposal and to solicit input and identify concerns. Federal and state agency scoping meetings were held with the Alaska Departments of

Natural Resources, Fish and Game, and Community and Regional Affairs; and the United States Fish and Wildlife Service, National Park Service, Bureau of Land Management, and Bureau of Indian Affairs. Public scoping meetings were held in fourteen communities, and public input was solicited through a mail-out brochure and survey form. Meetings were also held with local governments, public interest organizations, and other groups, including the Alaska Congressional delegation, Tanana Chiefs Conference, and the Fairbanks North Star Borough. Additionally, the SHPO was consulted separately to discuss the possible effects that might occur to cultural resources due to the Proposed Action or Alternatives.

Conclusion.

As outlined above, it is not anticipated that implementation of any alternative of the proposal to restructure military operations areas in Alaska would change in any way the characteristics that qualify properties in the Region of Influence for inclusion in the Register. The undertaking would not diminish the integrity of such characteristics. Therefore, this Determination of No Adverse Effect is made.

This Determination has been made final upon receipt of concurrence from the SHPO (see attached letter, February 28, 1994). If for any reason the nature of the Proposal changes during the regular course of the Environmental Impact Statement process, further consultation with the SHPO and with the public and other agencies will occur.

HQ ELEVENTH AIR FORCE (PACAF)
ELMENDORF AFB AK 99506-2150

12 April 1994

11 AF/LGV
5800 G Street Suite 203
Elmendorf AFB AK 99506-2150

Ms Claudia Nissley
Western Office of Project Review
Advisory Council on Historic Preservation
730 Simms Street Room 401
Golden CO 80401

Dear Ms Nissley

In accordance with the provisions of Title 36 CFR 800.5(d)(1)(i), this letter notifies the Advisory Council on Historic Preservation (Council) of the consultation between the Pacific Air Forces, Eleventh Air Force, and the Alaska State Historic Preservation Officer (SHPO) regarding the Air Force Proposal to Restructure Military Operations Areas in Alaska (Proposal) and associated Determination of No Adverse Effect to Cultural Resources (Determination).

Consultation regarding potential effects to cultural resources included meetings with the SHPO and other agencies. The following documents are enclosed for your information and records:

a) Eleventh Air Force Preliminary Determination of No Adverse Effect to Cultural Resources and request for SHPO concurrence with Determination (Letter of 4 Feb 94 [Attachment 1])

b) SHPO concurrence with determination (Letter of 28 Feb 94 [Atch 2]).

c) The Final Determination of No Adverse Effect to Cultural Resources (Atch 3) which includes a brief description of the undertaking; a brief summary of the historic properties subject to effect; and a brief explanation of why the undertaking will have no adverse effect on the historic properties involved.

d) Map showing the Proposal Areas within the State of Alaska (Atch 4).

The Determination and associated correspondences will be published and available for public inspection in the *Draft* Environmental Impact Statement (EIS). The Draft EIS is presently scheduled to be published on or before 2 September 1994.

If there are any questions, please contact Mr James W. Hostman, 11 AF/LGV, at 907-552-4151.

G. VIRGIL HANSON, Major, USAF
Chief, Environmental Management

Attachments:
1. Spectrum Letter of 4 Feb 94
2. Final Determination of No Adverse Effect
3. SHPO Concurrence letter, 28 Feb 94
4. Map of Proposed Action

Advisory
Council On
Historic
Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

Reply to: 730 Simms Street, #401
Golden, Colorado 80401

May 17, 1994

G. Virgil Hanson, Major, USAF
Chief, Environmental Management
HQ Eleventh Air Force (PACAF)
11 AF/LGV
5800 G. Street, Suite 203
Elmendorf Air Force Base, AK 99506-2150

REF: No Adverse Effect determination for the reconstruction of Military Operations Areas in Alaska

Dear Major Hanson:

We have reviewed the documentation regarding your no adverse effect determination for the above referenced undertaking. Under procedures set forth in 36 CFR Section 800.5(d)(2), the Council does not object to the finding of no adverse effect. This letter evidences that the requirements of Section 106 of the National Historic Preservation Act and the Council's regulations have been met for this project. It should be retained with all supporting documentation in your agency's environmental or project file.

If you have any questions or require the further assistance of the Council, please contact the Western Office at (303) 231-5320.

Sincerely,

Claudia Nissley
Director, Western Office
of Review

received
May 27, 1994

RECEIVED
MAY 26 1994

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APPENDIX M

Selected Big Game Species 1991-1992 Harvest Data

The Alaska Department of Fish and Game (ADF&G) administers the state's Game Management Units (GMUs), and oversees the harvest of game species in them. The tables in this Appendix present harvest data for selected big game and furbearing species in the GMUs underlying the four regions of the project area. It is important to note that the GMUs listed may not be completely located beneath the associated MOAs, and in most cases are not. It is also important to keep in mind that all animals reported harvested in a GMU may not have been taken in the area underlying the associated MOA, and, again, in most instances were not. The percentage figures have been rounded to the nearest whole number.

Maps depicting the existing and proposed MOAs and the Game Management Subunits are provided at the end of this Appendix (Figures M-1 through M-3). These maps show the MOA and GMU boundaries and designations along with the names of communities in each region. Background data, such as rivers and roads, are not shown, but this information is depicted on numerous other maps throughout the EIS.

M.1 Northern Interior Region MOAs

Table M-1 1991-1992 Species Harvest Data for the Northern Interior Region

SPECIES	Total Animals Reported Harvested by Game Management Subunit[1]						TOTAL REPORTED HARVEST (Approximate Percentage of Statewide Harvest)[2]
	20B	20D	20E	25B	25C	25D	
	YUKON 1, 6	YUKON 1	YUKON 3, 4	YUKON 4	YUKON 2	YUKON 2, 4, 5	
Black Bear	101	10	7	0	3	1	122 (8%)
Brown Bear	8	5	11	0	0	1	25 (2%)
Caribou[4]	A	A,B,D	A	C	A,C,D	C,D	618 (7%)
Moose	493	144	91	32	46	43	849 (12%)
Dall Sheep	2	53	6	0	2	0	63 (4%)
Wolf[5]	56	11	19	13	7	19	125 (11%)
Wolverine[5]	8	12	9	19	2	7	57 (10%)

Source: Alaska Department of Fish and Game. 1993. *Alaska Wildlife Harvest Summary: 1991-1992.*

[1]A GMU subunit may not be completely located beneath the MOA; all animals reported harvested in a GMU may not have been taken in the area underlying the MOA.
[2]Rounded to the nearest whole number.
[3]"*" means species is not hunted in this GMU.
[4]Caribou harvest information is reported by herd rather than by Game Management Unit. Applicable herd summaries are presented in Table M-2 below.
[5]Harvested by hunting or trapping.

Table M-2 1991-1992 Reported Harvest Data for Caribou Herds in the Northern Interior Region

Code	Herd	Airspace	Total Reported Harvest	Est. Harvest (High)
A	Fortymile	YUKON 1, 2, 3, 4, 6	445	506
B	Macomb	YUKON 1	50	50
C	Porcupine	YUKON 2, 4, 5	104	104
D	White Mountains	YUKON 1, 2, 4, 5	19	19

M.2 Southern Interior Region MOAs

Table M-3 1991-1992 Species Harvest Data for the Southern Interior Region

SPECIES	Total Animals Reported Harvested by Game Management Subunit[1]			
	20A	20B	20D	TOTAL REPORTED HARVEST (Approximate Percentage of Statewide Harvest)[2]
	CLEAR CREEK, EIELSON, BIRCH	CLEAR CREEK, BIRCH, FALCON	BUFFALO	
Black Bear	33	101	10	144 (9%)
Brown Bear	14	8	5	27 (2%)
Bison	*[3]		93	93 (72%)
Caribou[4]	A	B	B,C,D	816 (9%)
Moose	382	493	144	1,019 (15%)
Dall Sheep	109	2	53	164 (11%)
Wolf[5]	67	56	11	134 (12%)
Wolverine[5]	15	8	12	35 (6%)

Source: Alaska Department of Fish and Game. 1993. *Alaska Wildlife Harvest Summary: 1991-1992.*

[1]A GMU subunit may not be completely located beneath the airspace; all animals reported harvested in a GMU may not have been taken in the area underlying the MOA.
[2]Rounded to the nearest whole number.
[3]"*" means species is not hunted in this Game Management Unit.
[4]Caribou harvest information is reported by herd rather than by Game Management Unit. Applicable herd summaries are presented in Table M-4 below.
[5]Harvested by hunting or trapping.

Table M-4 1991-1992 Reported Harvest Data for Caribou Herds in the Southern Interior Region

Code	Herd	Airspace	Total Reported Harvest	Est. Harvest (High)
A	Delta and Yanneri	EIELSON, BIRCH, CLEAR CREEK	302	452
B	Fortymile	BIRCH, CLEAR CREEK, FALCON, BUFFALO	445	506
C	Macomb	BUFFALO	50	50
D	White Mountains	BUFFALO	19	19

M.3 SUSITNA MOA

Table M-5 1991-1992 Species Harvest Data for the SUSITNA MOA

SPECIES	Total Animals Reported Harvested by Game Management Subunit[1]		
	16A	16B	TOTAL REPORTED HARVEST (Approximate Percentage of Statewide Harvest)[2]
Black Bear	41	109	150 (9%)
Brown Bear	12	56	68 (5%)
Bison	*[3]	*	0
Caribou[4]	Rainy Pass Herd		67 (<1%)
Moose	138	262	400 (6%)
Dall Sheep	1	14	15 (1%)
Wolf[5]	2	3	5 (<1%)
Wolverine[5]	2	19	21 (4%)

Source: Alaska Department of Fish and Game. 1993. *Alaska Wildlife Harvest Summary: 1991-1992.*

[1]A subunit may not be completely located beneath the airspace; all animals reported harvested in a GMU may not have been taken in the area underlying the MOA.
[2]Rounded to the nearest whole number.
[3]"*" means species is not hunted in this Game Management Unit.
[4]Caribou harvest information is reported by herd rather than by Game Management Unit.
[5]Harvested by hunting or trapping.

M.4 FOX MOA (FOX 1 TMOA)

Table M-6 1991-1992 Species Harvest Data for the FOX 1 TMOA

SPECIES	Total Animals Reported Harvested by Game Management Subunit[1]				
	13A	13B	13E	20A	TOTAL REPORTED HARVEST (Approximate Percentage of Statewide Harvest)[2]
Black Bear	4	4	22	33	63 (4%)
Brown Bear	15	7	42	14	78 (6%)
Bison	*[3]	*	*	*	0
Caribou[4]	Nelchina Herd				2,956 (33%)
	Delta and Yannert Herds				302 (4%)
	TOTAL				3,258 (37%)
Moose	120	221	181	382	904 (13%)
Dall Sheep	42	4	22	109	177 (12%)
Wolf[5]	23	26	44	67	160 (14%)
Wolverine[5]	4	1	16	15	36 (6%)

Source: Alaska Department of Fish and Game. 1993. *Alaska Wildlife Harvest Summary: 1991-1992.*

[1]A subunit may not be completely located beneath the airspace; all animals reported harvested in a GMU may not have been taken in the area underlying the MOA.
[2]Rounded to the nearest whole number.
[3]"*" means species is not hunted in this Game Management Unit;
[4]Caribou harvest information is reported by herd rather than by Game Management Unit.
[5]Harvested by hunting or trapping.

M.5 Proposed TANANA MOA (FOX 2 TMOA)

Table M-7 1991-1992 Species Harvest Data for the FOX 2 TMOA and Proposed TANANA MOA

SPECIES	Total Animals Reported Harvested by Game Management Subunit[1]					
	12	13B	13C	20D	20E	TOTAL REPORTED HARVEST (Approximate Percentage of Statewide Harvest)[2]
Black Bear	18	4	7	10	7	46 (3%)
Brown Bear	9	7	5	5	11	37 (3%)
Bison	*[3]	*	*	93	*	93 (72%)
Caribou[4]	Chisana Herd					0
	Fortymile Herd					445 (5%)
	Macomb Herd					50 (<1%)
	Mentasta Herd					26 (<1%)
	Nelchina Herd					2,956 (33%)
	TOTAL					3,477 (40%)
Moose	110	221	90	144	91	656 (9%)
Dall Sheep	324	4	7	53	6	394 (27%)
Wolf[5]	32	26	11	11	19	99 (9%)
Wolverine[5]	27	1	3	12	9	52 (9%)

Source: Alaska Department of Fish and Game. 1993. *Alaska Wildlife Harvest Summary: 1991-1992.*

[1]A subunit may not be completely located beneath the airspace; all animals reported harvested in a GMU may not have been taken in the area underlying the MOA.
[2]Rounded to the nearest whole number.
[3]"*" means species is not hunted in this Game Management Unit;
[4]Caribou harvest information is reported by herd rather than by Game Management Unit.
[5]Harvested by hunting or trapping.

M.6 NAKNEK 1 and 2 MOAs

Table M-8 1991-1992 Species Harvest Data for the NAKNEK 1 and 2 MOAs

SPECIES	Total Animals Reported Harvested by Game Management Subunit[1]			
	9B	17B	17C	TOTAL REPORTED HARVEST (Approximate Percentage of Statewide Harvest)[2]
Black Bear	n/a[3]	2	n/a	2 (<1%)
Brown Bear	34	32	10	76 (5%)
Bison	*[4]	*	*	0
Caribou[5]	Mulchatna Herd			1,936 (22%)
Moose	57	172	85	314 (4%)
Dall Sheep	2	*	*	2 (<1%)
Wolf[6]	27	34	3	64 (6%)
Wolverine[6]	22	39	9	70 (12%)

Source: Alaska Department of Fish and Game. 1993. *Alaska Wildlife Harvest Summary: 1991-1992.*

[1]A subunit may or may not be completely located beneath the airspace; all animals reported harvested in a GMU may not have been taken in the area underlying the MOA.
[2]Rounded to the nearest whole number.
[3]"n/a" means no data was available.
[4]"*" means species is not listed as hunted in this Game Management Subunit.
[5]Caribou harvest information is reported by herd rather than by Game Management Unit.
[6]Harvested by hunting or trapping.

M.7 STONY A and B MOAs and STONY C TMOA

Table M-9 1991-1992 Species Harvest Data for the STONY A and B MOAs and STONY C TMOA

SPECIES	Total Animals Reported Harvested by Game Management Subunit[1]						
	19A	19B	19C	19D	16B	21A	TOTAL REPORTED HARVEST (Approximate Percentage of Statewide Harvest)[2]
Black Bear	n/a[3]	6	3	2	109	n/a	120 (7%)
Brown Bear	3	17	9	2	56	0	87 (6%)
Bison	*[4]	*	36	*	*	*	36 (28%)
Caribou[5]	Beaver Mountains Herd						13 (<1%)
	Big River Herd						63 (<1%)
	Mulchatna Herd						1,936 (22%)
	Rainy Pass Herd						67 (<1%)
	Sunshine Mountains Herd						0
	Tonzona Herd						36 (<1%)
	Kuskokwim Mountains Herd						n/a
	TOTAL						2,115 (24%)
Moose	137	102	129	102	262	137	869 (12%)
Dall Sheep	*	5	114	0	14	*	133 (9%)
Wolf[6]	20	20	39	16	3	7	105 (9%)
Wolverine[6]	5	14	27	8	19	9	82 (14%)

Source: Alaska Department of Fish and Game. 1993. *Alaska Wildlife Harvest Summary: 1991-1992.*

[1]A subunit may or may not be completely located beneath the airspace; all animals reported harvested in a GMU may not have been taken in the area underlying the MOA.
[2]Rounded to the nearest whole number.
[3]"n/a" means no data was available.
[4]"*" means species is not listed as hunted in this GMU.
[5]Caribou harvest data is reported by herd rather than by GMU.
[6]Harvested by hunting or trapping.

M.8 GALENA MOA

Table M-10 1991-1992 Species Harvest Data for the GALENA MOA

SPECIES	Total Animals Reported Harvested by Game Management Subunit[1]			
	21A	**21B**	**21D**	**TOTAL REPORTED HARVEST (Approximate Percentage of Statewide Harvest)[2]**
Black Bear	n/a[3]	4	1	5 (<1%)
Brown Bear	0	0	1	1 (<1%)
Bison	*[4]	*	*	0
Caribou[5]	Beaver Mountains Herd			13 (<1%)
	Galena Mountain Herd[6]			3 (<1%)
	Sunshine Mountains Herd			0
	Western Arctic Herd			1,346 (15%)
	Wolf Mountain Herd[6]			3 (<1%)
	TOTAL			1,362 (15%)
Moose	137	65	303	505 (7%)
Dall Sheep	*	*	*	0
Wolf[7]	7	10	29	46 (4%)
Wolverine[7]	9	4	8	21 (4%)

Source: Alaska Department of Fish and Game. 1993. *Alaska Wildlife Harvest Summary: 1991-1992.*

[1]A subunit may or may not be completely located beneath the airspace; all animals reported harvested in a GMU may not have been taken in the area underlying the MOA.
[2]Rounded to the nearest whole number.
[3]"n/a" means no data was available.
[4]"*" means species is not listed as hunted in this Game Management Subunit.
[5]Caribou harvest data is reported by herd rather than by GMU.
[6]Galena Mountain, Ray Mountains, and Wolf Mountains herds comprise the Kokrines Herd.
[7]Harvested by hunting or trapping.

