Malmstrom Air Force Base: A Sensible Tanker Choice

Executive Summary

The Air Force favors the efficiencies of maintaining larger, "core" tanker bases

- By consolidating tanker assets, the Air Force reaps obvious savings in maintenance, operation, and training efficiency
- Consolidated tanker assets operating from one location can support war planners in larger operational packages

Malmstrom can and should be that Core Tanker Base

- Core tanker base capability for up to 36 tankers;
- Over $100 million investment in recent tanker support facilities;
- Access to a superior training environment;
- Unencroached air space; and,
- Environmentally unencumbered operations.

Core Tanker Base Malmstrom is mission-ready

- Malmstrom has versatile tanker capabilities for both east and west deployment support missions due to its central CONUS and norther tier location
- Malmstrom's takeoff load capability is sufficient to support over 90% of real-world tanker missions

VLDC01-44621.1

✓ with GEN DAVIS

WEATHER

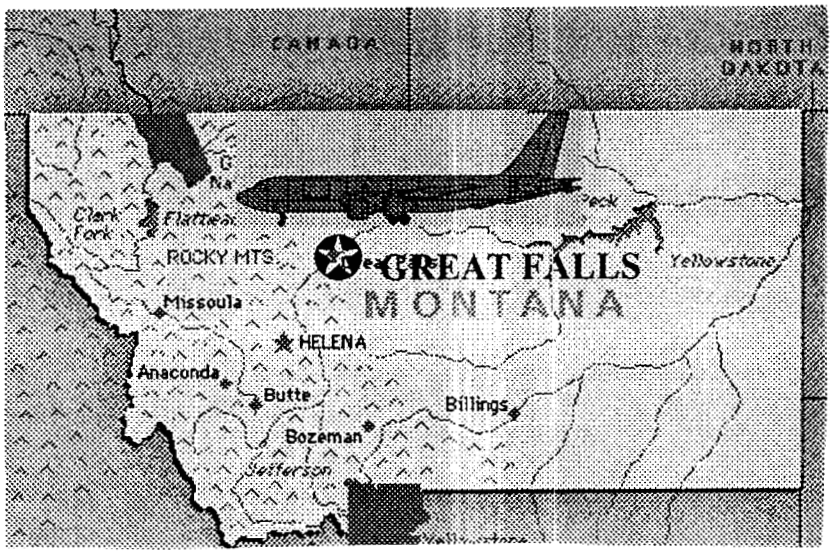
Executive Summary (cont.)

Malmstrom as a Core Tanker Base makes sense

- This realignment allows maximum cost savings by completely closing Grand Forks Air Force Base
- Greater efficiencies result from combining the missile and tanker missions at one base
- An operating runway enhances the military value of Malmstrom's missile mission through ready air support
- This solution frees up more northern tier tankers for geographic redistribution to tanker-needy areas

Malmstrom Air Force Base:

A Sensible Tanker Choice



Malmstrom Air Force Base:

A Sensible Tanker Choice

Introduction

The Commission should retain a tanker mission at Malmstrom Air Force Base because it makes strategic sense and it makes financial sense. First, Malmstrom is an outstanding tanker base with a valuable strategic location. Malmstrom can support nearly all "real world" tanker missions originating in the continental United States. Second, Malmstrom has a "core" tanker base capability. Malmstrom can support 36 tankers without significant additional military construction, allowing the Commission to reap the maximum savings by closing Grand Forks Air Force Base.

This paper will first summarize the strategic advantages of Malmstrom Air Force Base, demonstrating its capabilities in light of "real world" missions. Second, the paper will explain why the best financial solution to the current geographical tanker distribution problem involves establishing Malmstrom as a Core Tanker Base.

I. Malmstrom Makes Strategic Sense

A. MALMSTROM IS A SUPERIOR FLIGHT FACILITY

Malmstrom is one of the most modern and up-to-date flight facilities available for tanker missions. Its **superior military value** is derived from:

1. Over $100 million investment in recent tanker support facilities;
2. "Core" tanker base capability;
3. Access to a superior training environment;
4. Unencroached air space; and,
5. Environmentally unencumbered operations.

This paper describes those advantages briefly.

1. **Malmstrom's Recently Constructed Tanker Support Facilities**

Starting in 1987, Malmstrom Air Force Base has undergone an amazing transformation into a premier tanker base. Over $100 million dollars in construction has been spent to provide state-of-the-art mission support facilities. Commissioners and staff have witnessed first-hand the incredible capabilities resident in the brand new facilities, such as the three bay hanger, corrosion control facility and maintenance complex.

2. **Malmstrom's "Core" Tanker Base Capability**

The logic behind using "Core" tanker bases is discussed in more detail in the next section of this paper. Initially, the Commission needs to understand that **Malmstrom is ready to serve as a Core Tanker Base**. Although Malmstrom currently only has 12 assigned tankers, Malmstrom is capable of bedding down up to 36 KC-135 aircraft with minimal ramp alterations. The recent military construction improvements at Malmstrom were designed to fully support up to 36 aircraft.

3. **Malmstrom's Superior Training Environment**

The ready access of Malmstrom tankers to low level routes and numerous A/R tracks provide the Air Force a tremendous tanker training platform. Incredibly, there are 43 A/R routes within 500 nautical miles of the base, and 8 within 200 nautical miles. There are 11 major Western fighter ranges within 1.5 hours flight time of Malmstrom. Of particular value is Malmstrom's immediate or easy access to: 1) the composite wing at Mountain Home Air Force Base; 2) the Nellis Training Range, and; 3) the Utah Test Range. The proximity to these DoD assets provide a myriad of additional training opportunities available to Malmstrom tankers. State-of-the-art tanker simulators at Malmstrom provide the final component in a training environment capable of maintaining tanker crew readiness for **any** mission.

Easy access to A/R routes, low-level routes, ranges and MOAs combine to provide the Air Force a superior training environment around Malmstrom Air Force Base.

4. Malmstrom's Unencroached Airspace

The "Big Sky" country of Montana offers a tremendous operating environment for all military operations. The Commission was presented dramatic testimony regarding the military advantages which accrue to the Air Force missile mission from Montana's wide open spaces and very low population density. Those benefits convey to the flying environment within Montana as well.

The low population base throughout Montana keeps commercial air traffic demand relatively low. **Accordingly, the air space in and around Montana is totally unencroached.** Malmstrom experiences no ATC delay problems. Close access to training and A/R routes, ranges and MOA's is unfettered by congested commercial or general aviation traffic. This superior operating environment is not anticipated to erode in the near future due to projected growth. Montana, and Malmstrom in particular, should be an Air Force target location for increased flight operations based on the lack of present and future encroachment.

5. Malmstrom's Environmentally Unencumbered Operations

Increasingly, all military services must be concerned with environmental constraints on base and military operations. The Air Force, due to the substantial emission pollution inherent in flying operations must be particularly mindful of present, but more importantly, future mission limitations in CONUS.

Urban bases, competing with substantial civilian polluters, will find it increasingly difficult to fully meet all mission requirements. The options to overcome this growing problem are simple:

1. Fail to meet all mission requirements from environmentally constrained bases.
   Result: eroded readiness
2. Deploy assets to remote locations to operate and train.
   Result: increased cost and inefficient use of basing structure
3. Consolidate environmentally challenging missions (flying) to remote, unencumbered bases.
   Result: forego costly, inefficient and militarily unacceptable options; enjoy unencumbered operations.

Again, Malmstrom is in a sparsely populated area free from environmental problems. **Malmstrom is anticipated to remain an environmentally superior location for flying operations into the foreseeable future.**

VLDC01-44621.1

* * * * *

These five points and other advantages found at Malmstrom add up to unparalleled military value among northern-tier tanker bases. The bottom line is **Malmstrom Air Force Base presently offers the Air Force modern, efficient aviation support facilities capable of meeting tanker needs well into the next century.**

B. MALMSTROM BENEFITS FROM GEOGRAPHICAL ADVANTAGES

Malmstrom Air Force Base is located in Great Falls, Montana. The base's strategic location on our Nation's "Northern tier" provides the Air Force innate military value to both the missile and tanker missions resident at Malmstrom.

Commissioners have been convinced that Malmstrom's location in Montana provides superior military value due to:

- Malmstrom's **geographic** access to circle routes for enemy missile targeting
- Montana's **geology** which provides hardness for deployment of Minute Man III missile systems
- Montana's **topography** which provides defensive value for missile survivability
- Montana's **population** density affords the Air Force an unencroached, secure missile operation

All of these missile advantages, which are inherent to Malmstrom, translate to military value for Malmstrom tankers as well. In particular, Malmstrom's "Northern tier" location and easy access to the Northern "Great Circle Routes" provide superior military value for tanker mission support. **See** Exhibit A to this paper, "Radius Distances from Malmstrom."

C. MALMSTROM IS MISSION-READY FOR "REAL-WORLD" TANKER MISSION SUPPORT

In order to appreciate Malmstrom's full capability to support world-wide tanker missions, it is critical to understand how these missions are accomplished in the "real world". A comparison of realistic tanker mission requirements to Malmstrom's tanker

range and take-off load capabilities clearly demonstrates Malmstrom's existing ability to fully support world-wide tanker missions.

1. Deployment Support Generally

Tactical fighter and airlift deployments from the Continental United States (CONUS) are supported in two ways:

(1) Initial off-coast or OCONUS refueling
(2) Staged tanker in-route support

Because our fighter and lifters must be ready to deploy to strategic locations around the globe, both East and West deployments **must** be supportable. Therefore, it is desirous that CONUS tanker bases possess capability to support deployments in **both** the east and west directions. For comparative purposes, requirements for standard four ship F-15, four ship F-16, and single C-141 packages are utilized in this discussion.

2. Eastern Deployment Support

(1) Initial Off-Coast or OCONUS Refueling:

After final CONUS refueling, fighters deployed for European or Southwest Asian contingencies will require initial tanker support within roughly 1,300 nautical miles. The requirement for initial fueling could be up to 80,000 pounds for a four ship F-15 package and up to 40,000 pounds for a four ship F-16 package.

For a representative lift support mission, an out-bound C-141 may require up to 80,000 pounds of fuel within 500 nautical miles of the coast.

(2) In Route Support:

F-15, F-16 and C-141 range limitations would demand in route refuelings for all these aircraft. Again, the fueling requirement for either the F-15 package or C-141 may require a maximum fuel off-load of up to 80,000 pounds.

Assuming an achievable fuel take-off load of 140,000 pounds, tankers originating at Malmstrom have a maximum range/off-load capacity to meet these requirements. **Malmstrom is capable of supporting initial off-coast or OCONUS fueling requirements for northern route Eastern tactical fighter or airlift deployments. See** Exhibit B to this paper, "Composite Graphs of Offload Capability from Malmstrom."

For East coast tanker support, the Air Force is much more likely to assemble a tanker support package utilizing **staged** tanker assets. Staging out of appropriate East coast tanker support bases, Malmstrom tankers provide the identical support of **any** CONUS tanker unit. KC-135 tanker range enables Malmstrom aircraft to reach any appropriate location for pre-staged tanker support.

Malmstrom is fully capable of supporting staged tanker requirements for Eastern tactical fighter deployments or airlift support. See Exhibit B to this paper, "Composite Graphs of Offload Capability from Malmstrom."

3. Western Deployment Support

After final CONUS refueling, fighters or lifters deployed for Southeast Asian contingencies will, again, be supported in two ways:

(1) Initial off-coast or OCONUS refueling
(2) Staged tanker in-route support

(1) Initial Off-coast or OCONUS Refueling

Again assuming standard F-15 and F-16 deployment packages, initial off-coast refueling will be demanded between 1300 and 1700 nautical miles. C-141 demand again typically arises at 500 nautical miles.

On either the Northern or Southern Circle Route, **Malmstrom tankers are fully capable of supporting initial off-coast fueling requirements for Western tactical fighter deployments and airlift missions. See** Exhibit B to this paper, "Composite Graphs of Offload Capability from Malmstrom."

(2) In Route Support:

Staging out of appropriate West Coast tanker support bases, Malmstrom tankers provide the identical support of **any** CONUS Tanker Unit. KC-135 range enables the Malmstrom aircraft to reach any appropriate location for pre-staged tanker support. **Malmstrom is fully capable of supporting staged tanker requirements for Western tactical fighter deployments and airlift missions. See** Exhibit B to this paper, "Composite Graphs of Offload Capability from Malmstrom."

Bottom line: Due to its northern tier and central CONUS location, Malmstrom is a superior base for both east and west northern hemisphere deployments.

II. Malmstrom Makes Financial Sense

With the capability of Malmstrom's tankers to fully support world-wide missions clearly established, it is now critical to understand **all** of the benefits which accrue from a decisions to retain tankers at Malmstrom.

A. MALMSTROM'S "CORE" TANKER BASE CAPABILITY.

The Air Force has made the prudent fiscal and operational decision to consolidate tanker assets on to "core" tanker bases. This concept takes advantage of stationing large numbers of tanker assets together on one base. It is plainly evident that operational, maintenance and training benefits accrue from such consolidations. Malmstrom agrees with this concept; however, those advocating the closure of Malmstrom's tanker mission have failed to recognize one crucial point:

Malmstrom Offers The Air Force An Alternative "Core" Tanker Base Today.

Malmstrom has the requisite facilities to meet the operational and maintenance needs of a "core" tanker base. Malmstrom, with minimal ramp alterations, is capable of bedding down 36 KC-135 aircraft. The recent military construction improvements at Malmstrom were designed to fully support up to 36 aircraft. The option to make Malmstrom a core northern tier tanker base deserves serious consideration, especially in light of the maximum cost savings that could be realized by completely closing Grand Forks Air Force Base.

B. MALMSTROM IS A COST-EFFICIENT ALTERNATIVE TO GRAND FORKS AIR FORCE BASE AS A CORE TANKER BASE.

Designation of Malmstrom as a northern-tier core tanker base in place of Grand Forks Air Force Base maximizes saving and minimizes up-front costs. The Air Force and the Commission have already recognized the important contribution to our nation's security made by Malmstrom's missile mission. Malmstrom **will** remain open. On the other hand, Grand Forks is facing the prospect of having its missile field closed. As a result, the decision to utilize Malmstrom's superior tanker facilities for a core tanker base would permit the total closure of Grand Forks resulting in substantial savings associated with a total closure.

This total closure would save up to $78 million in annual costs. The fact that Malmstrom's existing facilities are available for fulfilling the core tanker mission results in substantial up-front cost avoidance to implement total closure of Grand Forks.

In assessing the viability of closing Grand Forks, the Commission needs to realize that the full closure COBRAs for Grand Forks were biased to make it **appear** that closure of Grand Forks would be costly. The Air Force based its closure scenario on the assumption that surplus tankers from Grand Forks would be moved to other Air Force bases that would require extensive, costly military construction to recreate a core tanker base capability--**a capability that exists at Malmstrom today.** The Air Force failed to consider that **Malmstrom is ready to house up to 24 additional tankers from Grand Forks with no significant additional military construction.** The Commission needs to appreciate the advantages and cost savings resulting from complete closure of Grand Forks and the substitution of Malmstrom as a core tanker base, despite the Air Force attempts to disguise those savings.

The Air Force also skewed their COBRA analysis to inflate the yearly savings for the proposed Malmstrom tanker realignment. The Air Force claimed that the yearly savings from moving Malmstrom's tankers to MacDill Air Force Base to total $5 million. This $5 million cost savings figure, however, included $4.5 million per year associated with reduced airfield operating expenses at MacDill. Currently the Air Force supports unified command air support in contract operations. They have determined that substantial savings can be realized by reopening MacDill's runway and operating the airfield as an Air Force facility. These anticipated savings, the result of an unrelated action for MacDill, are inappropriately applied to Malmstrom in order to inflate the projected savings. **These unrelated savings apply only to MacDill Air Force Base; they cannot be applied to tanker ralignments, regardless of where they come from.**

The yearly savings realized by the proposed Malmstrom missile realignment would only total a maximum of $450,000 according to a study made by Coopers and Lybrand. These savings are minor compared to the savings of completely closing a military base. Further, the Coopers and Lybrand analysis did not take into account the costs of projected missile mission support "work arounds" due to lost airfield support at Malmstrom. The efficiencies of maintaining missiles and tankers together on the same base must be considered against the costs and inefficiencies of dividing the two missions between separate bases.

In short, **Malmstrom makes financial sense.**

VLDC01-44621.1

C. SUBSTITION OF MALMSTROM FOR GRAND FORKS AS A CORE TANKER BASE MAKES SENSE IN REDISTRIBUTING TANKER ASSETS.

Just as the Air Force's proposed realignment of Malmstrom's tanker mission fails to make financial sense, it also fails to resolve fully the tanker distribution problem. The whole impetus for the tanker realignment comes from northern tier tanker saturation and tanker shortfalls in the Southeastern and Southwestern United States. The Commission should note, however, that redistribution of the twelve KC-135's stationed at Malmstrom does not sufficiently relieve northern tier tanker saturation or sufficiently address regional tanker shortfalls.

The movement of more tankers from the northern tier bases is required to redress this imbalance. **This geographical tanker imbalance can be rectified by realignment of the 48 tankers stationed at Grand Forks.** The northern tier can retain a core tanker base at Malmstrom with up to 36 of the 60 total tankers found at the two bases. A substantial number of the remaining tankers needed to better relieve the geographical tanker distribution problem can be realigned to MacDill and/or any other appropriate bases.

Once again, **realigning Malmstrom's tanker mission is not the answer; closing Grand Forks and realigning its tankers is the alternative which maximizes savings and better address the tanker imbalance.**

Conclusion

The total closure of Grand Forks Air Force Base, the retention of Malmstrom tankers and reassignment of up to 24 Grand Forks tankers to Malmstrom will allow:

- for the maximum savings from options presently available to the DBCRC
- the Air Force to shed the excess capacity of one large aircraft base.
- the Air Force to retain a 36 tanker "Core" base
- the Air Force to maximize the benefits of recent $100 million investments at Malmstrom
- the Air Force to enjoy the continued benefits of Malmstrom's superior training, unencroached air space and lack of environmental constraints now and into the foreseeable future.
- the Air Force to better distribute tanker assets in CONUS to address Northern tier tanker saturation and Southeastern/western tanker deficiencies.

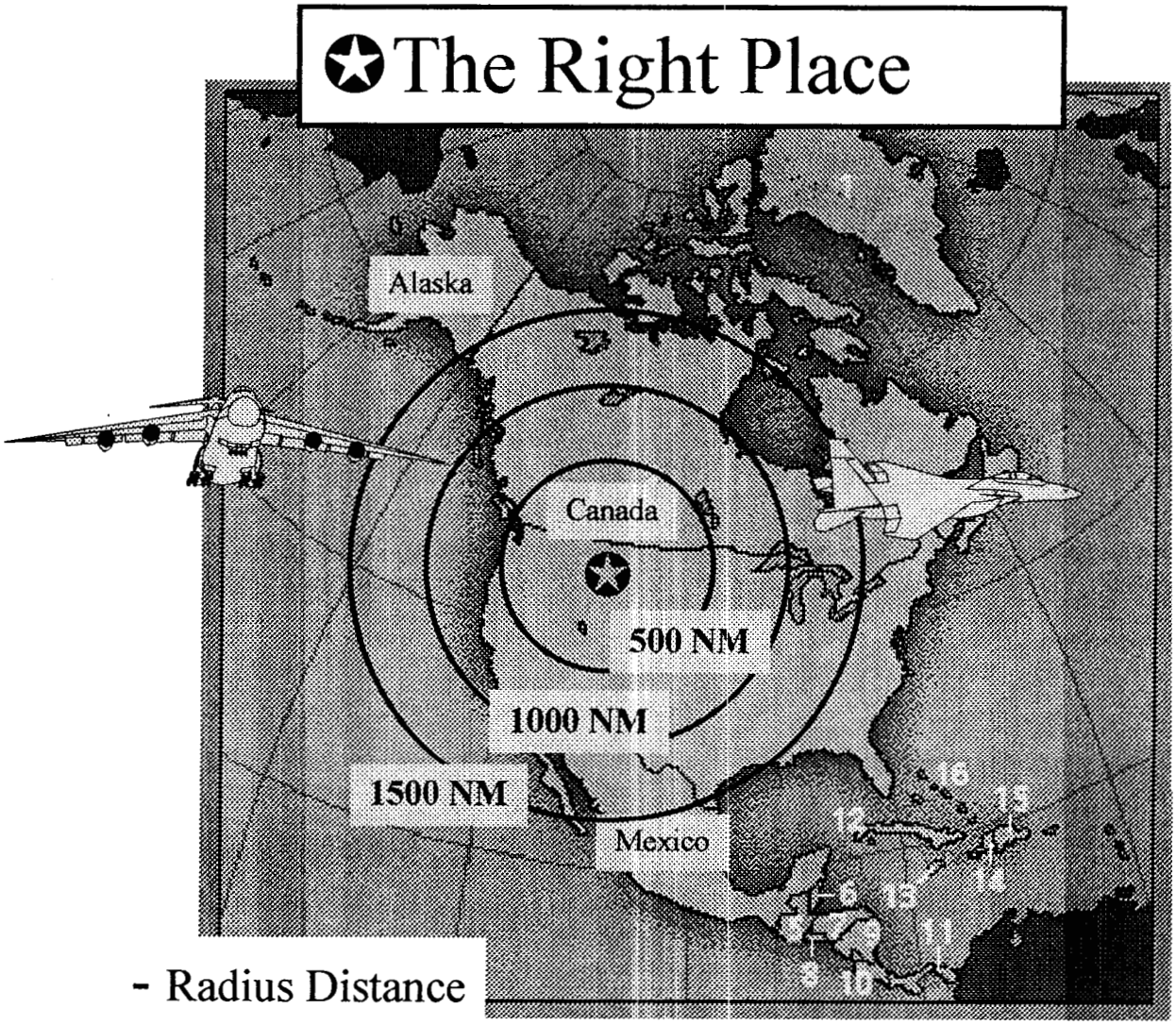
The final point which cannot be overstated is:

These capabilities and benefits exist at Malmstrom today and <u>no</u> investment is necessary to duplicate this capability elsewhere. The cost-avoidance resulting from consolidating tanker assets to Malmstrom are compelling.

VLDC01-44621.1

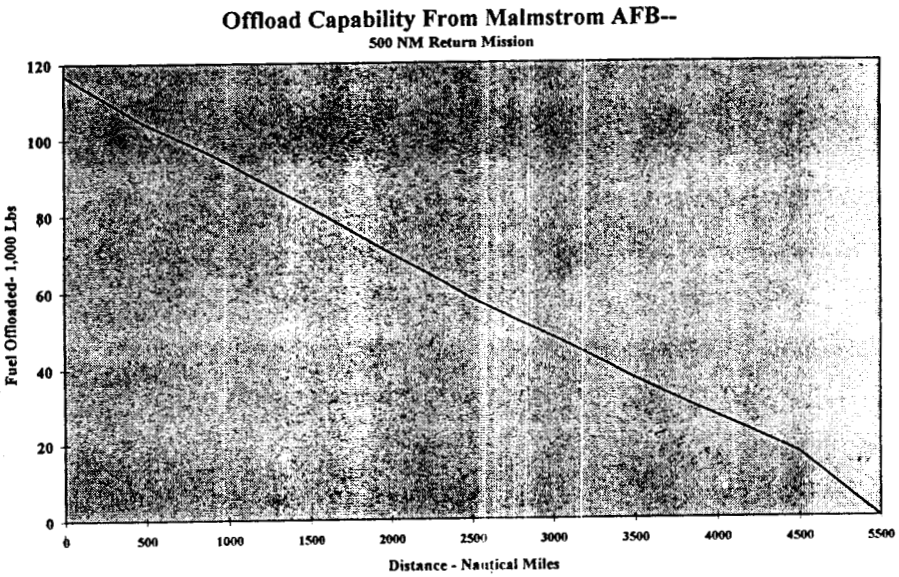
Exhibit A: Radius Distances from Malmstrom

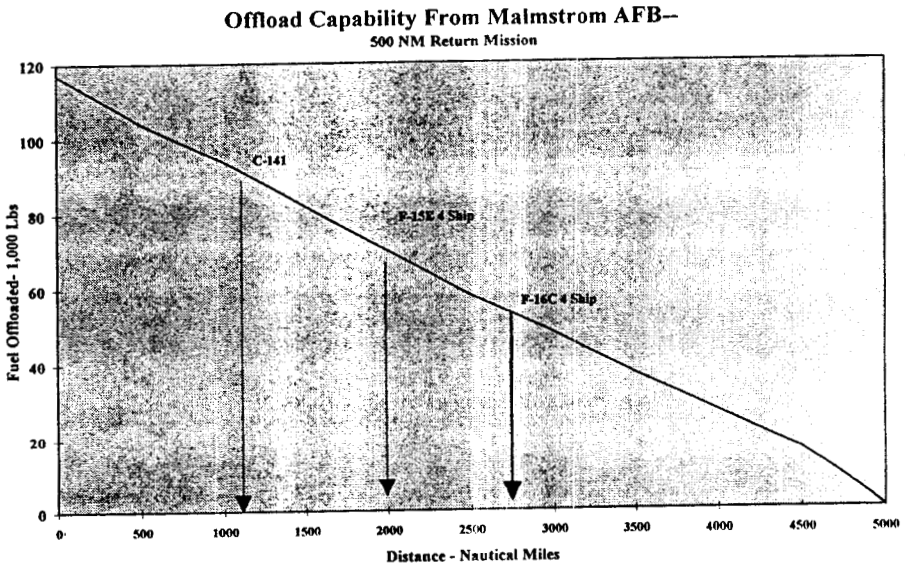
Malmstrom AFB, Montana

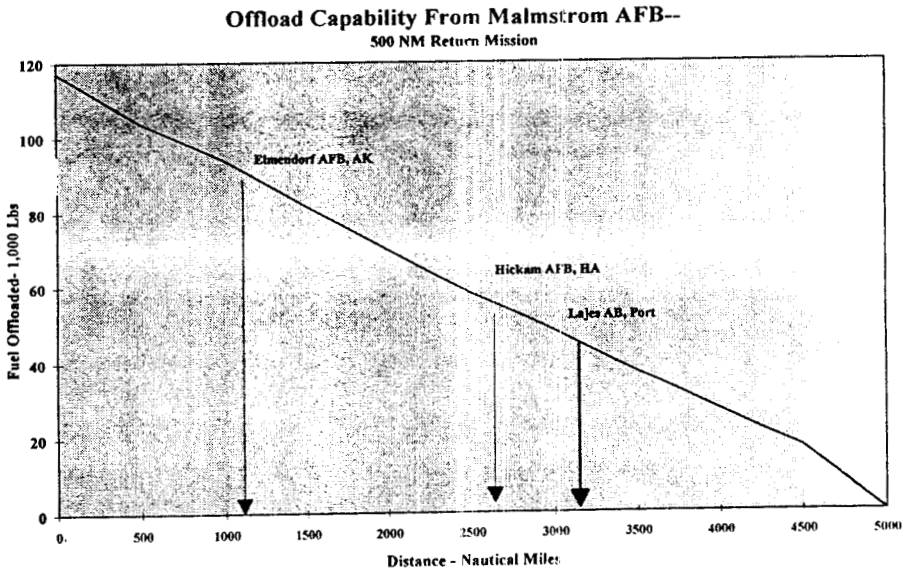


- Radius Distance

Exhibit B: Composite Graphs of Offload Capability from Malmstrom

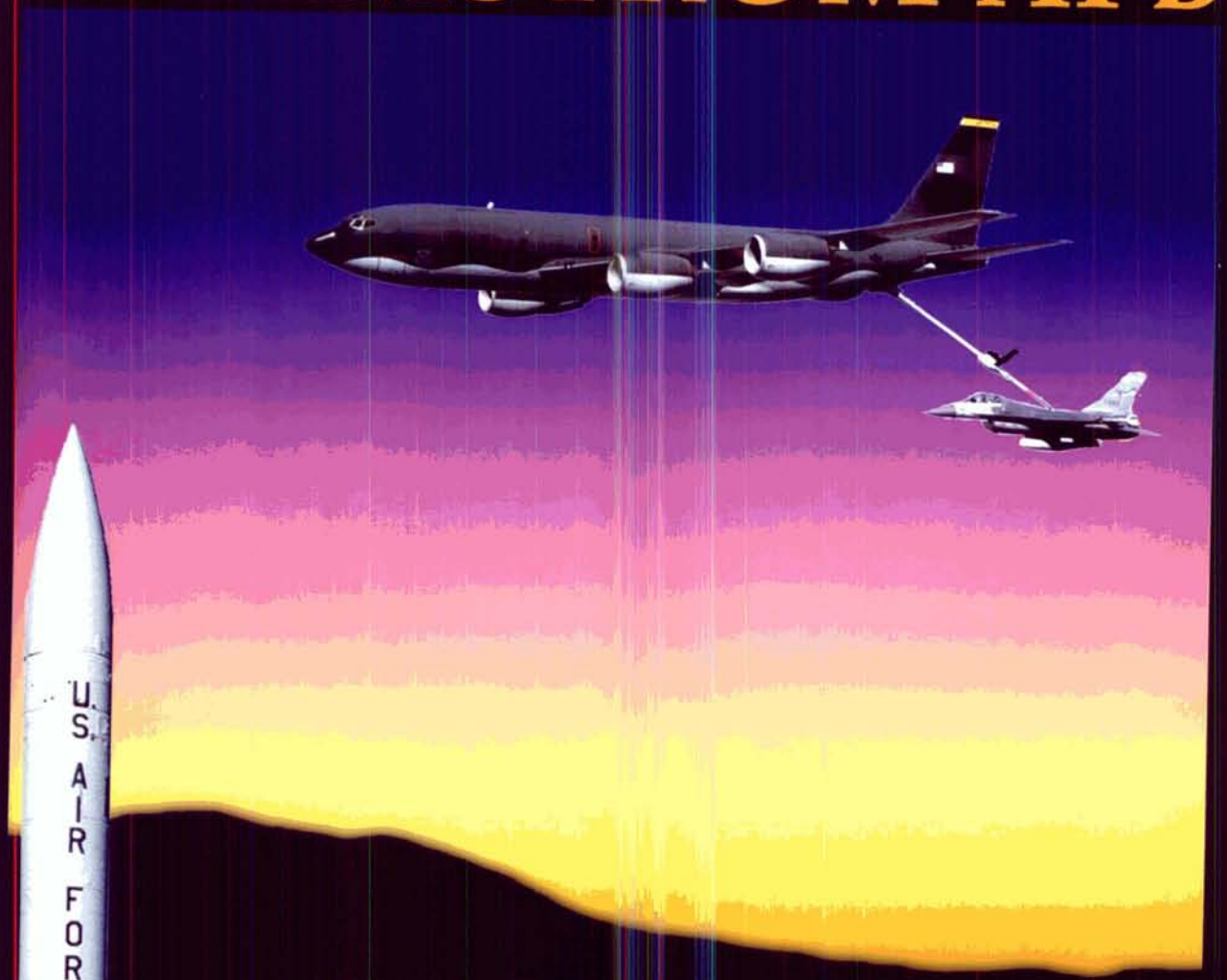






Document Separator

MALMSTROM AFB



Mr. DiCamillo

MALMSTROM

DEPARTMENT OF THE AIR FORCE
341ST MISSILE WING (AFSPACECOM)

31 Mar 95

MEMORANDUM FOR DEFENSE BASE CLOSURE AND REALIGNMENT COMMISSION

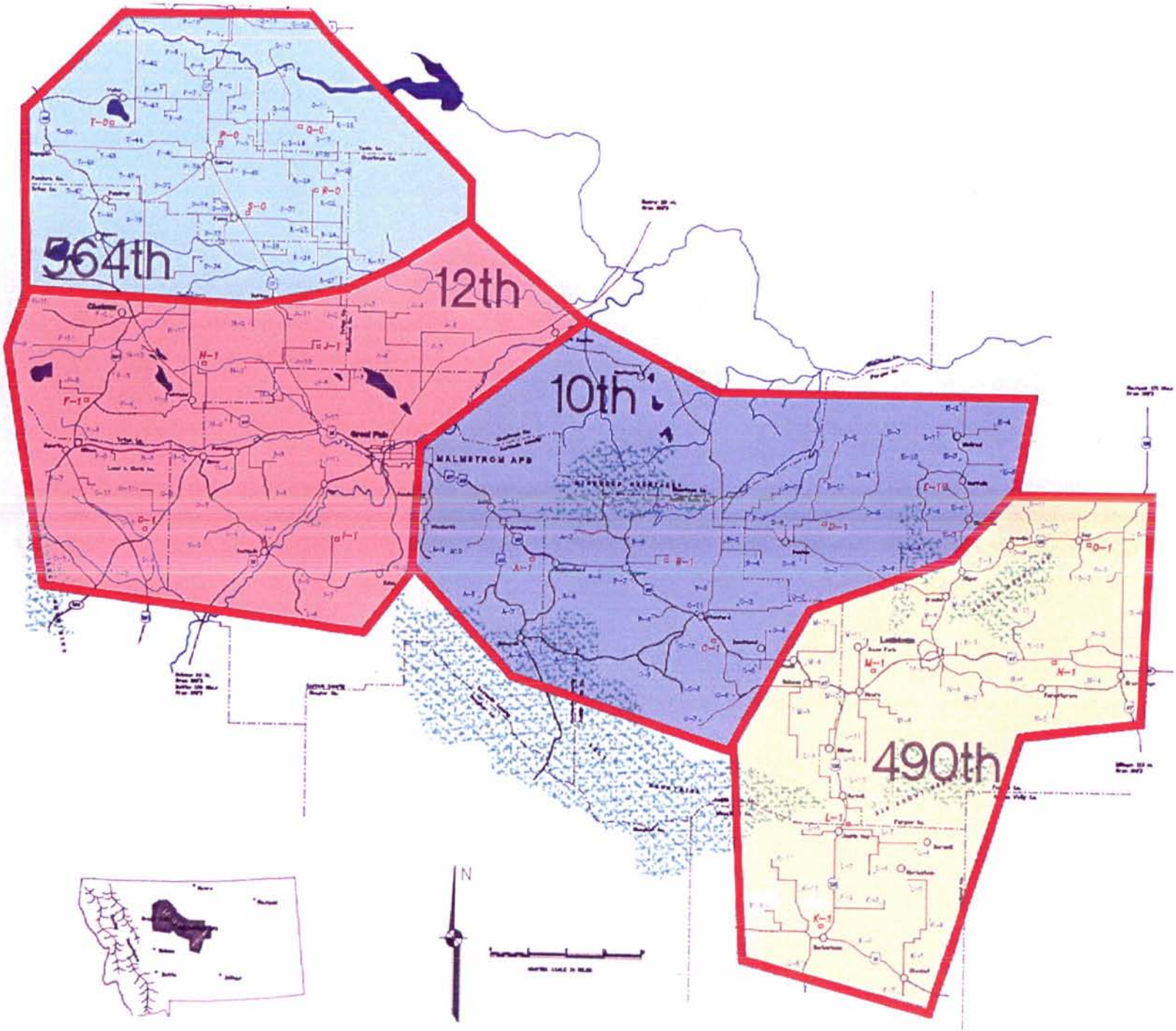
FROM: 341 MW/CC

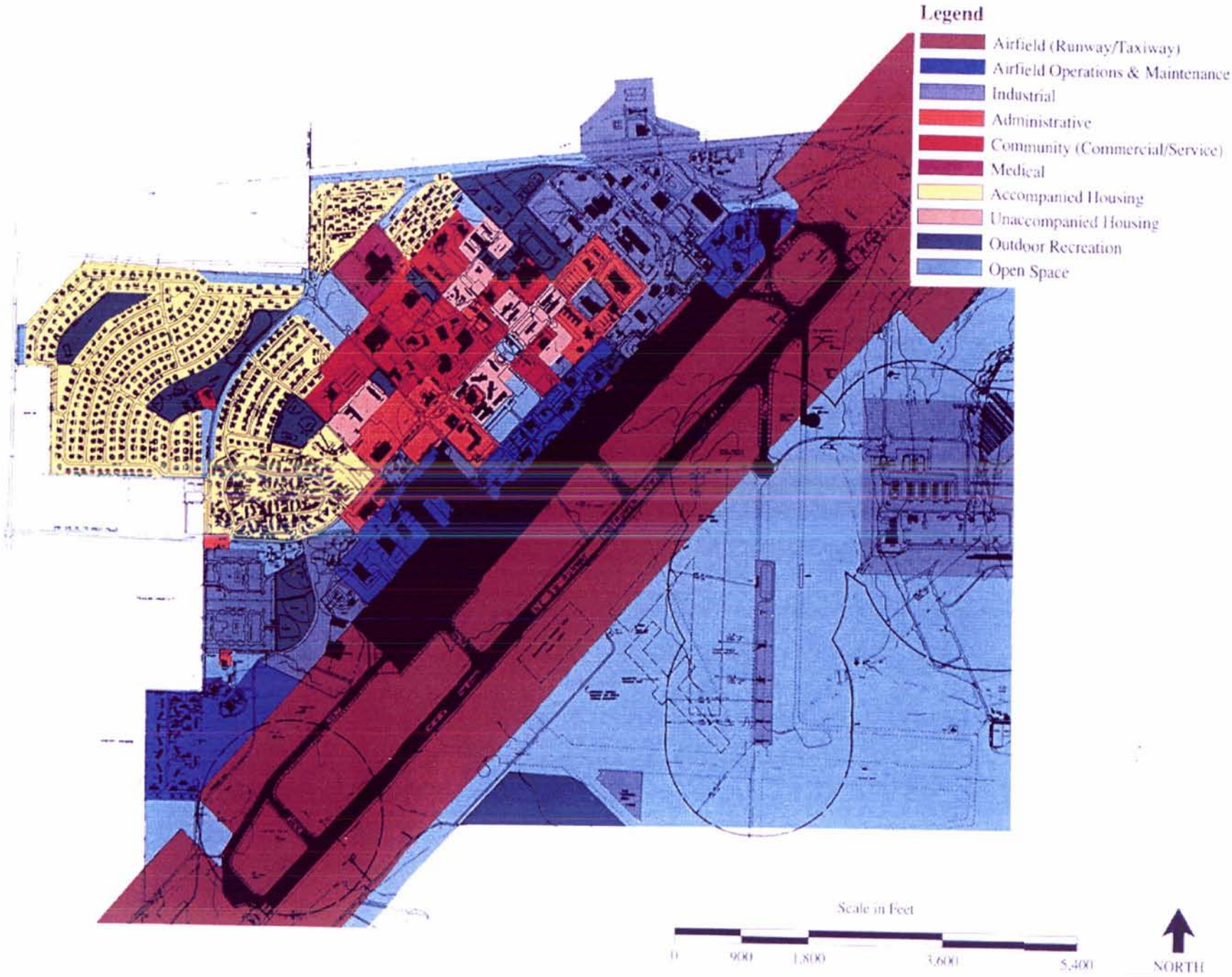
SUBJECT: Malmstrom Air Force Base Assessment

1. On behalf of the men and women of Malmstrom Air Force Base, welcome to "Big Sky Country." This book includes additional data on Malmstrom, to help you assess the military value of the base and its facilities.