Figure M-1 Game Management Units in the Eastern Region (Proposed Action and Alternatives A and B)

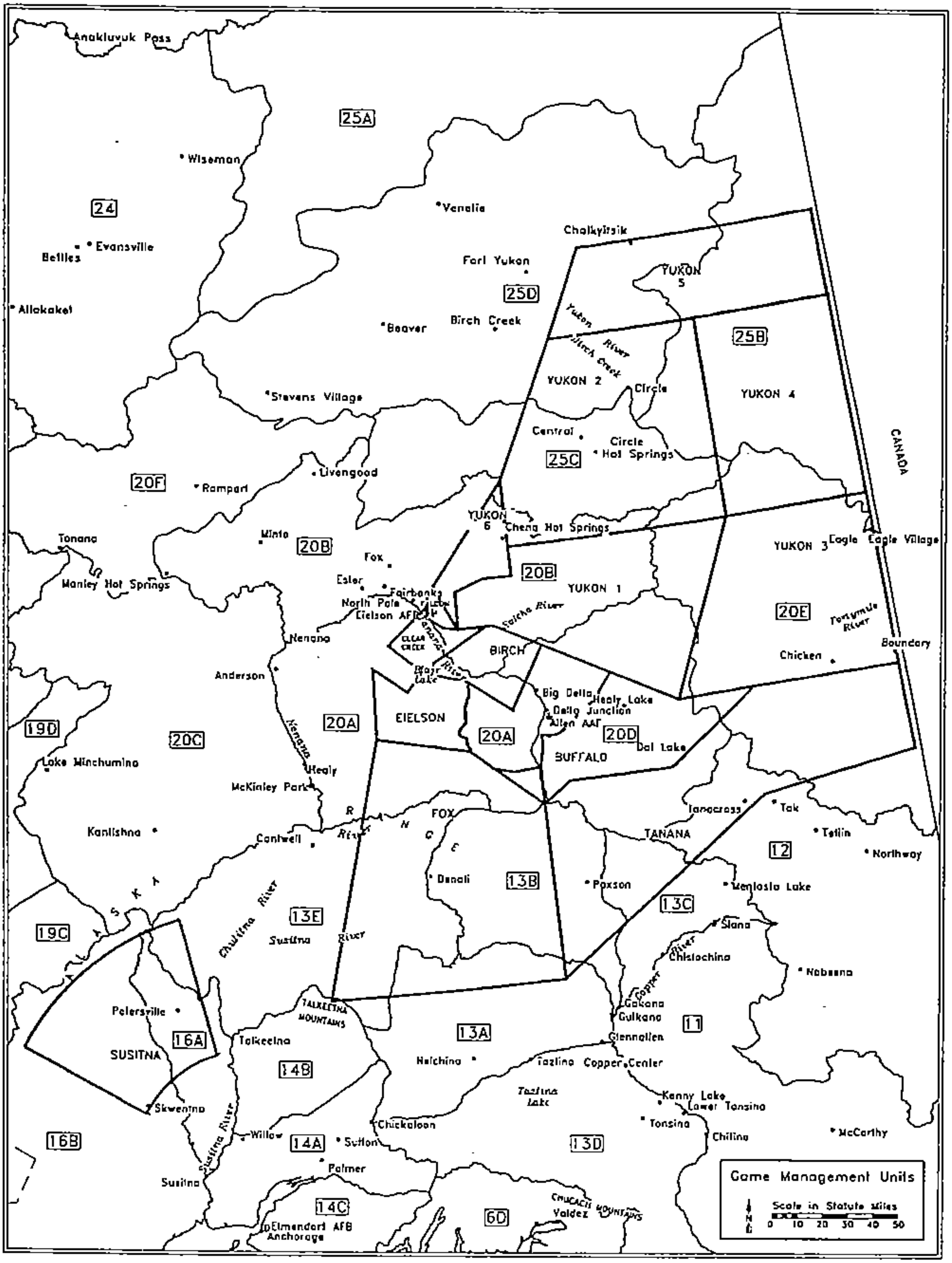


Figure M-2 Game Management Units in the Eastern Region (No Action Alternative)

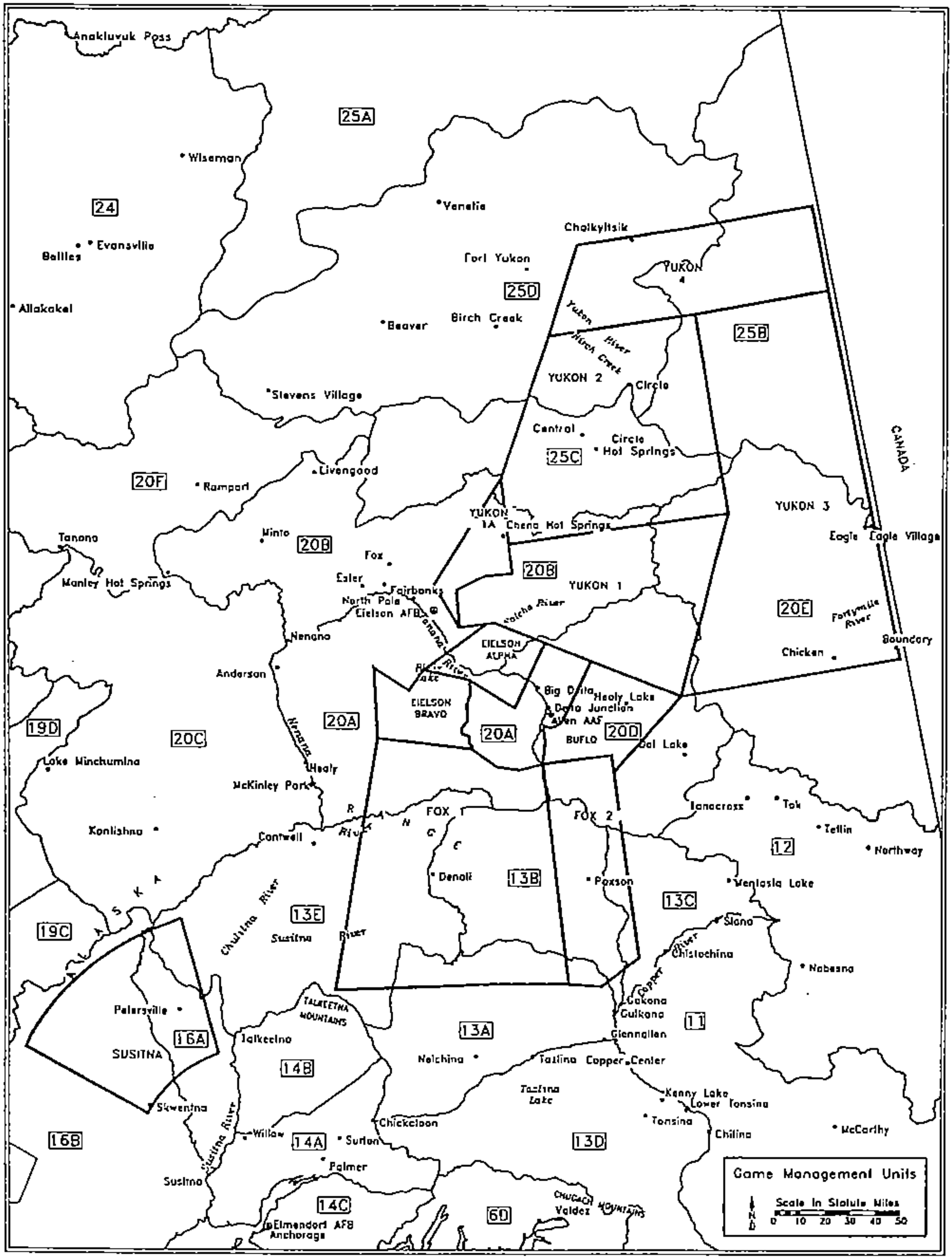
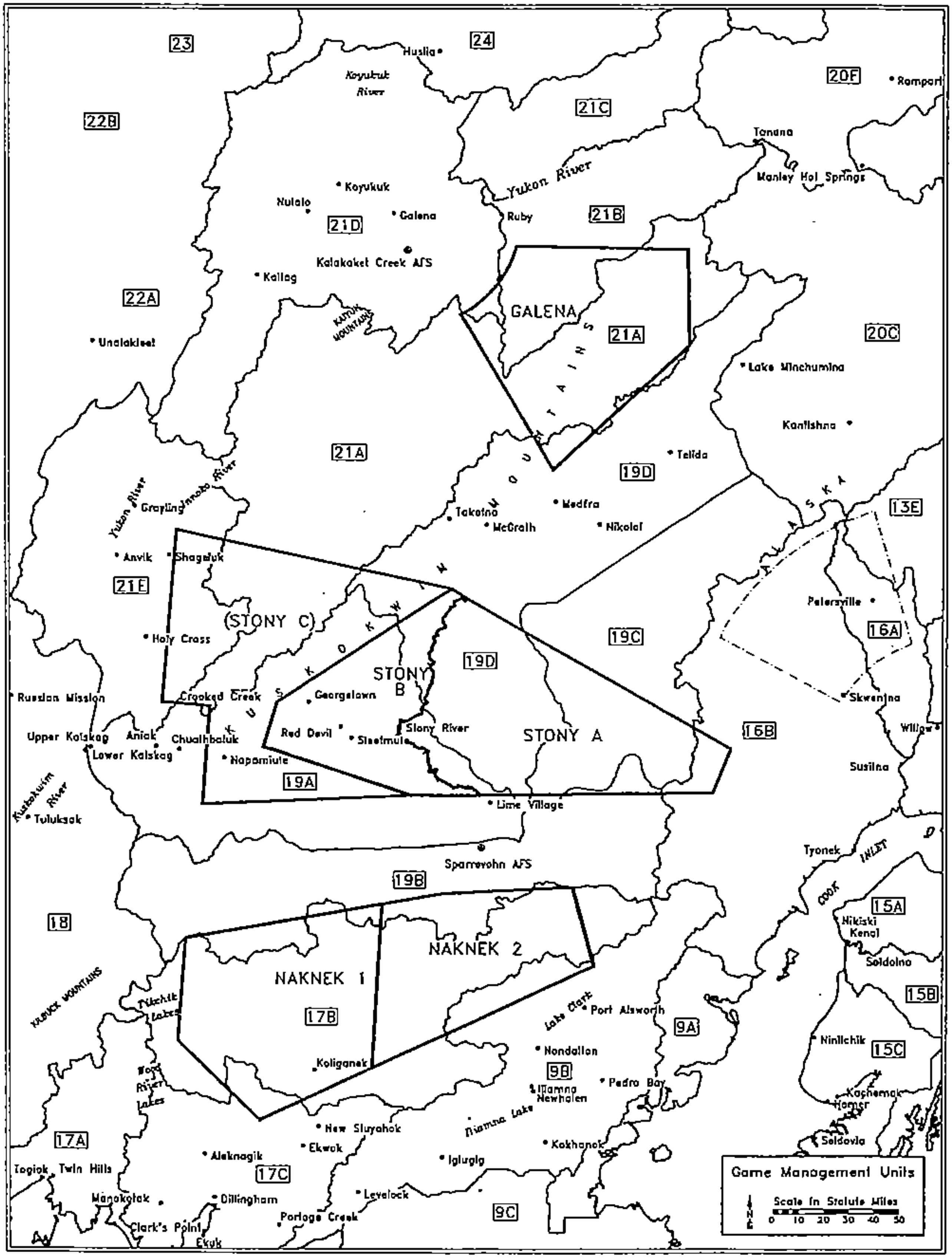


Figure M-3 Game Management Units in the Western Region (Proposed and Alternative Actions)



APPENDIX N

ALTERNATIVES EVALUATION

N.1 INTRODUCTION

N.1.1 Purpose

An assumption inherent to the *Environmental Impact Statement for Alaska Military Operations Areas (Alaska MOA EIS)* is that all military tactical flying training conducted in Alaska originates from and returns to Alaskan bases. This includes training completed by the 11 AF, PACAF, and other American and allied military units. This document will narrow the focus of the subsequent Environmental Impact Analysis Process (EIAP) by presenting criteria to evaluate airspace restructuring alternatives. It does not advocate or adopt any alternative as the preferred action.

N.1.2 Scope

The scope of this document is limited to Military Operations Areas (MOAs) airspace restructuring needs. MOAs are part of the Special Use Airspace (SUA) system, which may include Restricted Areas (RAs), Warning Areas (WAs), Prohibited Areas, Controlled Firing Areas, Alert Areas, as well as MOAs. Other military use airspace also exists outside of the SUA system and includes Military Training Routes (MTRs), Air Refueling Routes (ARs), Air Traffic Control Assigned Airspace (ATCAAs), Altitude Reservations, Low-Altitude Tactical Navigation Areas (LATNs), Maneuver Areas, and Slow Speed Low-Altitude Training Routes (SRs). All or some combination of these types of airspace form the infrastructure that supports military tactical flying training in an area. **For the purpose of this document, airspace restructuring is defined as converting a previously utilized temporary MOA to a permanent MOA; modifying an existing permanent MOA; creating a new MOA; or some combination of these actions.** Alternatives deemed acceptable by the Air Force in terms of the criteria established in this document will be forwarded for consideration in the EIAP.

N.1.3 Relationship to the Environmental Impact Analysis Process

This document presents the mandatory and evaluative criteria to judge alternatives in terms of their ability to meet mission needs, and for identifying those alternatives that warrant further consideration in the EIAP. Alternatives that satisfy mandatory and evaluative criteria will be included in the Description of the Proposed Action and Alternatives (DOPAA), and a complete environmental impact analysis performed on each in the EIAP. Alternatives that fail to satisfy the mandatory criteria or to adequately meet the evaluative criteria will be eliminated from further consideration. **As the goal is to achieve an integrated airspace system, these criteria must be applied to an airspace proposal in its entirety, and it is the total proposal that must satisfy the criteria.** This document states the need for airspace restructuring and the general supporting requirements, but does not analyze aircrew training or mission requirements.

N.2 FACTORS THAT DEFINE NARROWING CRITERIA

Evaluation of airspace restructuring proposals to determine their suitability as reasonable potential alternatives requires criteria that integrate several key factors. These factors include aircraft operational parameters; a significant, unique, and immovable array of facility infrastructure; the existing airspace infrastructure; and the tactical flying training program.

N.2.1 Aircraft Operational Parameters

The effective training ranges of Alaska-based aircraft are the only aircraft operational parameters pertinent to the evaluation of airspace. Effective training range is defined as the maximum distance an aircraft may travel from its base to conduct valid training and still have adequate fuel supplies, without air refueling, to return to base. The effective training ranges of the four types of tactical aircraft based in Alaska are:

F-15C/D	225 NM
F-15E	400 NM
F-16	200 NM
OA-10	165 NM

For aircraft engaged in air-to-ground training missions (i.e., the F-15E, F-16, and OA-10), approximately 90 percent of tactical flying missions also include operations on one or more of the bombing ranges. This mission requirement results in the effective training ranges depicted in Figure N-1.

N.2.2 Facilities and Assets

Facilities and assets may be either fixed or mobile. Fixed assets include bases, bombing ranges, and training feedback systems such as Air Combat Maneuvering Instrumentation (ACMI) systems. Mobile assets are some of the Electronic Combat (EC) devices.

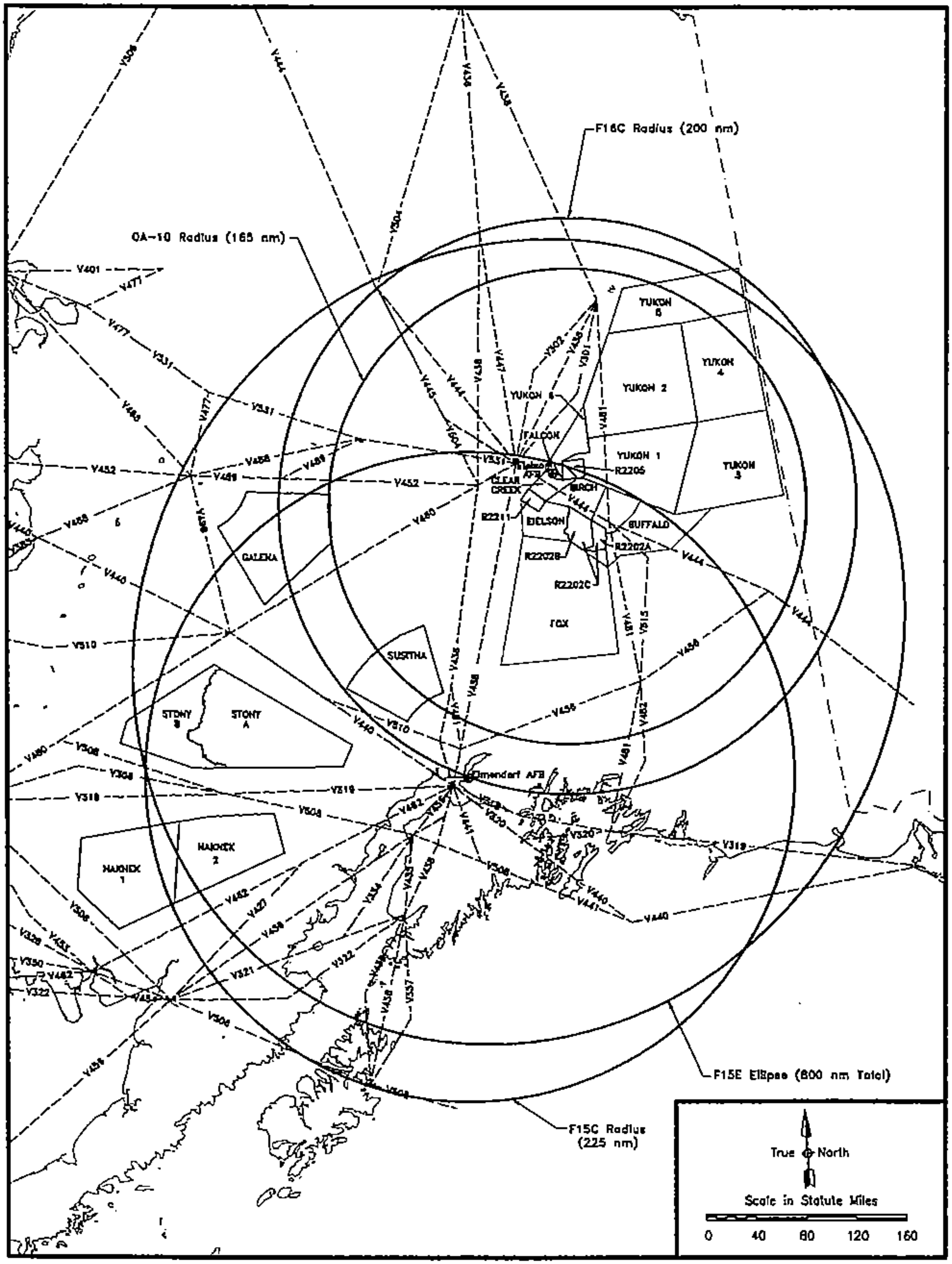
N.2.2.1 Bases

Bases are comprised of runways, ramp space and taxiways, aircraft maintenance hangars, logistics capabilities and facilities, housing facilities, and personnel. There are two primary Air Force bases in Alaska: Elmendorf AFB, located north and adjacent to the City of Anchorage and west and adjacent to Fort Richardson; and Eielson AFB, located southeast of the City of Fairbanks and Fort Wainwright. Elmendorf AFB also provides centralized radar and communications command and control for Military Radar Units located throughout the state.

N.2.2.2 Bombing Ranges

Bombing ranges contain targets, control facilities, camera facilities/weapons drop scoring systems, fire control measures, and other engineered safety measures. There are three bombing ranges in Alaska, all centrally located in the vicinity of Eielson AFB. The Oklahoma Range (Restricted Area R-2202) is located on the Fort Greely reservation, southeast of Eielson AFB and west of Fort Greely cantonment and the community of Delta Junction. The Stuart Creek Range (Restricted Area R-2205) is located on the Fort Wainwright reservation, northeast of Eielson AFB. The Oklahoma and Stuart Creek Ranges are joint use ranges, shared by the U.S. Air Force (USAF) and the U.S. Army (USA). The USAF drops live and inert ordnance on these ranges. The Blair Lakes Range (Restricted Area R-2211) is located south/southwest of Eielson AFB and Fairbanks. The Blair Lakes Range is used only by the USAF and only inert ordnance is employed on this range. Establishing a new range or ranges at another location(s) elsewhere in the state ". . . would not be environmentally sound or feasible due to the current land selection process under the Alaska Native Claims Settlement Act (ANCSA), the contamination already present on [the existing ranges], and the estimated cost of relocation." (U.S. Department of the Army,

Figure N-1 Effective Training Ranges of Alaska-Based Aircraft



Final Environmental Impact Statement Concerning Proposed Land Withdrawal for the 172nd Infantry Brigade [Alaska] at Fort Wainwright, 1980). Therefore, for the purpose of this EIAP there are no other bombing ranges in the State of Alaska and no others will be identified for possible analysis.

N.2.2.3 Training Feedback Systems

Training Feedback Systems significantly enhance aircrew tactical training by providing necessary near real-time mission feedback to aircrew and operational staff on the utility of various tactics, training, and exercise scenarios. One training feedback system is located in the STONY MOAs (the Alaska ACMI). A second training feedback system, planned for the Eielson AFB area, is in the construction phase now. Completion of this training feedback system, known as the Yukon Measurement and Debriefing System (or Yukon MDS) is planned for June 1995.

N.2.2.4 Electronic Combat Assets

Electronic Combat (EC) assets consist of ground-based fixed, transportable, and mobile (i.e., self-transporting) systems, and airborne systems (e.g., the E-3 Airborne Warning and Control System or AWACS). All fixed, transportable, and mobile EC assets are located within the effective training range of Alaska-based aircraft. Ground EC assets typically electronically replicate the characteristics of ground threat devices. Airborne assets may be employed anywhere within authorized airspace as need dictates. Airborne EC assets may consist of electronic countermeasure systems or communication and radar coverage systems.

N.2.3 Existing Airspace Infrastructure

N.2.3.1 Existing Military Airspace

Existing military airspace infrastructure in Alaska consists of SUA and some other types of military use airspace. Alaskan Special Use Airspace currently includes MOAs, RAs over the three bombing ranges (Oklahoma/R-2202, Stuart Creek/R-2205, and Blair Lakes/R-2211), a WA over Blying Sound, and two Controlled Firing Areas (R-2202C and the Blying Area airspace). Other military use airspace in Alaska consists of MTRs, AR anchors/tracks, ATCAAs, LATNs, and SRs.

N.2.3.1.1 Military Operations Area (MOA)

This airspace is designated for non-hazardous military aircraft activities (i.e., maneuvering operations without weapons expenditure). Activities conducted in a MOA include, but are not limited to, air combat tactics, transition, formation, and aerobatics training. Aircraft operating in a MOA may conduct vertical and horizontal aircraft maneuvering operations at speeds in excess of 250 knots and supersonic operations below 30,000 feet Mean Sea Level (MSL) when properly authorized. This airspace serves to segregate non-participating Instrument Flight Rules (IFR) aircraft from the military aircraft activities, and informs non-participating Visual Flight Rules (VFR) aircraft where these activities are being conducted. Non-participating IFR traffic may be cleared through a MOA if IFR separation minimums can be provided by the air traffic control agency responsible for flight operations in and around the MOA. VFR aircraft are not prohibited from transiting a MOA; however, VFR pilots must exercise caution since the status (i.e., active or inactive) of a MOA can change throughout the day. MOAs are depicted on various en route and planning charts.

N.2.3.1.2 Restricted Area (RA)

This airspace contains hazardous military activities, such as ordnance delivery, and separates non-participating aircraft (military and civilian) from these activities. Most RAs are designated joint use and IFR/VFR operations in the area may be authorized by the controlling Air Traffic Control (ATC) facility when the RA is not being used. RAs are depicted on en route charts.

N.2.3.1.3 Warning Area (WA)

Warning Areas are designed for military aircraft activities in international airspace. They are exclusively located over coastal waters of the U.S. and its territories. Aircraft activities in these areas may be hazardous, but international agreements do not prohibit flight in international airspace; thus no restriction to flight is imposed by the designation. Warning Areas are depicted on en route charts.

N.2.3.1.4 Controlled Firing Area

This airspace contains activities conducted under conditions so controlled as to eliminate hazards to non-participating aircraft and to ensure the safety of persons and property on the ground. Controlled Firing Areas are not depicted on aeronautical charts.

N.2.3.1.5 Military Training Route (MTR)

An MTR is established to allow aircraft to conduct low-altitude navigation and tactical training at subsonic airspeeds in excess of 250 knots. All activities conducted on an MTR are in accordance with applicable Federal Aviation Regulations (FARs), unless waived or exempted by the FAA. MTRs do not restrict civil aviation, but are charted on FAA sectionals and DoD Low IFR charts to make civil aviation pilots aware of them.

N.2.3.1.6 Air Refueling Route (AR Route)

An air refueling route consists of either a track or an anchor and is designed for air refueling operations. Permanent air refueling routes are established via a letter of agreement with the appropriate air traffic control facility and are published in the Flight Information Publication (FLIP). Temporary ARs, assigned by the airspace controlling agency, may be used to support special mission scenarios.

N.2.3.1.7 Air Traffic Control Assigned Airspace (ATCAA)

ATCAAs are Federal Aviation Administration (FAA) airspace established above 17,999 feet MSL. They are commonly associated with MOAs to allow increased vertical maneuvering, but can exist without an underlying MOA. ATCAAs are not published on aeronautical charts.

N.2.3.1.8 Low-Altitude Tactical Navigation Area (LATN)

LATNs are established for random VFR low-altitude navigation training, at or below 250 knots. LATNs are for local use only, are not published on aeronautical charts, and do not restrict civil aviation.

N.2.3.1.9 Slow Speed Low-Altitude Training Route (SR)

SRs are low-altitude training routes used for VFR military aircraft operations at or below 1,500 feet AGL and at airspeeds of less than 250 knots. SRs are not part of the MTR system. SRs are published in FLIP AP/1B, but not on aeronautical charts. They do not restrict civil aviation.

N.2.3.2 Existing Civilian Airspace

Civilian airspace in Alaska includes Federal airways, both the Victor Routes (17,999 feet MSL and below) and the Jet Routes (18,000 feet MSL and above); an Airport Radar Service Area (ARSA) at Anchorage International Airport; a Terminal Control Area (TCA) at the Fairbanks Airport; and Air Traffic Control facilities (radar and communications coverage). There is also extensive Visual Flight Rules traffic throughout the state, much of it on regularly used (although uncharted) routes.

N.2.4 Tactical Flying Training Program

Air Combat Command (ACC) and PACAF *Tactical Aircraft Flight Training Manual 51-50, Volumes II (OA-10), VII (F-15C/D), VIII (F-16), and XXI (F-15E)*; and the *Multi-Command Regulation 51-130 (C-130)* establish training standards and programs to ensure that units maintain the capability to perform their assigned tactical mission(s) in an effective manner. The training program is driven by the mission(s) a flying unit is tasked with, and the discrete events that comprise the mission(s). This training must be accomplished by each aircrew member in order to maintain individual currency as well as overall unit capability.

N.2.4.1 Routine Training

Routine training involves aircraft departing from their assigned operating base, participating in training missions with one or more objectives (e.g., interdiction, ACBT, intercepts, ordnance delivery, close air support, low altitude navigational training, AR, EC training, etc.) and returning to base. This scenario (a takeoff, training flight, and landing) is called a "sortie." During each sortie, individual aircrew members are required to accomplish specific training events designed to maintain individual and unit combat capability.

N.2.4.2 Exercise Training

Exercise training includes Major Flying Exercises (MFEs), LANTIRN (Low-Altitude Navigation and Targeting Infrared (System) for Night (Operations) exercises, weapons training deployments, Air National Guard and Air Force Reserve deployments, and joint and multinational exercises. These exercises integrate air-to-air and air-to-ground missions, as well as support missions such as airborne command and control, electronic combat, search and rescue, etc.). MFEs may be composed of aircraft from other military services (i.e., joint exercises), NATO allies, and allies from other nations. During MFEs, a combat scenario is developed and participating aircraft are given roles according to their mission tasking. Ground forces position simulated air defenses throughout the training area to provide, in concert with airborne defenses, an integrated air defense environment. This integrated air defense environment provides a realistic training scenario from which aircrews can learn successful tactics. Participating aircraft are temporarily assigned to an operating base in Alaska from which they depart and to which they return. During an exercise, aircraft typically accomplish two sorties per day.

N.2.4.3 Operational Missions

The following operational missions are accomplished during both routine and exercise tactical flying training. Definitions are extracted from AFM 1-1 *Basic Aerospace Doctrine of the USAF*, TACM 2-1 *Tactical Air Operations*, and MCM 3-1, Volume I *Mission Employment Tactics*. Supersonic operations are a necessary component of some operational training missions. Modern combat aircraft are capable of tactical flight at supersonic airspeeds. U.S. and allied aircrews need to train to exploit this capability both offensively and defensively and to negate similar tactics in adversarial aircraft. It is therefore critical to provide an airspace environment in which realistic training at both subsonic and supersonic airspeeds can be accomplished. Supersonic operations are only conducted at or above approved altitudes within authorized MOAs and ATCAAs, or above 30,000 feet MSL.

N.2.4.3.1 Air-to-Air Missions

Air-to-air training missions include detection, interception, and destruction or neutralization of target aircraft. No weapons are employed, although chaff and flares may be used. Following is an overview of the general types of air-to-air training missions.

Counter Air (CA)

To gain control of the aerospace environment. The first goal of counter air is air superiority, which means no prohibitive enemy interference. The ultimate goal of counter air is air supremacy, which means no effective enemy interference.

Offensive Counter Air (OCA)

To seek out and neutralize or destroy enemy aerospace forces at a time and place of our choosing. Seizing the initiative at the onset of hostilities, conducting operations in the enemy's aerospace environment, and neutralizing or destroying the enemy's aerospace forces and supporting infrastructure.

Defensive Counter Air (DCA)/Air Defense (AD)

To detect, identify, intercept, and destroy enemy aerospace forces that are attempting to attack friendly forces or penetrate friendly airspace. To defend friendly lines of communication, protect friendly bases, and protect friendly land and naval forces while denying the enemy the freedom to carry out offensive operations.

N.2.4.3.2 Air-to-Ground Missions (Ordnance Delivery)

Air-to-ground missions include low-altitude, high speed subsonic, highly maneuverable range ingress to actual or simulated weapons delivery, followed by a similar egress from the range. Aircraft may be intercepted by opposing aircraft at some point during ingress/egress, and may be forced into an ACBT engagement. Following is an overview of the general types of air-to-ground training missions.

Air Interdiction (AI)

To delay, disrupt, divert, or destroy an enemy's military potential before it can be brought to bear against friendly forces. Performed at such distances from friendly surface forces that detailed integration is not required. Interdiction directed against targets which have a near-term effect on the scheme of maneuver of friendly ground forces require coordination prior to being executed (formerly referred to as battlefield air interdiction [BAI]).

Close Air Support (CAS)/Forward Air Control (FAC)

To support surface operations by attacking hostile targets in close proximity to friendly surface forces. Requires detailed coordination and integration with the fire and maneuver plans of friendly surface forces.

Suppression of Enemy Air Defenses (SEAD)

To neutralize, destroy, or temporarily degrade enemy air defensive systems in a specific area by physical and/or electronic attack. The goal is to allow friendly aerospace forces to perform their other missions effectively without interference from enemy air defenses.

N.2.4.3.3 Specialized Tasks

These tasks enhance the execution and successful completion of Air Force missions. These specialized tasks often support the accomplishment of other services' missions as well. Definitions are extracted from AFM 1-1 *Basic Aerospace Doctrine of the USAF*, TACM 2-1 *Tactical Air Operations*, and MCM 3-1, Volume I *Mission Employment Tactics*.

Air Refueling (AR)

Air refueling can be used to enhance airpower flexibility and responsiveness during deployment and employment by improving its reach. Air refueling acts as a force multiplier and facilitates extended airborne operations. It helps enhance our global power by reducing our dependence on forward basing and foreign enroute bases.

Electronic Combat (EC)

EC employs electronic warfare (EW); elements of command, control, and communications countermeasures (C^3CM); and SEAD to create or exploit weaknesses in an enemy's offensive, defensive, and supporting capabilities. EC can be accomplished by an asset targeted against ground-based or airborne early warning assets, ground-controlled intercept (GCI) sites, surface-to-air missile (SAM)/antiaircraft artillery (AAA) systems, and C^3 nodes. EC is conducted to help our forces achieve their objectives and may be required for the successful completion of any mission.

N.3 DETERMINING MILITARY OPERATIONS AREA AIRSPACE REQUIREMENTS TO MEET TRAINING OBJECTIVES

The missions that comprise aircrew training programs determine MOA airspace requirements. Airspace standards for the missions of each aircraft in the USAF inventory are outlined in the *U.S. Air Force Airspace Master Plan* (1993). These standards include lateral dimensions (miles), vertical dimensions (feet), speed (supersonic or subsonic, above or below 250 knots), timing, proximity to base (miles), and linkage to other airspace or ranges. Local (11 AF) and MAJCOM (PACAF) directives and FAA regulations and recommendations also affect airspace requirements.

N.3.1 MOA Airspace Standards

Table N-1 presents MOA airspace standards, outlined in the *U.S. Air Force Airspace Master Plan* (1993), for routine tactical flying training missions and tasks of Alaska-based tactical combat aircraft. Table N-2 presents the MOA airspace standards for MFEs. MFEs attempt to replicate actual combat, incorporating all of the missions and tasks accomplished in routine tactical flying training, and may involve up to 100 aircraft. PACAF and 11 AF have determined that successful execution of MFEs requires an area of contiguous airspace 200-300NM long and 80-120NM wide, extending from the surface up to 50,000 feet MSL.

Table N-1 MOA Airspace Standards by Mission/Task

Mission/ Task	Aircraft Type	MOA Linkage to	Lateral Dimensions	Vertical Dimensions	Distance from Base	Speed	Time[1]
DCA OCA AD	F-15C/D F-16	ATCAA; AR. ACMI and Range desirable	70NM x 60NM	500' AGL - FL 500	As close as possible (overhead)	SS[2] Subsonic	10 hrs/day (12 hrs during night flying)
AD (Med-Hi)	F-15E	ATCAA; Restricted Area; Range desirable	40NM x 80NM	5,000' AGL - FL 500	As close as possible	SS[2] Subsonic	8 hrs/day
AD (Lo)	F-15E	Restricted Area; Range; ATCAA	40NM x 60NM	Surface - 5,000' AGL	100NM	Subsonic	8 hrs/day
AI OCA	F-15E	RA; Range; MTR	30NM x 40NM	Surface - FL 250	100NM	Subsonic	16 hrs/day
AI	F-16	ATCAA; Range; MOA	60NM x 40NM	Surface - FL 250	100NM	SS[2] *desired but not required* Subsonic	8 hrs; 10 hrs w/ LANTIRN
EC SEAD	F-16	ATCAA; Range; MOA	50NM x 50NM	Surface - FL 250	100NM	SS[2] Subsonic	4 hrs/day
CAS FAC AI	OA-10	ATCAA; Range	50NM x 50NM	100' AGL - 20,000' AGL	100NM	Subsonic	Sunrise to Sunset plus 3 hrs
AR	F-15C/D F-15E F-16 OA-10	ARAnchor; ATCAA; proximity to a Range is essential	84NM x 28NM (nominal)	2,000' or 3,000' AGL, below FL 180	75-100NM	300-475 KIAS	45 minutes

[1]Available an average of 240 days per year; [2]Supersonic, only conducted at or above approved altitudes.

Table N-2 MOA Airspace Standards for Major Flying Exercises

Mission/ Task	Aircraft Type	MOA Linkage to	Lateral Dimensions	Vertical Dimensions	Distance from Base	Speed	Time[1]
DCA OCA AD AI EC SEAD CAS FAC AR	F-15C/D F-15E F-16 F-4 F-14 CF-18 EA-6B A-6 F/A-18 A-10 OA-10 A-7 F-111 F-5E E-3 E-2 KC-10 KC-135 EF-111 EC-117 NKC-135 B-52G/H B-1B C-130 C-141 Tornado etc.	ATCAA; AR; ACMI; Range; RA.	200-300NM x 80-120NM	Surface - 50,000' MSL	As close as possible to Elmendorf AFB and/or Eielson AFB, but not more than 400NM from Elmendorf AFB.	SS[2] Subsonic	Two 2-hr blocks per MFE Flying Day

[1]Available an average of 60 days per year; [2]Supersonic, only conducted at or above approved altitudes.

Note: DCA = Defensive Counter Air; OCA = Offensive Counter Air; AD = Air Defense; AI = Air Interdiction; EC = Electronic Combat; SEAD = Suppression of Enemy Air Defenses; CAS = Close Air Support; FAC = Forward Air Control; AR = Air Refueling; SS = Supersonic.

N.4 THE NARROWING PROCESS

The narrowing process links the scoping phase to the analysis phase. **The narrowing process, through the application of specific measurable criteria to all potential alternatives, is designed to ensure proper focus is placed upon reasonable alternatives.** The goal of this process is to provide the decision-maker with an adequate level of comparative data to make an informed decision. The narrowing process consists of two stages:

1) application of mandatory criteria to identify those alternatives that warrant further consideration and eliminate those that are clearly not appropriate; and
2) application of evaluative criteria to the considered alternatives to determine how well each meets the needs of the USAF.

This process is outlined below:

All Identified Alternatives
⇓
Mandatory Criteria
⇓
Considered Alternatives
⇓
Evaluative Criteria
↙ ↘
Alternatives Considered but Eliminated — Reasonable Alternatives

N.4.1 Mandatory Criteria

The mandatory criteria established by PACAF and 11 AF for any airspace restructuring proposal are based on the effective training ranges of Alaska-based aircraft, the standards outlined in the *U.S. Air Force Airspace Master Plan* (1993), and the standards established for MFEs. Note that these mandatory criteria are not intended to be applied to each individual MOA in an airspace proposal since the goal is to achieve an integrated airspace system. Rather, these criteria must be applied to an airspace proposal in its entirety, and it is the total airspace proposal that must satisfy these criteria. It is, therefore, possible for individual MOAs in an airspace proposal to fail to meet some of these criteria and still be an integral part of the airspace proposal as a whole. Alternatives will be judged either acceptable or unacceptable.