2. Please call me if you need any additional information ....(406) 731-3411.

ROBERT E. LARNED
Brigadier General, USAF
Commander


364th
12th
10th
490th
MALMSTROM AFB
N


Legend
Airfield (Runway/Taxiway)
Airfield Operations & Maintenance
Industrial
Administrative
Community (Commercial/Service)
Medical
Accompanied Housing
Unaccompanied Housing
Outdoor Recreation
Open Space
Scale in Feet
0
900
1,800
3,600
5,400
NORTH

Base Headquarters Facility

Description

- Building 500
- 192,000 square feet
- Original construction 1959
- $11.6M (MILCON) renovation 1989/90

Function

- Wing command section
- Operation group command section
  - 4 Tactical missile squadrons
  - Operations support squadron
  - Missile training flight
  - Missile plans and Intelligence flight
- Missile standardization and evaluation division
  - Armory
- Logistic group command section
- Support group command section
  - Communications squadron command section
- Wing command post
- Wing job control
- Communications Job Control
- Wing safety offices

Vehicle Readiness Center

Description

- Building 510
- 29,900 square feet
- $2.7M (MILCON) new construction 1990

Function

- Heated parking and vehicle operations center for missile operations center
- Heated vehicle parking for missile communications activities
- Supports and maintains 187 general and special purpose vehicles

PME Center/Treaty Compliance Office

Description

- Building 581
- 7,900 square feet
- Original construction 1952
- Renovated 1987-1990 (base O&M funding and self help)

Function

- Airman Leadership School
- Lieutenant's Professional Development Program
- Office and operations center for treaty compliance
- START Treaty
- Open Skies Treaty
- Chemical Weapons Treaty

Vehicle Maintenance Facility

Description

- Building 870
- Original construction 1960
- $760K (MILCON) addition 1985
  - Added 5,500 square feet

Function

- Main repair facility for missile and tanker unit's vehicles

Central Heating Plant

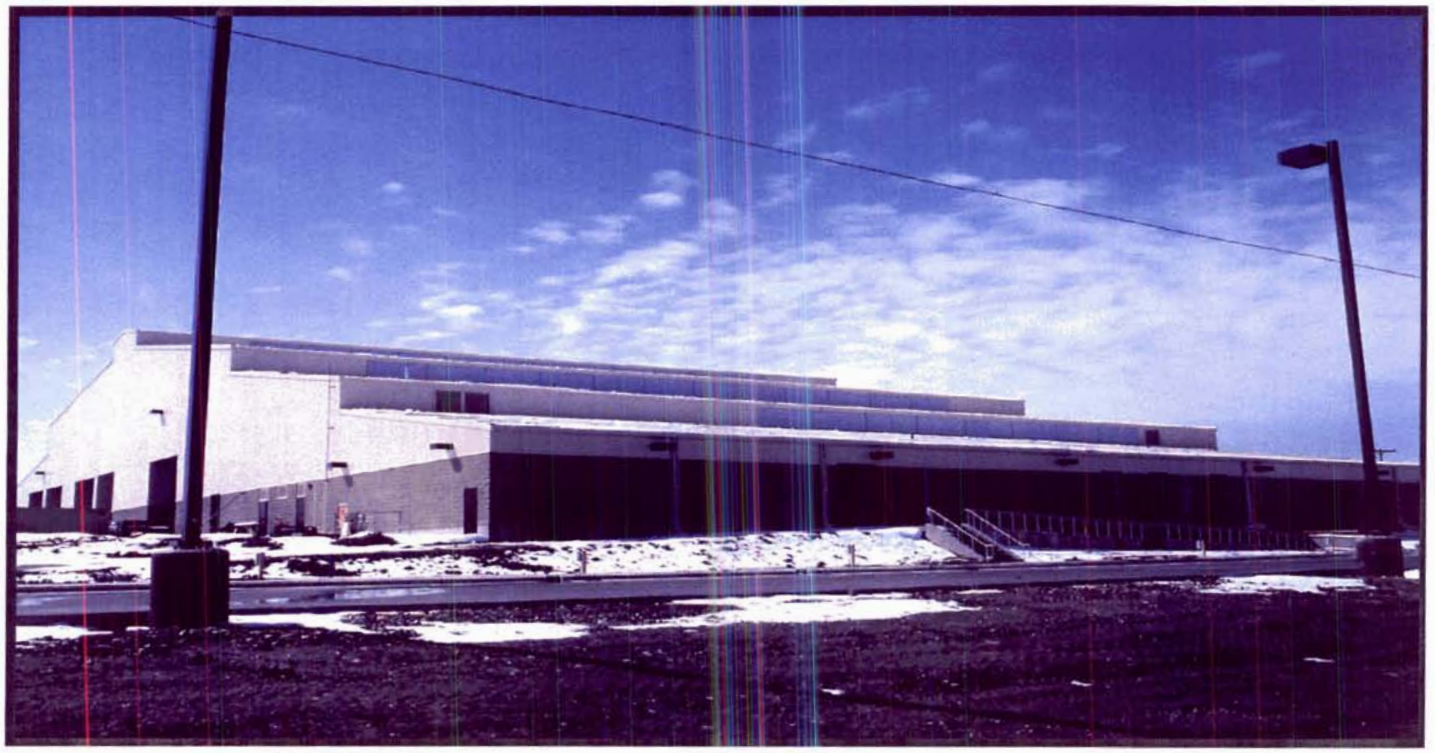
Description

- Building 82110
- $40M (MILCON) new construction 1985

Function

- Main heat source for base and hot water heating system
- Operates with either natural gas or coal

Base Civil Engineering Complex



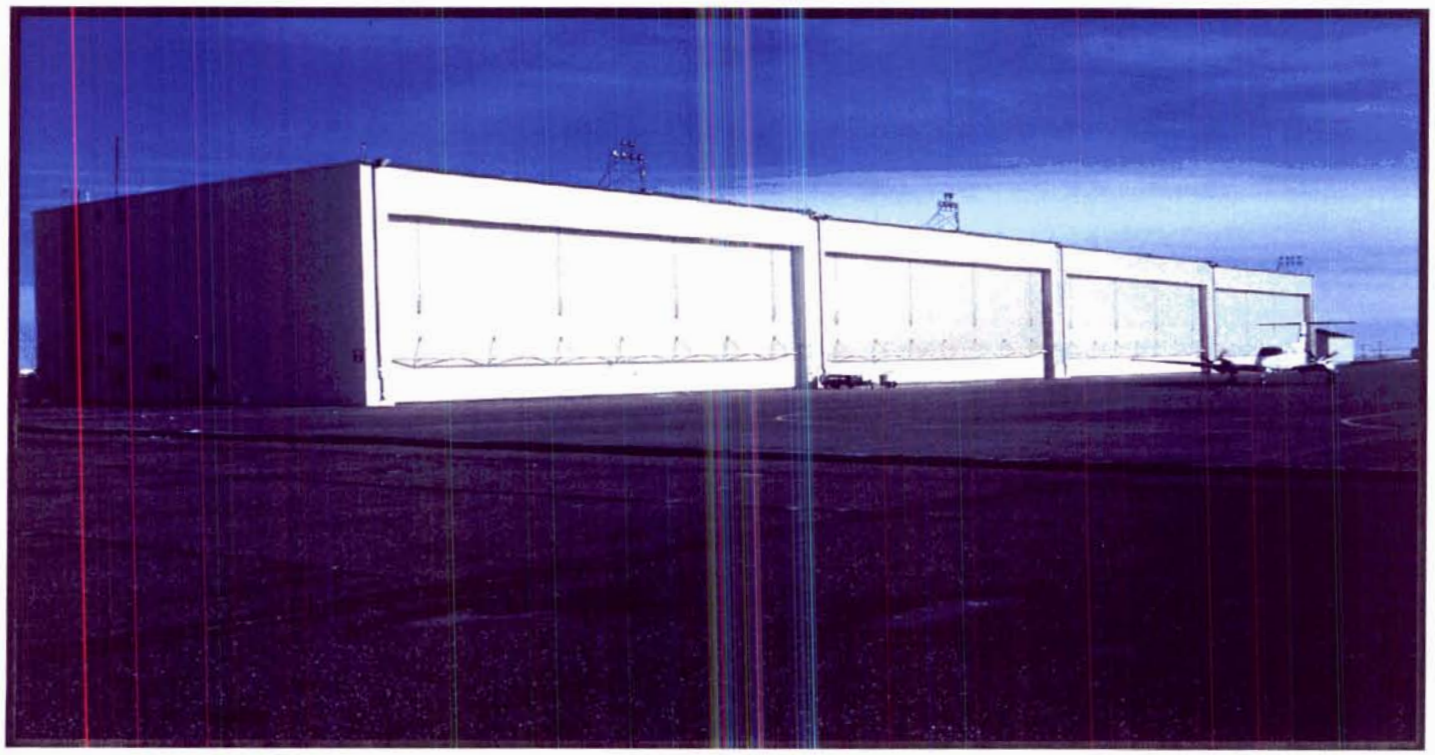
Description

- Building 407
- 50,000 square feet
- $5.1M (MILCON) new construction 1995

Function

- Houses electrical, structural, and grounds repair shops
- Disaster preparedness center
- Allows demolition of 1943 era hangar (building 210)

Companion Trainer Program Hangars



Description

- Building 219
- 37,900 square feet
- Constructed 1959
- $910K (MILCON) completed 1989
- Renovated 2 hangars for aircraft training program

Function

- Two hangar bays support aircraft companion trainer program (CTP) with two C-12 aircraft
- One hangar contains missile maintenance silo trainer
- One hangar contains security police equipment to support world-wide mobility taskings

Flight Training Simulator

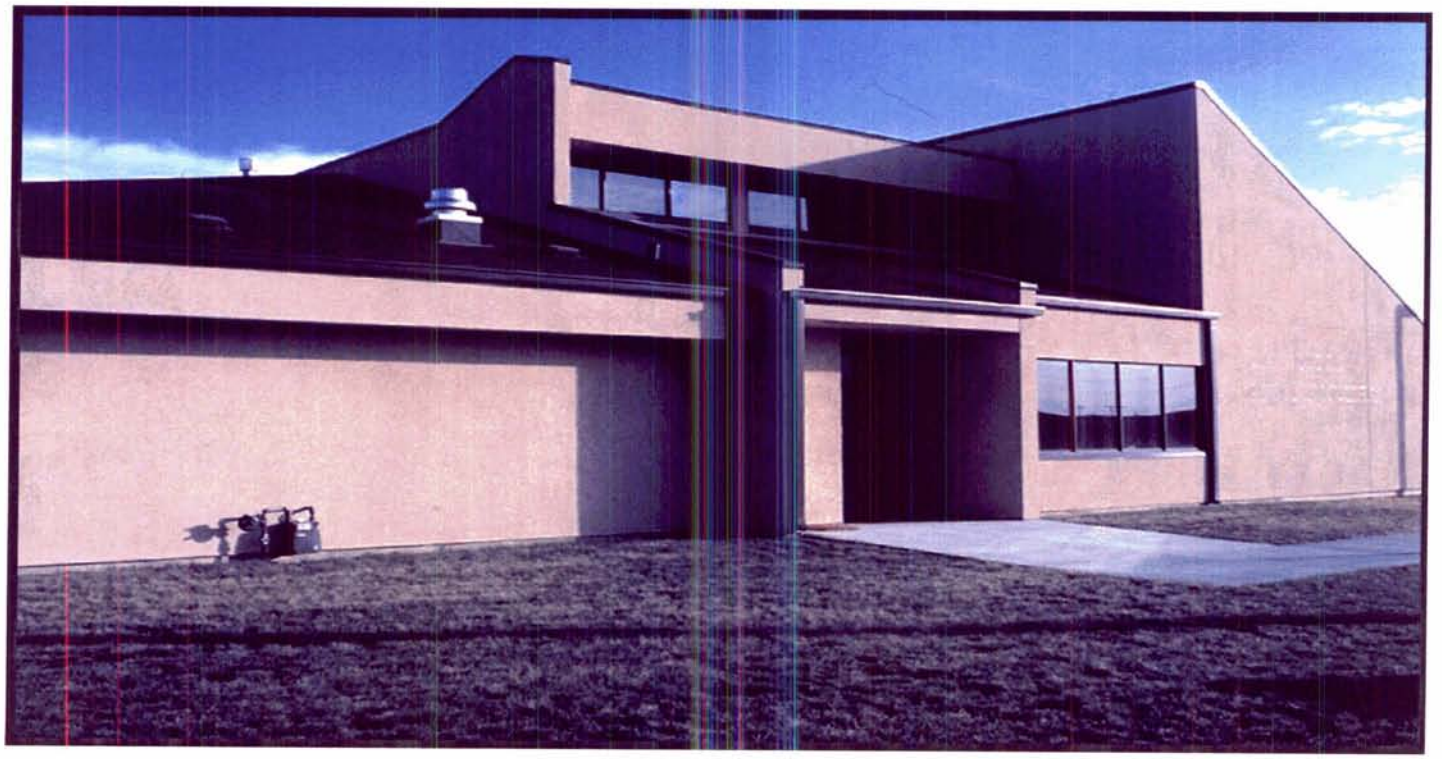
Description

- Building 610
- 6,200 square feet
- $1.7M (MILCON) new construction 1991

Function

- Flight training simulator for KC-135R aircraft

Base Quality Office (Alert Crew Support Facility)



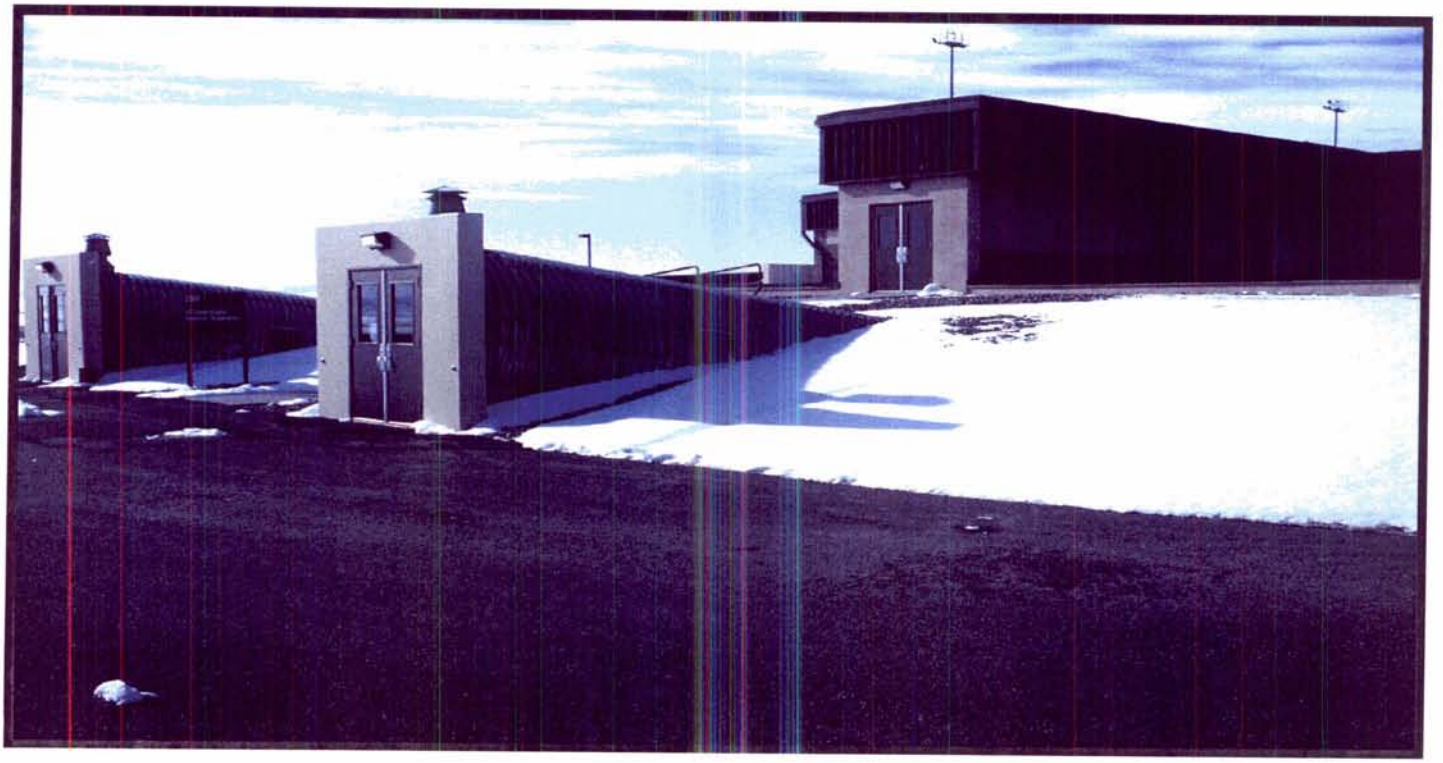
Description

- Building 650
- 4,000 square feet
- $450K (MILCON) new construction 1990

Function

- Offices and classroom for base quality awareness training and other quality associated operations
- Originally constructed for family visitation and recreation area for tanker alert

Aircraft Alert Facility



Description

- Building 250
- 21,700 square feet
- Original construction 1959
- $3.1M (MILCON) renovation 1991 - 1992
  - Integral field kitchen
  - Sleeping facilities for 80+ people
  - Administrative and briefing areas

Function

- 43d ARG Operations Support Squadron work centers
- Renovated to support tanker aircrew alert taskings

43d Air Refueling Group Headquarters

Description

- Building 300
- 13,000 square feet
- Original construction 1958
- $1.2M (MILCON) renovation 1990

Function

- 43d Air Refueling Group command section and associated aircraft functions

Refueling Vehicle Storage

Description

- Building 320
- 4,900 square feet
- *Original construction 1988*

Function

- Four bay heated storage for aircraft refueling trucks

Precision Measurement Electronics Laboratory

Description

- Building 330
- Original construction 1959
- $3M (MILCON) renovation 1993

Function

- Supports aircraft and missile operations PMEL requirements

Refueling Pump House

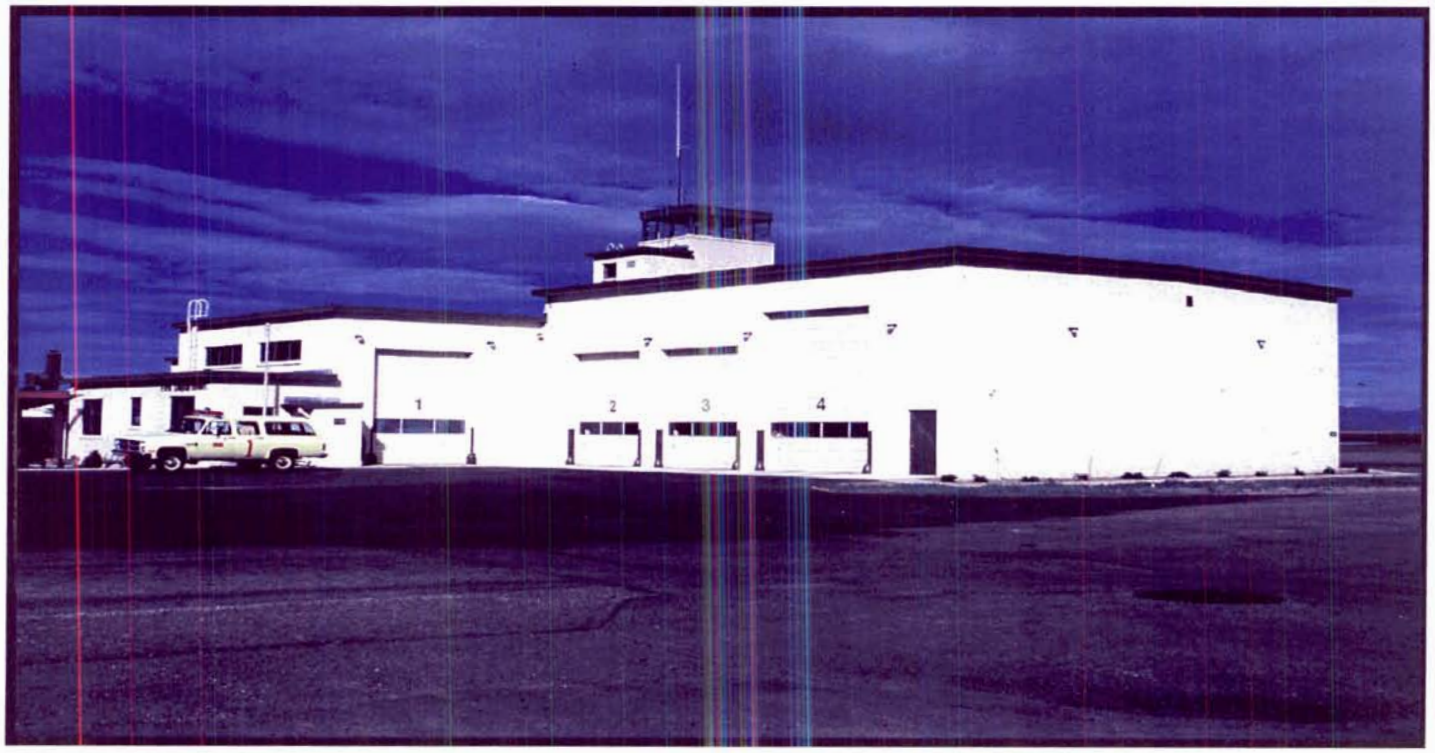
Description

- Building 334
- Original construction 1954
- $1.1M demolition and remediation cost

Function

- Undergoing removal as part of base environmental compliance actions
- Project tied to similar action for building 245 with similar characteristics

Base Fire Station



Description

- Building 349
- 16,600 square feet
- Original construction 1957
- $712K (O&M) renovation 1995
  - Upgraded living quarters
  - 4,100 square feet addition

Function

- Base fire department

Transient Alert Building

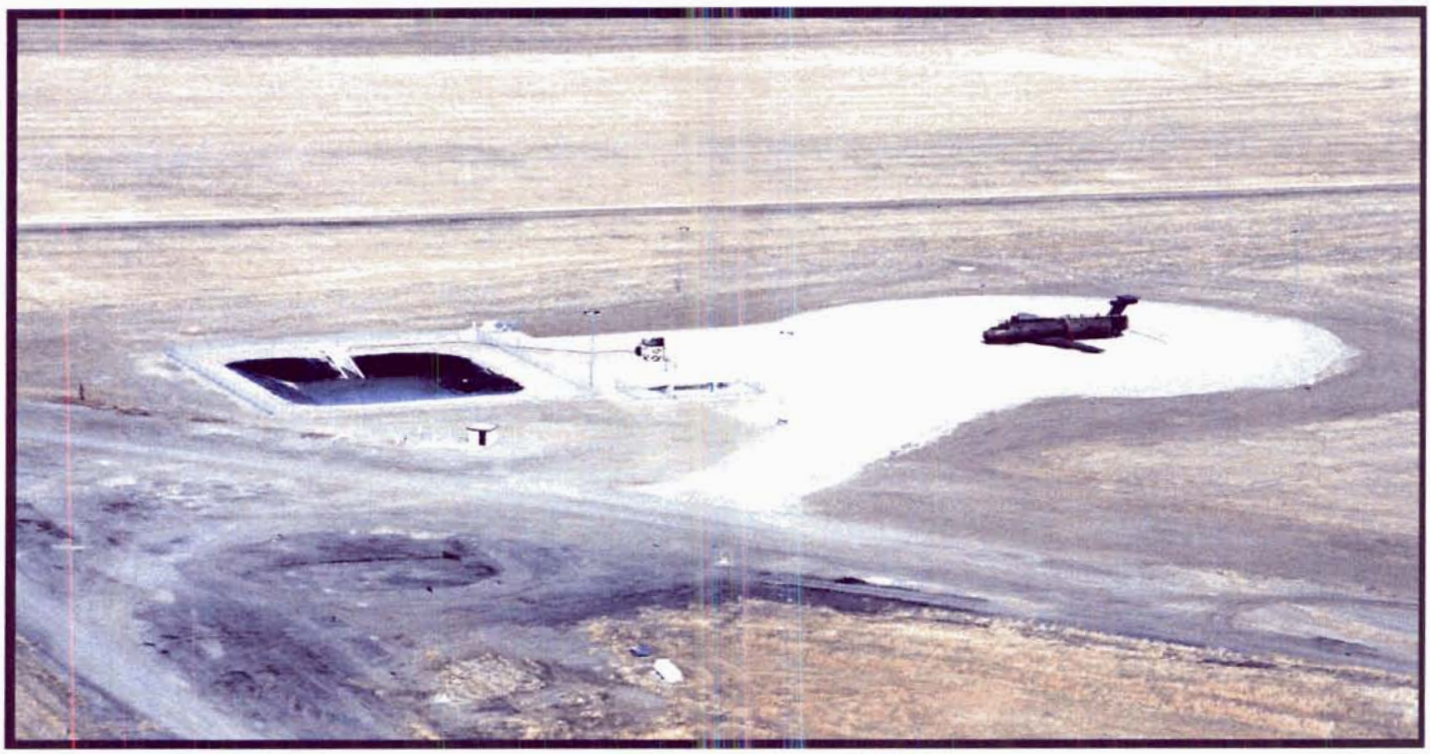
Description

- Building 370
- 2,900 square feet
- $450K (MILCON) new construction 1990

Function

- Houses aircraft transient alert office and equipment

Fire Training Facility



Description

- $1.1M (MILCON) new construction 1995

Function

- Mock KC-135 aircraft for fire training
- Fully compliant with current environmental and safety requirements

Three Bay Hangar

Description

- Building 1440
- 80,000 square feet
- $16M (MILCON) renovation 1993

Function

- Three maintenance bays, each capable of fully enclosing a KC-135 aircraft
- Administrative and maintenance shops

Aircraft Maintenance Complex

Description

- Building 1439
- 78,000 square feet
- $6.5M (MILCON) new construction 1990

Function

- Aircraft maintenance shops
- Jet engine inspection and maintenance shops
- Parachute shop
- Nondestructive inspection shop
- Maintenance squadron command and administration section

Air Ground Equipment (AGE) Complex

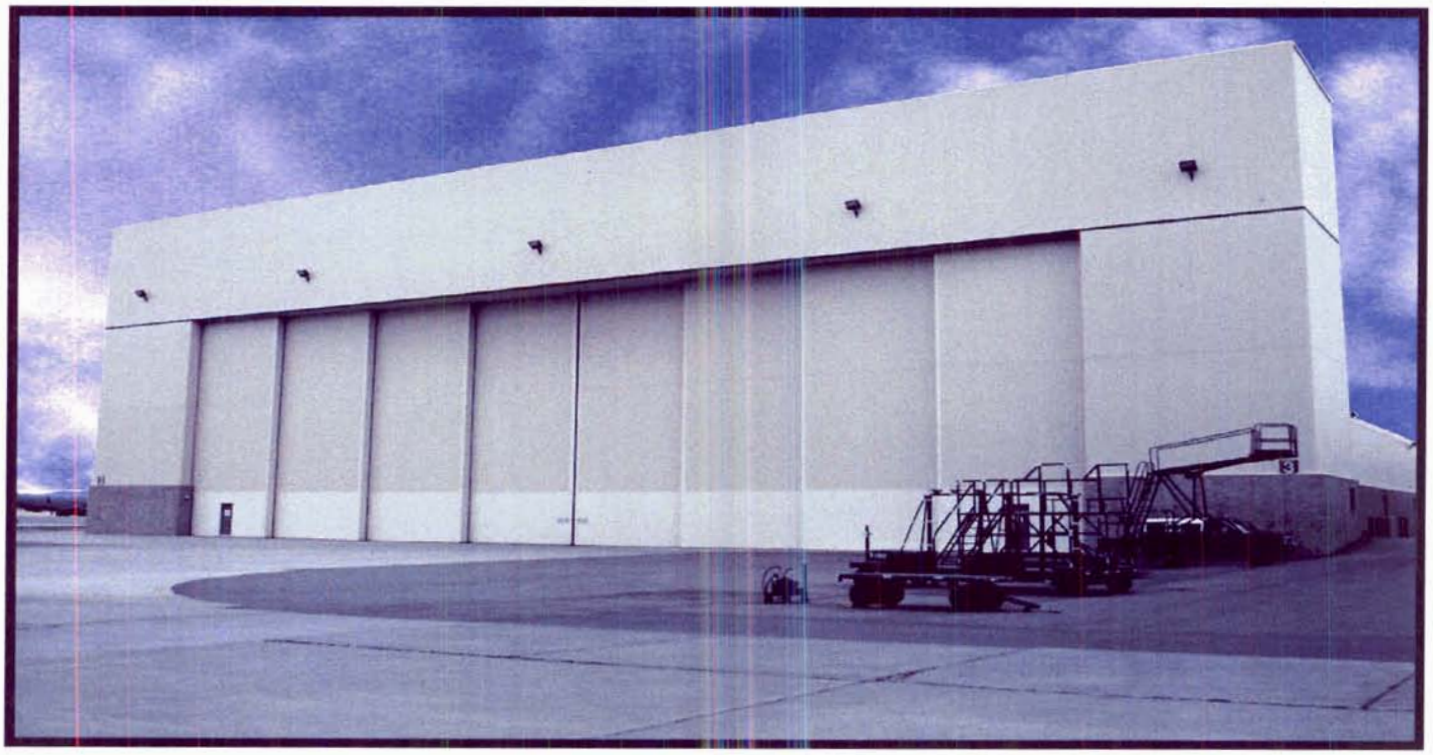
Description

- Building 1447
- $270,000 dollar (MILCON) renovation 1988
- $1.3M (MILCON) new addition 1992

Function

- Supports missile and aircraft AGE requirements

Aircraft Corrosion Control Dock



Description

- Building 1450
- 36,500 square feet
- $5M (MILCON) new construction 1990

Function

- Supports aircraft corrosion control requirements

Aircraft Fuel Cell Maintenance Dock

Description

- Building 1460
- 28,200 square feet
- Original construction 1959
- $1.6M (MILCON) renovation 1989 - 1990
  - Converted building from missile communication operations to fuel cell maintenance dock

Function

- Supports maintenance on aircraft fuel cells

Aircraft Maintenance Dock

Description

- Building 1464
- 26,400 square feet
- Original construction 1959
- $3.4M (MILCON) renovation 1989 - 1990
  - Converted building from commissary warehouse function to aircraft maintenance dock

Function

- General purpose aircraft maintenance

Jet Fuel Dispensing Center

Description

- Building 1469
- 3,700 square feet
- 2 bulk storage jet fuel tanks
- $5.6M (MILCON) new construction 1993

Function

- Refueling vehicle wash facility
- Refueling hydrant outlets
- Fuels operations center

Missile Codes Vault and Electronics Laboratory

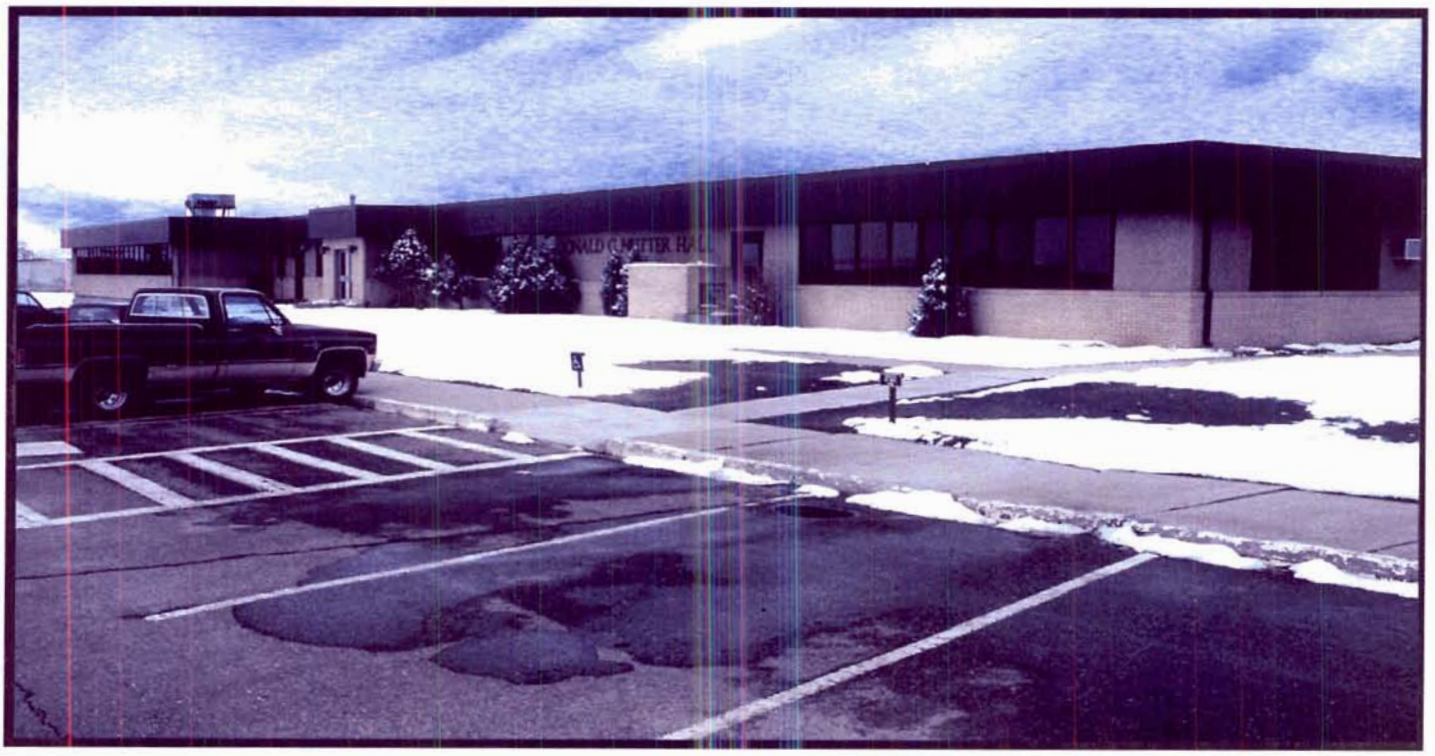
Description

- Building 165
- 28,400 square feet
- Original construction 1967
- O&M upgrades projects to interior/exterior

Function

- Missile maintenance electronics lab
- Missile codes vault
- Missile guidance system storage vault

Civilian Personnel/Manpower Office/Disaster Preparedness



Description

- Building 160
- 18,400 square feet
- Original construction 1957
- O&M upgrades to interior/exterior to convert building from wing and air division headquarters building

Function

- Administrative, classroom, and conference facilities for base support agencies

People Center North

Description

- Building 1191
- 35,000 square feet
- Original construction 1973
- $1.2M (O&M) upgrade 1993 - 1994

Function

- Houses military personnel flight and comptroller functions
- Will include civilian personnel and manpower offices by May 1995

Chapel

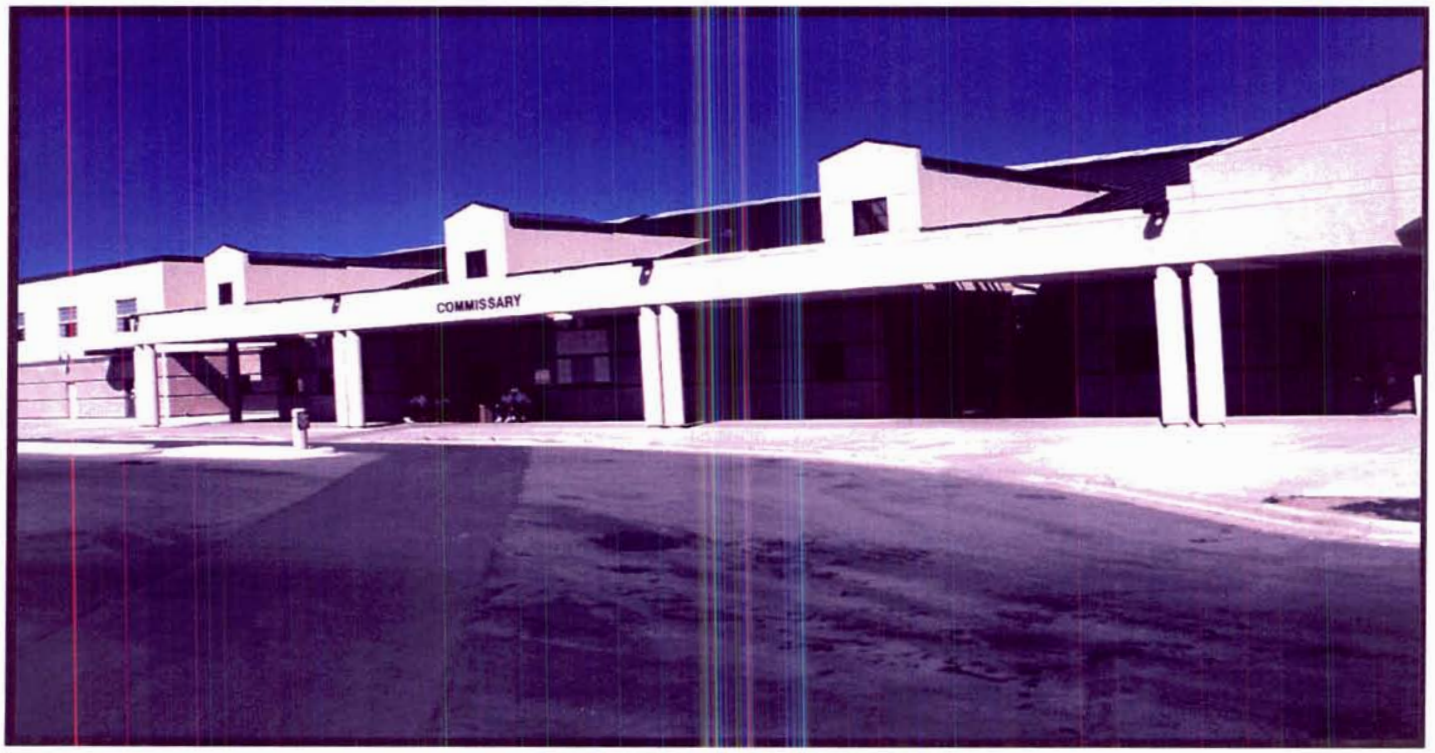
Description

- Building 1199
- 18,000 square feet
- Original construction 1957
- $500K (O&M) upgrade scheduled for summer 1995
  - 2,400 square feet addition for religious education programs

Function

- Religious services, base functions, and religious education

Commissary (DECA)



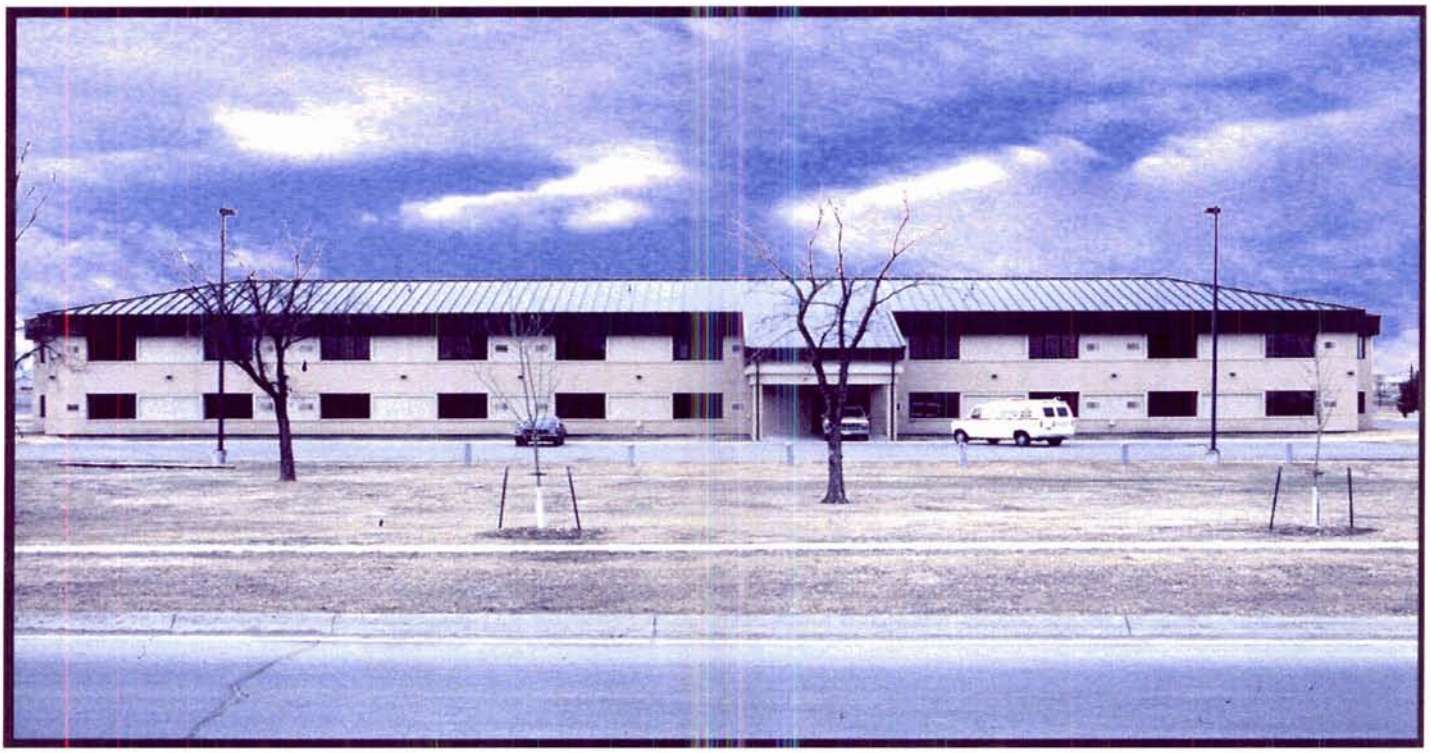
Description

- Building 1320
- 68,000 square feet
- $6.8 million dollars (MILCON) new construction 1988
  - Replaced old facility collocated with aircraft hanger that served as commissary warehouse

Function

- Supplies consumables for base populous

Visiting Officers' Quarters



Description

- Building 1620
- 18,000 square feet
- Original construction 1970
- $1.4M (O&M) complete renovation 1995

Function

- Provides additional lodging for visiting officers

Officer's Club

Description

- Original construction 1966

Function

- Dining Room
- Ball Room
- Kitchen
- Main Bar
- Casual Bar

Base Clinic

Description

- Building 2040
- 91,000 square feet
- $16M (MILCON) new construction 1990 - 1991

Function

- Complete clinic services to support pediatrics, flight medicine, dental, radiology, pharmacy, physical therapy, bio-environmental health and emergency services

Base Theater

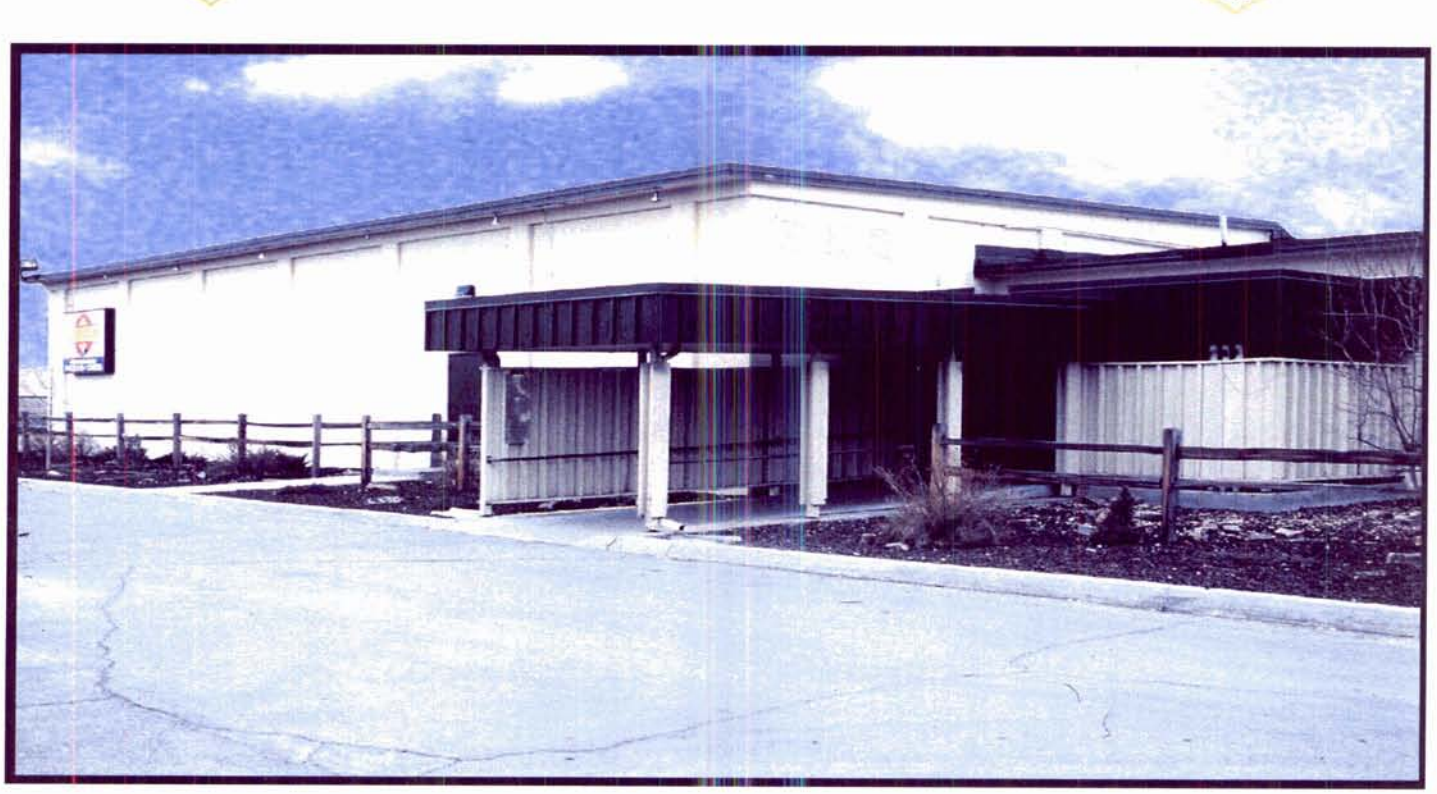
Description

- Building 1156
- 500 seats
- Original construction 1957

Function

- Entertainment for base personnel

Enlisted Club



Description

- Building 1305
- 17,400 square feet
- Original construction 1959

Function

- Dining Room
- Ball Room
- Kitchen
- Main Bar
- Casual Bar

Library

Description

- Building 1152
- 7,800 square feet
- Original construction 1957
- Various Interior/Exterior upgrades

Function

- Reference material for base personnel and leisure reading services

Auto Hobby and Wood Shop

Description

- Building 1250
- Original construction 1973
- New NAF Construction Project to begin Summer 1995 to replace this facility and adjacent arts and crafts building 1245

Function

- Supervised facilities for self-help auto repairs
- Instruction and equipment to perform wood working skills

Education Center

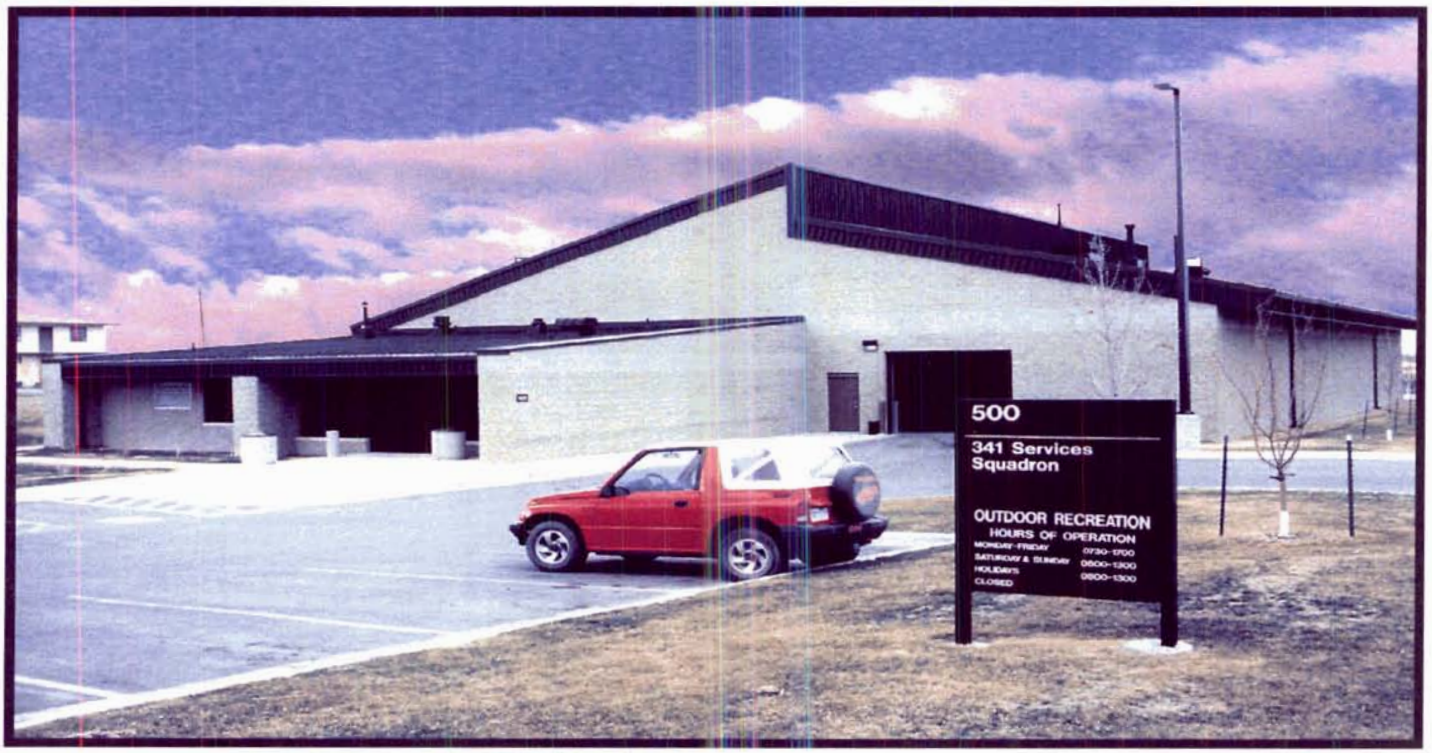
Description

- Building 1240
- 18,400 square feet
- Original construction 1981

Function

- Slated to test Air Force combined education and training flight
- Incorporates military and civilian training and education functions

Outdoor Recreation



Description

- Building 1222
- 13,200 square feet
- $1.3M (MILCON) new construction 1992
- Built in conjunction with demolition of 1940-era hangar to accommodate 3-bay hangar

Function

- Supports MWR outdoor recreation services such as: boating, skiing, camping, hunting, fishing, and lawn and garden activities

Sun Plaza Park

Description

- Building 1201 / 1202
- Original construction 1986

Function

- Main picnic area with restroom facilities, pavilion, and picnic tables

Dormitory

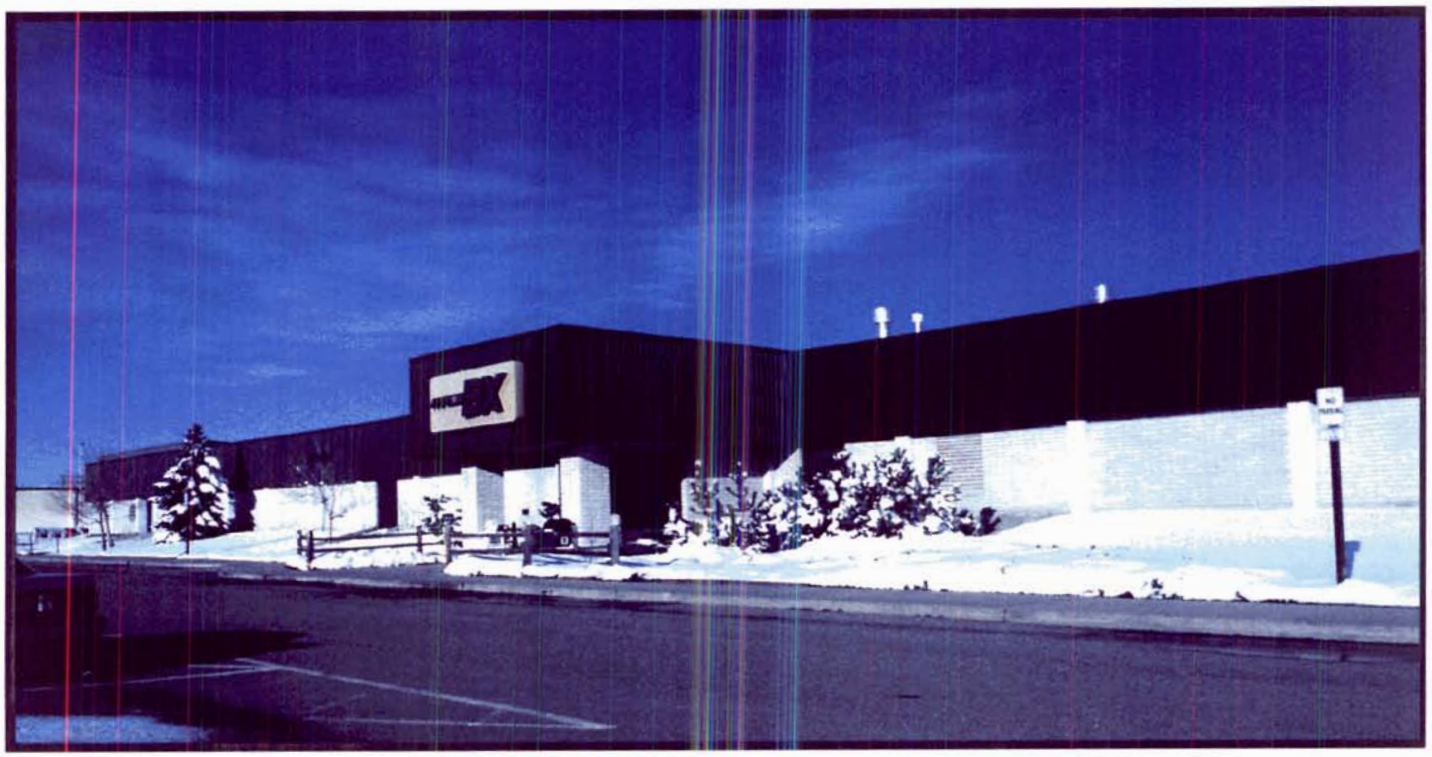
Description

- Building 635
- Original construction 1967
- Example of facility with upgraded roof and bathroom modifications

Function

- Houses 104 junior enlisted personnel

Base Exchange



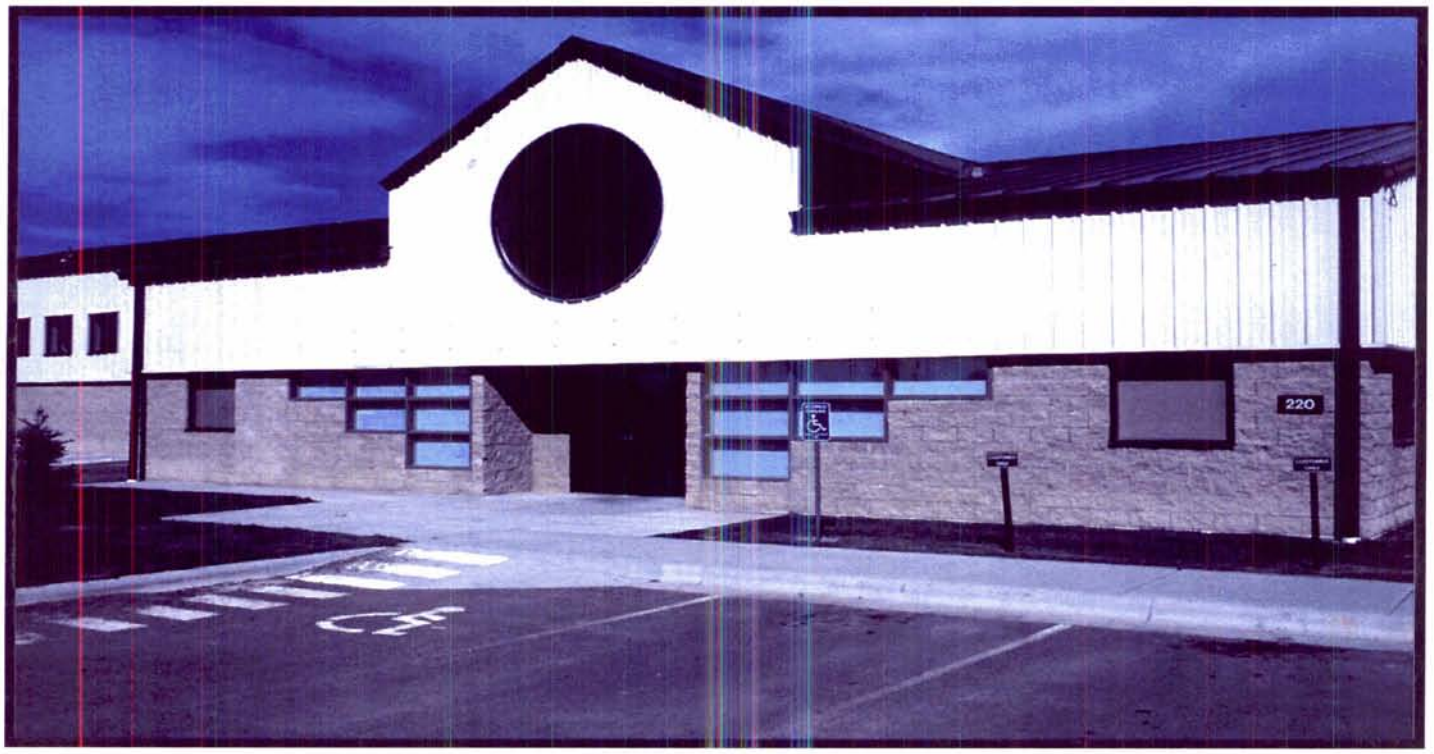
Description

- Building 1150
- 45,000 square feet
- $2.5M (MILCON) new construction 1981

Function

- AAFES service for base personnel
- Base Exchange
- Optical shop
- Barber/beauty shop
- Laundry
- Flower shop
- Shopette

Self Help Facility



Description

- Building 220
- 15,000 square feet
- $1.3M (MILCON) new construction 1990

Function

- Civil-Engineering Support Facility for Acquisition, Supply and issue of self-help materials for base organizations and military Family Housing
- Civil Engineering Support Facility for Base Water Treatment Program

43d AIR REFUELING GROUP

AIR MOBILITY COMMAND

15

FIFTEENTH AIR FORCE

43d AIR REFUELING GROUP

TEAM MALMSTROM

PROVIDING WORLD-CLASS GLOBAL AIR REFUELING AND AIRLIFT FOR AMERICA

43d AIR REFUELING GROUP

The 43d Air Refueling Group (ARG) is unique in the Air Mobility Command and the United States Air Force. It is the only active-duty KC-135R air refueling group in the Air Force today. The group is located at Malmstrom AFB, Montana and is a Direct Reporting Unit to the Fifteenth Air Force, headquartered at Travis AFB, California. The host wing at Malmstrom is the 341st Missile Wing, an Air Force Space Command wing.

The 43 ARG is commanded by Colonel Thomas M. Chester. He manages a 16.7 million dollar flying program which includes 12 aircraft and over 500 personnel. This program exceeds 4,423 flying hours annually. The group is composed of three squadrons, a standardization/evaluation division, a maintenance process improvement division, safety division, inspection/exercises division, quality improvement division, and a maintenance aircraft control center. The squadrons assigned under the 43 ARG are the 91st Air Refueling Squadron (ARS), the 43d Operations Support Squadron (OSS), and the 43d Logistics Squadron (LS). These squadrons and divisions represent the internal customers and suppliers for this one-of-a-kind organization.

PROVIDING WORLD-CLASS GLOBAL AIR REFUELING AND AIRLIFT FOR AMERICA

91st AIR REFUELING SQUADRON

The 91 ARS is commanded by Colonel (sel) S. Taco Gilbert III. The mission of the 91 ARS is to provide global mobility through air refueling and airlift in support of national interests. The squadron achieves this mission with the support of over 270 personnel, 12 KC-135Rs, and 2 C-12s. Members maintain mission-ready status through teamwork, integrity, and professionalism. Additionally, the 91 ARS enhances its readiness through aggressive Certified Mechanic and Cross Utilization Training programs, challenging flight simulator profiles, comprehensive life support training, and a demanding schedule of training flights and operational deployments.

43d OPERATION SUPPORT SQUADRON

The 43 OSS is commanded by Lt Col Duncan M. Shields. The mission of the 43 OSS is to deliver multifaceted support to the air refueling and mobility mission. This squadron is the most diverse unit in the group. It provides planning, training, and exercise support for contingency and SIOP taskings as well as tactics and intelligence fields. The squadron maintains flight records for the entire group and personnel management responsibility for the group staff. Monitoring the ATS contractor providing KC-135 simulator training for the group is also an OSS responsibility.

43d LOGISTICS SQUADRON

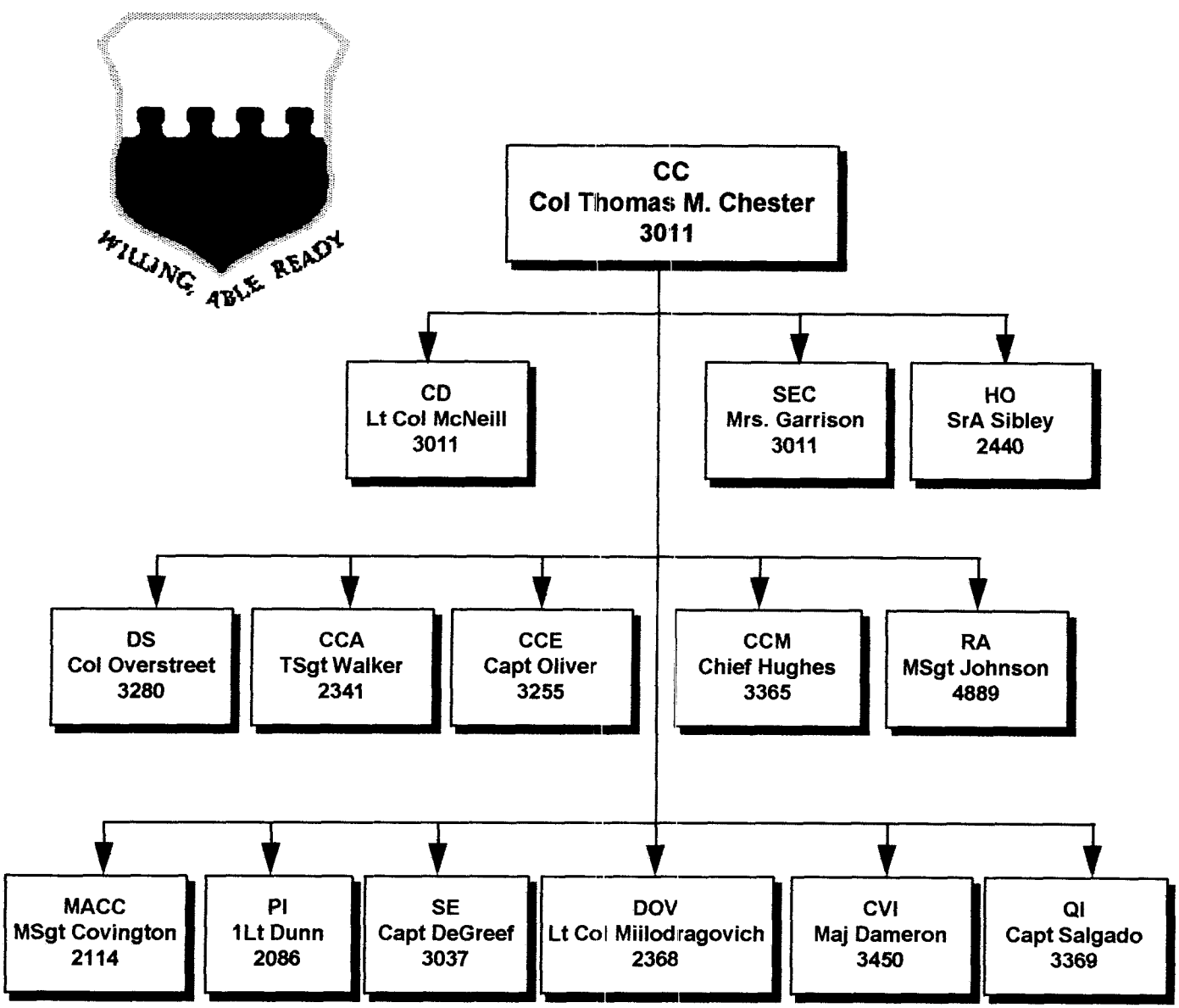
The 43 LS is commanded by Major Dale R. Werner. The squadron is expertly staffed with 177 highly skilled personnel with an annual operating budget of $1.5 million. It encompasses eight back shops that provide the necessary specialized maintenance support for all assigned KC-135R aircraft, an Isochronal inspection dock that completes an average of 25 major aircraft inspections annually, and a refurbishment dock that completely reconditions the interior of each aircraft. The squadron also has an aerospace group equipment flight that maintains 277 pieces of powered and nonpowered aircraft support equipment. The squadron administers the Maintenance Qualification Training Program for all maintenance personnel in the 43d Air Refueling Group and oversees the Group's Core Automated Maintenance System and deficiency analysis programs.

43d AIR REFUELING GROUP

43d AIR REFUELING GROUP

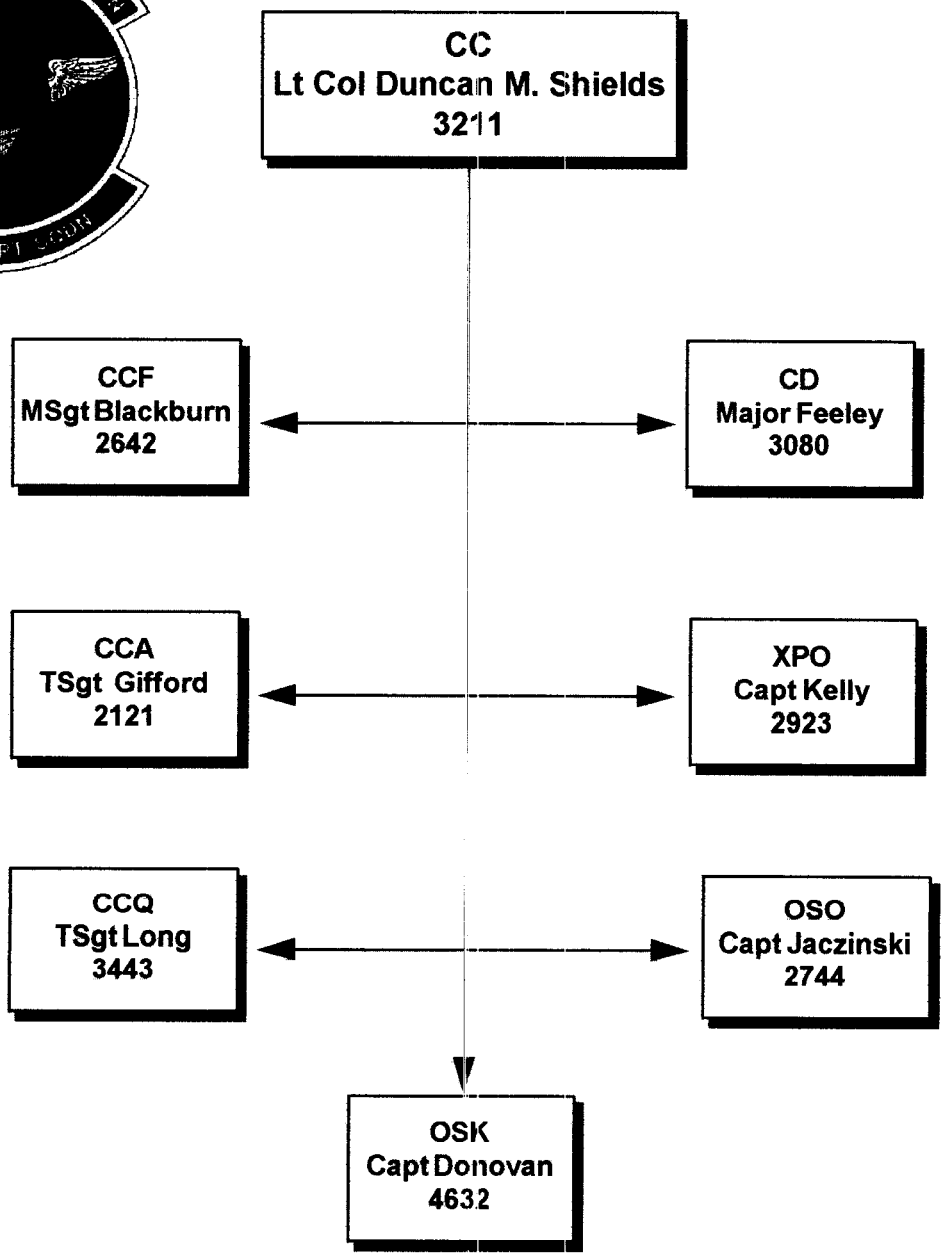
ORGANIZATIONAL CHARTS

Organization Chart
43d Air Refueling Group Staff



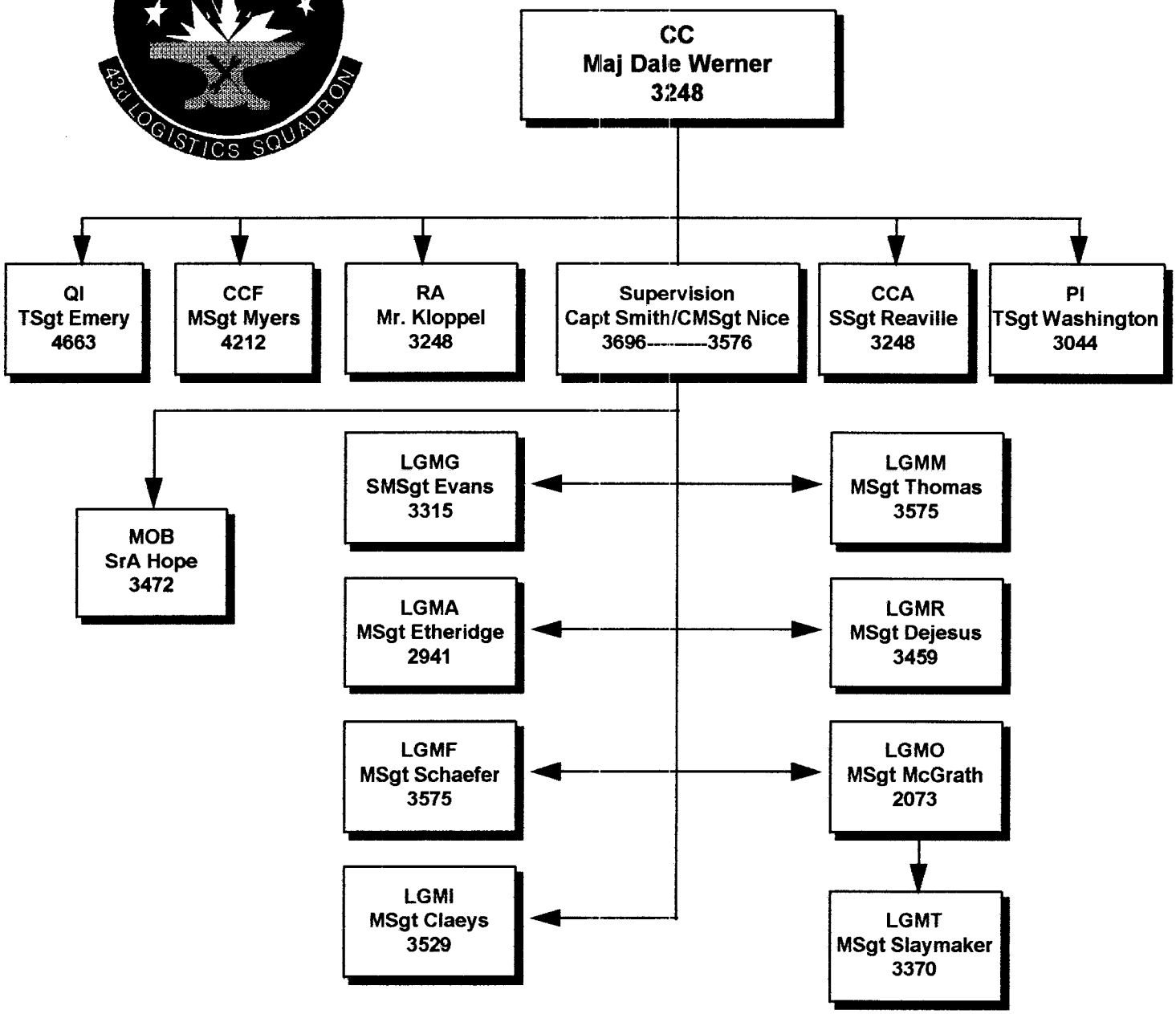
PROVIDING WORLD-CLASS GLOBAL AIR REFUELING AND AIRLIFT FOR AMERICA

Organization Chart
43d Operations Support Squadron



PROVIDE UNEQUALED SUPPORT TO GLOBAL AIR MOBILITY OPERATIONS

Organization Chart
43d Logistics Squadron



43d LS, MAINTAINING QUALITY AIRCRAFT, AGE, TRAINING AND INFORMATION SUPPORT FOR TEAM MALMSTROM, AMERICA, AND HER GLOBAL COMMITMENTS

43d AIR REFUELING GROUP

43d AIR REFUELING GROUP

SENIOR LEADERSHIP BIOGRAPHIES

Colonel Thomas M. Chester, Commander 43rd Air Refueling Group

BIOGRAPHY

United States Air Force

43d Air Refueling Group
Malmstrom AFB, MT 59402-7533

COLONEL THOMAS M. CHESTER

Colonel Mike Chester is the commander of the 43d Air Refueling Group, Malmstrom Air Force Base, Montana.