F-15E: MOA(s) adequate for the conduct of Air Defense (AD), Air Interdiction (AI), Offensive Counter Air (OCA), and Air Refueling (AR) routine and exercise tactical flying training must be within the effective training range described by the ellipse in Figure N-1 and available for 240 flying days per year.

F-15C/D: MOA(s) adequate for the conduct of Defensive and Offensive Counter Air (DCA/OCA), AD, and AR routine and exercise tactical flying training must be within the effective training range described by the ellipse in Figure N-1 and available for 240 flying days per year.

F-16: MOA(s) adequate for the conduct of DCA, OCA, AD, AR, and Air Interdiction (AI) routine and exercise tactical flying training must be within the effective training range described by the ellipse in Figure N-1 and available for 240 flying days per year.

OA-10: MOA(s) adequate for the conduct of Close Air Support (CAS), Forward Air Control (FAC), AI, and AR routine and exercise tactical flying training must be within the effective training range described by the ellipse in Figure N-1 and available for 240 flying days per year.

Major Flying Exercises: Suitable portions of the airspace (see above) must be within the effective training ranges described by the ellipses in Figure N-1; some contiguous portion of it must be 200-300NM long by 80-120NM wide; must extend vertically from the surface (100 feet AGL) to 17,999 feet MSL; suitable portions of the airspace must be connected to an ATCAA (18,000 feet MSL to 50,000 feet MSL), existing range or ranges and associated Restricted Areas, Air Refueling tracks and anchors, and ACMI assets; suitable portions of the airspace must be authorized for supersonic operations; and it must be available for a minimum of two hours of morning and two hours of afternoon flight operations per exercise day, 60 flying days per year (note that these 60 days are not in addition to the 240 flying days required for routine training).

Integrative: The airspace proposal must consist of a series of discrete MOAs, some geographically dispersed, to provide adequate flexibility to accomplish training programs (e.g., in the event of adverse weather conditions, when FAA temporarily restricts airspace to allow transit by non-participating aircraft, etc). It must also provide linkage to ACMI assets and to the existing ranges.

N.4.2 Mandatory Criteria Matrix

	Alt #1		Alt #2	
	YES	NO	YES	NO
ROUTINE TRAINING				
Within Training Range				
MOA Linkage to Existing Ranges/RAs				
MOA Linkage to Aerial Refueling Tracks				
MOA Linkage to Other MOAs				
Lateral Dimensions				
Vertical Dimensions				
Supersonic Operations				
Time Availability				
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage				
MAJOR FLYING EXERCISES				
Within Training Range				
MOA Linkage to Existing Ranges/RAs				
MOA Linkage to Aerial Refueling Tracks				
Lateral Dimensions				
Vertical Dimensions				
Supersonic Operations				
Time Availability				
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage				

N.4.3 Evaluative Criteria

These criteria will be used to determine how well each considered alternative meets the needs of the USAF, and/or satisfies Federal Aviation Administration (FAA) criteria (required or recommended). Alternatives will be judged either acceptable or unacceptable.

Accessibility: This criteria refers to the extent to which the MOAs included in an airspace proposal are accessible to Alaska-based aircraft.

(1) The FAA recommends that the DoD "... to the extent possible, locate MOAs within 100 miles of the base of flight origin..." (U.S. Federal Aviation Administration, *Federal Aviation Regulation Pt. 7400.2*).

(2) The *U.S. Air Force Airspace Master Plan* (1993) suggests that MOAs intended for F-15C/D, F-15E, and F-16 DCA, OCA, and AD tactical flying training be located as close as possible to the operating bases. It suggests that MOAs intended for all other tactical flying training missions listed in Tables N-1 and N-2 be located within 100NM of operating bases.

Compatibility: This criteria refers to the degree to which an airspace proposal is compatible with existing Special Use Airspace and other Military Use Airspace. The airspace should be appropriately connected (see Tables N-1 and N-2) to form an integrated and efficient airspace system.

Capacity: This criteria refers to the ability of an airspace proposal to accommodate the training programs described in section N.2.4 and their associated MOA airspace standards (see Tables N-1 and N-2).

Suitability: This criteria refers to the physical attributes of an airspace proposal. Specifically, an airspace proposal should include MOAs of the most optimum shape and size; a variety of underlying terrain; minimum man-made hazards; and minimum potential for conflict with Federal Victor Routes, regularly used VFR routes, public or private airports, and non-participating aircraft activities.

(1) The FAA recommends that the DoD "... to the extent possible, locate MOAs away from Federal Airways and regularly used VFR routes." (U.S. Federal Aviation Administration, *Federal Aviation Regulation Pt. 7400.2*).

N.4.4 Evaluative Criteria Matrix

	Alt #1			Alt #2		
	Optimal	Acceptable	Unacceptable	Optimal	Acceptable	Unacceptable
ROUTINE TRAINING						
Accessible						
Compatible						
Capacity						
Suitable						
MAJOR FLYING EXERCISES						
Accessible						
Compatible						
Capacity						
Suitable						

N.5 ALTERNATIVE EVALUATIONS

N.5.1 Evaluation of Mandatory Criteria

During public scoping and other public forums, 38 alternatives were presented to the Air Force. After eliminating duplicate comments, 33 alternatives were carried forward for evaluation and possible consideration in the *Alaska MOA EIS* under the Mandatory Criteria established in section N.4. Application of the Mandatory Criteria to all 33 comments was not possible because of several factors. Some of the comments (alternatives 6, 7, 11, 19, 23, and 27) constituted mitigation measures that could be applied to the Proposed or Alternative Actions.

Alternative 1: Use the MTR structure to accomplish routine training and conduct MFEs.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X (some)	
MOA Linkage to Aerial Refueling Tracks	X (some)	
MOA Linkage to Other MOAs	X (some)	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations		X
Time Availability	X	
Integrative Criteria: —Geographic Dispersion —Discrete MOAs ---ACMI Linkage	 X N/A X (few)	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X (some)	
MOA Linkage to Aerial Refueling Tracks	X (some)	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations		X
Time Availability	X	
Integrative Criteria: ---Contiguous Airspace ---Discrete MOAs ---ACMI Linkage	 X (few)	 X X

Result: Alternative 1 is rejected because FAA rules governing the use of MTRs do not allow their use for air combat training. The maneuvering airspace required to complete air combat training is not possible in the narrow corridor MTR structure.

Alternative 2: Conduct routine training and MFEs in only the existing permanent MOAs.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability		X
Integrative Criteria:		
—Geographic Dispersion	X	
—Discrete MOAs	X	
—ACMI Linkage	X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability		X
Integrative Criteria:		
—Contiguous Airspace		X
—Discrete MOAs	X	
—ACMI Linkage	X	

Result: Alternative 2 is rejected due to its lack of MOA linkage to air-to-ground weapons ranges as well as the unsuitable size and availability of the existing permanent MOAs for routine training or Major Flying Exercises. Limiting readiness training to the existing permanent MOAs would also continue to prevent the conduct of necessary Dissimilar Air Combat Training and Composite Force Training in Alaska. Additionally, it would continue the compromising practice of frequently segmenting individual MOAs into sizes well below Air Force Airspace Master Plan standards to accommodate current use levels as well as more sophisticated scenarios. This segmentation results in unrealistic training scenarios that unduly hampers the ability of Alaskan based units to achieve and maintain assigned combat readiness levels. Further, without access to airspace beyond the existing permanent MOAs, Major Flying Exercises (MFEs) could no longer be conducted in Alaska. The loss of COPE THUNDER, the premier MFE in Pacific Air Forces (PACAF), would preclude accomplishment of the most critical unit and aircrew combat readiness training within the Pacific theater. Given the inability of PACAF units to receive MFE training elsewhere, all units and aircrews would not be combat ready.

Alternative 3: Establish new TMOAs and conduct MFEs in existing permanent MOAs and new TMOAs.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		
MOA Linkage to Other MOAs		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage		
MAJOR FLYING EXERCISES		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage		

Result: Alternative 3 rejected. Unable to apply mandatory criteria to this alternative without specific proposed TMOAs

Alternative 4: Conduct MFEs in airspace outside of Alaska.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
MOA Linkage to Other MOAs		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage		
MAJOR FLYING EXERCISES		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage		X

Note: CONUS MFEs are currently operating at capacity and are forecast to continue operating at capacity for the foreseeable future, and thus do not offer overseas major command units MFE training opportunities.

Result: Alternative 4 is not applicable for routine training and is rejected for MFEs.

Alternative 5: Create other permanent MOAs in Alaska.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		
MOA Linkage to Other MOAs		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage		
MAJOR FLYING EXERCISES		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage		X

Result: Alternative 5 rejected. As it is a concept only, unable to apply mandatory criteria; specific alternative identified as Alternative 31.

Alternative 6: Move eastern boundary of FOX MOA 5 miles (near the Denali Highway) to 25 miles (southeast corner) to the west to remove potential conflicts with Delta/Gulkana Wild and Scenic Rivers, other recreation facilities, and trumpeter swans.

Result: *Alternative 6 is potential mitigation for the Proposed Action and Alternatives.*

Alternative 7: Cutoff the southeast corner of FOX MOA

Result: *Alternative 7 is potential mitigation for the Proposed Action and Alternatives.*

Alternative 8: Eliminate CLEAR CREEK MOA and FOX MOA, use existing permanent MOA's only

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability		X
Integrative Criteria: ---Geographic Dispersion ---Discrete MOAs ---ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability		X
Integrative Criteria: ---Contiguous Airspace ---Discrete MOAs ---ACMI Linkage	 X X	 X

Result: Alternative is rejected due to the suggestion to limit MOA airspace for routine and Major Flying Exercise training to the existing permanent MOAs as previously discussed in Alternative #2. Additionally, the elimination of FOX MOA would preclude the conduct of Dissimilar Air Combat Training and Composite Force Training in Alaska, key intermediate building blocks to achieving unit and aircrew combat readiness. However, elimination of only CLEAR CREEK MOA is a reasonable alternative that meets mandatory criteria and is accepted for further consideration.

Alternative 9: Eliminate CLEAR CREEK MOA, leave EIELSON A & B TMOAs, BUFLO TMOA and YUKON 3 TMOA as configured today.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X X	

Result: Although it does not meet all mandatory criteria, Alternative 9 is essentially the No Action Alternative and must be assessed.

Alternative 10: No new permanent MOAs, excludes recently designated TMOAs and reflects altered training needs since the end of the Cold War.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability		X
Integrative Criteria:		
—Geographic Dispersion	X	
—Discrete MOAs	X	
—ACMI Linkage	X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability		X
Integrative Criteria:		
—Contiguous Airspace		X
—Discrete MOAs	X	
—ACMI Linkage	X	

Result: Alternative #10 is rejected for the reasons specified in answers to Alternatives #2 and #8.

Alternative 11: Alternative with reduced use levels (Proposed Action at reduced level).

Result: *Alternative 11 is potential mitigation for the Proposed Action and Alternatives.*

Alternative 12: Use Zane Hills north of GALENA (as substitute for GALENA MOA) and the foothills of Wrangell/St Elias Mountains near Canadian border (as additional or replacement of some other MOAs).

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria:		
—Geographic Dispersion	X	
—Discrete MOAs	X	
—ACMI Linkage	X	
MAJOR FLYING EXERCISES		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria:		
—Contiguous Airspace	X	
—Discrete MOAs	X	
—ACMI Linkage	X	

Result: Alternative #12 is rejected due to the suggested airspace being out of the operational training range of aircraft based at Elmendorf and Eielson AFBs. Additionally, these suggested airspace locations lack access to any air-to-ground weapons ranges to conduct required training to acquire and maintain combat readiness status.

Alternative 13: Use smaller areas (for routine & MFE training).

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X X	

Result: Alternative #13 is rejected since smaller areas for the proposed MOAs would not provide suitably sized MOAs to conduct the variety of routine missions now assigned to Alaskan based units. Additionally, the airspace array, if smaller would not be of sufficient size to conduct realistic Major Flying Exercises necessary to assure unit and aircrew combat readiness status.

Alternative 14: Disperse training to lower use areas.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
MOA Linkage to Other MOAs		X
Lateral Dimensions	Unknown without specifics	
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
Lateral Dimensions	Unknown without specifics	
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X 	 X

Result: Alternative #14 is rejected since the lower use areas specified are well outside the operational training range of aircraft based at Elmendorf and Eielson AFBs. Additionally, these suggested areas lack any air-to-ground weapons ranges to conduct required training to acquire and maintain combat readiness status.

Alternative 15: Use Minto Flats area, Canadian airspace near the Yukon and Black Rivers.

Mandatory Criteria	YES	NO
ROUTINE TRAINING MINTO FLATS only		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
MOA Linkage to Other MOAs		X
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability **(Conflicts would occur with FAA high altitude traffic.)**		X
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability **(Conflicts would occur with FAA high altitude traffic.)**		X
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X X	

Result: Alternative #15 is rejected because placement of a MOA or MOAs in the Minto Flats in substitution for new MOAs described in the Proposed Action would not correct the readiness training deficiencies that exist in the current Alaska permanent MOA array. The deficiencies include a lack of linkage between the current permanent MOAs , the air-to-ground weapons ranges and mutually accessible airspace between Elmendorf and Eielson AFBs. Additionally the Minto Flats area is within a primary aviation corridor for intra-Alaskan and trans-polar commercial traffic. The suggestion to create MOAs for United States Air Force (USAF) control and use within Canadian airspace is not within the jurisdiction of the USAF nor the FAA.

Alternative 16: Establish MOAs further west of existing MOAs.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
MOA Linkage to Other MOAs	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability **(Conflicts would occur with FAA high altitude traffic.)**		X
Integrative Criteria:		
—Geographic Dispersion	X	
—Discrete MOAs	X	
—ACMI Linkage		X
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability **(Conflicts would occur with FAA high altitude traffic.)**		X
Integrative Criteria:		
—Contiguous Airspace	X	
—Discrete MOAs	X	
—ACMI Linkage		X

Result: Alternative #16 is rejected because as stated in the response to Alternative #15 above, placement of MOAs west of existing MOAs in substitution for new MOAs described in the Proposed Action would not correct the readiness training deficiencies that exist in the current Alaskan permanent MOA array.

Alternative 17: Do winter MFEs only.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	Not applicable for routine training	
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
MOA Linkage to Other MOAs		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage		
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability		X
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X X	

Result: Alternative 17 is potential mitigation for the Proposed Action and Alternatives.

Alternative 18: Chart TMOAs for MFEs only and use biannually.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
MOA Linkage to Other MOAs		X
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability		X
Integrative Criteria: —Geographic Dispersion ---Discrete MOAs —ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability		X
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X X	

Result: Alternative #18 is rejected for the same reasons specified in the responses to Alternatives #2, #8, and #10. Additionally, since its inception in the mid 1970's, Pacific Air Force's (PACAF) COPE THUNDER exercise schedule has been conducted on an annual basis to assure all PACAF units are able to participate one time per year. This annual frequency of training is the absolute minimum necessary to assure PACAF are able to achieve and maintain assigned combat readiness levels.

Alternative 19: Do not use MOAs during critical times; spring lambing, calving, and nesting seasons.

Result: *Alternative 19 is potential mitigation for the Proposed Action and Alternatives.*

Alternative 20: Modify or exclude MOAs to not overlie national park service units.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability		X
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations		X
Time Availability		X
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X	 X

Result: Alternative #20 is rejected since exclusion of MOAs over national park services units would preclude the Air Force from conducting necessary Major Flying Exercises (MFE) in the airspace that is adjacent to Alaska's only air-to-ground weapons ranges which are all located in the Interior region of Alaska. This exclusion would result in an exercise airspace array insufficient to conduct realistic scenarios. Inadequate airspace would drive aircrews toward the use of invalid aircraft employment tactics. Without a suitably sized airspace, large force employment concepts cannot be properly developed and critiqued during MFEs for their potential use in actual wartime contingencies.

Excluding areas over national park units would also force the Air Force to continue the practice of segmenting individual permanent MOAs to accommodate the wide variety of routine uses. This segmentation results in compromises in the realism of training due to reductions in the lateral and/or vertical dimensions of the MOA below the standards established in the Air Force Airspace Master Plan.

Alternative 21: Use existing permanent MOAs with previously utilized TMOAs. (This is the No Action Alternative and similar to Alternative 9).

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X X	

Result: Although it does not meet all mandatory criteria, Alternative 21 is the No Action Alternative and must be assessed.

Alternative 22: Use existing MOAs with new MOAs (this is the Proposed Action).

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: ---Geographic Dispersion ---Discrete MOAs ---ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X X	

Result: Alternative 22 is the Proposed Action.

Alternative 23: Leave YUKON 5 as a TMOA, while avoiding regular use from April 15 through September 30 and not authorize YUKON 5 for supersonic.

Result: *Leaving YUKON 5 as a TMOA is part of the No Action Alternative; otherwise, Alternative 23 is potential mitigation for the Proposed Action and Alternatives.*

Alternative 24: Establish MOAs over water areas.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
MOA Linkage to Other MOAs	Insufficient information	
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria:		
—Geographic Dispersion		X
—Discrete MOAs	X	
—ACMI Linkage		X
MAJOR FLYING EXERCISES		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
Lateral Dimensions	Insufficient information	
Vertical Dimensions		
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria:		
—Contiguous Airspace	X	
—Discrete MOAs	X	
—ACMI Linkage		X

Result: Alternative #24 is rejected for the same reasons provided in the responses to Alternatives #10, #14, #15, and #16. Relocation of MOAs over the Gulf of Alaska would create an array not accessible from Eielson AFB nor accessible to the air-to-ground weapons ranges exclusively located in the Interior region of Alaska. This array would not permit any Alaskan based units to reach combat ready status. It would also prevent Pacific Air Forces units from participating in any COPE THUNDER exercises which would prevent these units from maintaining combat ready status.

Alternative 25: Move all airspace to more remote portions of the state even if they are outside operational training range.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
MOA Linkage to Other MOAs		X
Lateral Dimensions	Insufficient information	
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage	 X X 	 X
MAJOR FLYING EXERCISES		
Within Training Range		X
MOA Linkage to Existing Ranges/RAs		X
MOA Linkage to Aerial Refueling Tracks		X
Lateral Dimensions	Insufficient information	
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage		 X X X

Result: Alternative #25 is rejected since an airspace array that cannot be reached from either Elmendorf or Eielson AFBs has no utility and could not contribute to achieving or maintaining combat readiness status.

Alternative 26: Continue to keep and chart YUKON 3, 4, and 5 as TMOAs and restrict use to MFEs only.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
MOA Linkage to Other MOAs		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage		
MAJOR FLYING EXERCISES		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage		

Result: Alternative 26 is part of the No Action Alternative and must be assessed.