Colonel Chester was born July 22, 1948 in Quincy, FL and graduated from Havana High School, Havana, FL in 1966. He attended the University of West Florida and Florida State University where he earned a Bachelor of Arts degree in Political Science/Law in 1971. He received a master's in Business Administration from Boston University in 1980.

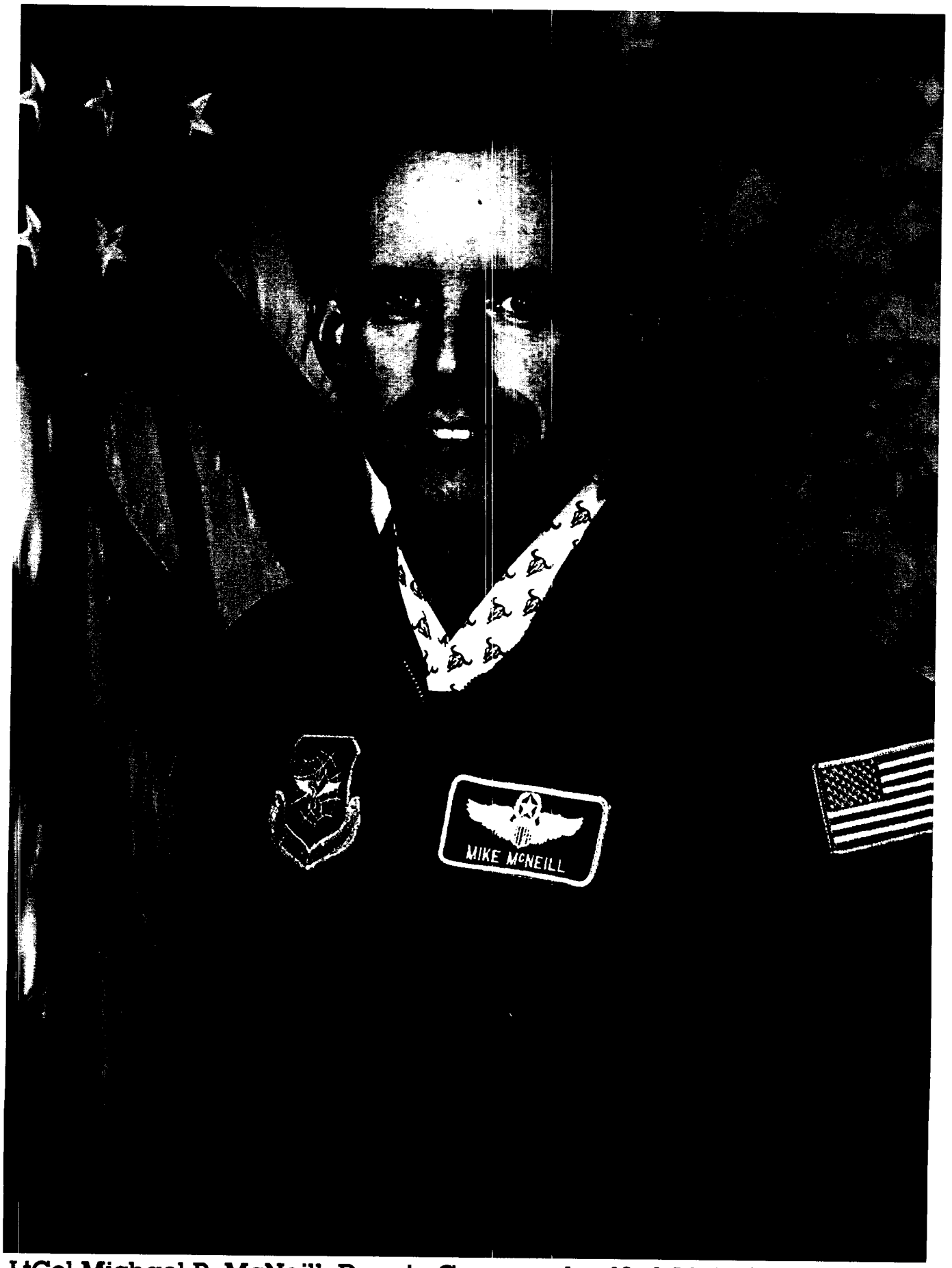
He was commissioned through the US Air Force Officer Training School in 1971. In May 1972, he attended undergraduate pilot training at Columbus Air Force Base, Mississippi. Upon earning his wings in February 1973, he joined the 28th Bomb Squadron, 19th Bomb Wing, Robins Air Force Base, GA where he served as copilot, pilot, and instructor in the B-52G. He performed the SRAM, EVS, ECM Phase VI tests as well as developed the Busy Observe I & II missions.

In July 1978 he was assigned as aide-de-camp for the Chief of Staff Air South, Naples, Italy. He also served as the aide for the Commander, Air South and 16th Air Force, as well as Ground Launch Cruise Missile beddown officer for the southern region of NATO.

Colonel Chester returned to flying in August 1980 with training in the FB-111A at Plattsburgh Air Force Base, NY, and assignment to the 715th Bomb Sq, 509th Bomb Wing, Pease Air Force Base, NH. At Pease, he was flight commander, chief of training flight and instrument school, test and evaluation pilot, and special projects.

After completion of Air Command and staff in residence, he was assigned to Headquarters US Air Force at the Pentagon, in July 1985. As Chief of Wartime Plans, Directorate of Manpower, he was responsible for mobilization, force structure integration, and planning to support the global family of war plans. In February 1987, he became Chief of CINC, Joint Issues, and Legislative Affairs Branch in the Directorate of Programs. He was responsible for Air Force POM support for the CINCs worldwide, theater allocation of resources, creation of Air Force Special Operations Command, and AF point of contact for other Agency programming.

He then returned to flying at Plattsburgh in March 1989 for requalification and in August as operations officer for the 528th Bomb Squadron. In January 1991 he attended Joint Service Officer School at Norfolk, VA, in preparation for his next assignment.



LtCol Michael R. McNeill, Deputy Commander 43rd Air Refueling Group

BIOGRAPHY

United States Air Force

43d Air Refueling Group
Malmstrom AFB, MT 59402-7533

LIEUTENANT COLONEL MICHAEL R. MCNEILL

Lieutenant Colonel Michael R. McNeill is the deputy commander of the 43d Air Refueling Group, Malmstrom Air Force Base, Montana.

He was born in Ontario, Oregon, on 2 December 1948. He graduated from Vale Union High School, Vale, Oregon, in 1967. He earned a Bachelor of Arts Degree in Geology from Oregon State University in 1972, and a Master's Degree in Aeronautical Science from Embry-Riddle Aeronautical University in 1987.

He received his commission through the Air Force Reserve Officer Training Corps program at Oregon State University in June 1972, and was assigned to Vance Air Force Base, Oklahoma, as an undergraduate pilot training student. Upon graduation in December 1973, he was assigned to Ellsworth Air Force Base, South Dakota, as a KC-135 pilot.

In December 1981, he was assigned to the 909th Air Refueling Squadron and 376th Strategic Wing, Kadena Air Base, Japan. While in Japan, he served as a KC-135 aircraft commander, instructor pilot, emergency action controller, and squadron flight commander, seeing service throughout the Pacific and Indian Ocean.

In July 1985, he was assigned as chief, training flight at the 924th Air Refueling Squadron, Castle Air Force Base, California. He soon moved to the 93d Air Refueling Squadron as a combat crew training school flight line instructor and later served as an academic instructor at the 329th Combat Crew Training Squadron at Castle. He later returned to the 93d Air Refueling Squadron in late 1987 as a flight commander and squadron operations officer, and served there until 1989.

In July 1989, he transferred to Offutt Air Force Base, NE where he served as Chief, Aircrew Force Management Branch, Force Management Division, Directorate of Personnel Plans and Policy, Deputy Chief of Staff, Personnel at Headquarters Strategic Air Command. In 1990, he was assigned as Chief, Force Management Division, where he managed long range planning for both aircrews and missile crews.

In May 1992, he was assigned to the 43d Air Refueling Wing here at Malmstrom Air Force Base as chief of safety. In October 1992, he assumed command of the 97th Air Refueling Squadron. He took command of his present position as Deputy Commander, 43 Air Refueling Group in July 1994. He is a command pilot and flight instructor with 3500 military flight hours including 900 hours of instructor time in the KC-135.

His military decorations include the Meritorious Service Medal, the Air Force Commendation Medal with one Oak Leaf Cluster and an Aerial Achievement Medal.

Colonel McNeill is married to the former Shirley Kuwahara of Vale, Oregon. They have two children, Laurie and Kelly.

LtCol Duncan M. Shields, Commander 43rd Operations Support Squadron

BIOGRAPHY

United States Air Force

43d Operations Support Squadron
Malmstrom AFB, MT 59402-7533

LIEUTENANT COLONEL DUNCAN M. SHIELDS

Lt Col Duncan M. Shields was born 21 April 54 in Pittsburgh PA. He graduated from Mt. Lebanon Senior High School, Mt Lebanon PA in 1972. He attended the USAF Academy where he graduated as a member of the "Spirit of 76" with a Bachelors of Science Degree in Electrical Engineering. He later earned a Master of Science Degree in Electro-Optics from the Air Force Institute of Technology at Wright-Patterson AFB, OH.

Lt Col Shields attended Undergraduate Pilot Training at Reese AFB, TX and earned his wings in June 1977. He then completed KC-135 Combat Crew Training in November 1977.

His first operational assignment was with the 920th Air Refueling Squadron, Wurtsmith AFB, MI. While at Wurtsmith he upgraded to Aircraft Commander. In July 1981 he was assigned to the 384th Air Refueling Squadron, McConnell AFB, KS. During his short stay at McConnell he supported both European and Pacific Tanker Task Force Operations.

In March 1983, Lt Col Shields departed for Wright-Patterson AFB, OH, attending Squadron Officers School enroute. At Wright-Patterson he completed the requirements of his master's program with an experimental thesis sponsored by the Foreign Technology Division of the Air Force Systems Command. His work validated Russian research and extended American knowledge of optical processing technology.

In January 1985, Lt Col Shields was assigned to the Air Force Electronic Warfare Center, Electronic Security Command at Kelly AFB, TX, as an Electro-Optics analyst. In April 1985, he moved to the space side of the business and was selected as Chief of the Space Systems Analysis Branch. In this capacity he produced studies evaluating electronic combat survivability of virtually every US current and proposed space system to numerous Department of Defense customers.

After completing Air Command and Staff College at Maxwell AFB in 1988 and 1989, Lt Col Shields was assigned as a flight commander in the 380th Air Refueling Squadron, Plattsburgh AFB, NY.

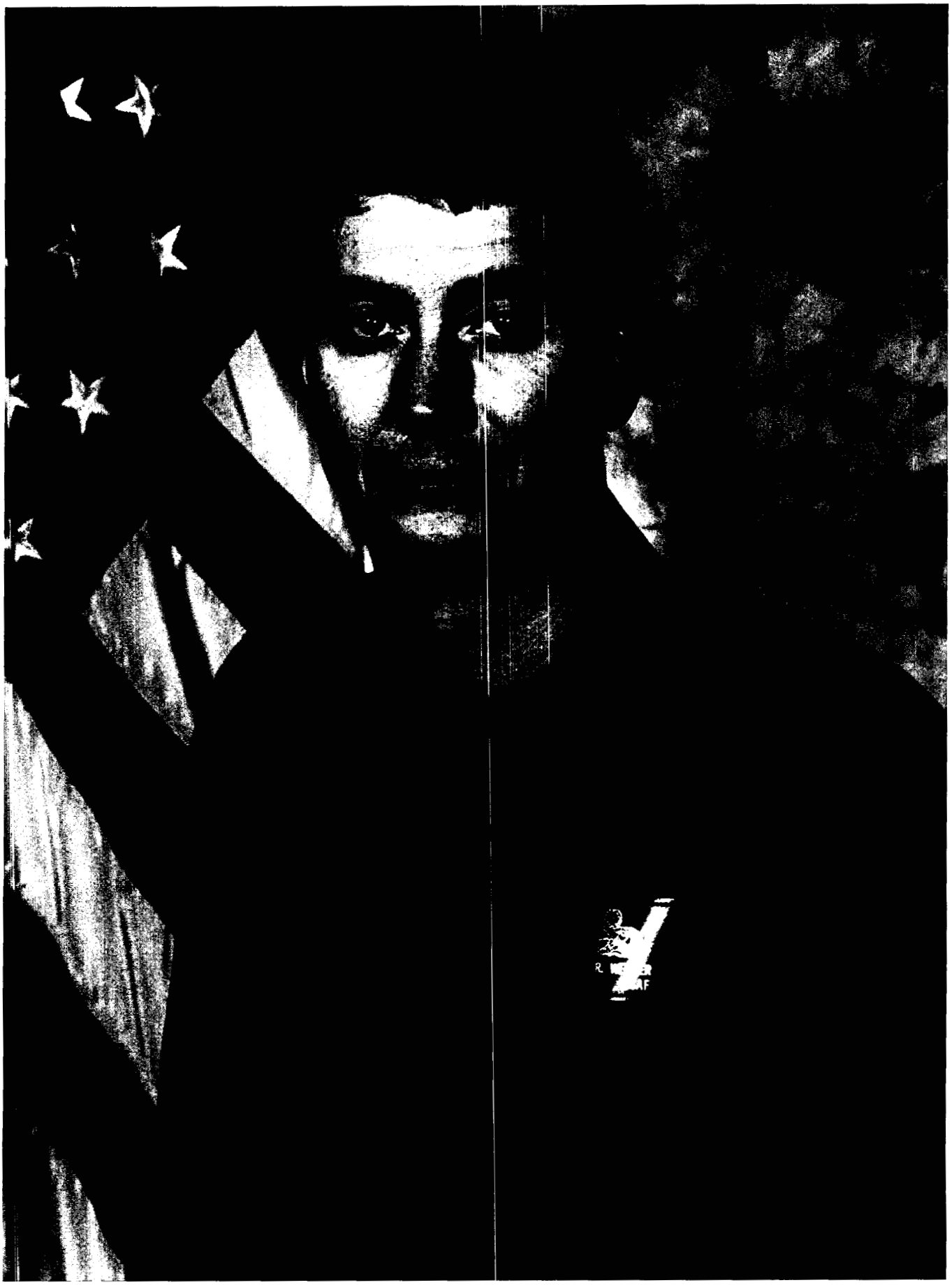
He spent five months deployed to King Khalid International Airport, Saudi Arabia for Operations DESERT SHIELD and DESERT STORM, flying the KC-135A/Q in direct support of combat forces. Upon returning to the United States he became Chief of Training Flight in the 310th Air Refueling Squadron and then in October 1992, Operations Officer for the 380th Air Refueling Squadron.

During his stint as Operations Officer, Lt Col Shields acted as Squadron Commander on numerous occasions while the commander was deployed. He deployed as commander to Moron Air Base, Spain for Operation RESTORE HOPE II in October of 1993, supporting the rapid reinforcement of forces. Under his command the squadron excelled in three major inspections, the 21st AF Aircrew Standardization/Evaluation Visit, the Quality Air Force Assessment, and the Operation Readiness Inspection.

Lt Col Shields assumed command of the 43d Operations Support Squadron, Malmstrom AFB, Montana on 24 June 1994.

Lt Col Shields is a Command Pilot with over 3,000 flying hours. His decorations include the Meritorious Service Medal, the Air Force Commendation Medal with one oak leaf cluster, the Armed Forces Expeditionary Medal, the Air Medal, the Aerial Achievement Medal, and the Combat Readiness Medal with two oak leaf clusters.

He is married to the former Celia Goodson of Littleton, Colorado. They have four daughters, Karen, Sarah, Kristin, and Catherine, and a son, Andrew.



Major Dale R. Werner, Commander 43rd Logistics Squadron

BIOGRAPHY

United States Air Force

43d Logistics Squadron
Malmstrom AFB, MT 59402-7533

MAJOR DALE R. WERNER

Major Dale R. Werner was born in St. Louis, Missouri, June 1, 1957, and graduated from Grover Cleveland High School in May 1975. He earned an Airframe and Powerplant mechanic's certificate in 1978 and a Bachelor of Science degree in Aircraft Maintenance from Parks College in 1979. He received a Master's Degree in Business Administration in 1985 from Embry-Riddle University.

A graduate of AFROTC, Major Werner was commissioned in 1979 and assigned to Chanute Air Force Base, Illinois, for the Aircraft Maintenance Officer Course. Upon completion in March 1980, he was assigned to the 2954th Combat Logistics Support Squadron, Kelly Air Force Base, Texas, as Officer in Charge of Air Force Logistics Command Aircraft Battle Damage Repair program, and later became the maintenance supervisor.

In March of 1983, he was assigned to the 86th Tactical Fighter Wing, Ramstein Air Base (AB), Germany, as the Officer in Charge of the Avionics Branch and Maintenance Supervisor to the 86th Component Repair Squadron and Officer in Charge of the 512th Aircraft Maintenance Unit. Major Werner moved to Headquarters 17th Air Force at Sembach, AB, Germany in April 1986 where he was Logistics Staff Officer.

In April 1988, he was reassigned to Decimomannu Air Base, Sardina, Italy, where he was the Deputy Commander for Maintenance of the 7555th Tactical Training Squadron. Major Werner transferred to Royal Air Force (RAF) Brampton, United Kingdom, as Exchange officer and staff member at Headquarters RAF Support Command in August 1990.

He became the Director of Logistics at Detachment 2, "Black Cats," of the 9th Reconnaissance Wing, Osan Air Base, Korea, in August 1992. In September 1993, he was reassigned to the 97th Air Refueling Squadron, Malmstrom Air Force Base, Montana, as the Maintenance Operations Officer. Major Werner assumed command of the 43d Logistics Squadron on 17 June 1994.

Major Werner's decorations include the Meritorious Service Medal with two oak leaf clusters, and the Air Force Commendation Medal with one oak leaf cluster.

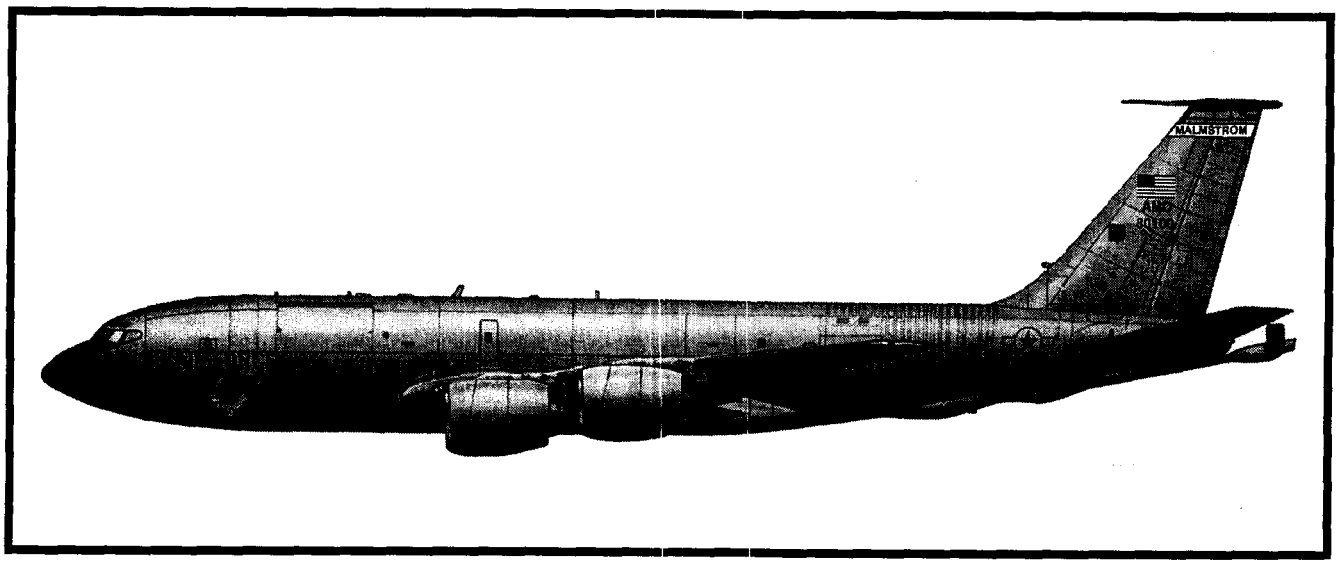
Major Werner is married to Darcy Maloney, of San Angelo, Texas.

FACT SHEET

United States Air Force

Secretary of the Air Force
Office of Public Affairs
Washington D.C. 20330-1690

KC-135 Stratotanker



Mission

The KC-135 Stratotanker's primary mission is to refuel long-range bombers. It also provides aerial refueling support to Air Force, Navy, Marine Corps and allied aircraft.

Features

Four turbojets, mounted under wings swept 35 degrees, power the KC-135. Nearly all internal fuel can be pumped through the tanker's flying boom, the KC-135's primary fuel transfer method. A special shuttlecock-shaped drogue, attached to and trailing behind the flying boom, is used to refuel aircraft fitted with probes. An operator stationed in the rear of the plane controls the boom. A cargo deck above the refueling system holds passengers or cargo. Depending on fuel storage configuration, the KC-135 can carry up to to 83,000 pounds (37.350 kilograms) of cargo.

Background

The Boeing military Airplane Company's model 367-80 was the basic design for the commercial 707 passenger plane as well as the KC-135A Stratotanker. In 1954 the Air Force purchased the first 29 of its future fleet of 732. The first aircraft flew in August 1956 and the initial-production Stratotanker was delivered to Castle Air Force Base, CA., in June 1957. The last KC-135A was delivered to the Air Force in 1965.

In southeast Asia, KC-135 Stratotankers made the air war different from all previous aerial conflicts. Mid-air refueling brought far-flung bombing targets within reach. Combat aircraft, no longer

limited by fuel supplies, were able to spend more time in target areas.

The KC-135A's are being modified with new CFM-56 engines produced by CFM-International. The re-engined tanker, designated the KC-135R, can offload 50 percent more fuel, is 25 percent cheaper to operate and is 96 percent quieter than the KC-135A.

Under another modification program, all Air Force Reserve and Air National Guard tankers were re-engined with TF-33-PW-102 engines. The re-engined tanker, designated the KC-135E, is 14 percent more fuel efficient than the KC-135A and can carry 20 percent more fuel.

With projected modifications, the KC-135 will fly and refuel into the next century. A new aluminum-alloy skin grafted to the underside of the wings will add 27,000 flying hours to the aircraft.

The KC-135 tanker fleet made an invaluable contribution to the success of Operation Desert Storm in the Persian Gulf, flying around-the-clock missions to maintain operability of allied warplanes. The KC-135's form the backbone of the Air Force tanker fleet, meeting the aerial refueling requirements of bomber, fighter, cargo and reconnaissance forces, as well as the needs of the Navy, Marines and allied nations.

General Characteristics (KC-135R)

Primary Function: Aerial refueling.
Contractor: Boeing Military Airplanes.
Power Plant: Four CFM-International F-108-CF-100 turbofans.
Thrust: 22,224 pounds (10,000.8 kilograms) each engine.
Length: 136 feet, 3 inches (40.8 meters).
Height: 38 feet, 4 inches (11.5 meters).
Wingspan: 130 feet, 10 inches (39.2 meters).
Speed: Maximum speed at 30,000 feet (9100 meters) 610 mph (Mach 0.93)
Ceiling: 50,000 feet (15,152 meters)
Weight: 119,231 pounds (56,654 kilograms) empty.
Maximum Takeoff Weight: 322,500 pounds (145, 125 kilograms).
Fuel Capacity: 31,275 gallons (203,288 pounds)
Range: 11,192 miles (9,732 nautical miles) with 120,000 pounds (54,000 kilograms) of transfer fuel.
Crew: Four or five; up to 80 passengers.
Date Deployed: August 1965.
Unit Cost: KC-135R, $53 million; KC-135E, $30.6 million; KC-135A, $26.1 million.
Inventory: Active force, 457; ANG, 158; Reserve, 30.

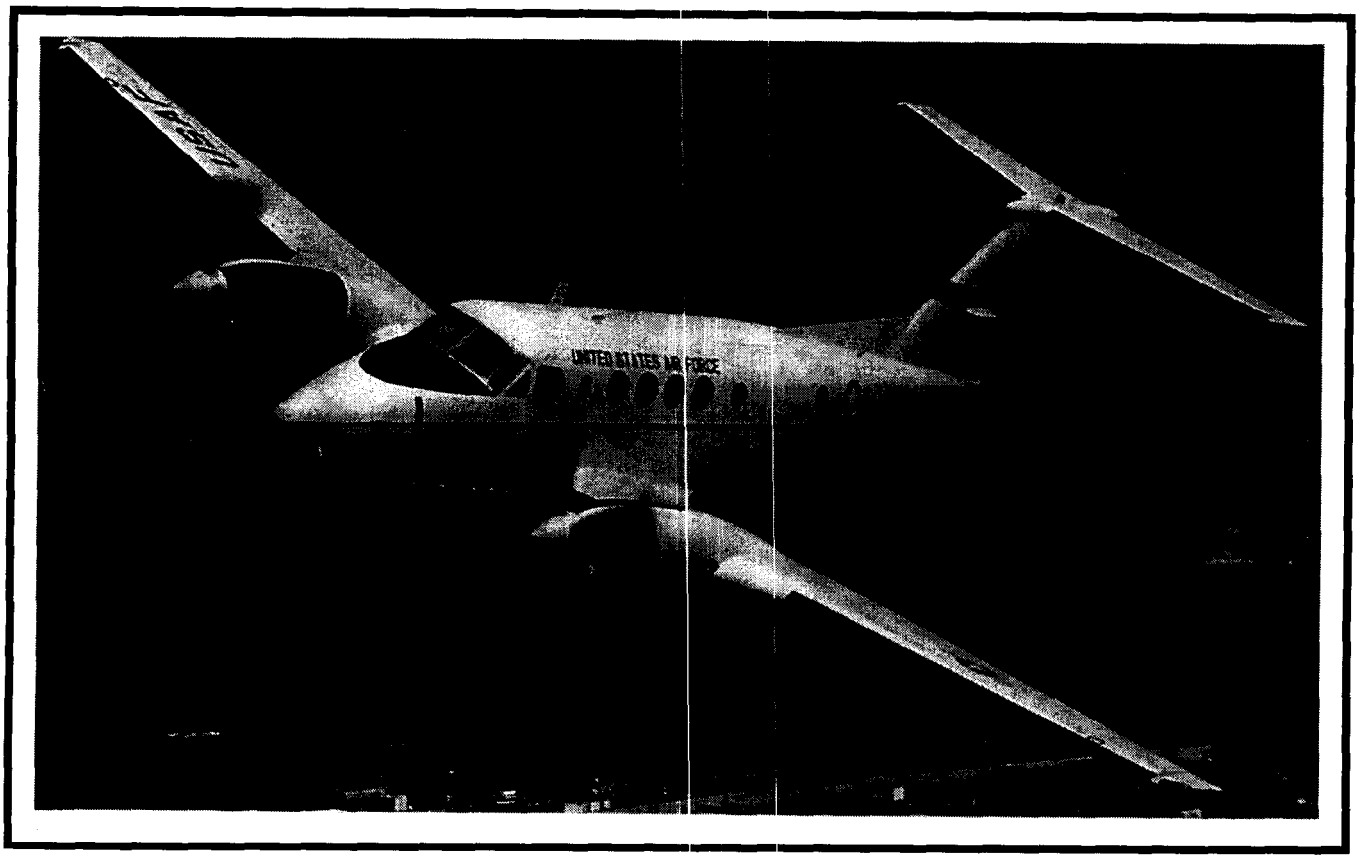
Point of Contact:
Air Mobility Command; Public Affairs Office; Bldg. 1905, Room 15; Scott Drive; Scott AFB, IL 62225-5317; DSN 576-4502, (618) 256-4502.

FACT SHEET

United States Air Force

Secretary of the Air Force
Office of Public Affairs
Washington D.C. 20330-1690

C-12F Huron



Mission

The C-12F twin turboprop aircraft provides operational support airlift of passengers and cargo.

Features

The plane is a military version of the Beechcraft Super King Air B200C. With a crew of two, the C-12F can carry up to eight passengers and has a cargo capacity of 56 cubic feet (1.6 cubic meters). In addition to carrying passengers and cargo, the aircraft can transport patients on medical evacuation litters. The plane is equipped with weather radar, autopilot, tactical air navigation (TACAN) equipment and high frequency, very high frequency and ultra high frequency radios for increased safety and operational capability. It has a retractable tricycle landing gear, steerable nose wheel and four-bladed propellers.

General Characteristics

Primary Functions: Passenger and cargo airlift.
Builder: Beach Aircraft Corporation.
Power Plant: Two Pratt & Whitney Aircraft of Canada PW-PT6A-42 turboprop engines.
Horsepower: 850 shaft horsepower each engine.
Length: 43 feet, 10 inches (13.3 meters).
Height: 15 feet (4.55 meters).
Wingspan: 54 feet, 6 inches (16.52 meters).
Speed: 336 mph (538 kph).
Ceiling: 35,000 feet (10,606 meters)
Maximum Takeoff Weight: 15,000 pounds (6,750 kilograms).
Range: 620 miles (539 nautical miles).
Maximum Load: Eight passengers or cargo of 2,647 pounds (1,191 kilograms).
Unit Cost: $2 million.
Crew: 2 (pilot and co-pilot).
Date Deployed: May 1984
Inventory: Active force, 19 F models; ANG, 13 F/J models; Reserve, 0.

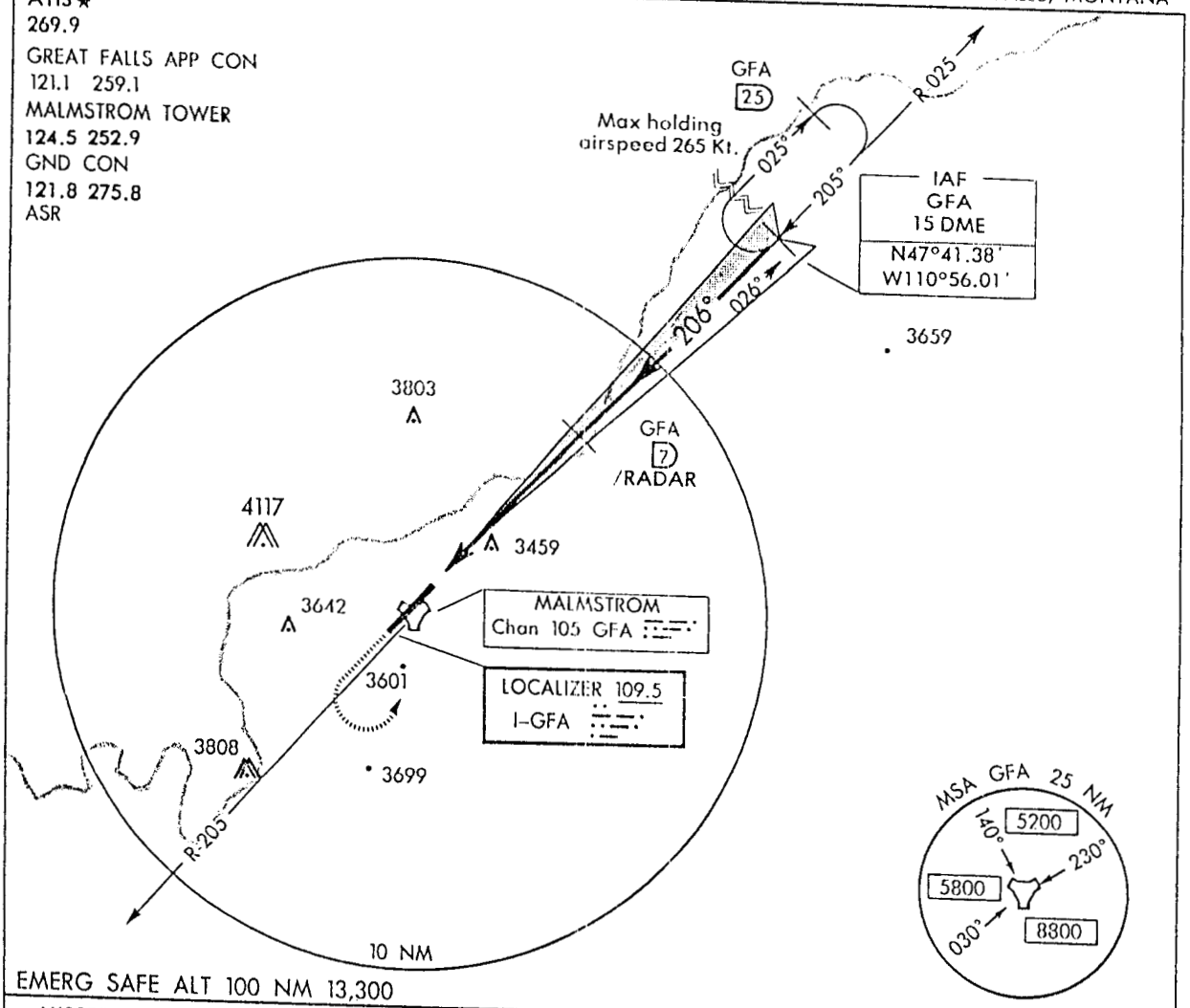
93259

ILS 1 RWY 21

AL-176.01 (USAF)

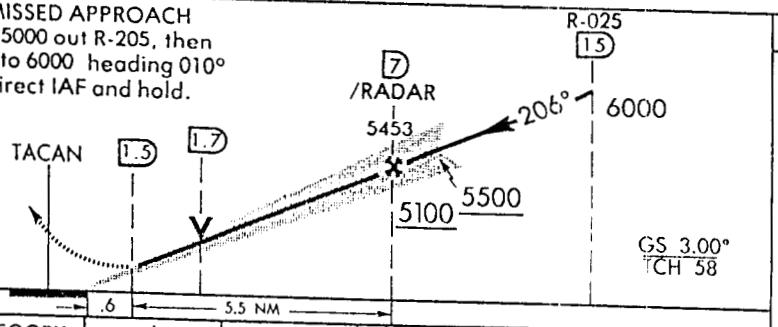
MALMSTROM AFB (KGFA)
GREAT FALLS, MONTANA

ATIS ★
269.9
GREAT FALLS APP CON
121.1 259.1
MALMSTROM TOWER
124.5 252.9
GND CON
121.8 275.8
ASR



EMERG SAFE ALT 100 NM 13,300

MISSED APPROACH
To 5000 out R-205, then left to 6000 heading 010° direct IAF and hold.

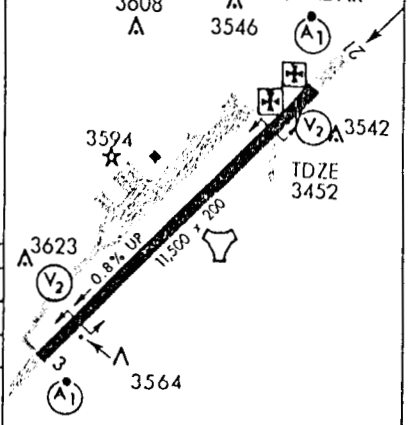


CATEGORY	A	B	C	D	E
S-ILS 21	3652/24 200 (200-½)				
S-LOC 21	3720/24 268 (200-½)		3720/40 268 (200-¾)		
CIRCLING*	3920-1 394 (400-1)	3980-1 454 (500-1)	3980-1½ 454 (500-1½)	4080-2 554 (600-2)	
S-ASR 21	3820/24 368 (300-½)		3820/40 368 (300-¾)		

*Circling not authorized W of Rwy 3-21.

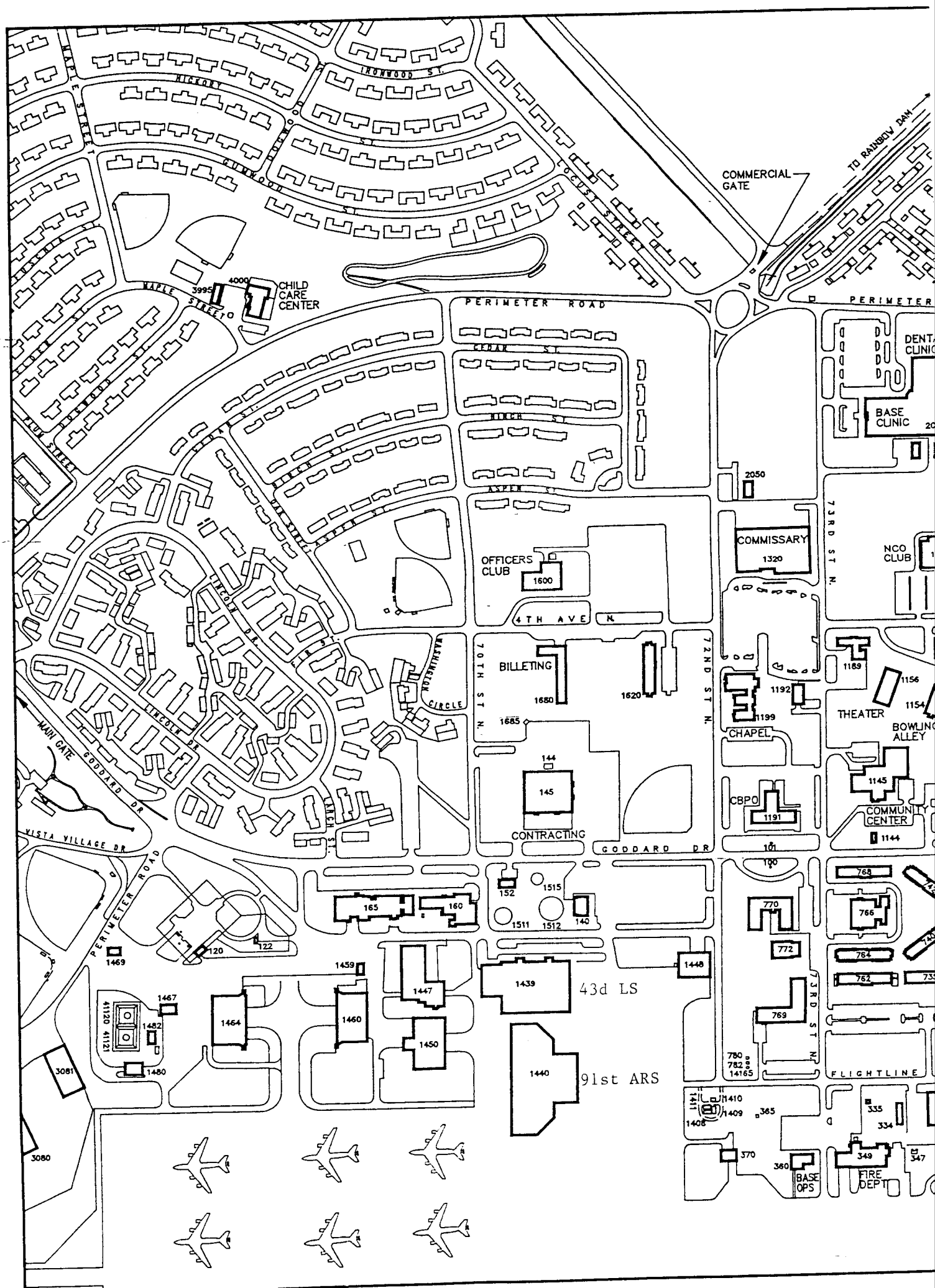
ELEV 3526

206° 6.1 NM from 7 DME/RADAR



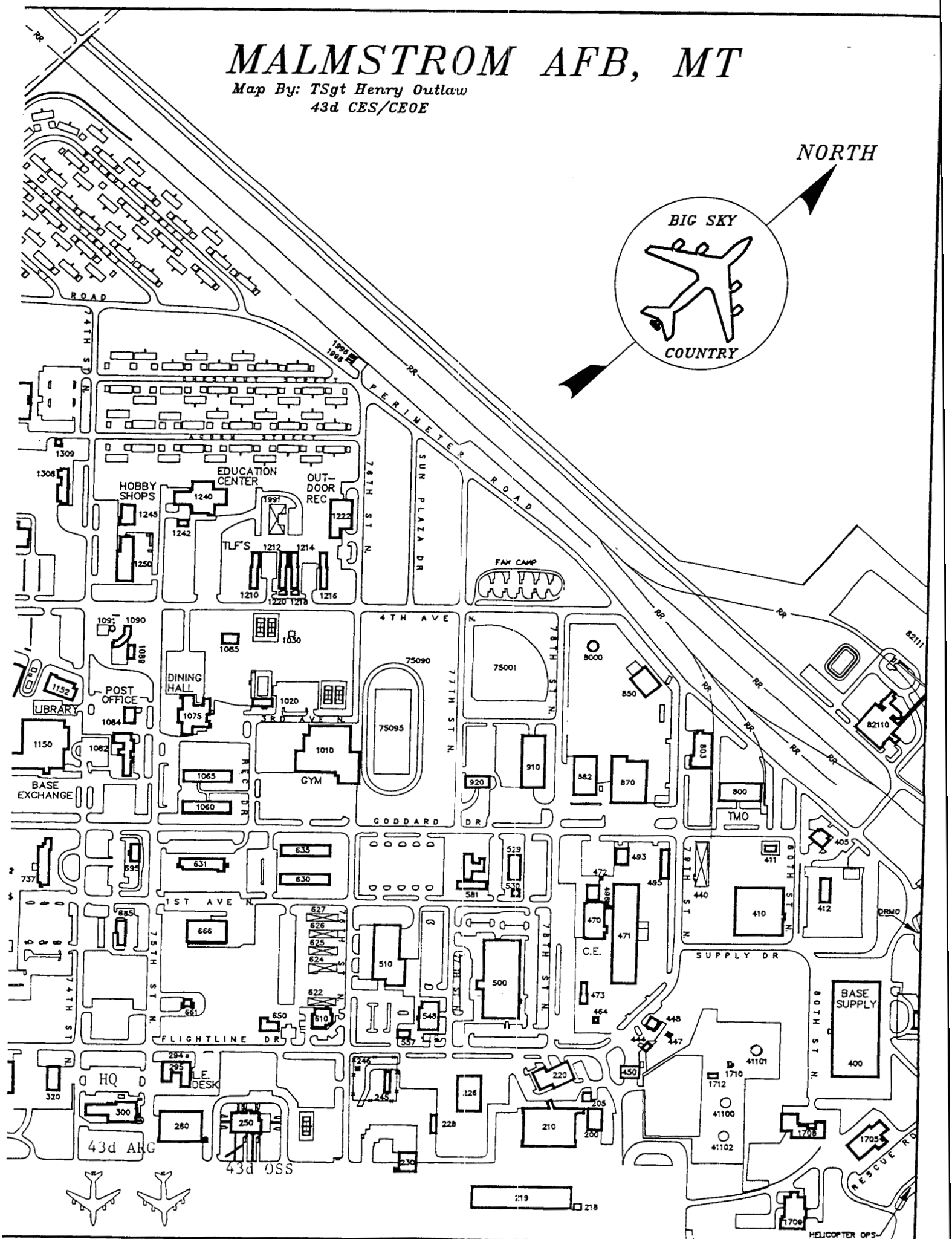
HIRL Rwy 3-21

LOC FAF to MAP 5.5 NM					
Knots	60	90	120	150	180
Min:Sec	5:30	3:40	2:45	2:12	1:50


IRONWOOD ST.
HICKORY
MAPLE STREET
GUNWOOD ST.
LOCUST STREET
COMMERCIAL GATE
TO RAINBOW DAM
CHILD CARE CENTER
4000
3995
PERIMETER ROAD
CEDAR ST.
BIRCH ST.
ASPEN ST.
DENTAL CLINIC
BASE CLINIC
2050
COMMISSARY
1320
73RD ST N.
NCO CLUB
OFFICERS CLUB
1600
4TH AVE N.
BILLETING
1680
1620
70TH ST N.
72ND ST N.
1685
CHAPEL
1192
1199
1189
1156
THEATER
1154
BOWLING ALLEY
LINCOLN DR.
WASHINGTON CIRCLE
MAIN GATE
GODDARD DR
144
145
CONTRACTING
CBPO
1191
1145
COMMUNITY CENTER
1144
VISTA VILLAGE DR
PERIMETER ROAD
165
160
152
1515
1511
1512
140
100
101
768
770
766
772
764
762
769
120
122
1469
1459
1447
1439
43d LS
1448
1467
1482
4120
4121
1464
1460
1450
1440
91st ARS
3081
1480
3080
780
782
14165
FLIGHTLINE
1411
1410
1409
1408
365
335
334
370
360
349
347
BASE OPS
FIRE DEPT

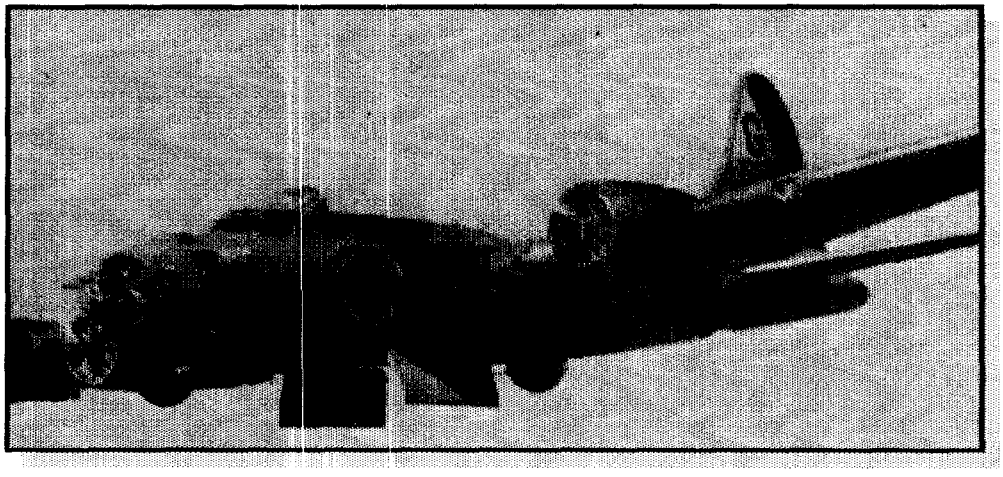
MALMSTROM AFB, MT

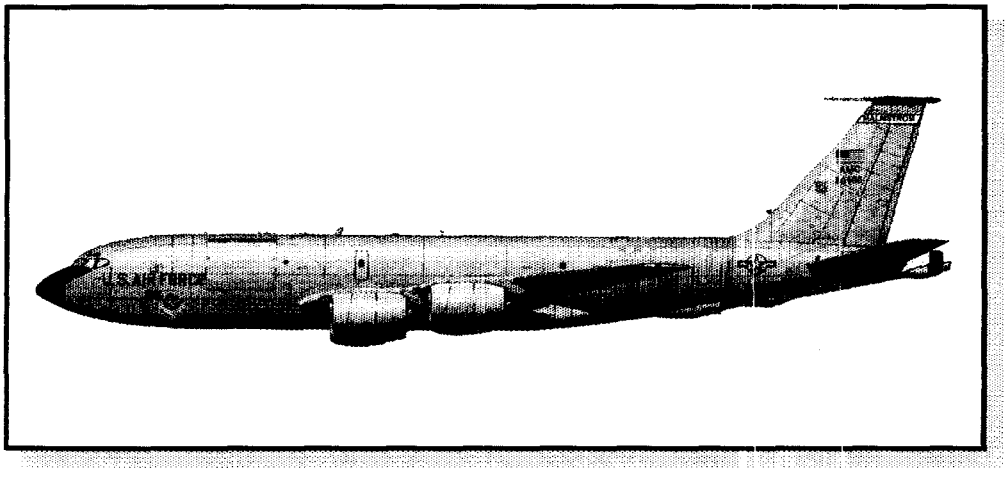
Map By: TSgt Henry Outlaw
43d CES/CEOE



History of the 43d Air Refueling Group

World War II





Present Day

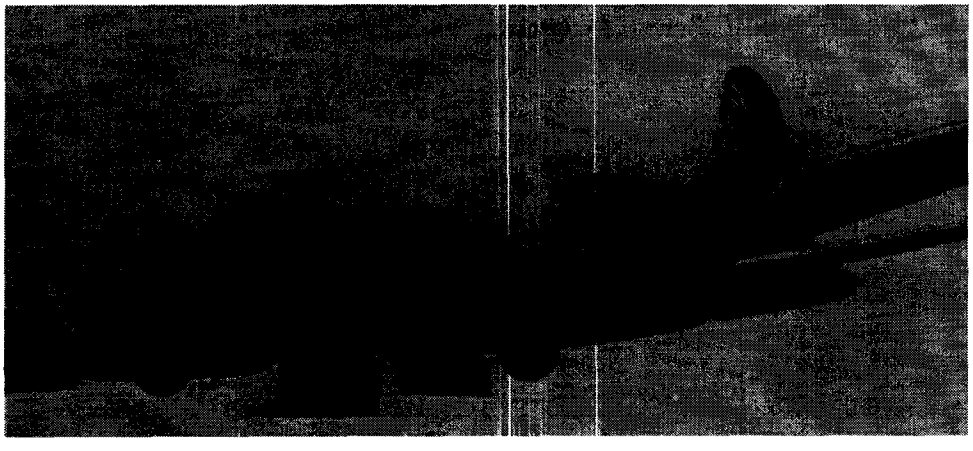
Willing, Able, and Ready since 1941

History of the 43d Air Refueling Group

The 43d Air Refueling Group traces its proud and decorative heritage to the days before World War II. Activated as the 43d Bombardment Group (Heavy) on 15 January 1941, the group trained at Langley Field, Virginia for its early antisubmarine mission. The group moved in August 1941 to Dow Field, Maine. There, the 43d flew A-29, B-17, B-18, B-24, and B-25 aircraft on antisubmarine patrols along the New England coastline. The group continued in this role until shortly after the Japanese bombing of Pearl Harbor.

With the outbreak of war in the Pacific, the 43d found itself on the move. The group departed Dow Field in B-17s on 18 February 1942 and arrived in Sydney, Australia on 28 March. After its arrival, the group began flying bombing missions over Japanese held territories and against enemy ship convoys. During these missions the group became highly decorated; earning two Distinguished Unit Citations and producing two Medal of Honor winners.

The group earned its first Distinguished Unit Citation when Japanese forces began an advance towards the allied stronghold at Port Moresby, Papua. Bombers from the 43d attacked Japanese shipyards, airfields, and supply routes on the other side of the island nation. These missions kept enemy reinforcements and needed supplies away from the front lines, destroying the Japanese's ability to wage war. After they were driven from Papua, the Japanese tried to establish a new stronghold in the region. The 43d was ready for the move.



The 43d flew B-17 bombers during WW II.

On 2 March 1943, reconnaissance aircraft detected a large Japanese convoy steaming towards New Guinea. The 43d Bomb Group, who had developed a new bombing technique called "skip bombing," attacked the convoy. All of the transport ships and several escort vessels were destroyed, resulting in a major allied victory. In recognition of this achievement, the 43d was awarded their second Distinguished Unit Citation. This battle demonstrated what the group as a whole could do, but three months later a little-known air battle showed what the individuals in the 43d were made of.

Captain Jay Zeamer, Jr. piloted a B-17 on a reconnaissance mission over the Solomon Islands on 16 June 1943. As the mission neared completion, the aircraft came

under heavy attack by more than 20 Japanese fighters. During the ensuing battle, Captain Zeamer and the bombardier, Lieutenant Joseph R. Sarnoski, were seriously wounded. Despite their injuries, both officers performed heroically. Lieutenant Sarnoski continued to fend off repeated attacks by the interceptors until he died at his post. Captain Zeamer managed to lose the assailants and land the aircraft safely at an allied airfield 500 miles away. Both men were awarded the Medal of Honor for their actions.

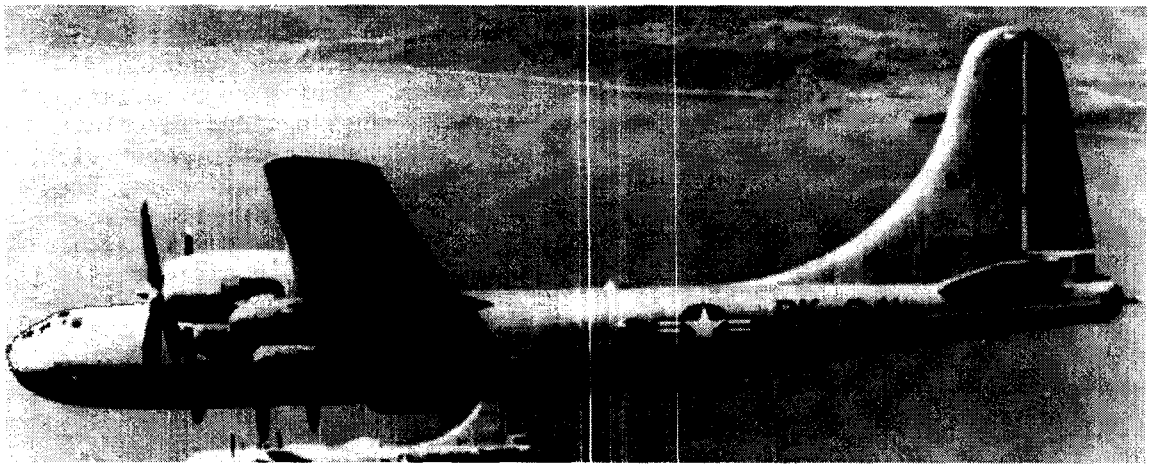
As the United States began to push the Japanese back, the Air Corps discovered the value of low level bombing in the Southwest Pacific. Because of this, the group switched to B-24 bombers in the summer and fall of 1943. The group's B-24s continued bombing Japanese forces in support of amphibious landings throughout the theater. As allied forces advanced, the group eventually focused on destroying strategic targets in Japan. The 43d sustained its strategic bombing efforts until the Japanese surrendered in September 1945. With the war over and the Asiatic Pacific Theater secure, the group inactivated on 29 April 1946.

B-24 Liberator like the 43d flew from summer 1943 to April 1946.

With the onset of the Cold-War, the newly formed United States Air Force (USAF) saw fit to reactivate the 43d Bomb Group at Davis-Monthan Air Force Base (AFB), Arizona on 1 October 1946. Once operational, the group trained in strategic bombing with B-29 bombers. In 1948 the group became the 43d Bombardment Wing and received the first B-50 aircraft in the USAF inventory. That same year the wing expanded its mission to include air refueling and added KB-29s to its roster. Aircrews from the 43d set records with all three aircraft.

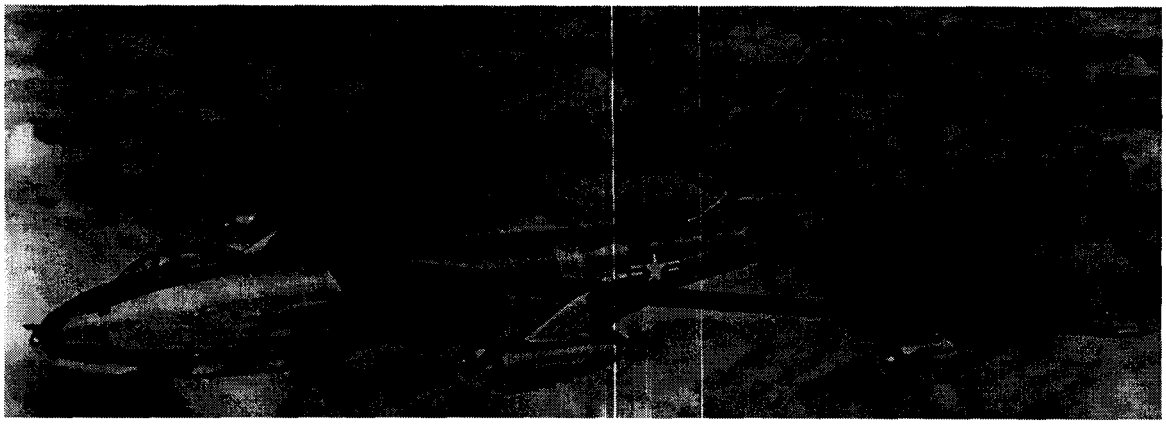
On 22 July 1948, three B-29s set out from Davis-Monthan AFB on a planned 14 day trip around the world. The crash of one B-29 delayed the trip one day, but the remaining aircraft completed the trip in a record 15 days. The 20,000 mile flight required eight stops along the way and took 103 hours, 50 minutes of flying time to complete. Though impressive for the day, the 43d accomplished a greater feat the next year.

On 26 February 1949, Captain James Gallgher commanded the B-50A *Lucky Lady II* as it's crew of 14 departed on another record breaking flight. Refueled four times by KB-29s from the 43d Air Refueling Squadron, the *Lucky Lady II* completed the first non-stop flight around the world. This 94 hour one minute mission demonstrated the effectiveness of air refueling to the world. As a result of this accomplishment, the crew won the first ever Mackay Trophy and the Air Age Trophy.



B-50A like that of the 43d Bomb Wing.

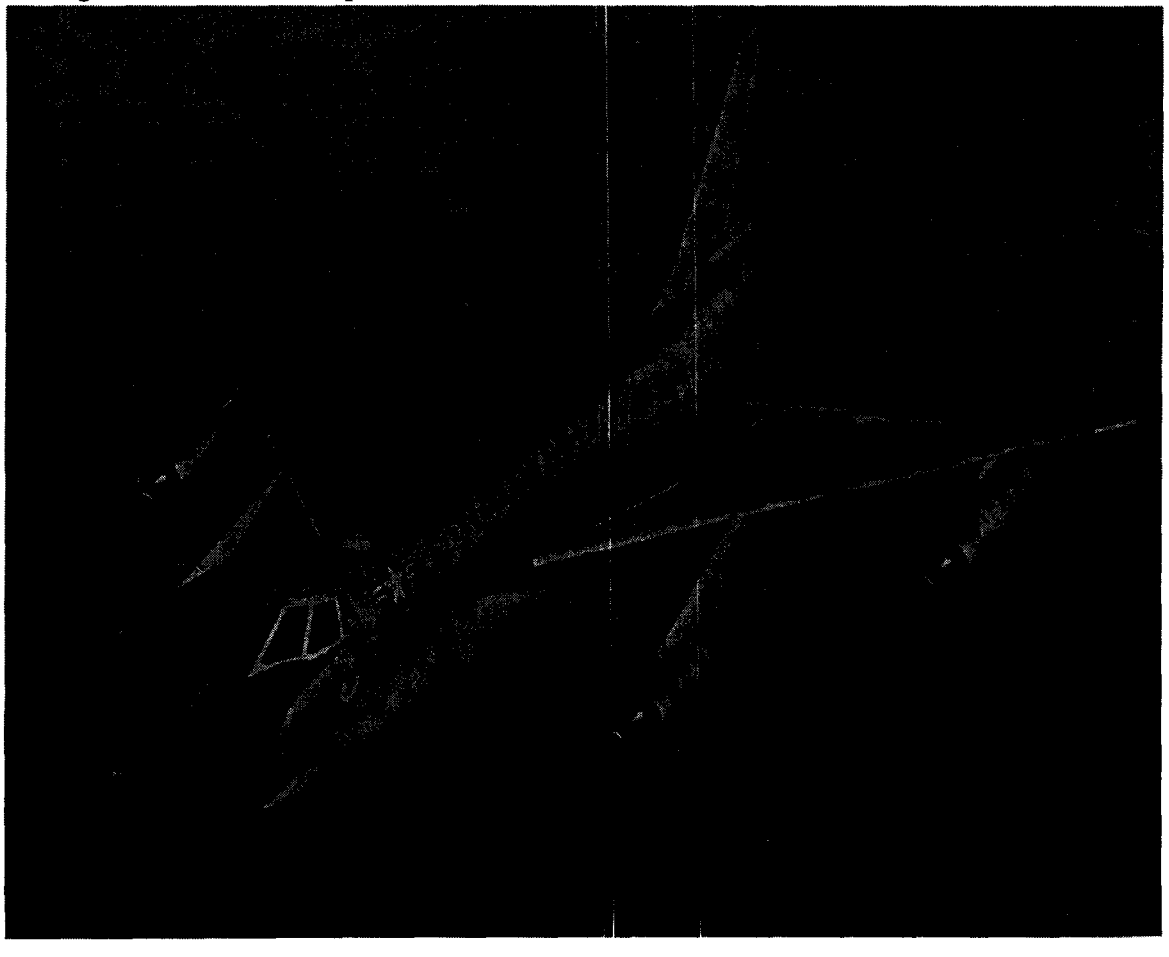
The wing continued its strategic bombing and air refueling missions into the 1950s. Always in the lead, 43d crews in two KB-29s earned the first combat sortie credits for tankers when they refueled an RF-80 over Korea on 28 September 1951. Two years later the wing replaced the KB-29s with KC-97s. Also in 1953, the wing transitioned into the jet age with the replacement of B-50s with B-47s. As chance would have it, a 43d crew did not wait long to set a record with the new Stratojet.



The 43d transitioned into the jet era with B-47s.

On 17 November 1954, Colonel David A. Burchinal, 43d Bomb Wing Commander, took off from Sidi Slimane, Morocco in his B-47. Colonel Burchinal planned to join up with the rest of the 43d on a training rotation at Fairford RAF Station, England. As he approached the English base, Colonel Burchinal encountered inclement weather, which prevented his landing. The B-47 flew back to Sidi Slimane and discovered bad weather there, too. With no other options, the B-47 crew arranged for air refuelings until the weather cleared up at one of the locations. After nine inflight refuelings and 47 hours 35 minutes in the air, the Stratojet was able to land at Fairford RAF Station. During its time aloft, the bomber traveled 21,163 miles and shattered the previous jet endurance record. Recognizing the 43d Bomb Wing's history of record breaking and firsts, the Strategic Air Comand (SAC) selected the 43d to fly the command's newest bomber, the B-58.

Its transition to B-58 Hustlers required the wing to move to Carswell Air Force Base, Texas in March 1960. The 43d received the first B-58 in the Air Force on 1 August of that year. After the wing added the Hustler to its inventory, it conducted Category II and III evaluations with the new bomber. The 43d also operated a school to train SAC aircrews in the B-58. Once they began flying, it did not take 43d aircrews long to start setting records with the supersonic bomber.



The 43d was the first unit to receive the B-58 Hustler.

On 12 January 1961, Major Henry J. Deutschendorf commanded a B-58 crew from the 43d that set out to break six flight records; five of which the Soviet Union held. The Hustler flew two laps around a course with Edwards AFB, California at one end and Yuma, California at the other. The bomber set three speed records over the 1000 kilometer (km) course with a 2000 kilogram (kg), 1000 kg, and 0 kg payload--averaging 1,200.194 miles per hour (mph) in each category. The crew managed an average speed of 1,061.88 mph in each of the same payload categories over the 2000 km course. This flight set the pace for the 43d with the B-58.

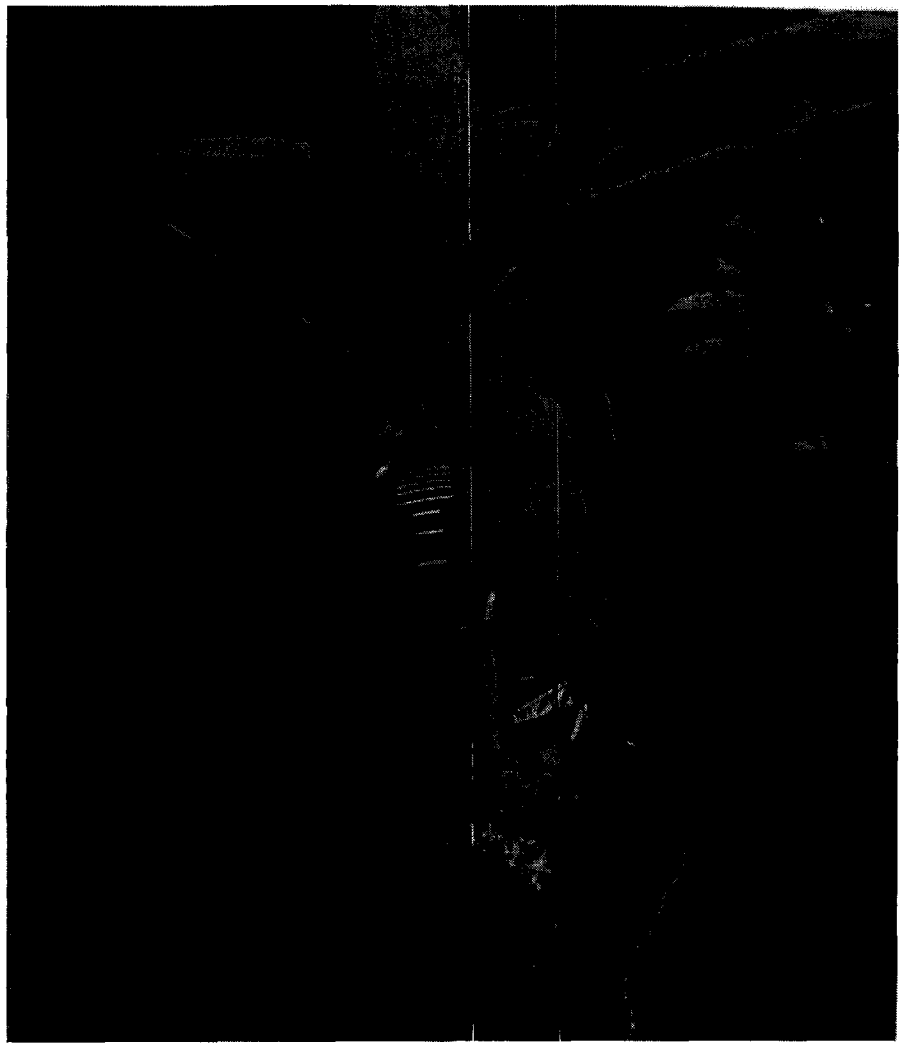
Crews set two more flight records with their Hustlers in 1961. On 10 May, Major Elmer E. Murphy flew his Hustler 669.4 miles in 30 minutes 45 seconds. Averaging 1,302 mph, Major Bleriot set a new record for sustained speed and earned France's Bleriot Cup. Sixteen days later a Hustler flew from New York City to Paris, France in 3 hours, 19 minutes, and 41 seconds. The B-58 averaged 1,089 mph along the 4,612 mile course and completed in 1/10th the time it took Charles Lindbergh in 1927. This transatlantic flight earned the crew the seventh Mackay Trophy and the Harmon International Trophy. Tragically, the crew was killed when their B-58 crashed on 3 June at the Paris Air Show. Though saddened by the event, crews from the 43d continued to set records with the Hustler.

Captain Robert G. Sowers piloted a B-58 that set out to break three speed records on 5 March 1962. Referred to as Operation Heat Rise, the 43d Bomb Wing B-58 flew from New York to Los Angeles and back to New York in 4 hours, 41 minutes, and 14.98 seconds. The crew drove the bomber from New York to Los Angeles in two hours, 15 minutes, and 50.8 seconds; beating the sun across the United States. The return trip took 2 hours and 58.71 seconds at an astonishing 1,214.65 mph. All three crewmen earned the eighth Mackay Trophy, the first Bendix Trophy, Distinguished Flying Crosses, and congratulations from President Kennedy.

One of the last things the wing did while at Carswell AFB took place on 28 March 1964, the day after a major earthquake devastated Alaska. Headquarters USAF tasked the 43d to provide it with photographs of the region hit by the quake. Members of the 43d flew two B-58s the 5,751 miles to Alaska and back, processed the film, and then delivered the pictures to Washington DC 14.5 hours after the wing received the request. Six months later the 43d Bomb Wing moved to Little Rock AFB, Arkansas. There it added KC-135 refuelers to its inventory. The 43d Bombardment Wing carried out its mission of strategic bombardment readiness and air refueling for five and a half years at Little Rock AFB. In mid 1969 the Air Force began to retire the B-58s. While the majority of the wing's bombers went to Davis-Monthan AFB for storage, the Air Force spared one. Aircraft 59-2458, the Hustler that flew the record breaking round trip flight from New York to Los Angeles, was placed on display at the Air Force Museum at Wright-Patterson AFB, Ohio. Shortly after the retirement of its last B-58, the 43d Bombardment Wing inactivated in January 1970. However, because of its illustrious history, the wing did not stay idle long.

Activated on 1 April 1970 at Andersen AFB, Guam, the 43d Strategic Wing assumed a combat role with B-52 bombers and KC-135 refuelers. The wing began with only light participation in SAC's Arc Light bombing campaign against North Vietnamese forces in South Vietnam. The wing's participation in Arc Light ceased when SAC made the 43d Strategic Wing part of its worldwide nuclear alert force in August 1971.

The 43d stayed out of Vietnam until early 1972. In response to increased aggressive action by the North, SAC initiated Operation Bullet Shot. Bullet Shot resulted in the build up of B-52 forces at Andersen AFB to carry out increased bombing missions. At the peak of the operation, 150 B-52s operated as part of the 43d, making it the largest unit in the USAF. These bombers participated in bombing raids against enemy targets all over Vietnam, including north of the demilitarized zone (DMZ), until President Nixon ordered a cessation to the aggressive bombing efforts. President Nixon gave that order when it appeared that the Paris Peace Talks were resulting in a possible agreement. However, when the communist forces took advantage of the bombing halt by increasing their operations tempo, President Nixon gave the order to execute Linebacker II.



A B-52 receiving fuel while on the way to its target.

Linebacker II involved the heavy application of air power against North Vietnamese supply routes to convince North Vietnam to return to the negotiating table. On 18 December 1972, the 43d kicked off the 11-day offensive when it launched 33 B-52s against an airfield north of Hanoi. In all, the 43d flew 170 sorties during Linebacker II. The success of the operation was not without cost to the wing. The 43d lost two B-52s and had four others damaged, all by surface-to-air missiles.

North Vietnam and the United States signed a cease-fire agreement on 28 January 1973. Though missions over Vietnam became a thing of the past, the 43d was not finished in its combat role. At the request of the Royal Laotian Government, the 43d bombed communist insurgents throughout Northern and Southern Laos. On 22 February the Pathet Lao agreed to a cease-fire with the Laotian government, officially ending the wing's combat role in that country. However, one other government in Southeast Asia requested military assistance from the United States.

Early 1973 saw increased efforts by the Khmer Rouge to take control of Cambodia. At the request of that country's government, B-52s from Guam bombed enemy strongholds throughout Southeast Cambodia. These actions continued over the next six months until President Nixon ordered there be no further military action in Southeast Asia after 15 August. On 11 August, 16 B-52s carried out the last bombing raids of the 43d to date.