Alternative 27: Establish and chart YUKON 3, 4, and 5 as permanent MOAs but limit use to MFEs only.

Result: *Alternative 27 is potential mitigation for the Proposed Action and Alternatives.*

Alternative 28: Eliminate GALENA and NAKNEK MOAs and establish them as TMOAs when required for exercises.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions		X
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability		X
Integrative Criteria:		
—Geographic Dispersion		X
—Discrete MOAs		X
—ACMI Linkage	X	
MAJOR FLYING EXERCISES		
Within Training Range	Not applicable, not MFE areas	
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage		

Result: Alternative #28 is rejected since the elimination of Galena and Naknek MOAs would severely limit the available airspace in the Western Region of Alaska. Readiness training opportunities are often severely curtailed during the Alaskan winter due to limited daylight hours and lengthy adverse weather patterns. Restricting the airspace options in Western Alaska to only the Stony MOA would periodically result in long grounding periods for Elmendorf AFB based units. These groundings singularly and cumulatively would have a severe impact on unit and aircrew combat ready status.

The current geographical dispersion of airspace in the Western Alaskan region has lessened the impact of adverse weather patterns and has allowed Elmendorf based F-15C units to maintain aircrew proficiency and currency. Sole reliance on the Stony MOA would unduly force segmentation of that MOA to such a degree that the lateral and vertical dimensions of the airspace would be far below the standards established by the Air Force Airspace Master Plan.

Alternative 29: Establish suitable airspace parcel east of Anchorage that is south of Glenn Highway for airspace proposed for southwestern portion of FOX MOA.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
MOA Linkage to Other MOAs		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage		
MAJOR FLYING EXERCISES		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage		

Result: Southwestern portion of FOX MOA eliminated from consideration; Alternative 29 not required.

Alternative 30: Substitute an airspace parcel adjacent to the northwest side of SUSITNA as an alternative to lowering the floor in STONY B.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions	X	
Vertical Dimensions		X
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Geographic Dispersion --Discrete MOAs ---ACMI Linkage	 X X 	 X
MAJOR FLYING EXERCISES		
Within Training Range	Not applicable, not an MFE area	
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: ---Contiguous Airspace --Discrete MOAs —ACMI Linkage		

Result: Alternative #30 is rejected since it cannot serve as a suitable substitute airspace for the unique characteristics and capabilities of the Stony B MOA. Stony A and B MOAs are unique airspaces in that they are exclusively located within the Alaska Air Combat Maneuvering and Instrumentation (ACMI) telemetry tracking system. ACMI capable airspace is the most valuable airspace given its ability to enhance air combat training and their associated mission debriefings. Substitution of airspace northwest of Susitna MOA for Stony B MOA would reduce the utility and return on investment made on the Alaska ACMI system as well as reduce the combat capability of Elmendorf AFB based flying units.

Alternative 31: Substitute airspace parcel south of YUKON 3 and BUFFALO MOAs, and east of FOX MOA as a replacement for YUKON 4 and 5 MOAs.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
MOA Linkage to Other MOAs	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage	 X X X	
MAJOR FLYING EXERCISES		
Within Training Range	X	
MOA Linkage to Existing Ranges/RAs	X	
MOA Linkage to Aerial Refueling Tracks	X	
Lateral Dimensions	X	
Vertical Dimensions	X	
Supersonic Operations	X	
Time Availability	X	
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage	 X X X	

Result: Alternative 31 accepted as a reasonable alternative.

Alternative 32: Move Federal airways and put MOAs in areas where airways presently exist.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
MOA Linkage to Other MOAs		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Geographic Dispersion —Discrete MOAs —ACMI Linkage		
MAJOR FLYING EXERCISES		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs —ACMI Linkage		

Result: Alternative 32 will be considered as part of Alternative 31.

Alternative 33: Create new bombing ranges and build new MOA complex around these ranges for routine and MFE training.

Mandatory Criteria	YES	NO
ROUTINE TRAINING		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
MOA Linkage to Other MOAs		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: ---Geographic Dispersion —Discrete MOAs ---ACMI Linkage		
MAJOR FLYING EXERCISES		
Within Training Range		
MOA Linkage to Existing Ranges/RAs		
MOA Linkage to Aerial Refueling Tracks		
Lateral Dimensions		
Vertical Dimensions		
Supersonic Operations		
Time Availability		
Integrative Criteria: —Contiguous Airspace —Discrete MOAs ---ACMI Linkage		

Result: Alternative #33 is rejected due to the prohibitive cost of relocating the air-to-surface weapons ranges, the lack of lands withdrawn from the public domain for such use, and the complete lack of support for such an action from the Alaskan citizenry or any federal, state, local, native, or aviation group.

N.5.2 Application of Evaluative Criteria

Alternatives 8 and 31 satisfied the Mandatory Criteria and are being carried forward for application of the Evaluative Criteria.

Evaluative Criteria	Alt #8		
	Optimal	Acceptable	Unacceptable
ROUTINE TRAINING			
Accessible		X	
Compatible		X	
Capacity		X	
Suitable		X	
MAJOR FLYING EXERCISES			
Accessible		X	
Compatible		X	
Capacity		X	
Suitable		X	

Comment: The portion of Alternative 8 pertaining to the elimination of the CLEAR CREEK MOA satisfies the evaluative criteria and will be assessed in the *Alaska MOA EIS*.

Evaluative Criteria	Alt #31		
	Optimal	Acceptable	Unacceptable
ROUTINE TRAINING			
Accessible		X	
Compatible		X	
Capacity		X	
Suitable		X	
MAJOR FLYING EXERCISES			
Accessible		X	
Compatible		X	
Capacity		X	
Suitable		X	

Comment: Alternative 31 satisfies the evaluative criteria and will be assessed in the *Alaska MOA EIS*.

APPENDIX O

COMPLAINTS AND CLAIMS

O.1 Noise Complaints

Noise complaints are handled by the Public Affairs offices at Eielson and Elmendorf AFBs. At Eielson AFB, the 354th Fighter Wing Public Affairs staff can be reached at (907) 377-2116; at Elmendorf AFB, the 3rd Wing Public Affairs staff can be contacted at (907) 552-8151. Inquiries or reports about military aircraft operations can also be phoned in to the 11th Air Force's toll-free information hotline at (800) 538-6647.

The number of noise complaints increases somewhat during MFEs or other types of exercises and in the summer when people tend to have their windows open and spend more time outside. When a complaint is made, pertinent information is recorded on a *Noise Complaint Log* (see Figure O-1). The more complete information a caller is able to provide, the better equipped Public Affairs is to determine which unit or aircraft may have been the source of the incident, and thus ensure a satisfactory response or resolution. At Eielson AFB, once the complaint has been recorded, it is given a sequential reference number and logged in Public Affairs' noise complaint file book. A copy of the complaint is hand-carried to the 354th Operations Group Current Operations office for research. A copy is also forwarded to Cope Thunder Operations if a Cope Thunder exercise is in progress.

The 354th Operations Group Current Operations office checks their schedule to determine if aircraft stationed at Eielson AFB and/or aircraft flying out of Eielson AFB have been in the area of concern during the time period of the event. If an aircraft flying out of Eielson AFB is determined to have been in the area, the Current Operations office requests a review of the Heads Up Display (HUD) video tape from the aircraft. The HUD tape is reviewed by the appropriate fighter squadron commander. Results of this review are forwarded to the Current Operations office, which sends a written response to the Public Affairs office. If a HUD tape is not available or an aircraft does not have HUD capability, the pilot is interviewed by the appropriate fighter squadron commander. Once again, the results of the interview are forwarded to the Current Operations office, which provides a written report to the Public Affairs office. If the review or interview determine that airspace policies have been violated, appropriate actions are taken against the pilot. If the event cannot be attributed to Eielson AFB aircraft, the Public Affairs office checks with the following agencies to determine if one of their aircraft could have caused the complaint: Elmendorf AFB, 168th Air Refueling Group, Kulis Air National Guard, Fort Wainwright, and U.S. Bureau of Land Management.

Once the Public Affairs office has received a response, the caller is notified of the findings of the investigation either by a phone call or letter. As a reference tool, first-time callers are also sent an *Aircraft Identification Guide* (see Attached). The outcome of the complaint is recorded on the complaint form and filed for future reference. Equivalent procedures for handling noise complaints are followed at Elmendorf AFB.

In an effort to reduce repeat events and complaints, Eielson AFB formed a Noise Complaint Review Panel (NCRP) in 1993. The NCRP is chaired by the 354th Fighter Wing vice commander and consists of representatives from the following base organizations: 354th Operations Group, Current Operations, 18th Fighter Squadron, 355th Fighter Squadron, Cope Thunder Operations, and Public Affairs. The purpose of the NCRP is to review complaints received at Eielson AFB and find ways to improve community feedback. The panel studies the affected areas for current flight restrictions and determines what actions can be taken to help eliminate or, at least, minimize the negative effects of flying on the civilian populace. One recent example of the NCRP's

Figure O-1 Sample Noise Complaint Log

Eielson Complaint Form

No: ______________________ PA Rep: ______________________

Date/Time of call ______________

Name of Caller: ____

Address: ____

____

Phone Number Home: ______________ Work: ______________

Attitude of Caller: Angry:_____ Calm:_____ Upset:_____ Threatening: ___________

Caller's Main Concern

Sonic Boom: _____ Low Flying: _____ Noise: _____ Property damage: ___________

Time/Date of occurance: ________ Location: ______________________________

Additional Info: ____

____

Aircraft Information

Direction aircraft was/were flying: __________ Approx. altitude: ______________

Type of aircraft: ______________________ Number of aircraft: ______________

Formation: ______________________ How often does this occur: ______________

Additional Info: ____

Delivered to 354 OG **Delivered to Cope Thunder**

______________________ ______________________

(Date/Time/POC) (Date/Time/POC)

Response Date/Time/Type: ____

____

____

____

efforts is the increase in the minimum flying altitude over the Lower Salcha River from 1,500 feet AGL to 8,000 feet AGL.

Table O-1 summarizes the noise complaints recorded at Eielson AFB between 1992 and 1995. Table O-2 summarizes complaints received by Elmendorf AFB between 1989 and 1995.

Table O-1 Noise Complaints Recorded at Eielson AFB (1992-1995)

Summary of Noise Complaints Received at Eielson AFB (1992 - 1995)	
1992	54
1993	46
1994	78
1995 (through April)	15

Table O-2 Noise Complaints Recorded at Elmendorf AFB (1989-1995)

Summary of Noise Complaints Received at Elmendorf AFB (1989 - 1995)	
1989	23
1990	18
1991	25
1992	30
1993	not available
1994	30
1995 (through April)	5

O.2 Damage Claims

Legal culpability and associated liability are addressed through the legal system on a case by case basis. The outcome of any particular case is entirely dependent on the specific factors of the situation or incident. It is inappropriate to attempt to predetermine potential liability for alleged damages from sonic booms. Air Force records for damage claims in Alaska show that, since 1988, five claims for damages have been made for military aircraft operations in various regions of the state. Of these five claims, three were paid and two denied. One claim from the Stony River area is now pending, and will be assessed when it is filed. No claims have been filed alleging adverse health effects.

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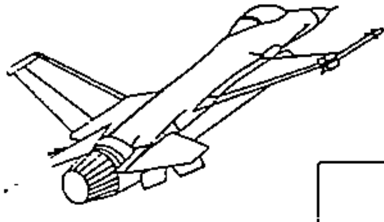
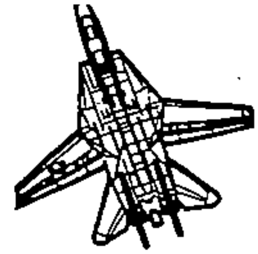
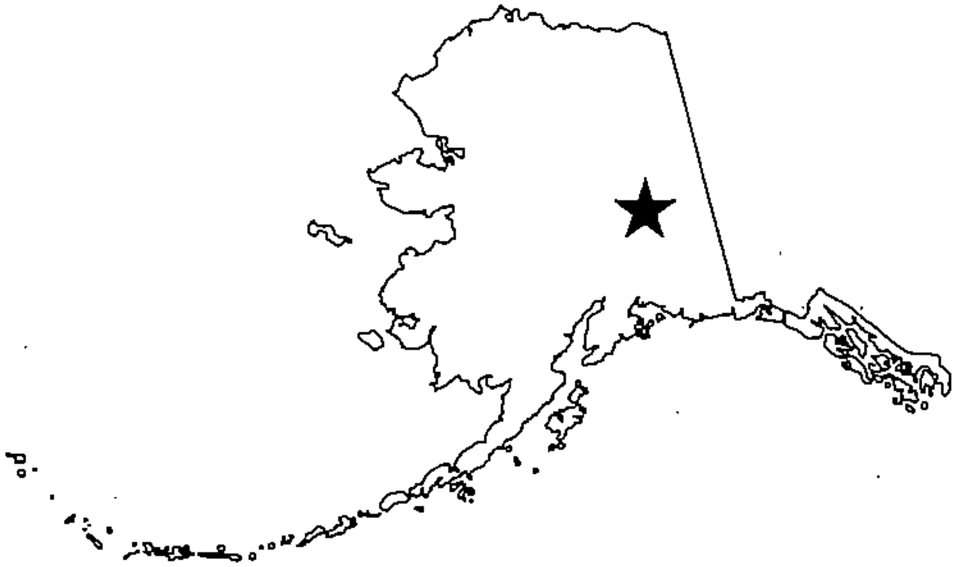
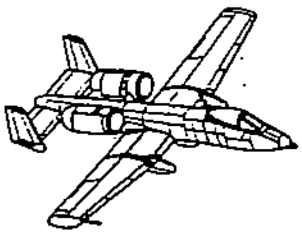
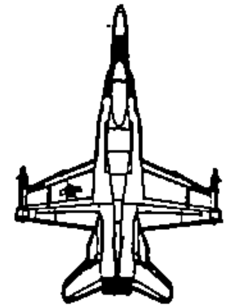
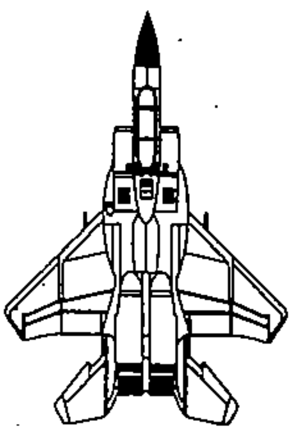
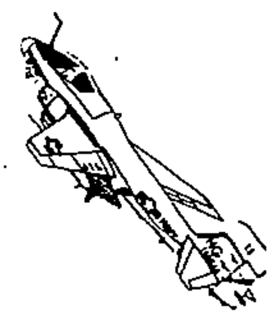
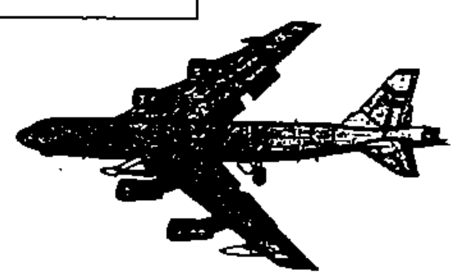


Aircraft Identification Guide

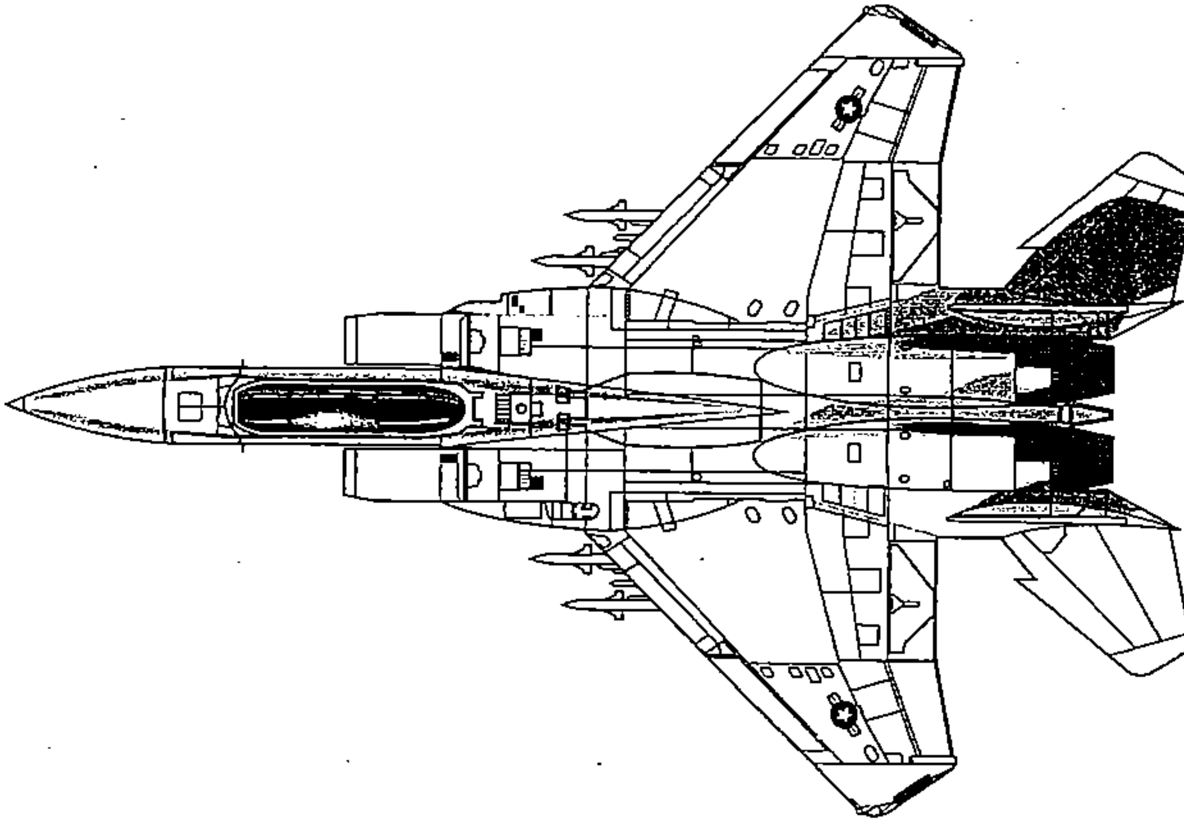



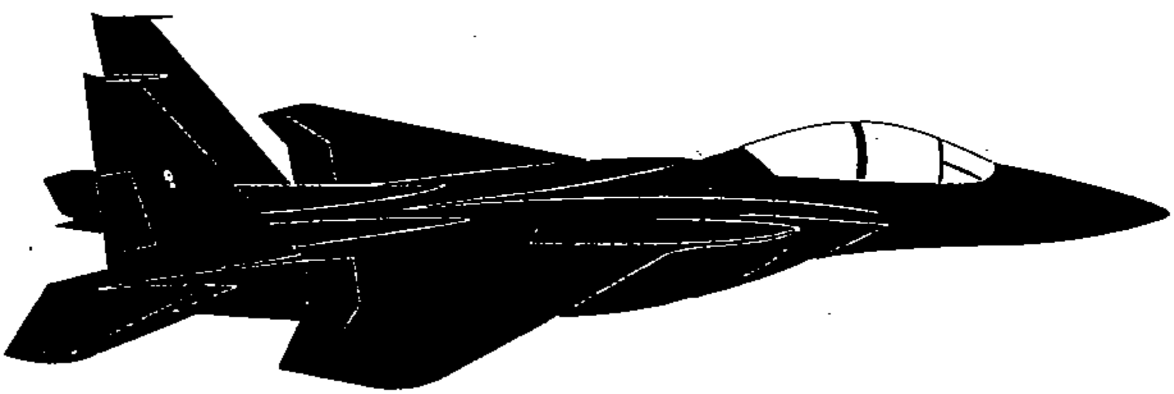
Provided by:
354th Fighter Wing Public Affairs
3112 Broadway Unit 15A
Eielson AFB AK 99702-1895
(907) 377-2116 or (907) 377-3148

F-16 (USAF)

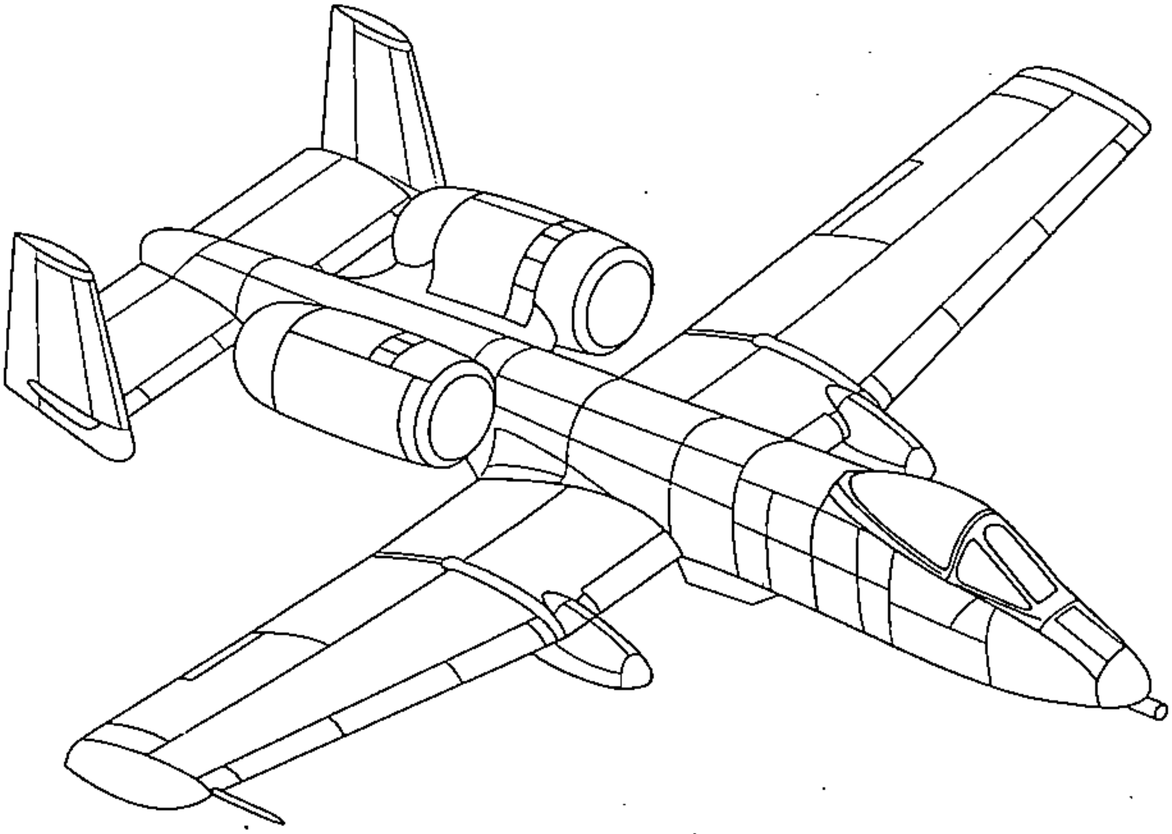
Wing Span: 31 feet
Length: 49 feet
Engine: Single Jet
Tail: Single, vertical
Wings: Delta
Key Visual Identification: Large intake under nose, small
Color: Battle Grey





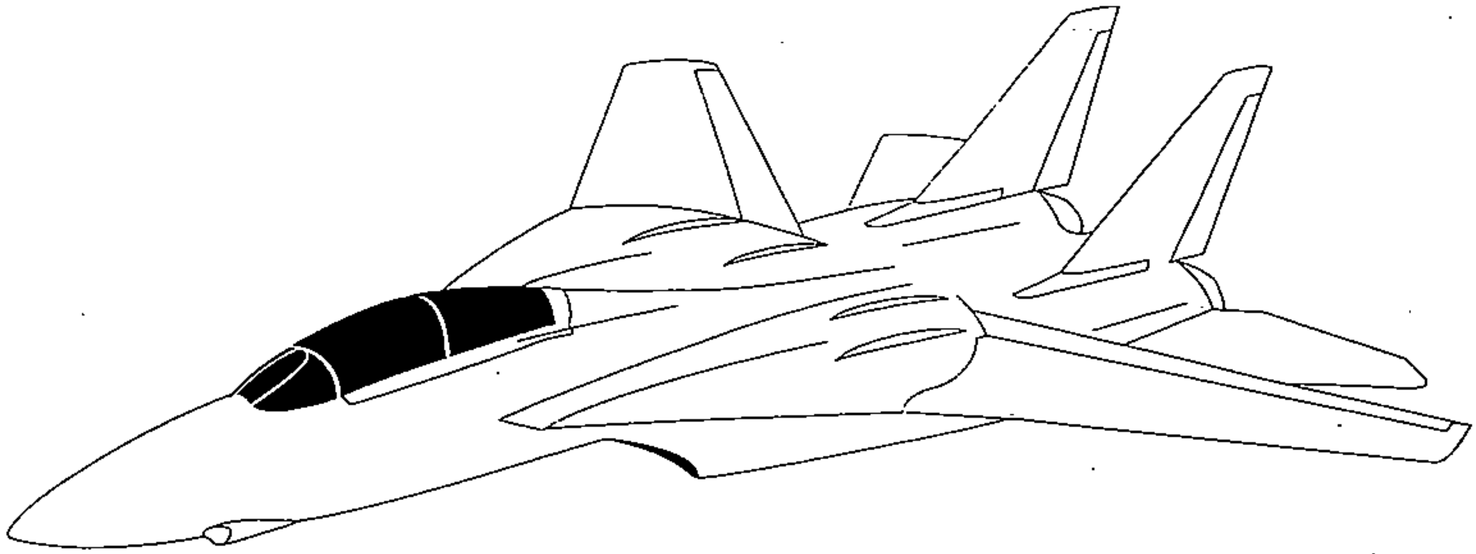
F-15 (USAF)

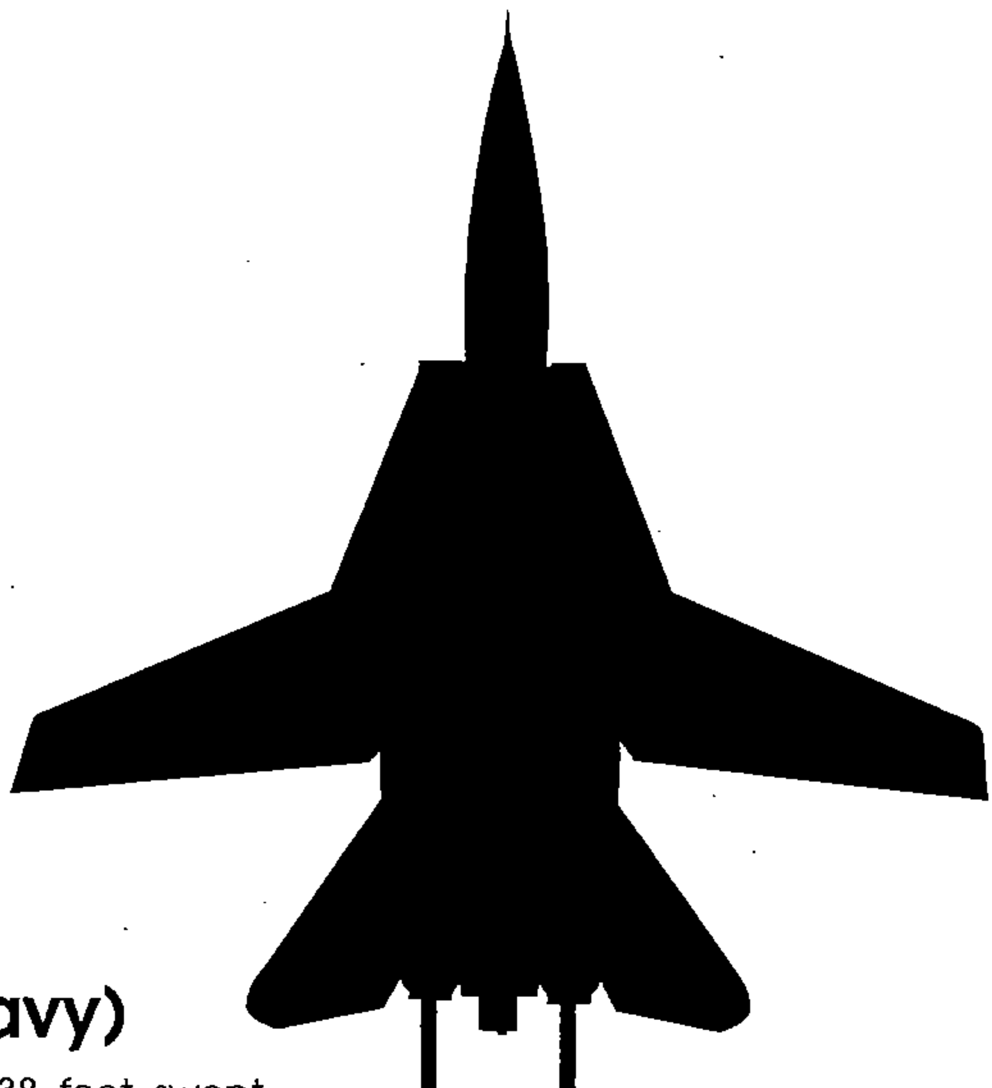
Wing Span: 42 feet
Length: 64 feet
Engine: Two jets, forward intakes
Tail: Two, vertical
Wings: High mounted, clipped delta
Key Visual Identification: Engine exhaust between two vertical tails
Color: Battle Grey



A-10 (USAF)

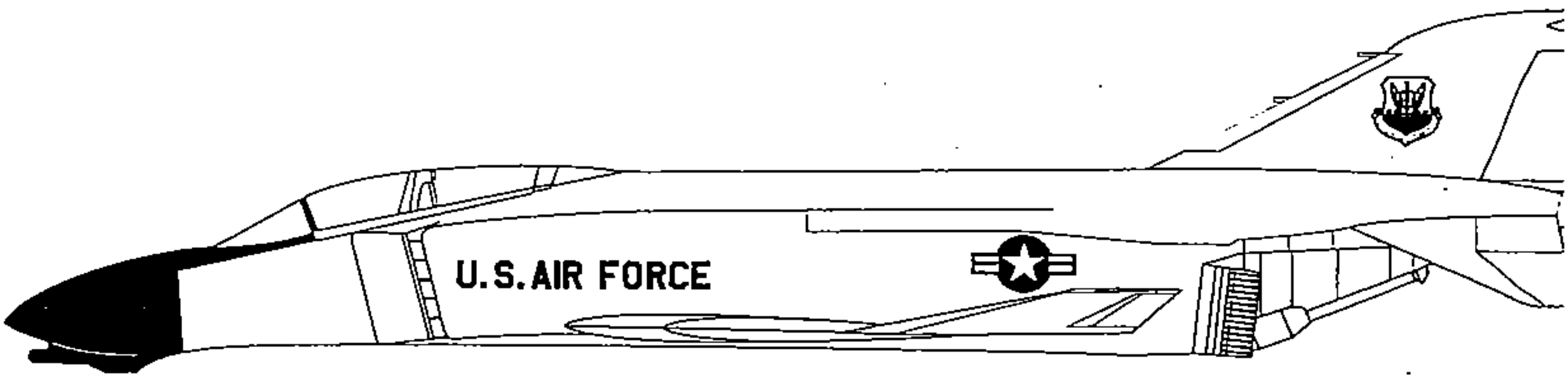
Wing Span: 58 feet
Length: 54 feet
Engine: Two jets
Tail: Two vertical on end of horizontal stabilizer
Wings: Low mounted, straight
Key Visual Identification: Two engines mounted high on rear of fuselage
Color: Green





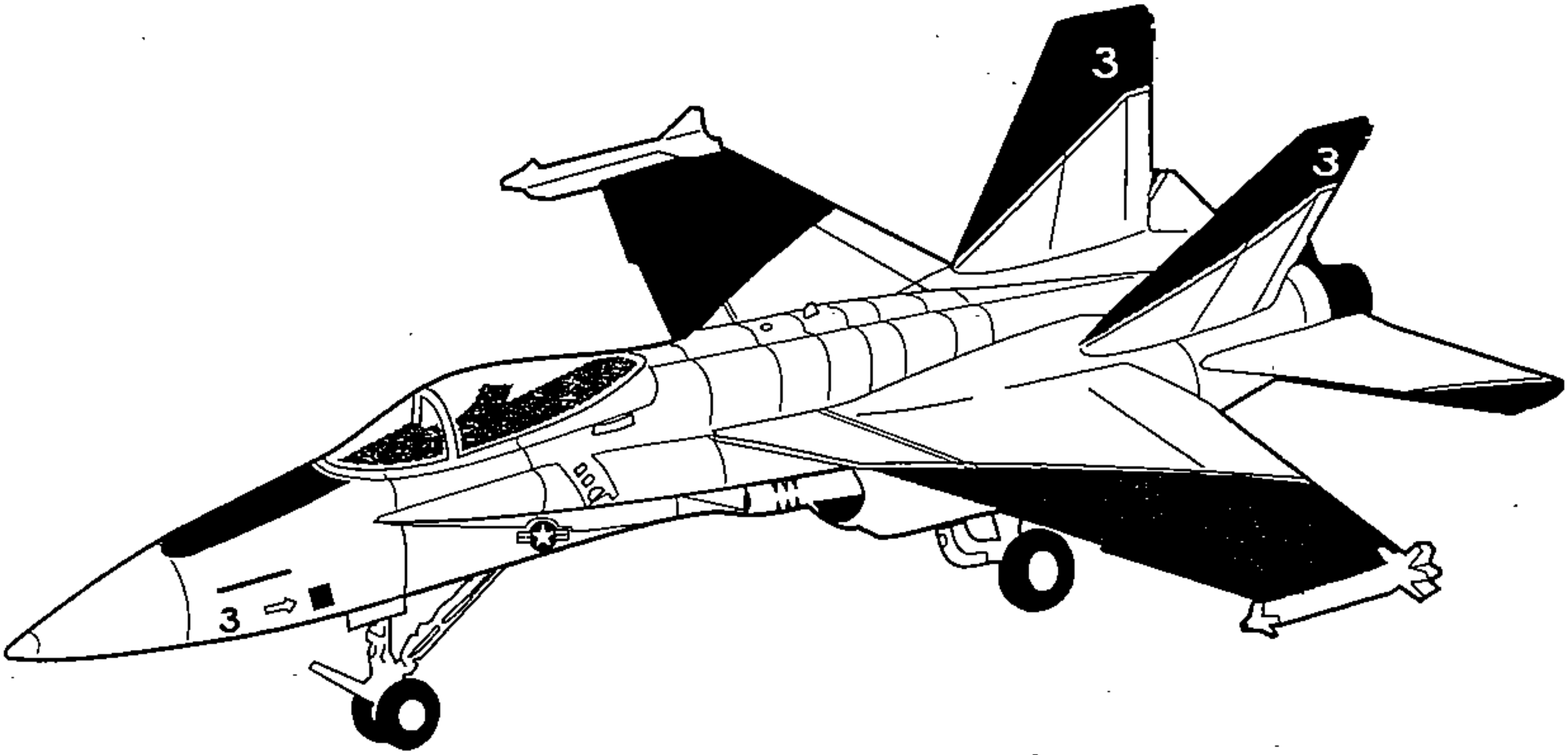
F-14 (US Navy)

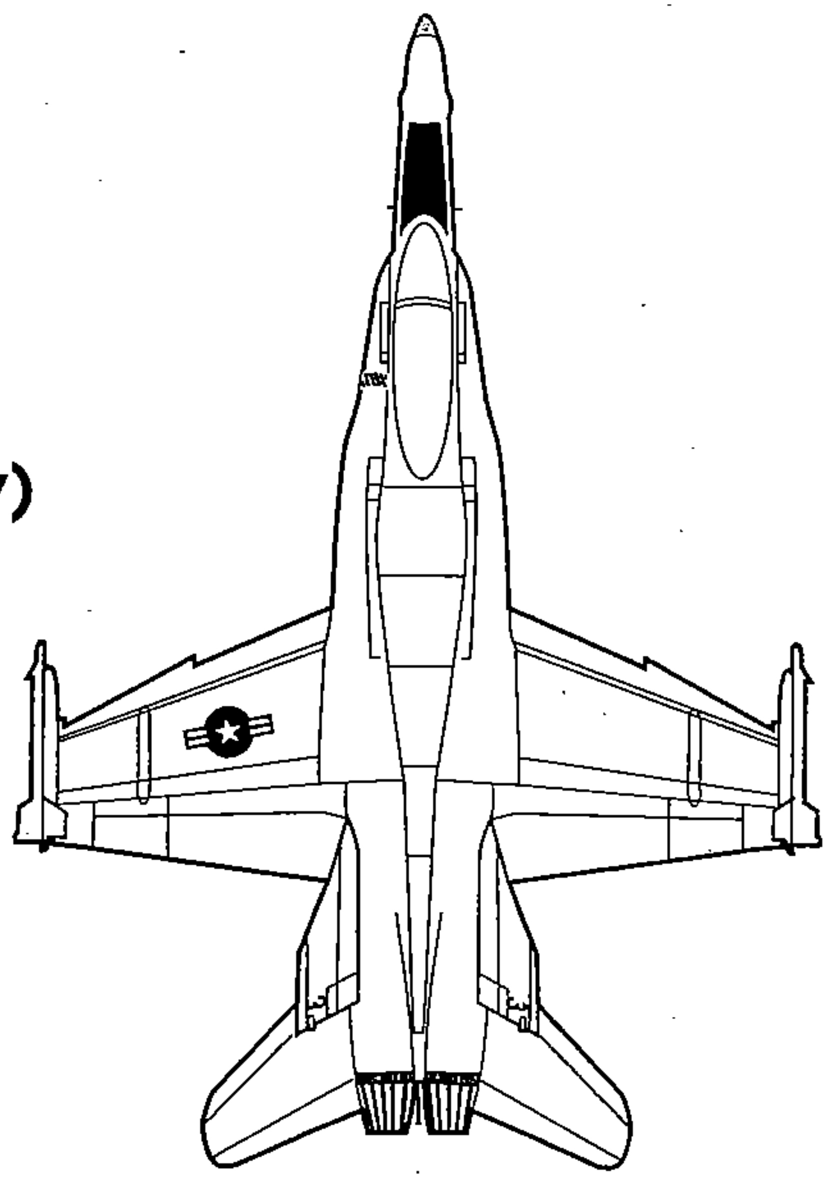
Wing Span: 64 feet/38 feet swept
Length: 62 feet
Engine: Two jets, intake under wings
Tail: Two vertical
Wings: Variable geometry, swept of forward
Key Visual Identification: Engine exhaust under vertical tail, swept wings
Color: Battle Grey