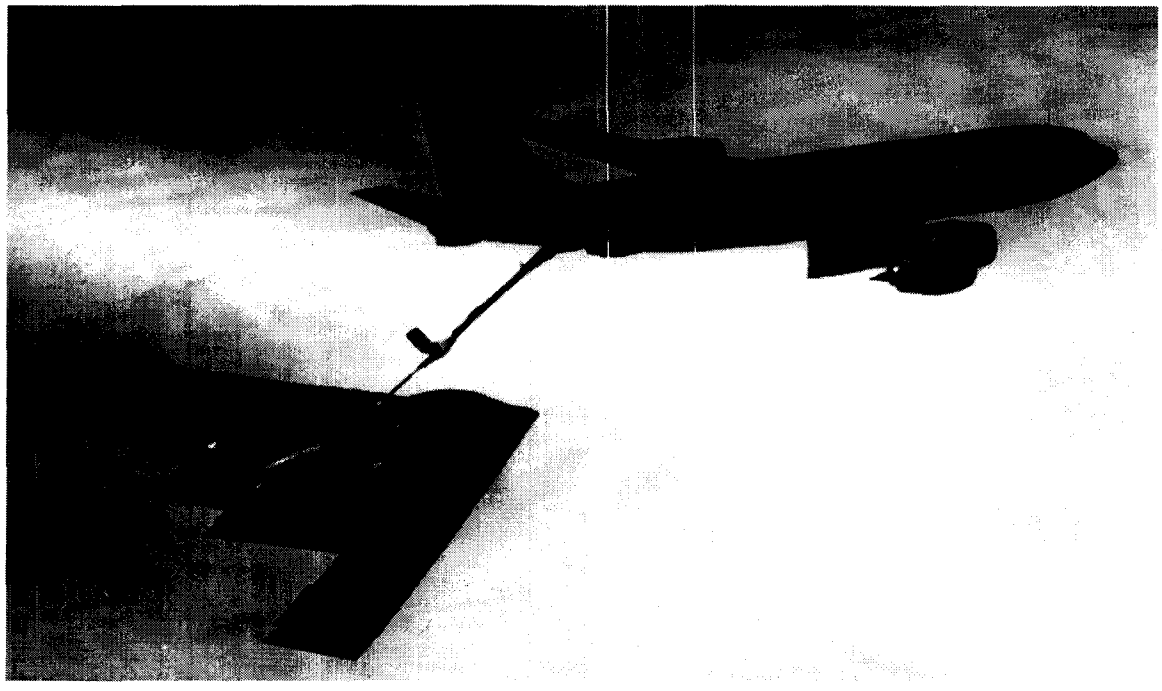
For more than a decade the 43d flew KC-135s and B-52s in a nuclear deterrent role.

With the official end of combat operations in Southeast Asia, the 43d switched from a conventional bombing mission to one of peacetime nuclear deterrence. During the period after the war the wing provided humanitarian assistance to Vietnamese refugees on two separate occasions in 1974 and 1978. In 1976, the wing conducted low level show-of-force missions over the Republic of Korea after North Korea murdered two US Army officers in Panmunjon. In 1977 the 43d added a conventional mission to its post-Vietnam strategic operation. From that point on, the wing trained its aircrews in sea surveillance, aerial mine laying, and anti-ship warfare.

The 43d Strategic Wing evolved with the changing world order in the 1980's. In 1983 the wing replaced its B-52Ds with B-52Gs. With the upgraded bombers the wing accepted its first Harpoon anti-ship missile, the second US Air Force unit to do so. In 1986, SAC redesignated the 43d Strategic Wing to the 43d Bombardment Wing. With

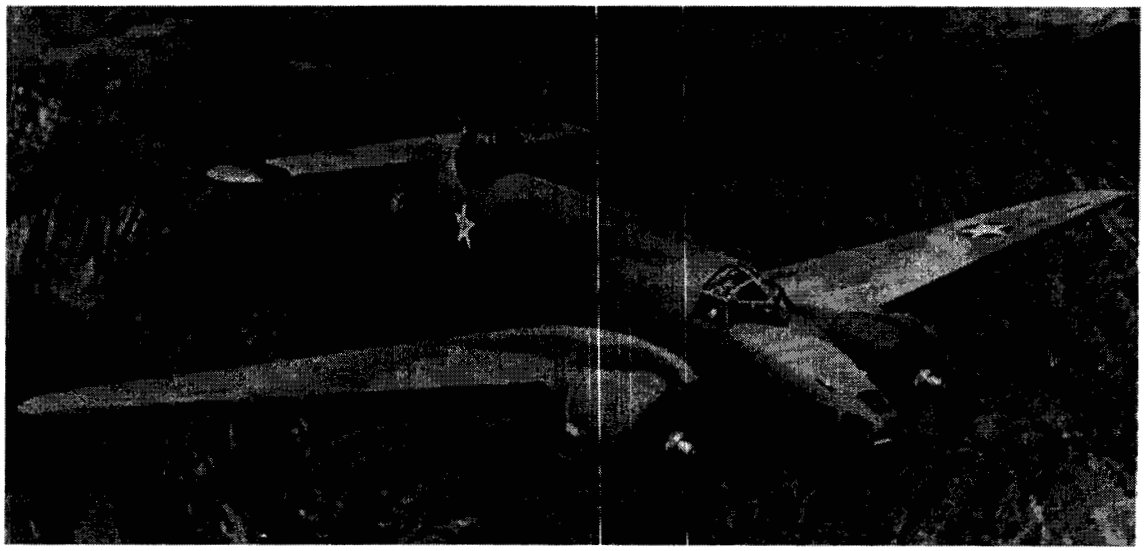
the name change the wing began a transition from a nuclear alert unit to SAC's lead contingency wing. The wing officially traded in its nuclear mission for its direct action role in October 1988. Two years later, President George Bush signed an executive order directing the inactivation of the 43d, which it did in September 1990. Less than two years later, the 43d activated again and accepted its current mission.

On 1 June 1992, the 43d Air Refueling Wing replaced the 301st Air Refueling Wing as the primary flying unit at Malmstrom AFB, Montana. With its KC-135Rs, the 43d provides air refueling support to US and allied forces around the world. The 43d supported Operations Southern Watch (Saudi Arabia), Provide Comfort (Turkey), Deny Flight (Boznia-Herzegovnia), Uphold Democracy (Haiti), and Support Hope (Rwanda). Though downsized and redesignated the 43d Air Refueling Group in July 1994, the 43d continues to provide global reach for America.

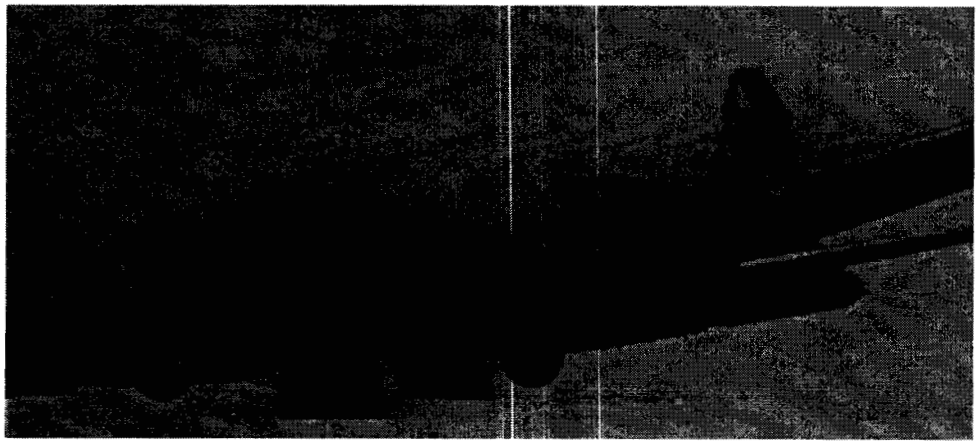


A KC-135R tanker from the 43d refuels the Air Force's newest bomber, the B-2.

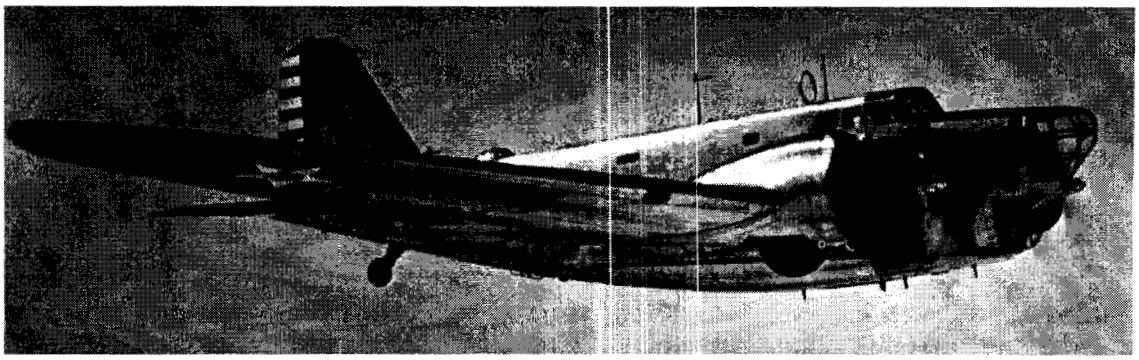
PICTORIAL HISTORY OF AIRCRAFT FLOWN BY THE 43d AIR REFUELING GROUP



A-29; 1941

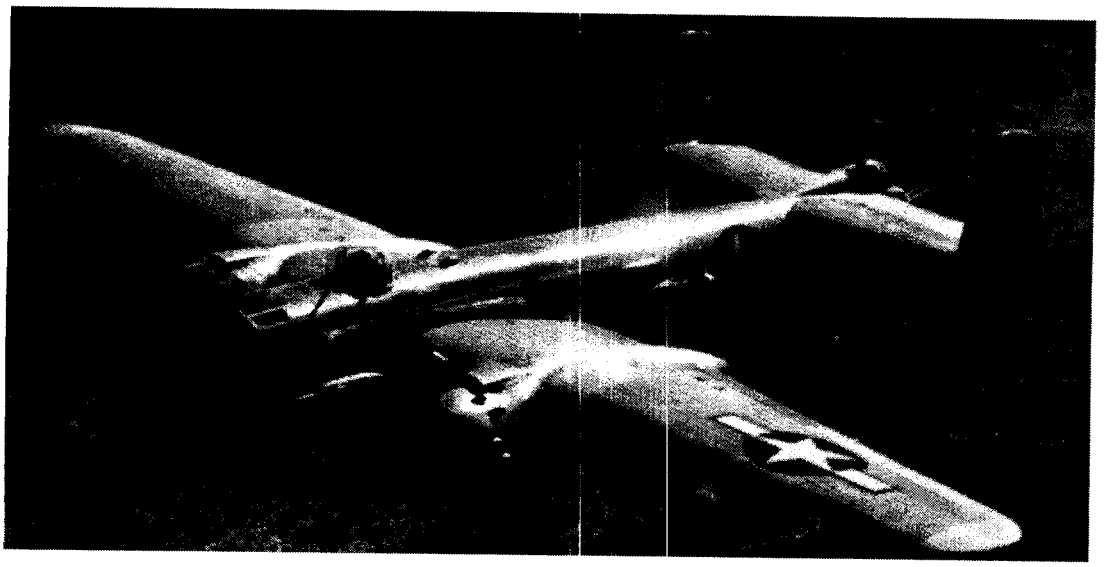


B-17; 1941-1943



B-18; 1941

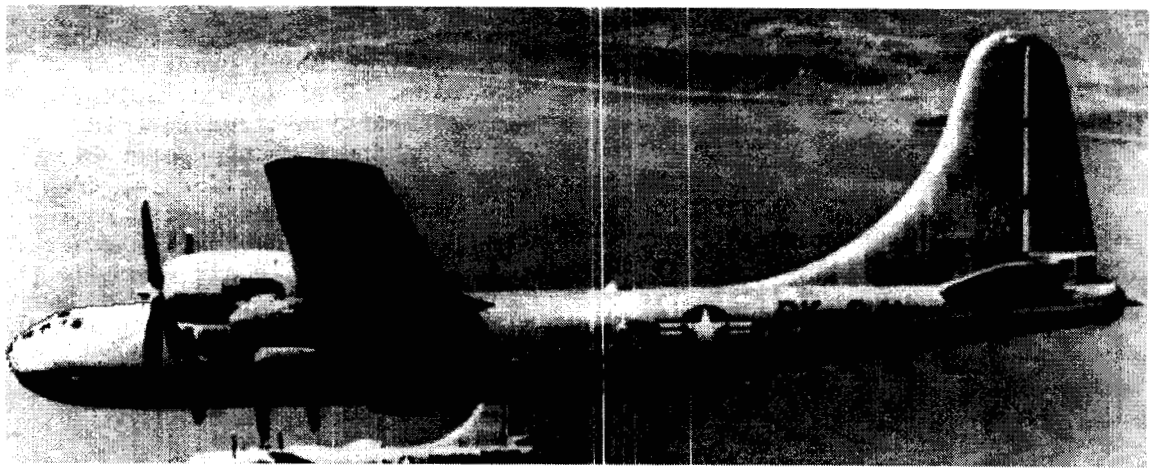
B-24; 1941, 1943-1946



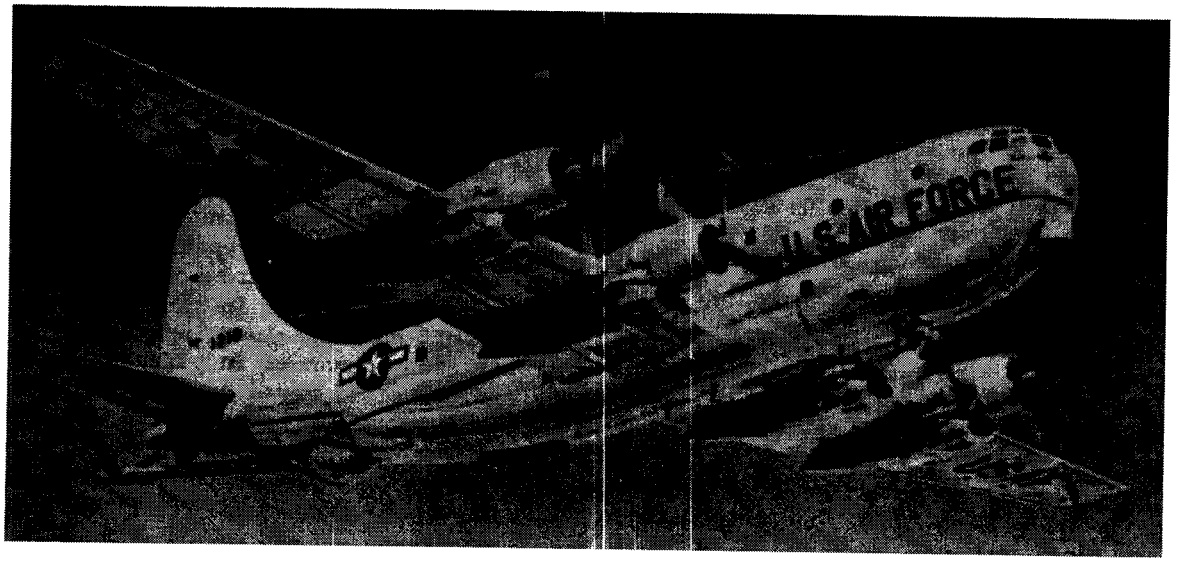
B-25; 1941

B-29; 1947-1948

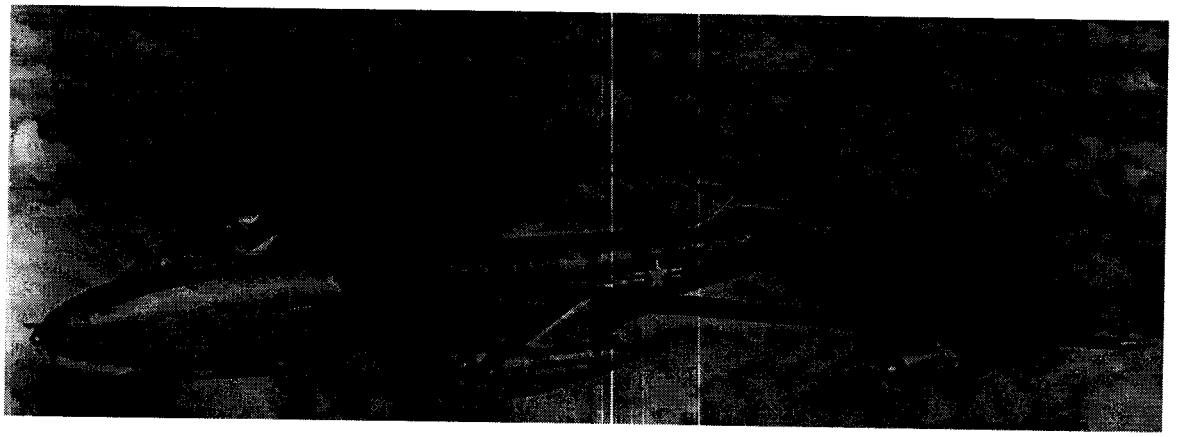
KB-29; 1949-1953



B-50; 1948-1954

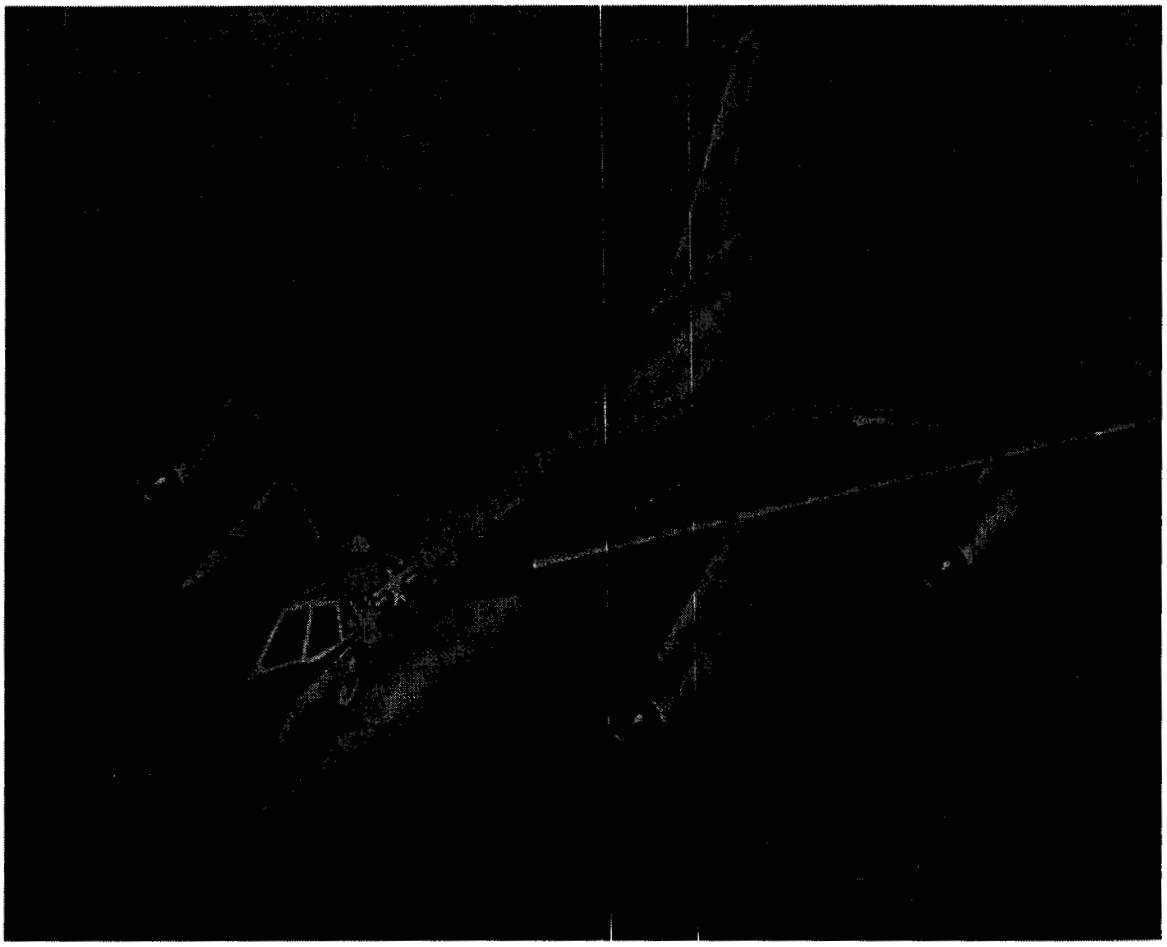


KC-97; 1953-1960



B-47; 1952-1960

TF-102; 1960-1962



B-58; 1960-1970

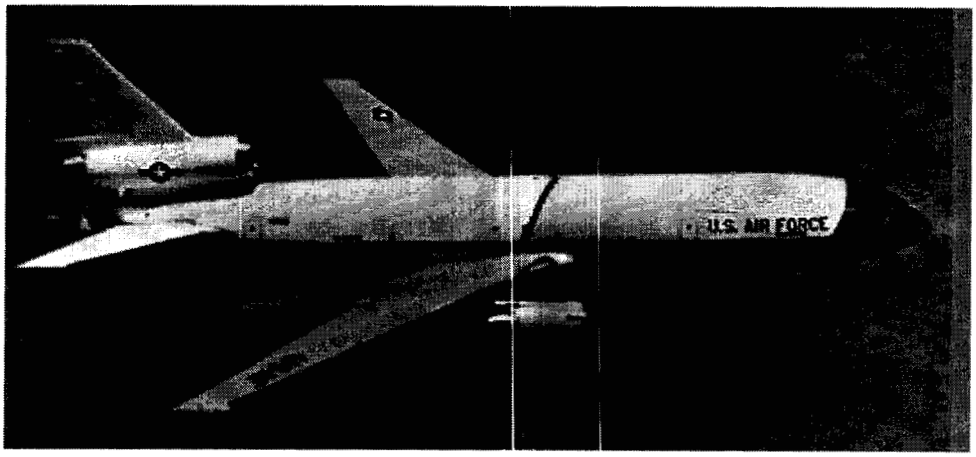
B-52; 1970-1990 and KC-135; 1964-1990, 1992-present

Photo Not Available

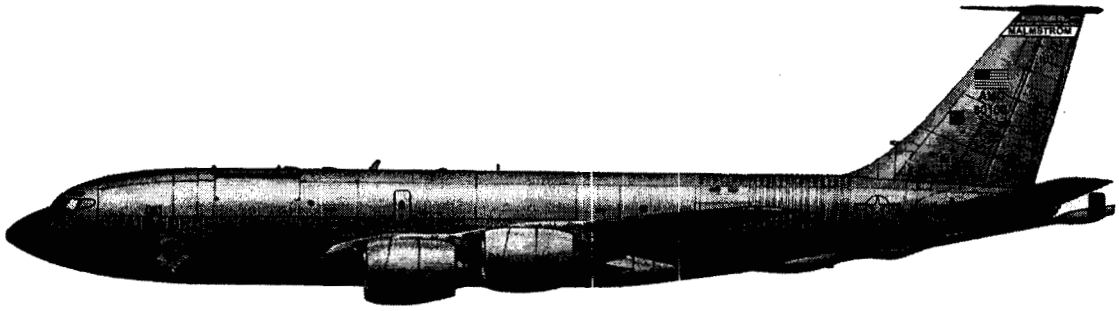
C-97; 1970-1972

Photo Not Available

C-118; 1973-1974



KC-10; 1986-1990



KC-135R; 1992-present

SECDEF RECOMMENDATION

- MMIII missiles will be relocated to Malmstrom from Grand Forks
- 43rd Air Refueling Group will relocate to MacDill AFB
- All Malmstrom AFB fixed-wing flying operations will cease and the runway will be closed

OTHER POLICY/GUIDANCE

- Nuclear Policy Review panel recommends 450-500 missile ICBM force
  - CINCSTRAT supports 500 ICBM option
  - Malmstrom is the only way to make 500 viable

MILITARY VALUE - Malmstrom's Missiles

- MISSILE PLANNING FLEXIBILITY*
  - Range #1
  - Spacing #1
  - Weather #1
  - Geology #2 (F.E.Warren #1)
- MAXIMIZES GLOBAL POWER

* Classified specifics contained in MINUTEMAN III Integrated Nuclear Effects Study (INEA) Document (Top Secret)

MILITARY VALUE - Malmstrom's Missiles

- NPR RECOMMENDATION
  - 200 LFs the only way to make 500 ICBM option viable
- FORCE MODERNIZATION
  - Only 50 REACT installation kits were purchased
    - REACT installation in progress---finish Feb 96
  - Significant $$$ to change scope of program
  - Required for single reentry vehicle deployment
    - REACT delay could impact U.S. ability to meet SRV proposals in START II

MILITARY VALUE - Malmstrom's Airfield

- FACILITIES
  - Over 35 facilities/projects built or renovated for aircraft beddown -- over $100M since 1987
  - Excellent indoor maintenance capability
- WEATHER
  - Good ceiling/visibility conditions 364 days per year
- ENCROACHMENT
  - AICUZ -- no problems on- or off-base
- ENVIRONMENTAL
  - Environmentally proactive -- no problems

HOST BASE ISSUES

- FACILITIES & RUNWAY
- Some airfield functions still necessary -- still researching
  - Helicopter Operations -- weather forecasting, radio, lighting
  - "Hotpad" capability and missile shipments
  - Mobility deployments, MedEvacs, transient aircraft
- Environmental compliance costs to close runway and associated operations -- to be determined
  - Oil/water separators, hydrant systems, etc.

Option – use Great Falls International

341ST MISSILE WING

MALMSTROM

43d AIR REFUELING GROUP

Welcomes

the

Defense
Base Closure and Realignment
Commision Team

OUR CHARTER

- Support SECDEF recommendations
- Support the DBCRC's installation visit and regional hearing process

OUR METHOD

- Provide DBCRC inbrief and answer questions
- Provide a base tour to assess the military value of facilities and capabilities
- Provide a missile complex tour to assess the military value of facilities and capabilities
- Support regional hearing session

MALMSTROM AFB

- Began construction: 1942
- Base population: 7,000 Workers
  3,000 Dependents
- Main base: 3600 Acres
- Missile complex: 23,500 square miles
  - Approximately 16% of the State of Montana
  - Located in 9 counties

First base w/ msls 10 NM spacing on msls

341st MW MISSION STATEMENT

Keeping America free by providing combat-ready ICBMs and by supporting tanker operations . . .

Global power and reach from Montana

43rd ARG MISSION STATEMENT

Provide world class global air refueling and airlift for America

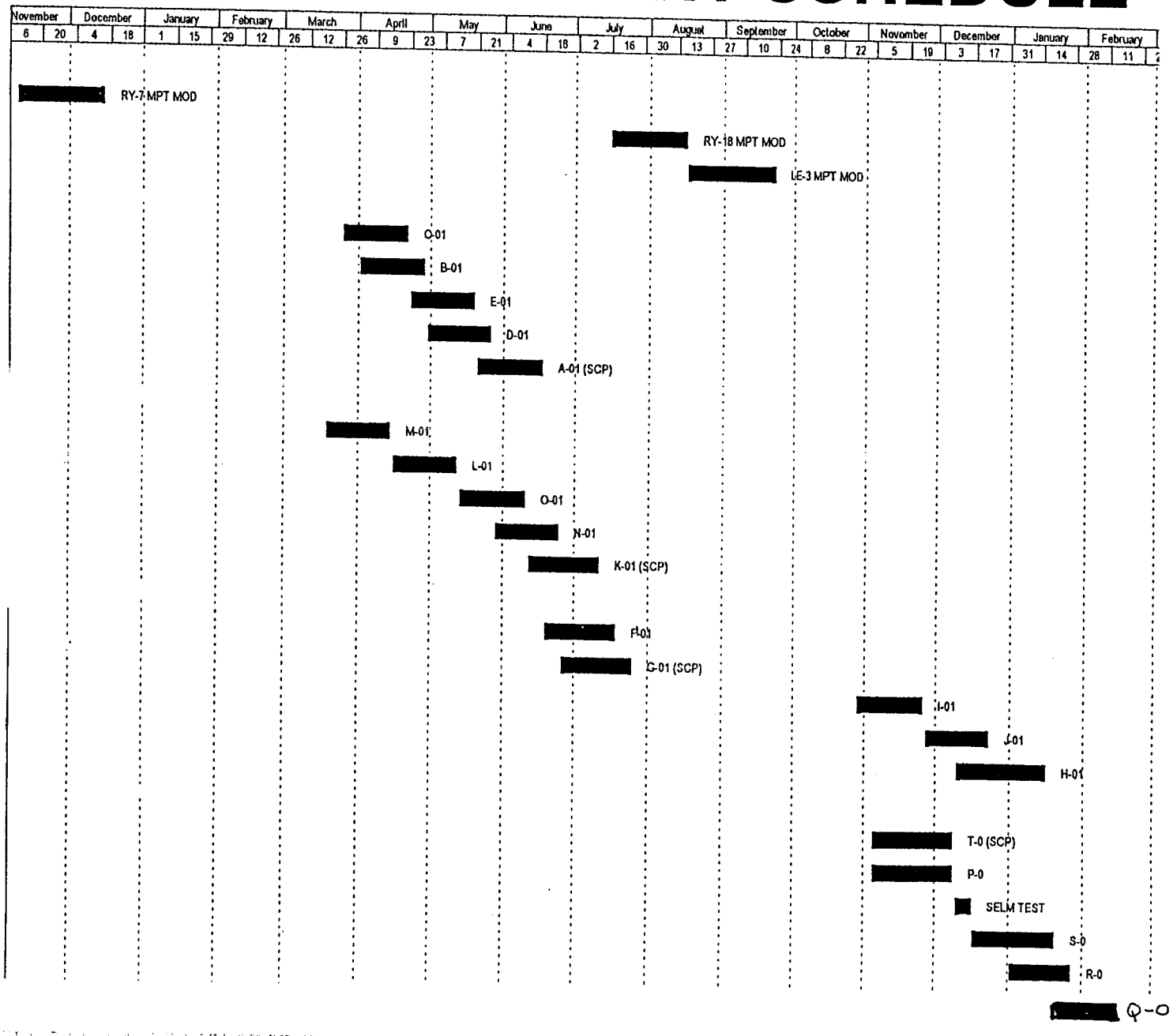
MISSILE OPERATIONS

- 200 ICBMs controlled by four tactical missile squadrons support national strategic objectives
  - 10th Missile Squadron
  - 12th Missile Squadron
  - 490th Missile Squadron
  - 564th Missile Squadron

SIGNIFICANT OPERATIONS

- MINUTEMAN II DEACTIVATION
  - 1991 Presidential Directive 19 left
- MINUTEMAN III CONVERSION
  - 1992 Implementation 80 wsls 120 mg
- RAPID EXECUTION AND COMBAT TARGETING (REACT) MODIFICATION
  - $600M force modernization
  - Required for START II single reentry vehicle (SRV) limitations

REACT DEPLOYMENT SCHEDULE

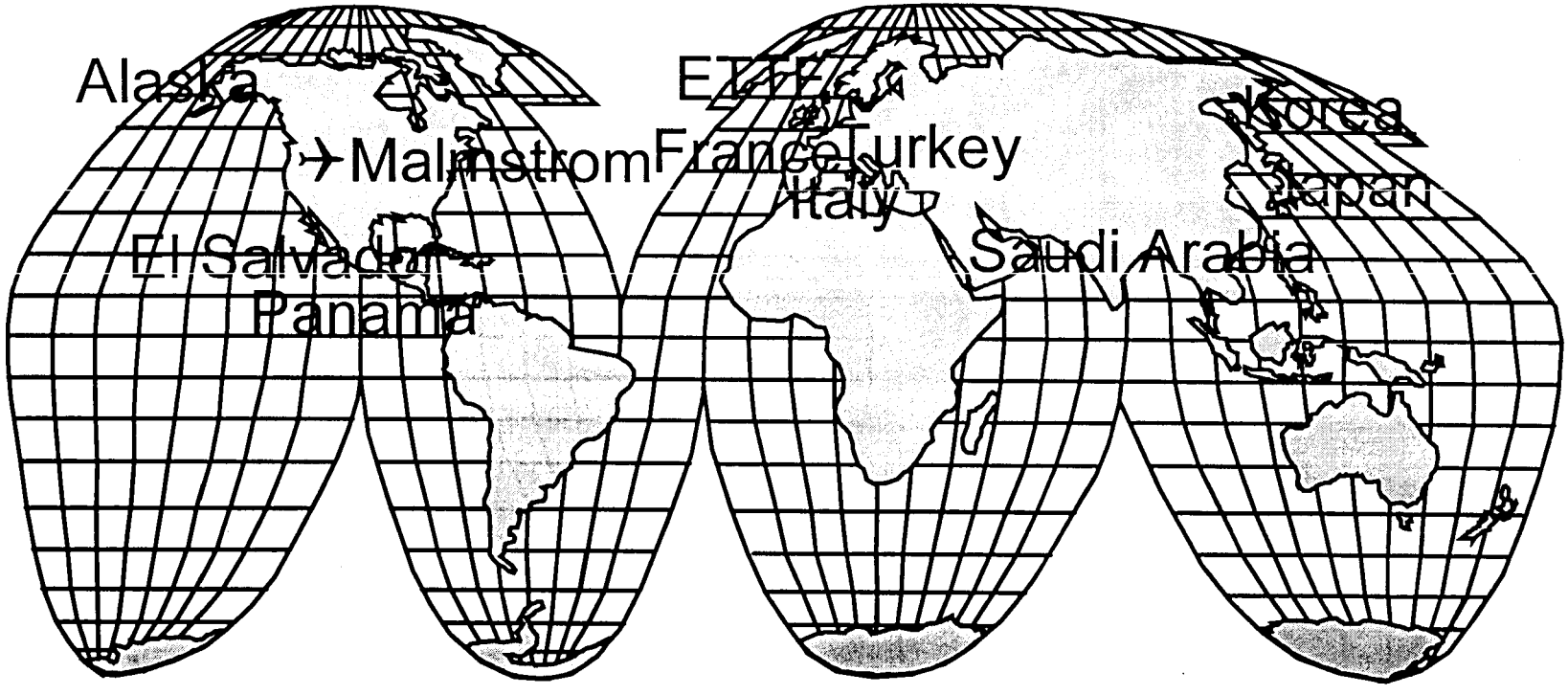


AIR REFUELING OPERATIONS

- 13 KC-135R aircraft assigned
- Approximately 470 authorized personnel
- Supporting virtually every major contingency operation

Busy Relay	Coronet East	Coronet West
European TTF	Global Shadow	Global Cruise
Have Point	Pacific Express	Phoenix Jackal
Polo Hat	Provide Comfort	Southern Watch
Support Hope	Uphold Democracy	
INF & CWC Treaty Support	El Salvador Transport	

43 ARG WORLDWIDE OPERATIONS



SIGNIFICANT OPERATIONS

- KC-135R cockpit modification
- All weather corrosion control capability
- Fuel cell maintenance
- Mtn Home AFB isochronal inspections and intermediate maintenance
- Three C-12 aircraft for Companion Trainer Program (CTP)

40th RESCUE FLIGHT

- 17 military and civilian contract maintenance
- 9 assigned UH-1N helicopters
  - Hoist and night vision capable
- Support nuclear convoy operations
- Support National Search and Rescue Plan

OVER 60,000 ACCIDENT-FREE FLYING HOURS

QUALITY OF LIFE

WHAT'S NEXT FOR MALMSTROM AFB ?

WHERE
DO WE GO
FROM
HERE
?