F-4 (USAF)

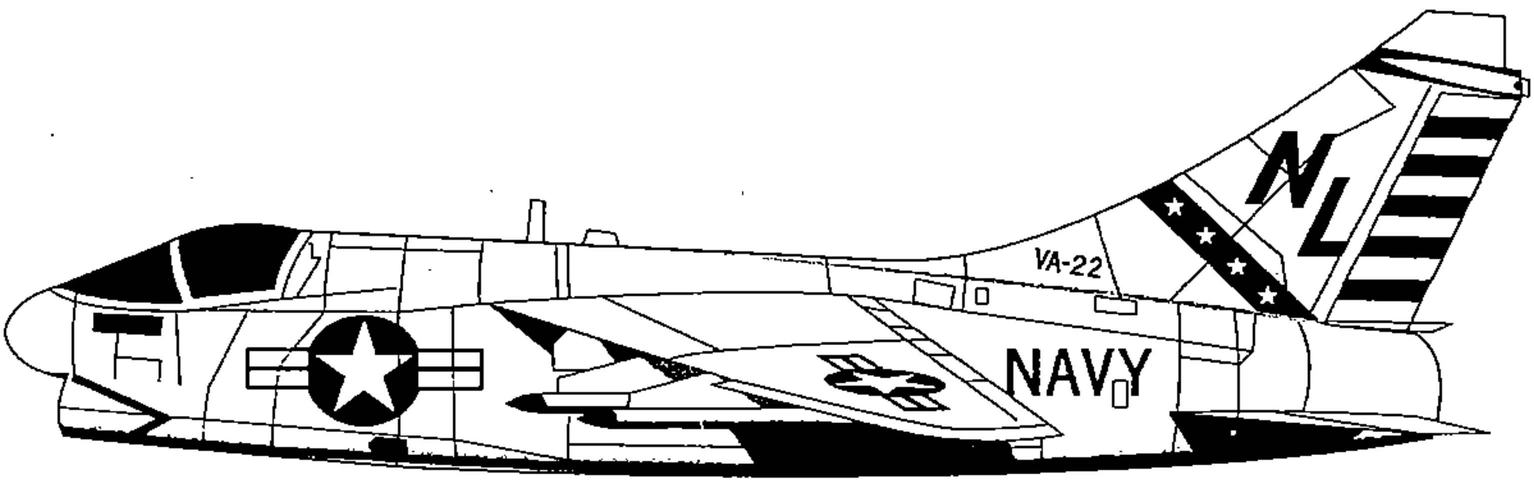
Wing Span: 38 feet
Length: 63 feet
Engine: Two jets, side intakes
Tail: Single, vertical; downward-slanting rear stabilizers
Wings: Low mounted, slanted, straight
Key Visual Identification: Wings turn upward at centerpoint
Color: Camouflage (Can be Battle Grey)





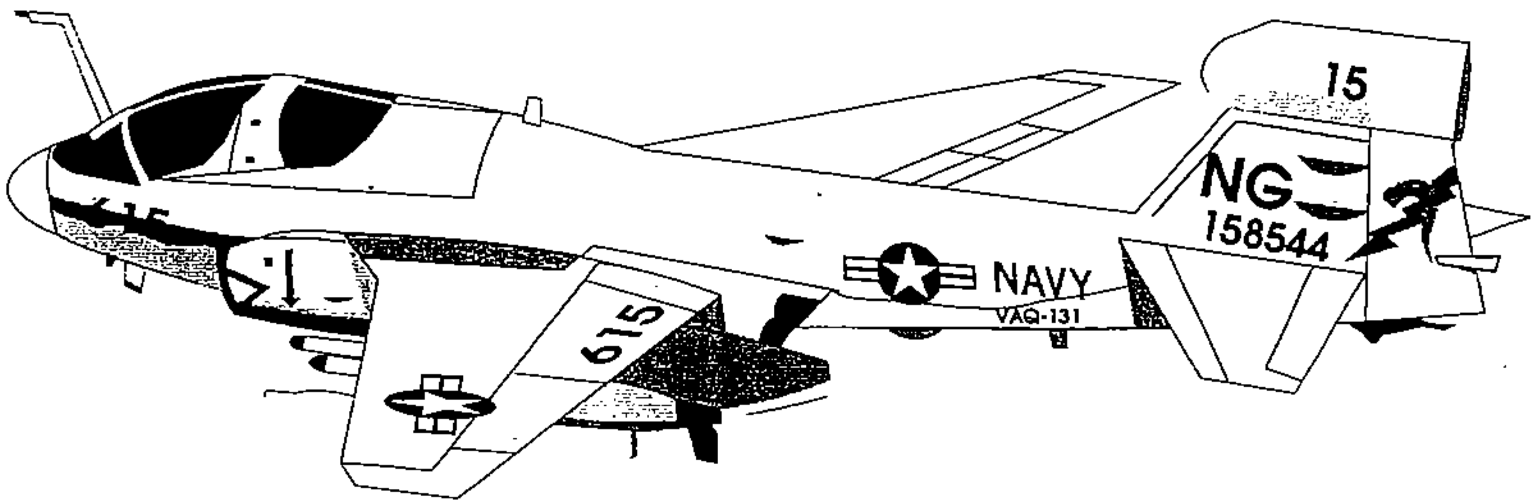
F/A-18 (US Navy)

Wing Span: 37 feet
Length: 56 feet
Engine: Two jets, parallel exhausts
Tail: Two, vertical
Wings: Slanted, straight
Key Visual Identification: Tail surfaces mounted at 15 degrees from horizontal
Color: Battle Grey



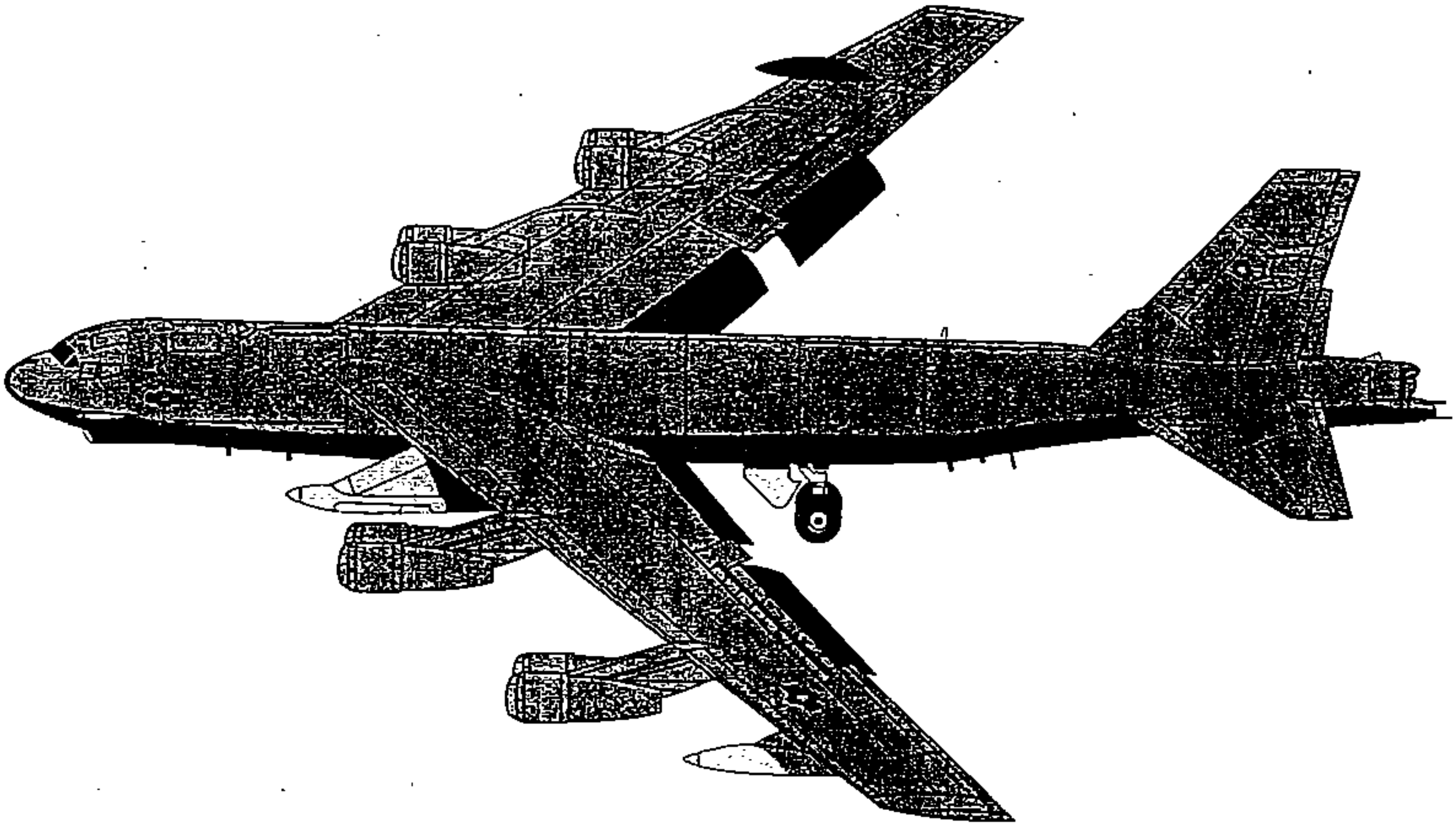
A-7 (US Navy)

Wing Span: 38 feet
Length: 46 feet
Engine: Single jet
Tail: Single, vertical
Wings: High mounted, swept
Key Visual Identification: Large engine intake under nose
Color: Battle Grey (Can be camouflage)



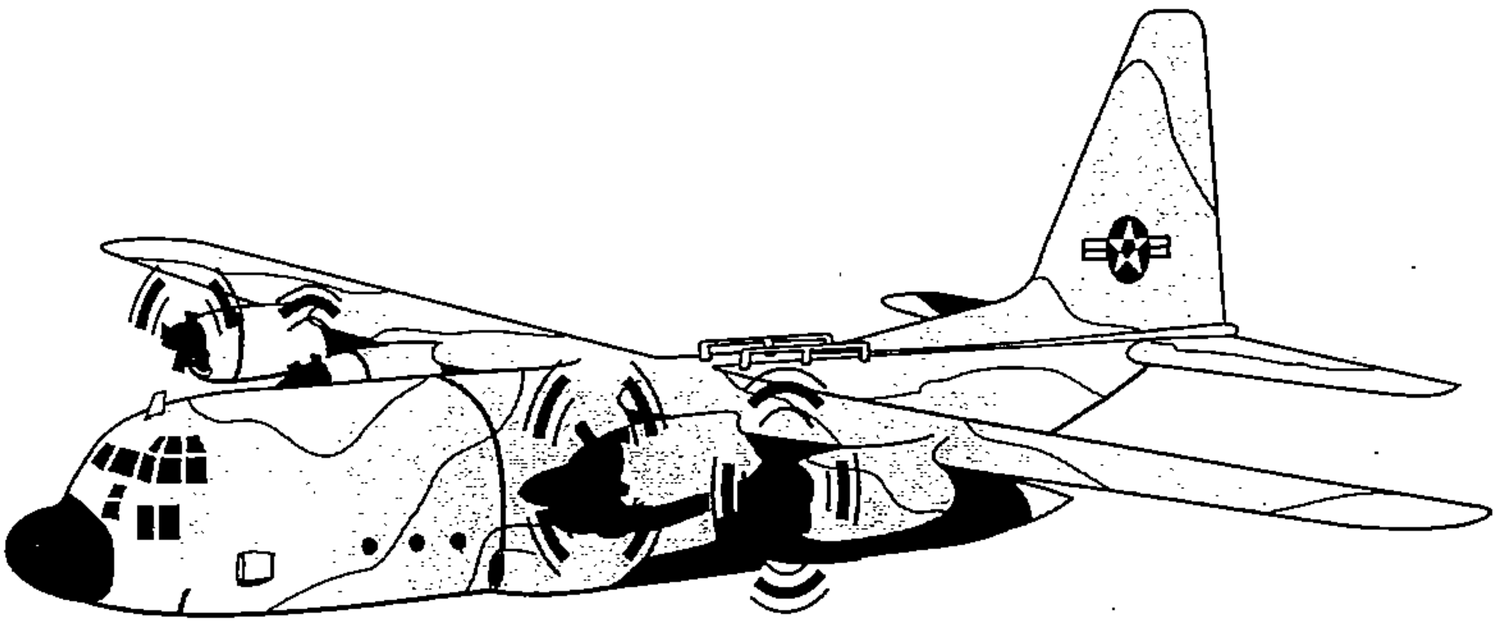
EA-6B (US Navy)

Wing Span: 53 feet
Length: 59 feet
Engine: Two jets, small intakes under fuselage
Tail: Single, vertical, expanded top
Wings: Slightly swept
Key Visual Identification: Refueling extention protruding off nose
Color:: Battle Grey



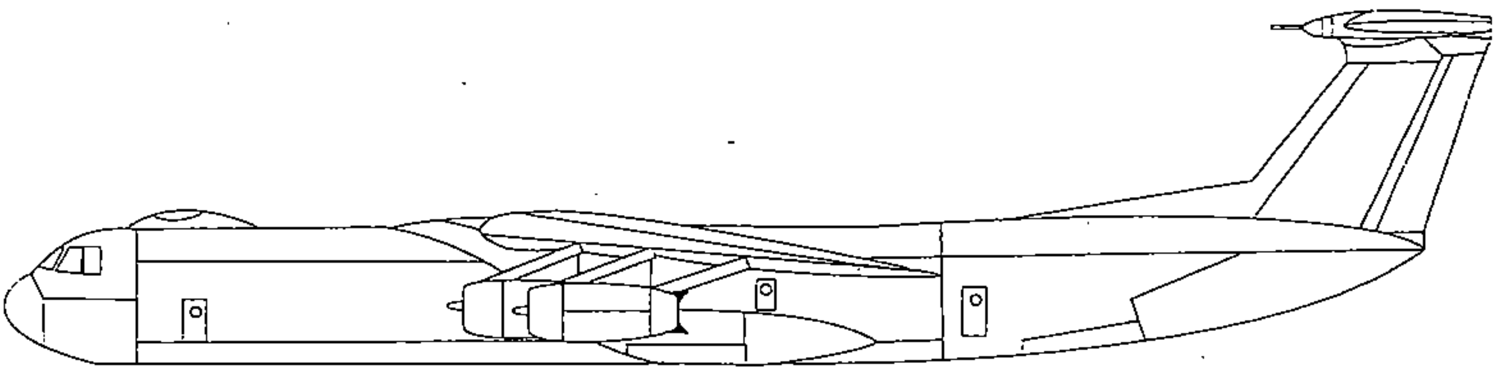
B-52 (USAF)

Wing Span: 185 feet
Length: 157 feet
Engine: Eight jets, paired
Tail: Single, vertical
Wings: Slightly swept
Key Visual Identification: Long tube-shape fuselage
Color: Camouflage top, Battle Grey belly



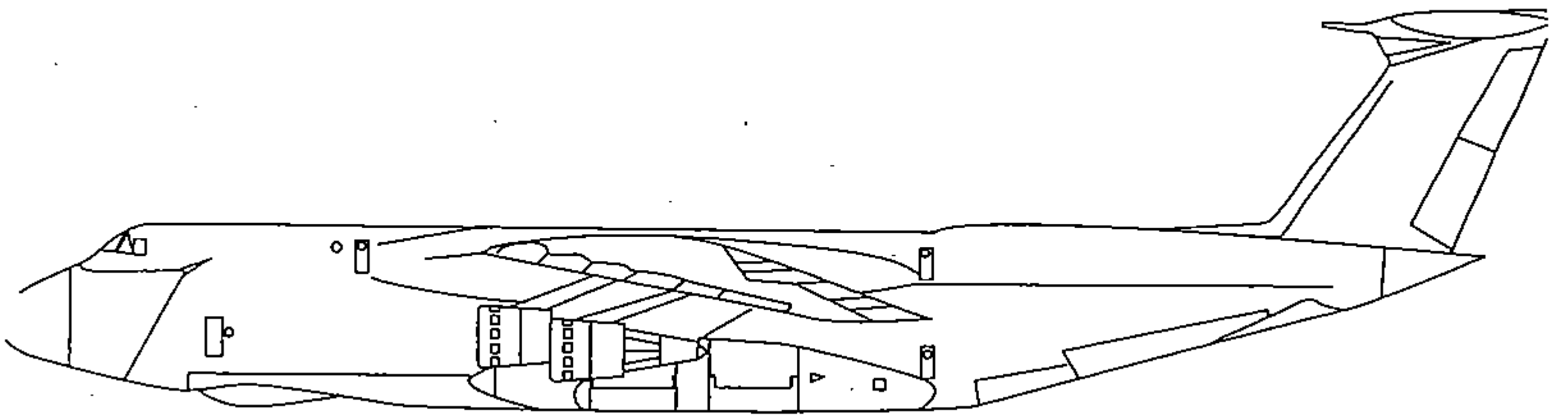
C-130 (USAF)

Wing Span: 132 feet
Length: 98 feet
Engine: Four turboprop
Tail: Single, vertical
Wings: High mounted, straight
Key Visual Identification: Bulb-shaped nose
Color: Camouflage (Can be Battle Grey)