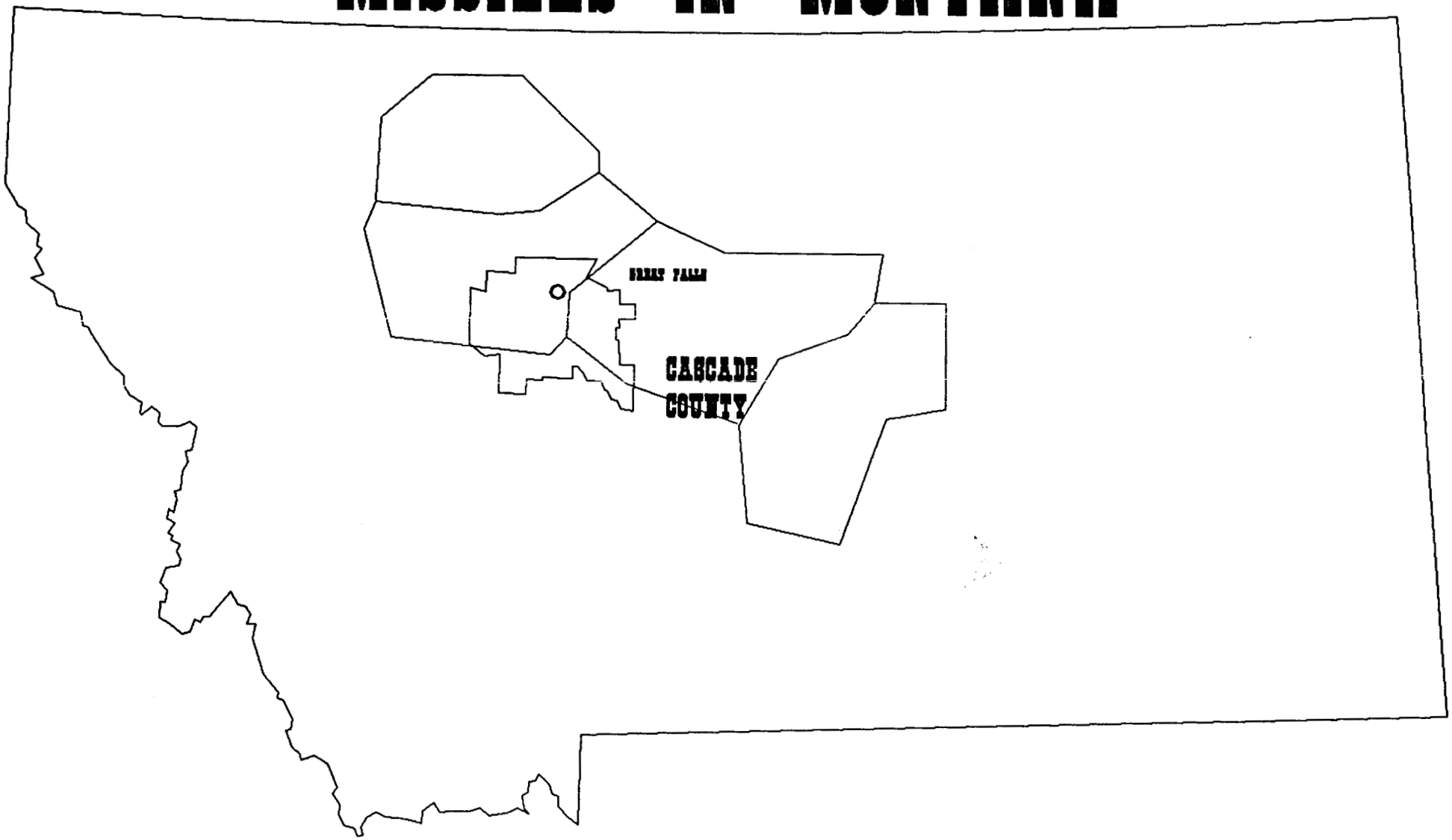
AMERICA ★ MONTANA

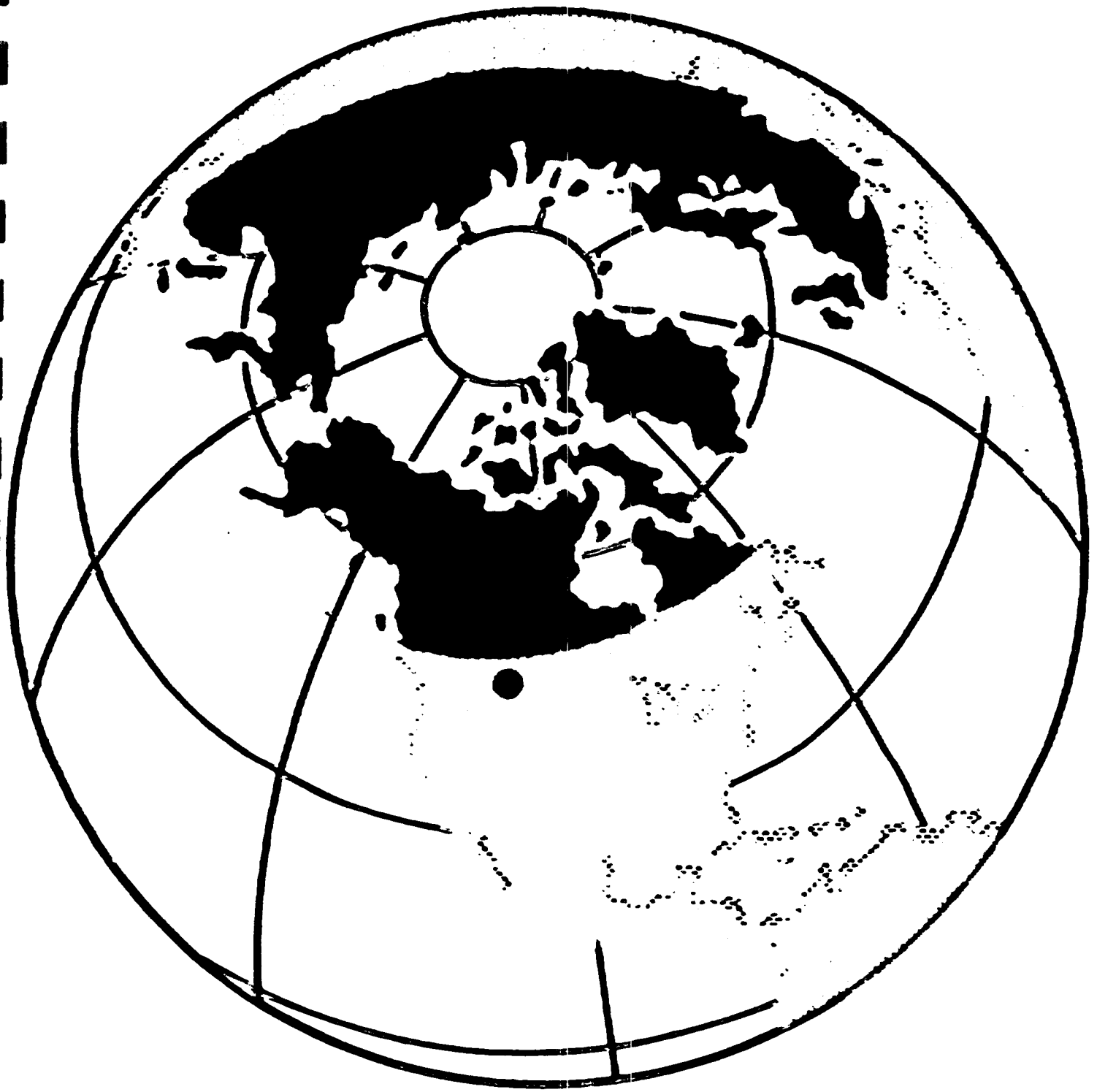
MALMSTROM

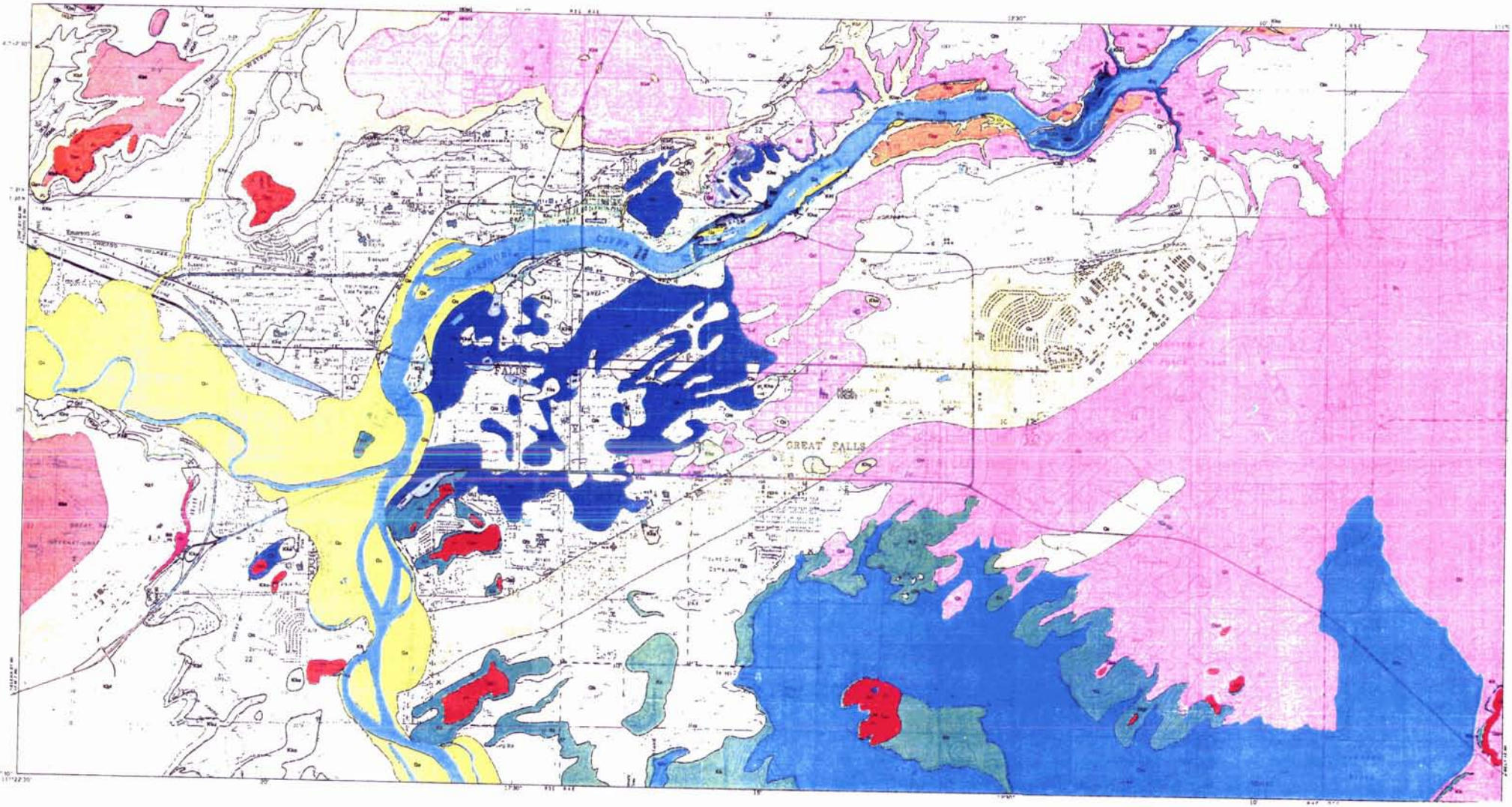
OUR HERITAGE ★ OUR FUTURE

★★★★★

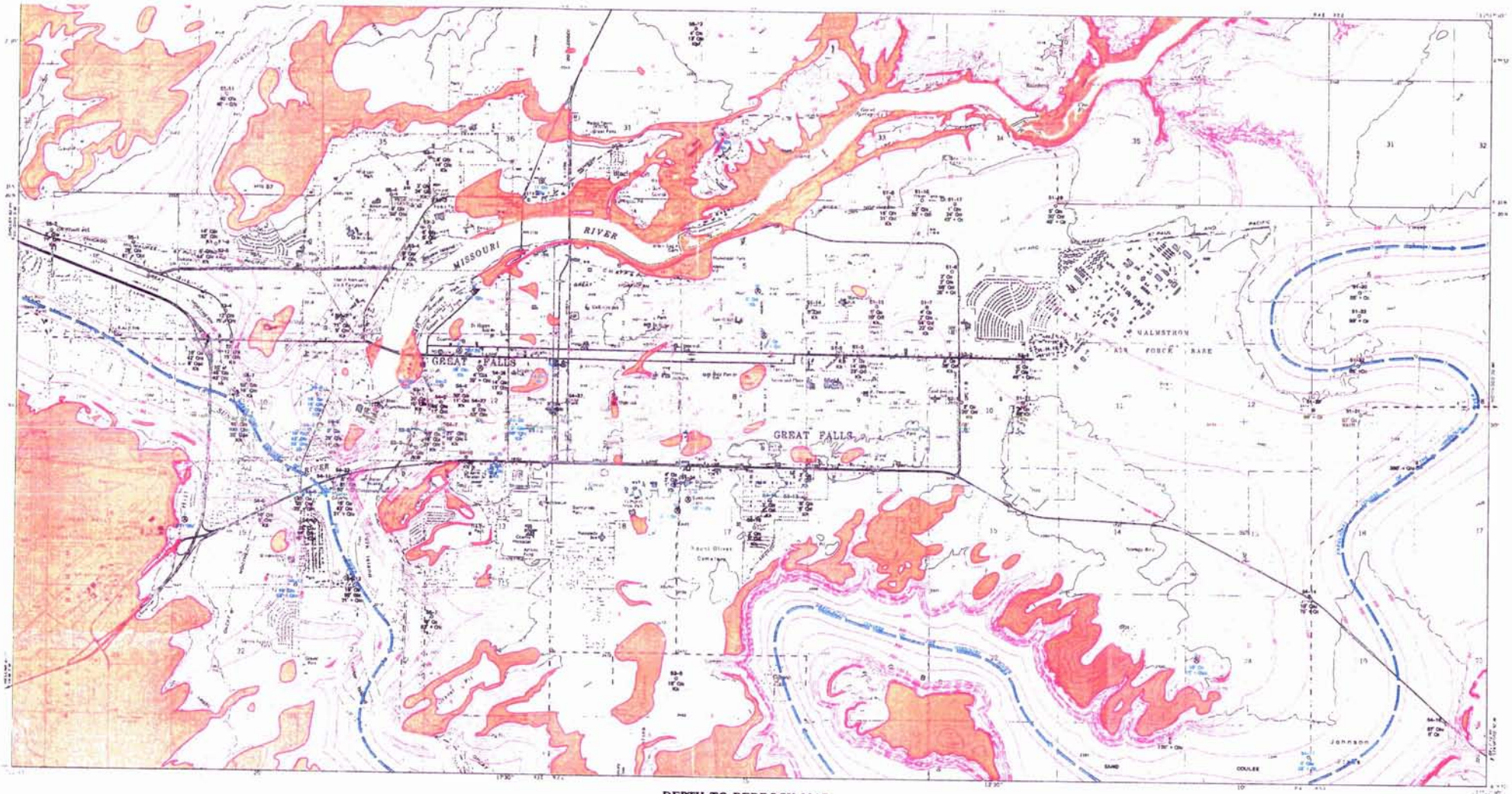
MISSILES IN MONTANA







GREAT FALLS AREA GEOLOGY



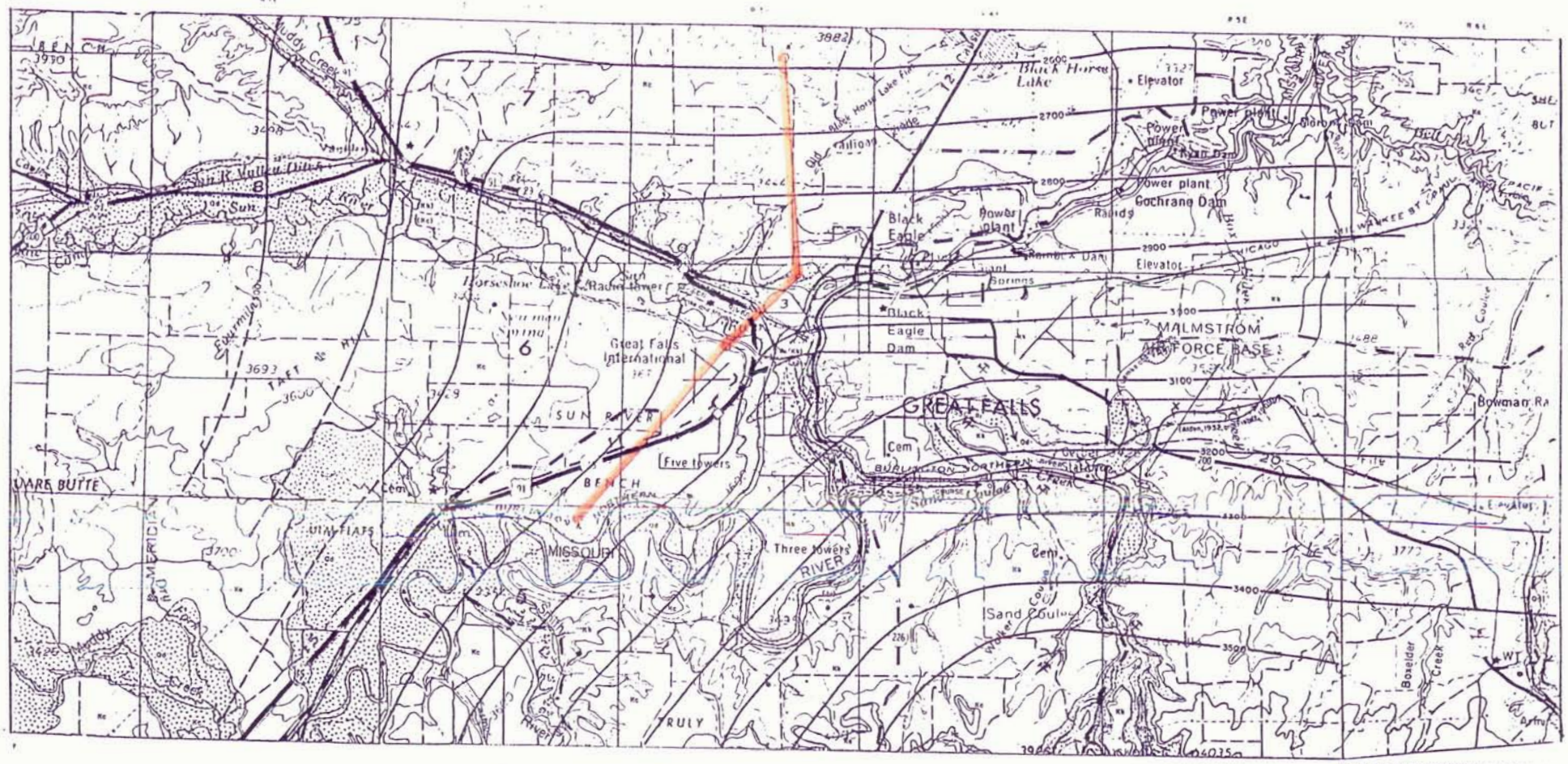
DEPTH-TO-BEDROCK MAP

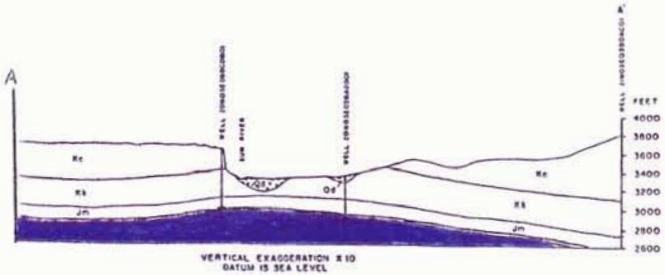
Impacts mapped in 1950-53 and 1974-75

GREAT FALLS AREA GROUNDWATER

BUREAU OF MINES AND GEOLOGY
of Montana College of Mineral Science and Technology

Prepared in cooperation with the
U.S. GEOLOGICAL SURVEY





VERTICAL EXAGGERATION X 10
DATUM IS SEA LEVEL

1 1/2 0 1 2 3 4 5 MILES

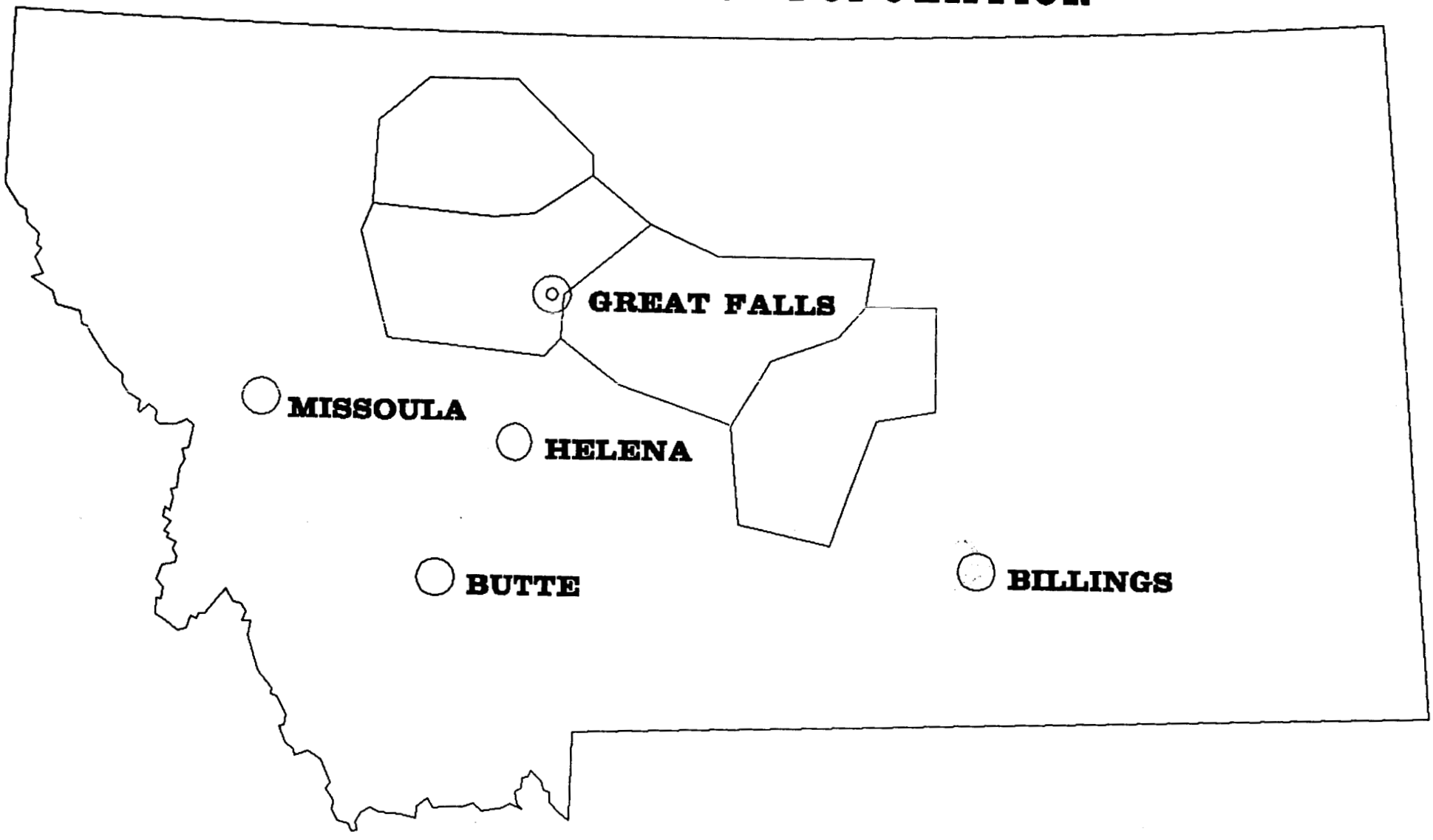
1 5 0 1 2 3 4 5 KILOMETERS

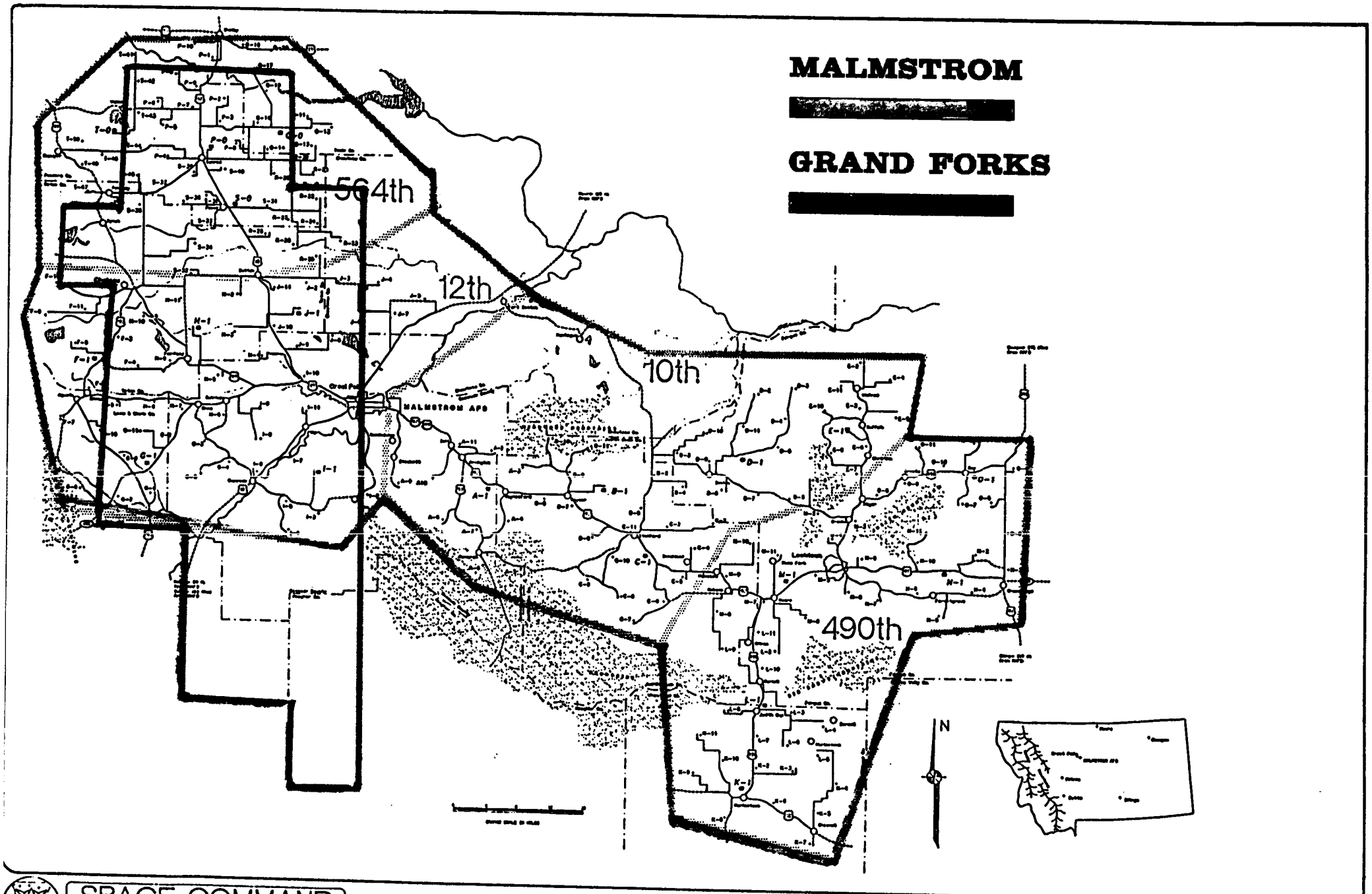
CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS SEA LEVEL

Geology modified from Alden (1932); Fisher (1909), Fox (1962), Lemke (1977); Lemke, Erskine, and Maughan (1954), Lemke, Maughan (1977); Maughan (1961)

GEOLOGIC MAP SHOWING CONTOURS OF THE TOP OF THE MADISON GROUP, NORTHERN CASCADE COUNTY, MONTANA

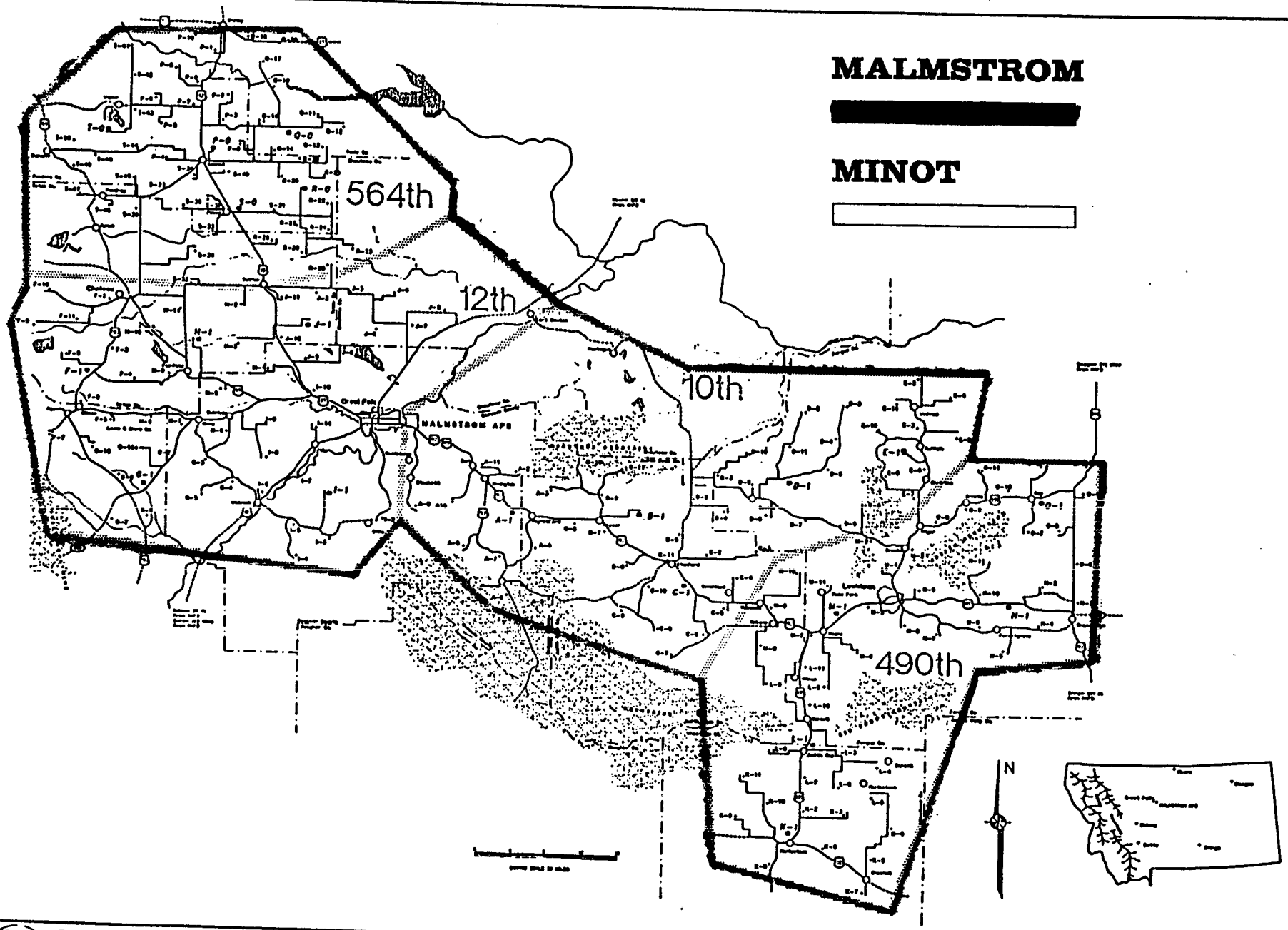
TOPOGRAPHY & POPULATION





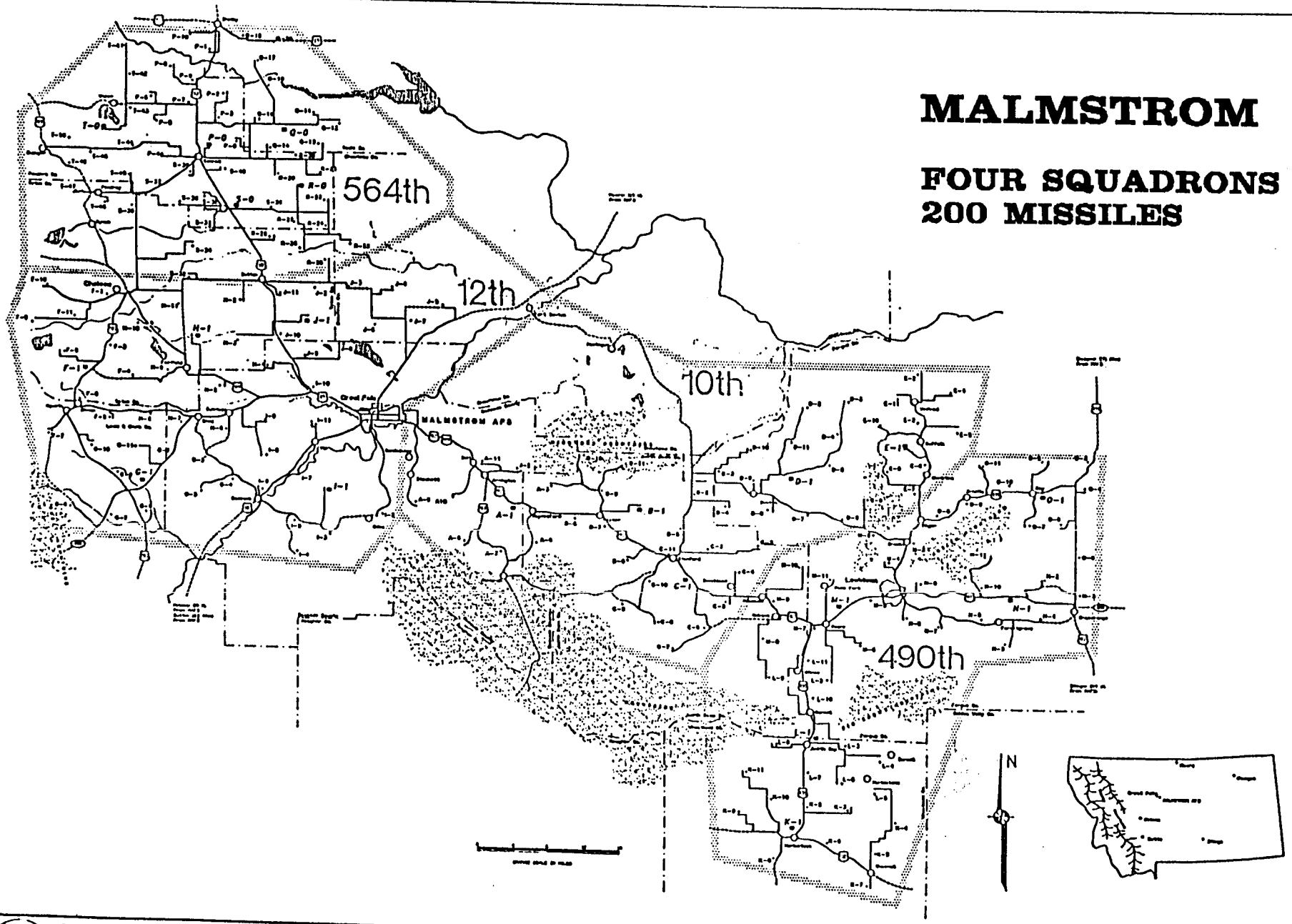
SPACE COMMAND
MALMSTROM AIR FORCE BASE, MONTANA

MINUTEMAN MISSILE COMPLEX



SPACE COMMAND
MALMSTROM AIR FORCE BASE, MONTANA

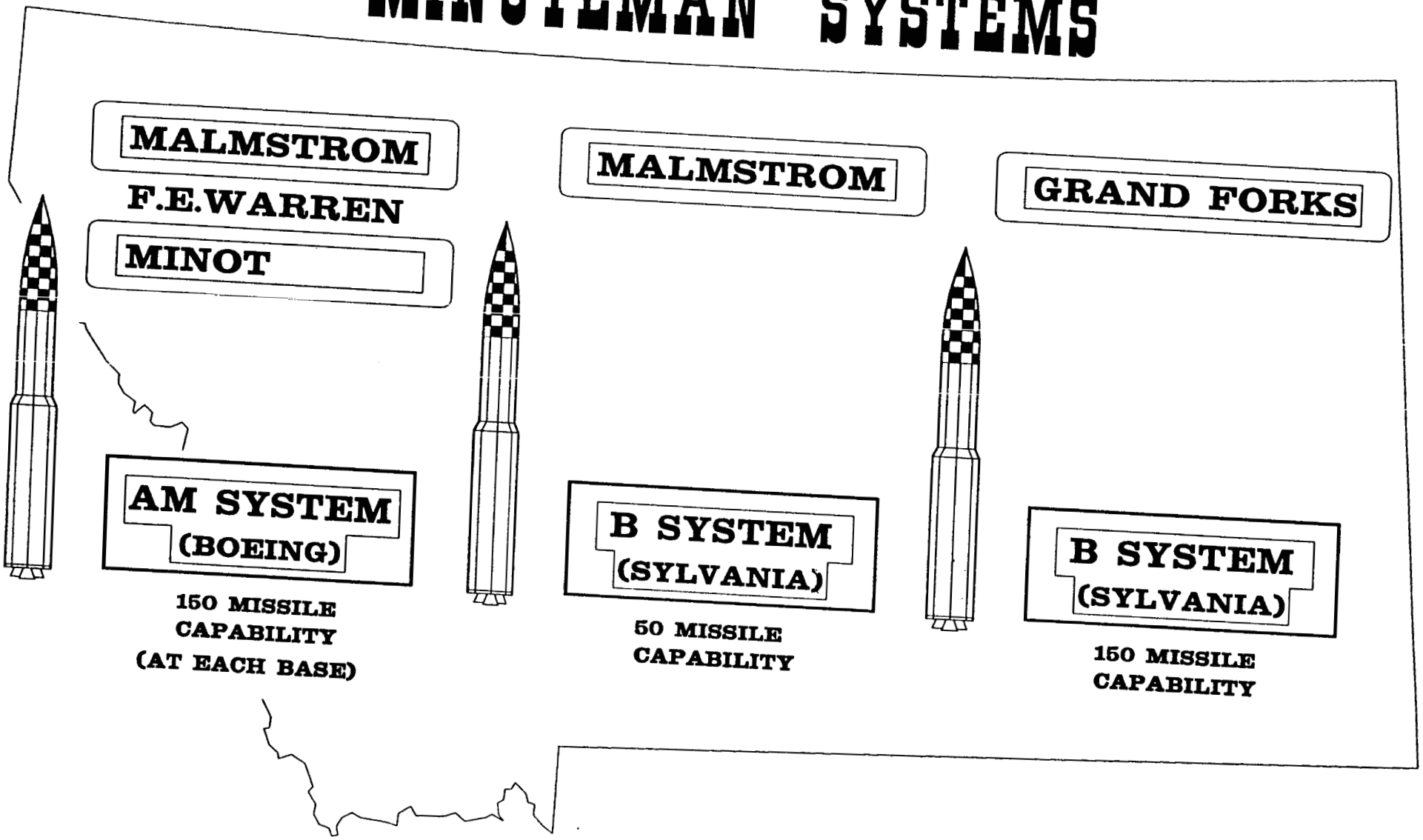
MINUTEMAN MISSILE COMPLEX



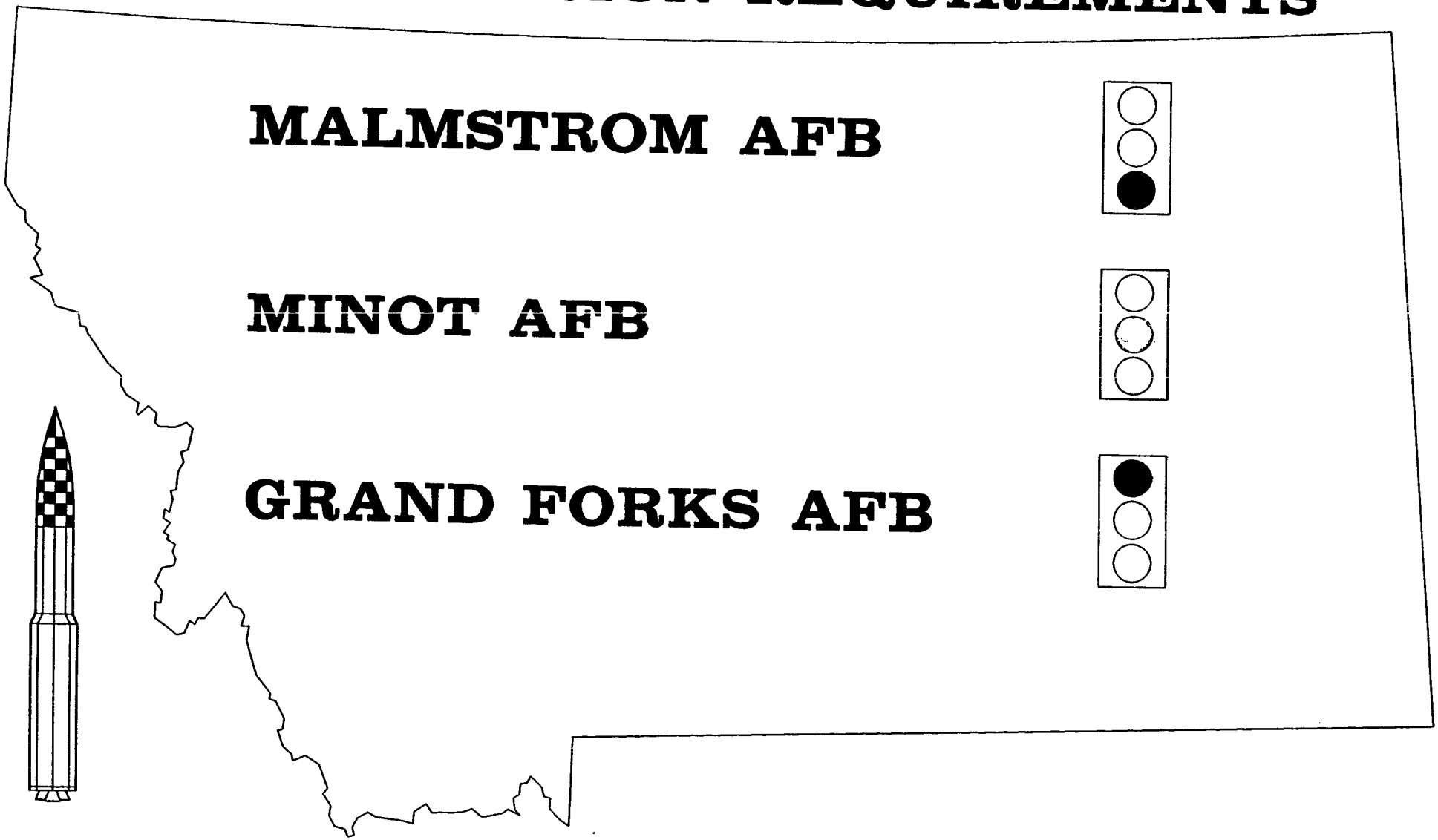
SPACE COMMAND
MALMSTROM AIR FORCE BASE, MONTANA

MINUTEMAN MISSILE COMPLEX

MINUTEMAN SYSTEMS



MISSILE MISSION REQUIREMENTS



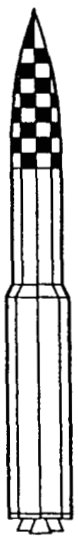
DEPARTMENT OF DEFENSE
MISSILE BASE RECOMMENDATION

RECOMMENDATION :

Realign Grand Forks Air Force Base, unless prior to December 1996, the Secretary of Defense determines that the need to retain ballistic missile defense (BDM) options effectively precludes this action. If the Secretary of Defense makes such a determination, Minot Air Force Base, North Dakota will be realigned.