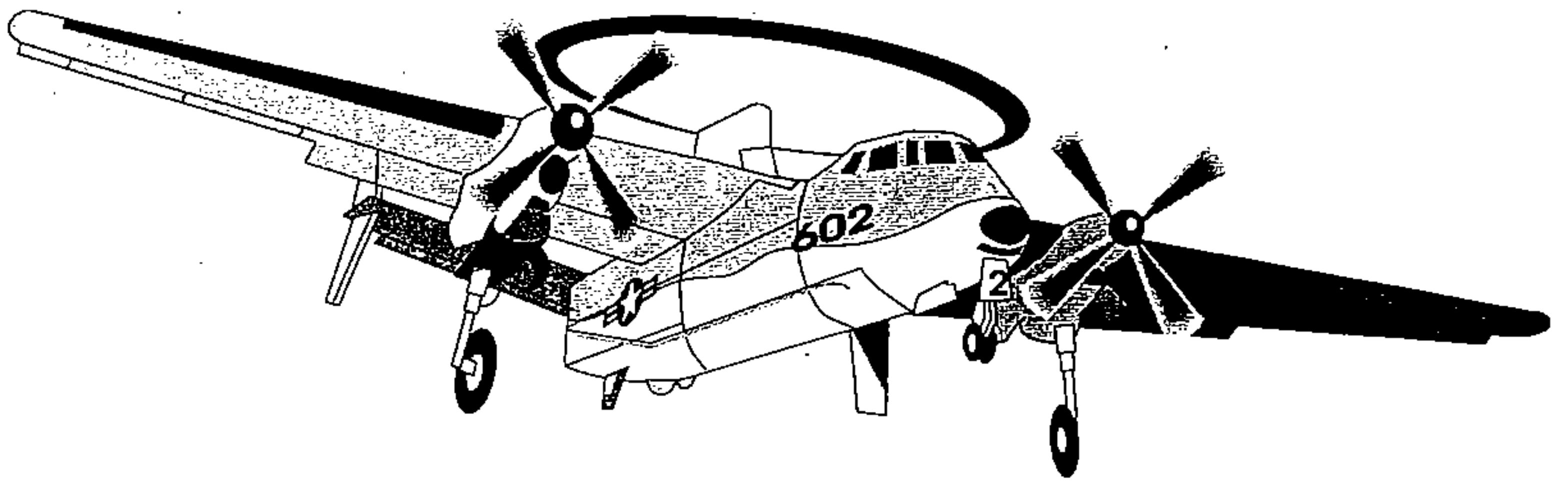
C-141

Wing Span: 161 feet
Length: 145 feet
Engine: Four jets
Tail: Single, vertical with "T"
Wings: High mounted, swept
Key Visual Identification: "T" tail, thin fuselage
Color: Camouflage



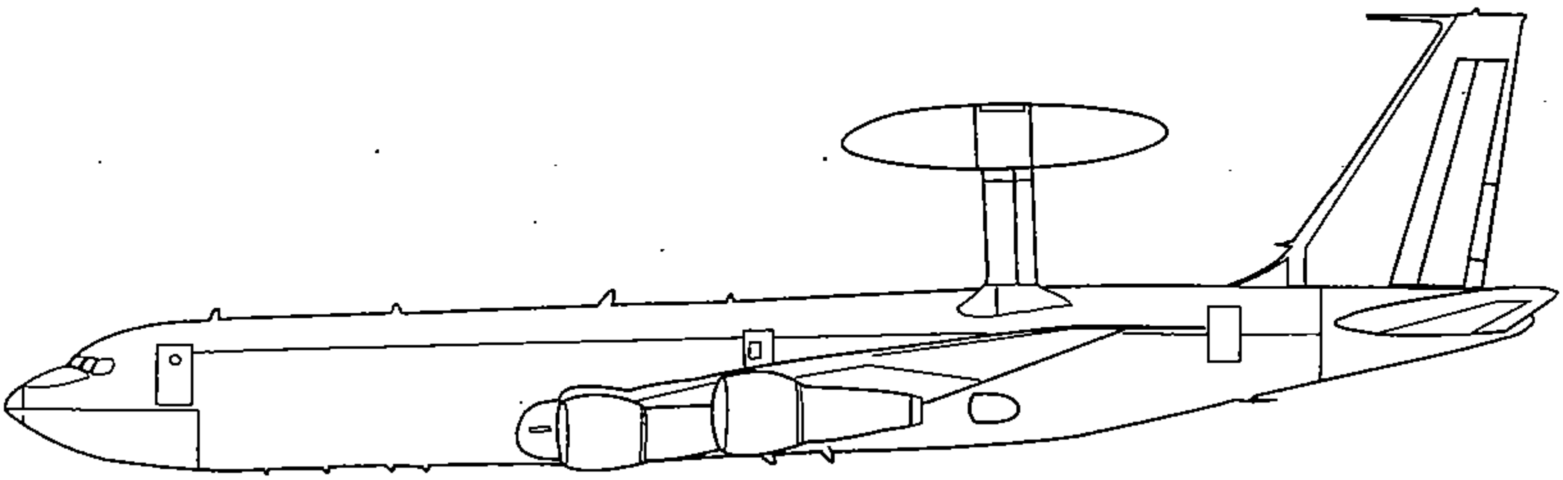
C-5 (USAF)

Wing Span: 223 feet
Length: 248 feet
Engine: Four jets
Tail: Single, vertical with big "T"
Wings: High mounted, swept
Key Visual Identification: Largest USAF aircraft, big "T" tail
Color: Camouflage (Can be Battle Grey)



E-2 (US Navy)

Wing Span: 81 feet
Length: 58 feet
Engine: Two turboprop
Tail: Single, vertical
Wings: Long, straight
Key Visual Identification: Disc mounted towards rear of fuselage
Color: White or grey



E-3 AWAC (USAF)

Wing Span: 146 feet
Length: 153 feet
Engine: Four jets
Tail: Single, vertical
Wings: Swept
Key Visual Identification: Large disc mounted above fuselage
Color: Camouflage (Can be Battle Grey)

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APPENDIX P

EXECUTIVE ORDER 12898

Executive Order 12898 (*Federal Actions To Address Environmental Justice In Minority and Low-Income Populations)* directs federal executive branch agencies to analyze as part of the environmental impact analysis process required by NEPA "disproportionately high adverse human health or environmental effects . . . on minority populations and low-income populations . . . ." An additional goal of Executive Order 12898 is to encourage and facilitate minority and low-income population participation in the formation of policies and the making of decisions affecting them.

P.1 Identification of Potentially Affected Minority and Low-Income Populations

Because of the types of aircraft activities (i.e., air combat maneuvering), FAA requirements to avoid maneuvering activities over and altitude restrictions above populated areas, and FAA requirements to establish MOAs away from federal airways, the vast majority of areas potentially impacted by the Proposed Action and Alternatives are sparsely populated rural areas. Several small villages and other population centers are scattered throughout the land underlying the MOAs or within their Region of Influence. Since it is impossible to pinpoint the residence of each and every person within this extensive geographic area or identify the total number of minorities and low-income persons, populations necessarily had to be classified according to population centers covered by census data. Additionally, no data is available to measure the percentage of the population that is a minority in the potentially affected geographic area.

A review of demographic information collected for the analysis of potential impacts on subsistence is included in Volume III, Appendix J. Population centers with a 1990 census showing a majority Native American population were considered to be part of the potentially affected minority population. Based on that data, the following villages constitute the minority population considered within the geographic area potentially affected by the proposal and its alternatives: Circle, Eagle Village, Chalkyitsik, Fort Yukon, Birch Creek, Venetie, Arctic Village, Healy Lake, Dot Lake, Gulkana, Tanacross, Chistochina, Koliganek, Lime Village, Red Devil, Sleetmute, Stony River Village, Nikolai, Ruby, Chuathbaluk, and Telida. According to the 1990 census, the population of these communities consists of 347 whites, 1,943 Native Americans, and 14 other minority group members.

Identification of potentially adversely affected low-income populations presented the same difficulties as identification of minority populations within the Region of Influence. Focus was necessarily again upon communities, with low-income status determined by those communities that available data showed to have a median income below Department of Health and Human Services poverty guidelines (i.e., $14,800.00 for a family of four in 1994) or, in the absence of median income levels, those communities with only seasonal or part-time sources of employment. Based on that data, the following communities constitute the low-income population potentially affected by the proposal and its alternatives: Circle, Central, Eagle City, Eagle Village, Chalkyitsik, Birch Creek, Venetie, Arctic Village, Healy Lake, Skwentna, Lime Village,, Sleetmute, Stony River Village, Lake Minchumina, Nikolai, Ruby, Chuathbaluk, and Telida.

P.2 Method of Identification of Potential Adverse Effects

No final guidance concerning how to implement the requirements of Executive Order 12898 to facilitate a specific environmental justice analysis was available during the preparation of the EIS. Consequently, the general analysis of adverse human health and environmental effects required by NEPA was used as the basis for identifying and analyzing the potential for disproportionately high adverse effects of the Proposed Action and Alternatives on minority and low-income populations. In other words, potential adverse effects on human health and the environment were identified as part of the NEPA analysis and, once identified, those potential adverse effects that might be expected to have the potential for disproportionate adverse effects on the identified minority and low-income populations were segregated.

P.3 Potential Adverse Effects Identified in the EIS

The EIS identified potential significantly adverse impacts in two areas that might disproportionately affect the identified minority and low-income populations because of the geographic area potentially impacted and because of the importance of the resource to minority and/or low-income populations. Those areas are subsistence and recreation.

P.3.1 Subsistence

While even some urban Alaskans are eligible to subsistence hunt, the State of Alaska's rural population, both non-minority and minority, often depend upon subsistence resources for meat and marketable furs and skins. The ability to harvest wildlife supplements the income of many rural residents by making purchase of some food and other items unnecessary. The sale of handicrafts made from animal bone, fur, and skin taken in subsistence hunting and trapping provide a source of supplemental income for many. Subsistence among the Alaska Native population is even more important and has been called "the very foundation of Native religious belief systems . . ."

The subsistence analysis in the EIS identified potential significantly adverse impacts generally during MFEs conducted in the August to September period for the following minority and/or low-income communities (see Chapter 4, section 4.7; and response to comment SUB-001): Eagle Village, Dot Lake, Healy Lake, and Tanacross. All of these communities are minority communities, and two, Eagle Village and Healy Lake, are also low-income communities. Of the individuals potentially adversely affected, 42 are white and 199 are Native Americans. Compared with the total population in the minority communities identified, 42 out of 347 whites (12.1 percent) are potentially adversely affected and 199 out 1,957 (10.1 percent) minority group members are potentially adversely affected. When the number of individuals who are subject to a potentially significant adverse effect on their subsistence hunting is compared to the total population whose subsistence areas are beneath or within the Region of Influence of one or more MOAs but not subject to potential significant impacts, 1.5 percent of whites are affected compared with 8.1 percent of minorities.

When the impact on low-income communities is examined, 82 persons in low-income communities are potentially significantly adversely affected, while 159 persons not in low-income communities are so situated. This is 5.8 percent of the total low-income individuals and 3.9 percent of those not of low-income whose communities lie beneath a MOA or are in the Region of Influence of one or more MOAs.

P.3.2 Recreation

Impacts on recreation are a concern to both Alaska Native and low-income individuals because many of the seasonal and part-time jobs held by members of these groups are dependent upon a viable recreation industry in the surrounding area. Actual impacts on specific business enterprises that depend on a viable recreation resource are impossible to predict. An effort was made to identify the number of master-guide outfitters, guide outfitters, and wilderness recreation and tourism businesses operating beneath each MOA (see Chapter 3, section 3.6.7).

The following potential significantly adverse impacts were identified to recreation resources during MFEs conducted in the June 15 to September 15 period (see Chapter 4, section 4.6): Those portions of the Yukon-Charley Rivers National Preserve and Charley National Wild River under the YUKON 3 and 4 MOAs; 87-97 percent of the Fortymile National Wild and Scenic Rivers, depending upon the alternative; up to 96 percent of the Gulkana National Wild River (Main Stem), depending on the alternative; the entire Gulkana National Wild River (Middle Fork) under Alternative B; up to 97 percent of the West Fork of the Gulkana River, depending on the alternative; 100 percent of the Delta National Wild River under Alternative B; and up to 85 percent of the proposed West Fork Gulkana River Area of Critical Environmental Concern (ACEC), depending upon the alternative.

Significantly adverse impacts that may reduce the number of tourists in areas underlying YUKON 3 and 4 MOAs could affect 6 guide-outfitters and 18 wilderness recreation and tourism businesses. Reductions in these businesses could potentially affect part-time and seasonal employment opportunities in the Alaska Native community of Eagle Village and the low-income community of Eagle City although there is no statistical data available to confirm that any of the inhabitants of either community are employed by any of the recreation businesses potentially impacted by Air Force operations in the YUKON 3 and 4 MOAs. Assuming 100 percent of the populations of these communities are employed in recreation services businesses, 28 Native Americans, or 1.1 percent of the minority community population in the Region of Influence, are potentially significantly adversely affected. This is compared with 7 whites in Eagle Village, or 2 percent of the whites living in the minority communities in the Region of Influence or .25 percent of the area's total white population. Both communities are classified as low-income and comprise 14.5 percent of the total low-income population in the Region of Influence.

The remaining potential significantly adverse impacts were located in the Southcentral Region beneath SUSITNA MOA (1 master-guide outfitter, 11 guide outfitters), FOX MOA (1 master-guide outfitter, 45 guide outfitters), and TANANA MOA (1 master-guide outfitter, 15 guide outfitters) MOAs. An additional 75 wilderness recreation and tourism businesses operated in the region, but 66 percent of these operated exclusively in Denali National Park and Preserve, which is not beneath any MOA. The low-income community of Skwentna is located beneath SUSITNA MOA. The Alaska Native community of Gulkana is potentially impacted by operations in the FOX MOA and the Alaska Native communities of Chistochina and Tanacross are potentially impacted by operations in FOX and TANANA MOAs. The potential impact is again based upon potential impacts to the volume of business done by the recreation services providers identified as operating beneath a MOA. However, as with the discussion concerning YUKON 3 and 4 MOAs, there is no statistical data available to confirm that any of the inhabitants of these communities are employed by any of the recreation businesses potentially impacted by Air Force operations in any of these Southcentral Region MOAs. Again assuming 100 percent of the populations of these communities are somehow employed in recreation service businesses potentially significantly adversely affected, then 85 low-income people in Skwentna, or 6.1 percent of the total low-income population in the Region of Influence, could be significantly adversely affected. Potential significant adverse impacts on the Alaska Native communities of Gulkana, Chistochina, and Tanacross could affect 198 minority group members or 11 percent of the total of the minority communities in the Region of Influence or 8 percent of the area's total minority population.

P.4 Mitigation to Reduce Impacts on Subsistence and Recreation

Mitigation to delete all or parts of MOAs, raise MOA floors to higher altitudes, avoid MFEs during the primary subsistence hunting seasons (August-September) and recreation times (a week before and a week after the 4th of July) can all lessen the impact on subsistence and recreation resources and the effect of those impacts upon minority and low-income communities. The Preferred Alternative implements a combination of these mitigations that result in a general decrease in the potential impacts upon subsistence and recreation. Any possible disproportionate effects upon minority and low-income individuals are, therefore, either eliminated or reduced from significantly adverse.

P.5 Minority/Low-Income Participation in the EIS Process

The EIS was marked by a concerted effort to involve Alaska Natives, low-income individuals, and rural residents in the process of defining the scope of the EIS and identifying issues of particular concern to Alaska Natives and rural residents of the potentially impacted areas. Part of this effort involved travelling to Interior and Western Alaska to hold scoping meetings and public hearings in or near the communities whose populations might be affected by the Air Force's proposal. The hearing locations also enhanced the access of low-income community members to a forum for expressing their views and suggestions. During the course of both the scoping and public hearing phases of the EIS, the following rural and Alaska Native communities were visited by a briefing team: Arctic Village, Lime Village, Chalkyitsik, Dot Lake, Tok, Fort Yukon, Eagle, Sleetmute, Venetie, and McGrath. Participants in the Alaska Native villages included village council members and village elders. In cases where the elders did not speak English, a younger villager served as his or her translator.

From the early days of the EIS, Alaska Native organizations and Alaska Native and rural communities were briefed on the Proposed Action and Alternatives and actively consulted on issues of concern to Alaska Natives. The following Alaska Native groups were either consulted or received copies of the Draft EIS Executive Summary:

Ahtna, Inc.
Alaska Federation of Natives
Alaska Native Foundation
Arctic Village Traditional Council
Baan o yeel kon Corporation
Beaver Native Village Council
Birch Creek Native Village Council
Bristol Bay Native Association
Calista Corporation
Community of Cantwell
Chalkyitsik Native Corporation
Chalkyitsik Village Council
Chickaloon/Moose Creek Native Association
Chickaloon Traditional Council
Chistochina Village Council
Circle Village
Cook Inlet Region, Inc.
Cook Inlet Tribal Council
Copper River Native Association
Crooked Creek Village Council
Danzhit Hanlaii Corporation
Dillingham Native Village
Dot Lake Native Corporation
Dot Lake Village Council
Doyon, Ltd.
Eagle Village Council
Fort Yukon Native Village
Gulkana Village Council
Gakona Village Council
Healy Lake Village Council
Iliamna Natives Limited
Iliamna Village Council
Koliganek Village Council
Kuskokwim Corporation
Kuskokwim Native Association
Lime Village Company
Lime Village Traditional Council
Mandas Cha-ag Native Corporation
McGrath Native Village
Mentasta Lake Village Traditional Council
Mentasta Village Council
Red Devil Corporation
Sleetmute Traditional Village Council
Stony River Village Council
Tanacross Village Council
Tanacross, Inc.
Tanana Chiefs Conference
Tihteet' Aii, Inc.
Venetie Traditional Council

A total of three written comments were received during the public comment period on the Draft EIS from Alaska Native groups. Individuals from the following potentially affected minority or low-income rural communities also submitted written comments: Fort Yukon, Ruby, Eagle City, and Lake Minchumina. Mr. Will Mayo, President of the Tanana Chiefs Conference, has said:

> To the 11th Air Force's credit, they recognized the importance of subsistence in Alaska and eliminated entire military training routes and implemented major shifts in military operations to address these concerns. In fact, they went far beyond the legal requirement to seek out and identify specific concerns. They deserve credit for working closely with Alaskans to make their presence as small and unobtrusive as possible. I wanted to publicly thank them for their close work with our organization (*Anchorage Daily News*, 21 April 1995, p. D11).

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