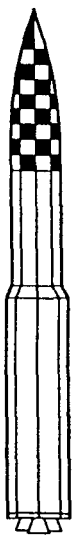
If Grand Forks AFB is Realigned, the 321st Missile Group will inactivate. Minuteman III missiles will relocate to Malmstrom AFB, Montana, be maintained at depot facilities, or be retired.

If Minot AFB is realigned, the 91st Missile Group will inactivate. Minuteman III missiles will relocate to Malmstrom AFB, Montana, be maintained at depot facilities, or be retired.

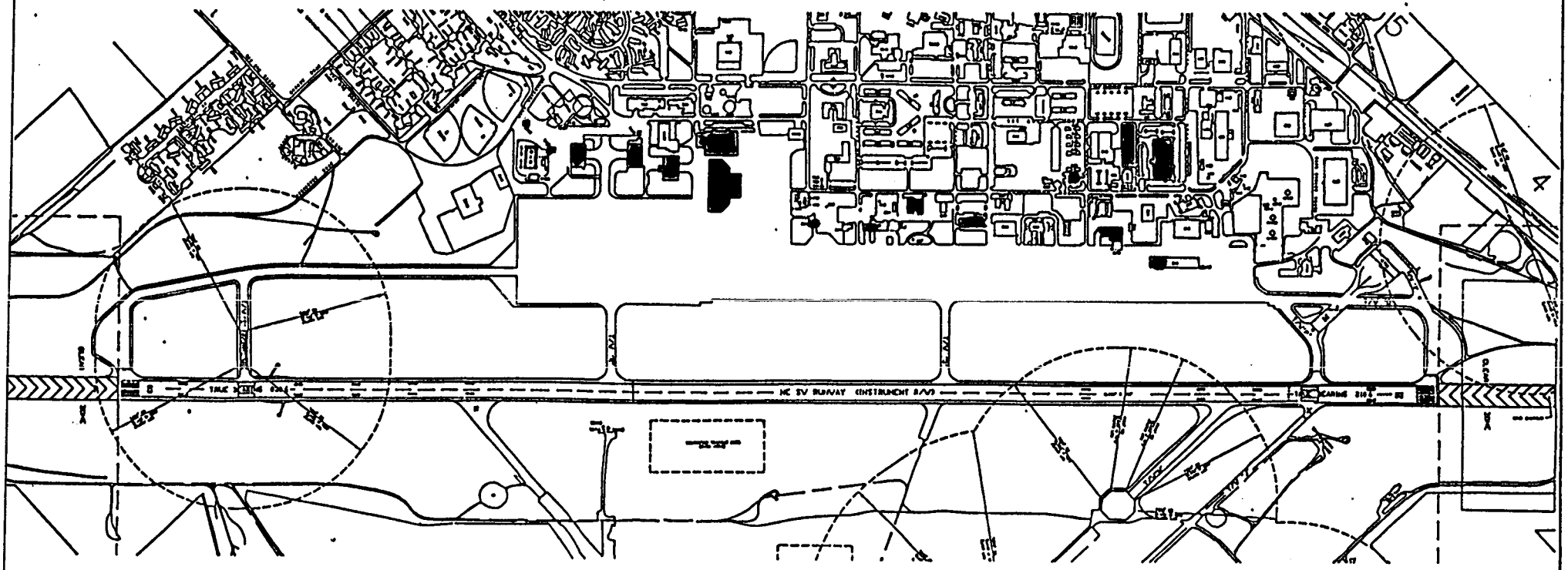


OSD RECOMMENDATION...
"JUST GOOD OLD COMMON SENSE"

- NEED TO REDUCE MINUTEMAN FLEET
- MALMSTROM: "RIVET ADD" READY
- ELIMINATES GRAND FORKS WATER INTRUSION
- PROVIDES SYLVANIA SYSTEMS SPARES
- MAINTAINS FLEXIBILITY FOR 500 ICBM FORCE



AIRFIELD CAPABILITY



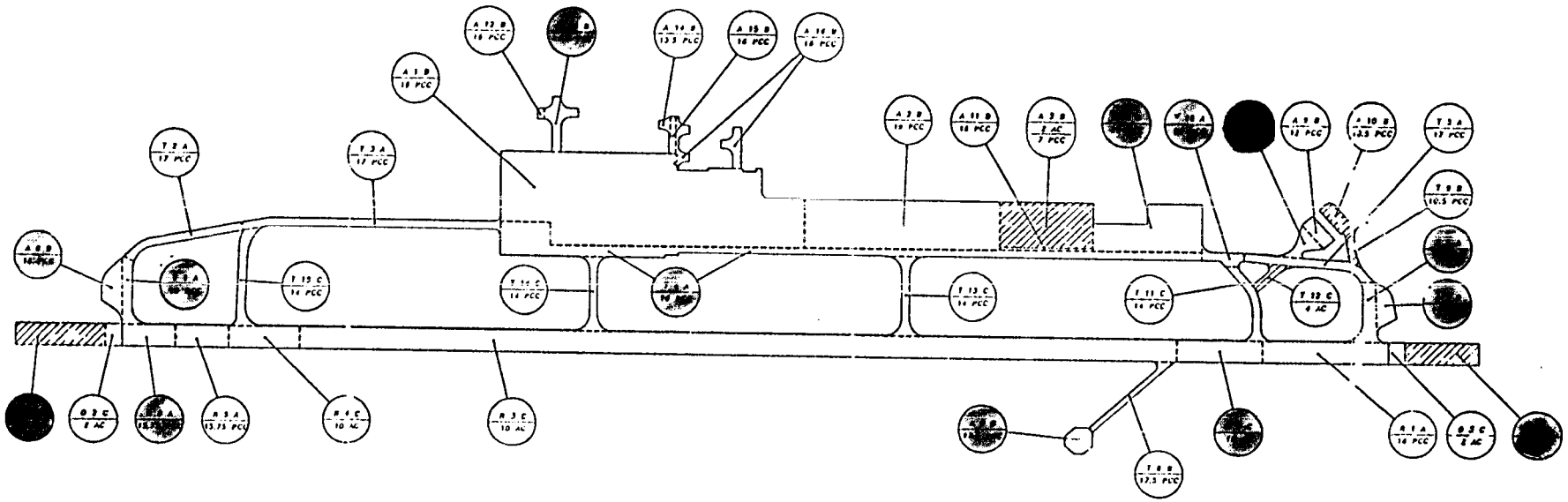
SPACE COMMAND
MALMSTROM AIR FORCE BASE, MONTANA

CANTONMENT AREA	
N/A	
SCALE GRAPHIC	PLAN C-1 PAGE 1 OF 1

PROJECT NUMBER NA
DRAWING NUMBER NA
DATE 930119
DRAWN BY SLOCUM

RUNWAY / RAMP CONDITION

- EXCELLENT
- VERY GOOD
- GOOD
- FAIR
- VERY POOR



LEGEND

R 2 A / 13 PCC — FEATURE DESIGNATION (SEE NOTE 1) / PAVEMENT THICKNESS IN INCHES & TYPE

TYPE OF FEATURE

R = RUNWAY
T = TAXIWAY
A = APRON
O = OVERRUN

TYPE TRAFFIC AREA (SEE NOTE 2)

A = A TYPE TRAFFIC
B = B TYPE TRAFFIC
C = C TYPE TRAFFIC

- - - - CHANGE IN FEATURE DESIGNATION
AC ASPHALTIC CONCRETE
PCC PORTLAND CEMENT CONCRETE

NOT EVALUATED

NOTES

1. FEATURE DESIGNATION DENOTES TYPE OF FEATURE, NUMBER OF FEATURE FOR GIVEN FEATURE TYPE AND TYPE TRAFFIC AREA.
2. TRAFFIC AREA DESIGNATIONS ARE BASED ON AFM 88-6, CHAP. 1.
3. FEATURE DESIGNATIONS DO NOT CORRESPOND WITH THOSE FROM PREVIOUS REPORTS AND DRAWINGS.

GRAPHIC SCALE IN FEET

GRAPHIC SCALE IN METERS

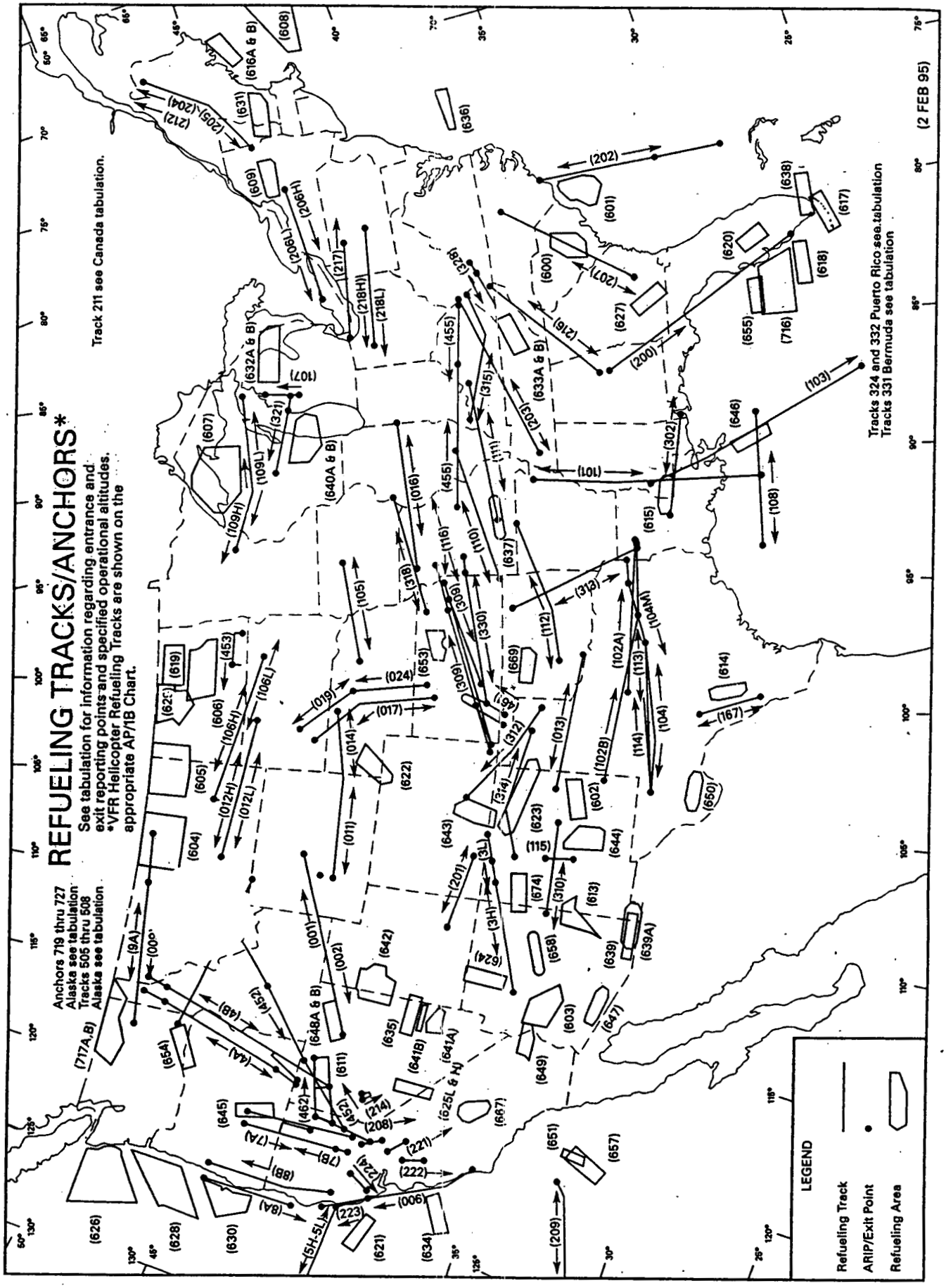
UNITED STATES AIR FORCE
CIVIL ENGINEERING SUPPORT AGENCY
TYNDALL AIR FORCE BASE, FLORIDA

AIRFIELD LAYOUT PLAN

MALMSTROM AIR FORCE BASE, MT

DESIGNED HARRIS	DATE	DRAWING NUMBER APPENDIX A
DRAWN SALISBURY	SCALE GRAPHIC	SHEET 1 OF 3

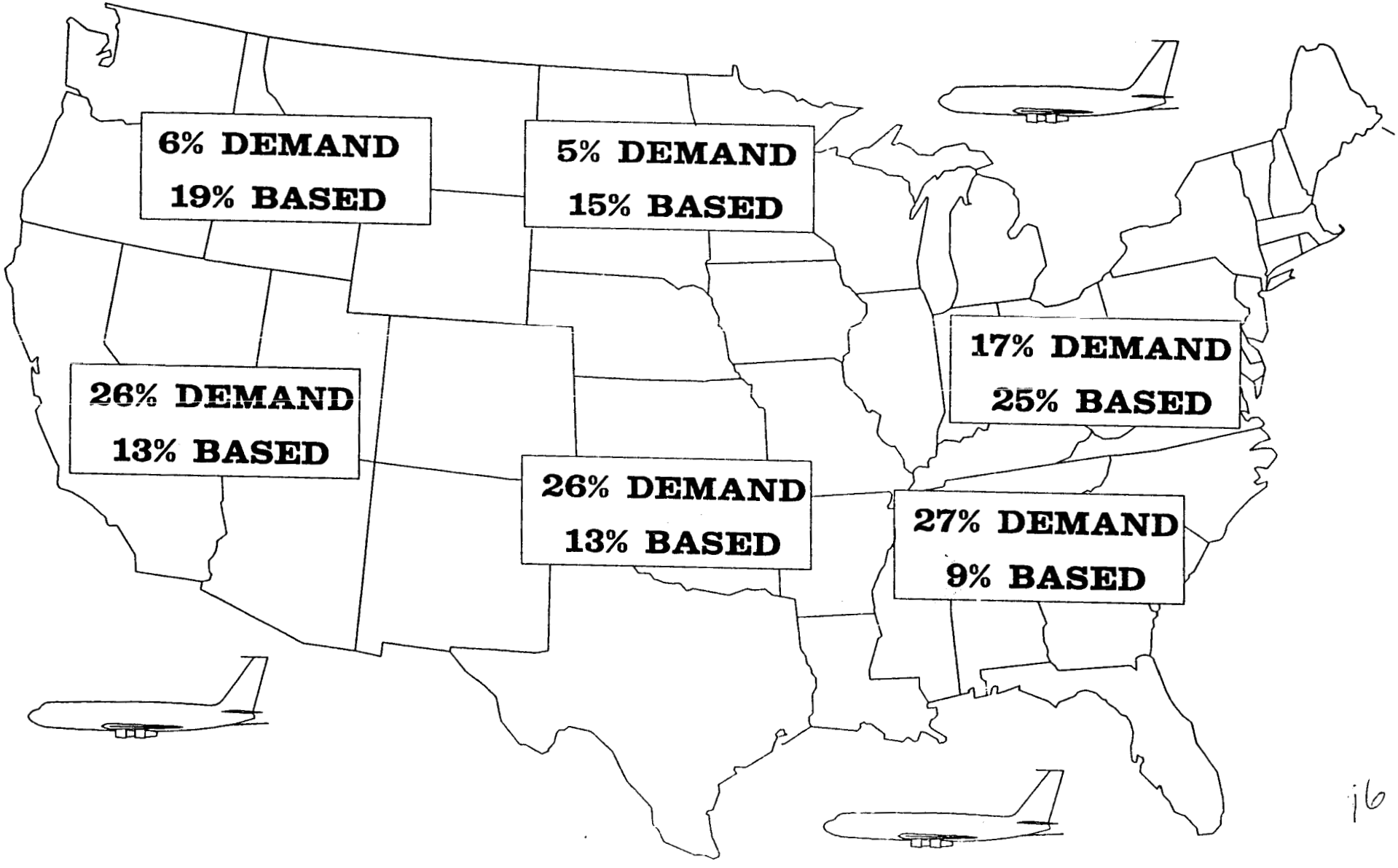
AR ROUTES


REFUELING TRACKS/ANCHORS*
See tabulation for information regarding entrance and exit reporting points and specified operational altitudes.
*VFR Helicopter Refueling Tracks are shown on the appropriate AP/1B Chart.
Anchors 719 thru 727 Alaska see tabulation
Tracks 505 thru 508 Alaska see tabulation
Track 211 see Canada tabulation.
Tracks 324 and 332 Puerto Rico see tabulation
Tracks 331 Bermuda see tabulation
(2 FEB 95)
LEGEND
Refueling Track
ARIP/Exit Point
Refueling Area

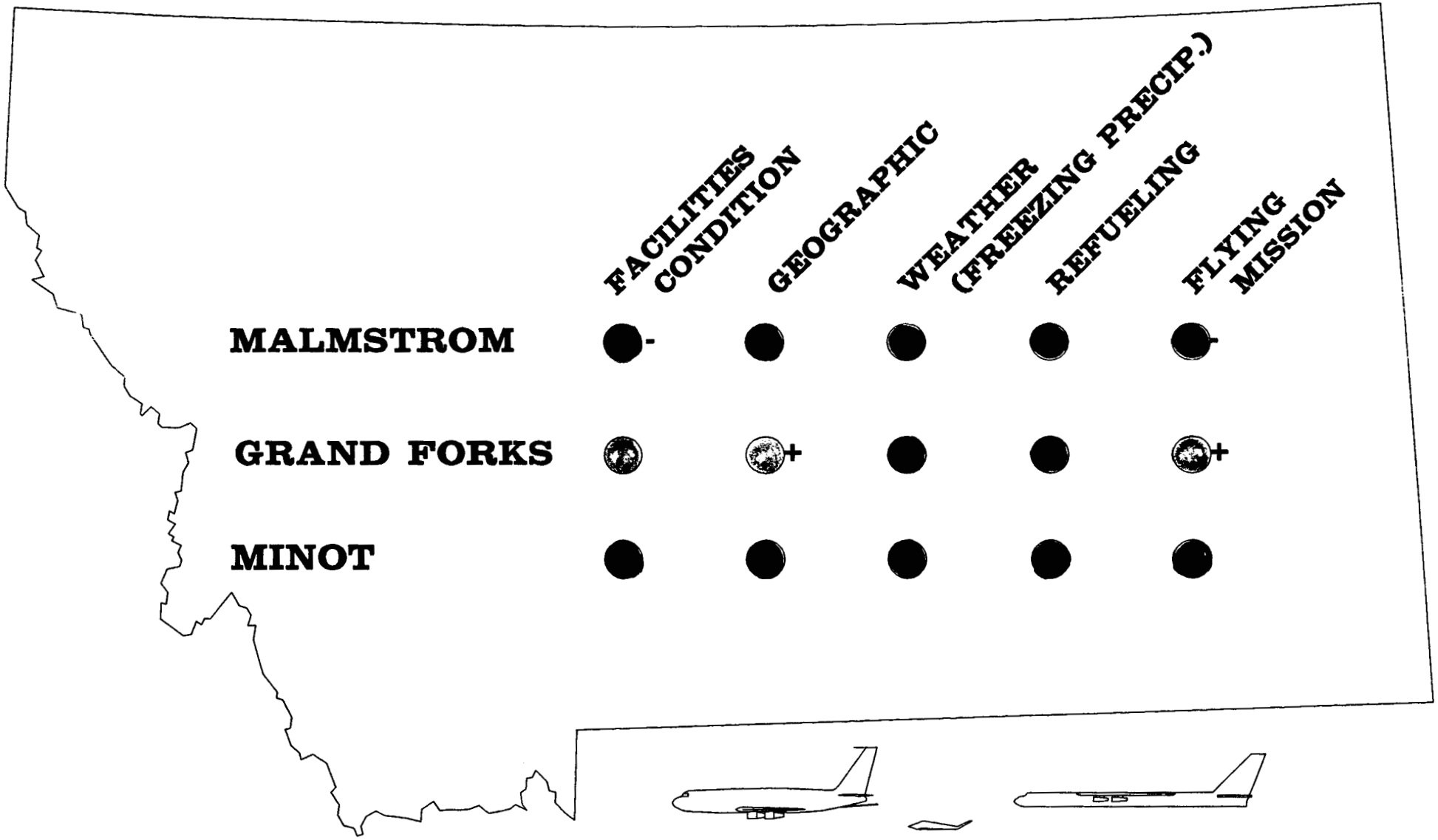
MAJOR CONCERNS

- $ INVESTED VS. $ SAVED
- TANKER DISTRIBUTION
- INAPPROPRIATE FACILITY USE

RECEIVER DEMAND VS. TOTAL TANKER BASING

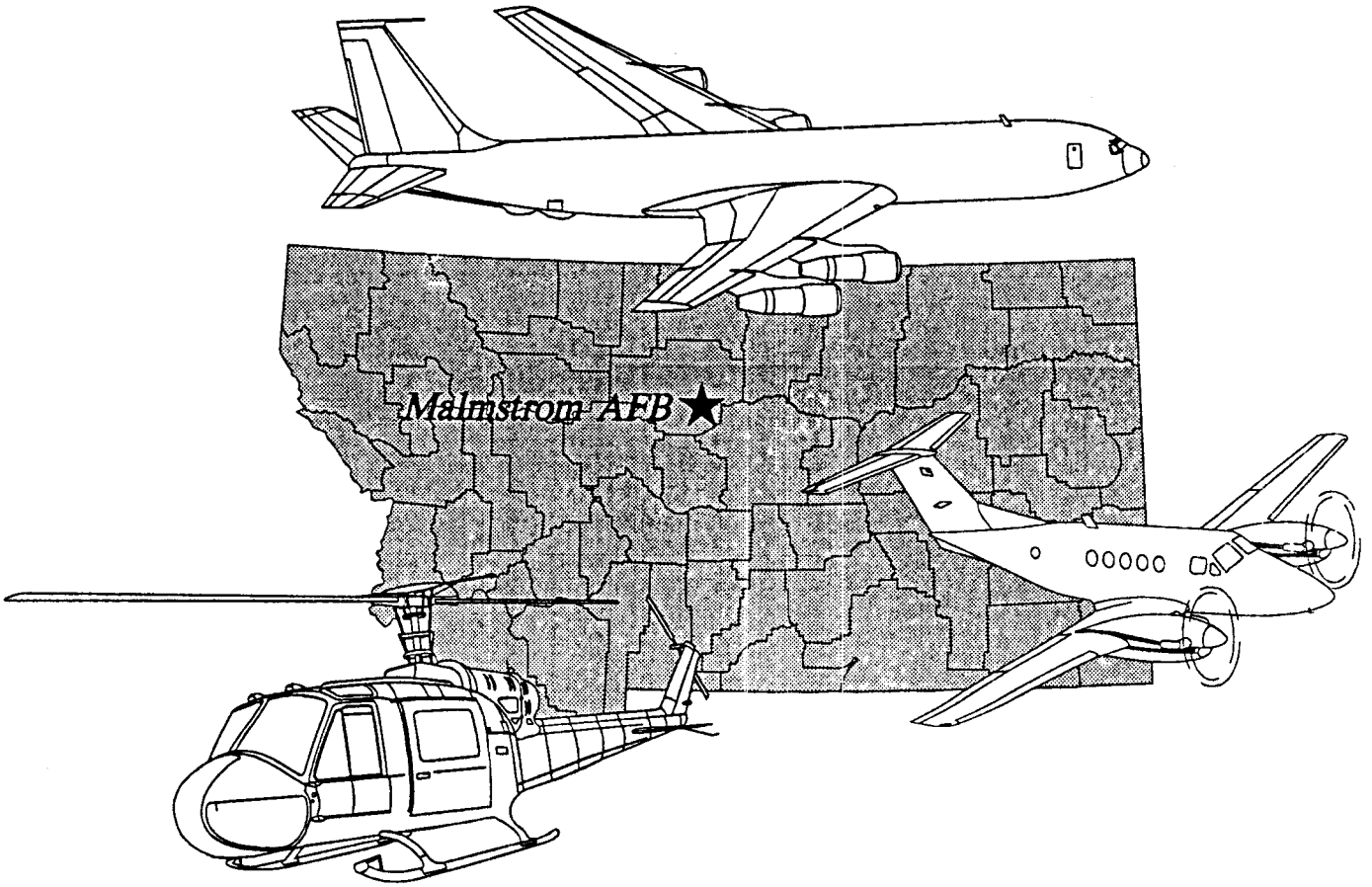


COMPARATIVE RATINGS



AICUZ STUDY

Volume I



UNITED STATES AIR FORCE
MALMSTROM AFB, MONTANA
1994

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 43D AIR REFUELING WING (AMC)

31 Mar 94

MEMORANDUM FOR GREAT FALLS AREA GOVERNMENTS

FROM: 43 ARW/CC
21 77th Street North, Suite 254
Malmstrom AFB, Montana 59402-7538

SUBJECT: Malmstrom Air Force Base Air Installation Compatible Use Zone (AICUZ) Study
- INFORMATION MEMORANDUM

1. This Air Installation Compatible Use Zone (AICUZ) Study for Malmstrom Air Force Base is an update of the original AICUZ study dated May 1978. The update was initiated because of changes in air operations and improvements in noise mapping software. It is a reevaluation of aircraft noise and accident potential related to Air Force flying operations and is designed to aid in the development of local planning mechanisms which will protect public safety and health, as well as preserve the operational capabilities of Malmstrom Air Force Base.

2. The report outlines the location of the runway clear zones, aircraft accident potential zones, and noise contours and recommends compatible land uses for areas in the vicinity of the base. We provide this information for your consideration as you develop your community plans, zoning ordinances, subdivision regulations, building codes, and other related documents.

3. The basic objective of the AICUZ program is to achieve compatible uses of public and private lands in the vicinity of military airfields by controlling incompatible development through local actions. This update provides noise contours based upon Day-Night Average A-Weighted Sound Level (DNL) metric used by the Air Force, and it provides the information necessary to maximize beneficial use of the land surrounding Malmstrom Air Force Base while minimizing the potential for degradation of the health and safety of the affected public.

4. We greatly value the positive relationship Malmstrom Air Force Base has experienced with its neighbors over the years. As a partner in the process, we have attempted to minimize noise disturbances through such actions as confining most flight operations and ground engine run-ups to the hours between 7:00 a.m. and 10:00 p.m. and avoiding flights over noise-sensitive locations.

5. We believe it would be mutually beneficial to all concerned to follow the recommended actions and guidelines presented in the AICUZ study.

Gary A. Voellger
GARY A. VOELLGER
Brigadier General, USAF
Commander

TABLE OF CONTENTS

LIST OF FIGURES iii

LIST OF TABLES iv

SECTION 1 PURPOSE AND NEED 1

1.1 Introduction 1

1.2 Purpose and Need 1

1.3 Process and Procedure 2

SECTION 2 INSTALLATION DESCRIPTION 3

2.1 Mission 3

2.1.1 91st and 97th Air Refueling Squadrons (AREFS) 3

2.1.2 Companion Training Program (CTP) 3

2.1.3 Detachment 5, 341st Operations Group (OG) 3

2.2 Economic Impact 4

2.3 Flying Activity 7

SECTION 3 LAND USE COMPATIBILITY GUIDELINES 10

3.1 Introduction 10

3.2 Land Use Compatibility 12

3.3 Participation In The Planning Process 12

SECTION 4 LAND USE ANALYSIS 19

4.1 Introduction 19

4.2 Existing Land Use 20

4.3 Current Zoning 21

4.4 Future Land Use 21

4.5 Incompatible Land Uses 22

4.5.1 Clear Zones and Accident Potential Zones 22

4.5.2 Noise Zones 22

4.6 Planning Considerations 22

SECTION 5 IMPLEMENTATION 27

5.1 Air Force Responsibilities 27

5.2 Local Community Responsibilities 28

LIST OF FIGURES

Figure 1 VICINITY 6

Figure 2 FLIGHT TRACKS 9

Figure 3 NOISE ZONES AND ACCIDENT POTENTIAL ZONES 11

Figure 4 LAND USE COMPATIBILITY 13

Figure 5 GENERALIZED EXISTING LAND USE 24

Figure 6 GENERALIZED ZONING 25

Figure 7 GENERALIZED FUTURE LAND USE 26

LIST OF TABLES

Table 2.1 FISCAL YEAR 1992 PERSONNEL BY CLASSIFICATION AND HOUSING . . . 5

Table 2.2 FISCAL YEAR 1992 EXPENDITURES 5

SECTION 1 PURPOSE AND NEED

1.1 Introduction

This study is an update of the 1978 Malmstrom AFB Air Installation Compatible Use Zone (AICUZ) Study. The update presents and documents the changes to the AICUZ for the period of 1978 to 1993. It reaffirms Air Force policy of promoting public health, safety, and general welfare in areas surrounding Malmstrom AFB. The report presents changes in flight operations since the last study and provides current noise contours and compatible use guidelines for land areas surrounding the base. It is hoped this information will assist local communities and serve as a tool for future planning and zoning activities.

The changes in the AICUZ are attributed to:

- Changes in the types of based aircraft.
- Changes in the number of flying operations.
- Technical improvements to the NOISEMAP program.

1.2 Purpose and Need

As stated in the previous Malmstrom AFB AICUZ Study, the purpose of the AICUZ program is to promote compatible land development in areas subject to aircraft noise and accident potential. Community cooperation regarding recommendations made in the earlier AICUZ Study has been outstanding. As Cascade County and the city of Great Falls prepare and modify their land use development plans and zoning maps, recommendations from this updated AICUZ Study should be included in their planning process to prevent incompatibility that may compromise Malmstrom AFB's ability to fulfill its mission requirements. Accident potential and aircraft noise should be major considerations in their planning processes.

Air Force AICUZ land use guidelines reflect land use recommendations for clear zones, accident potential zones I and II, and four noise zones. These guidelines have been established on the basis of studies prepared and sponsored by several federal agencies, including the Department of Housing and Urban Development, Environmental Protection Agency, Air Force, and state and local agencies. The guidelines recommend land uses which are compatible with airfield operations while allowing maximum beneficial use of adjacent properties. The Air Force has no desire to recommend land use regulations which render property economically useless. It does, however, have an obligation to the inhabitants of the Malmstrom AFB environs and to the citizens of the United States to point out ways to protect the people in adjacent areas as well as the public investment in the installation itself.

The AICUZ program uses the latest technology to define noise levels in areas near Air Force installations. An analysis of flying operations was performed, including types of aircraft, flight

patterns utilized, variations in altitude and power settings, number of operations, and hours of operations. This information was used to develop the noise contours contained in this study. The DoD NOISEMAP methodology and the Day-Night Average A-Weighted Sound Level (DNL) metric were used to define the noise zones for Malmstrom AFB.

1.3 Process and Procedure

Preparation and presentation of this update to Malmstrom AFB's AICUZ Study is part of the continuing Air Force participation in the local planning process. It is recognized that, as local communities prepare land use plans and zoning ordinances, the Air Force has the responsibility to provide inputs on its activities relating to the community. This study is presented in the spirit of mutual cooperation and assistance by Malmstrom AFB to aid in the local land use planning process. This study updates information on base flying activities since 1978. The noise contours depicted on the AICUZ maps are based on current missions.

Data collection was conducted 10-13 August, 1993. Aircraft operational and maintenance data was obtained to derive average daily operations by runway and type of aircraft. This data is supplemented by flight track information (where they fly), flight profile information (how they fly), and ground runup information. After verification for accuracy, data was input into the NOISEMAP program and converted to Day-Night Average A-Weighted Sound Level (DNL) noise contours. Noise contours were plotted on an area map and overlaid with clear zones and accident potential zones. Volume II, Appendix A contains detailed information on the development of the AICUZ program.

SECTION 2 INSTALLATION DESCRIPTION

2.1 Mission

Malmstrom AFB, an Air Mobility Command installation, is home to two operational command wing missions, that of the 43rd Air Refueling Wing (ARW) and the 341st Missile Wing (MW), as well as several associate units. The 43 ARW, reporting to the 15th Air Force at Travis AFB, California, provides combat ready KC-135R aircraft and aircrews to support the nation's Single Integrated Operational Plan (SIOP) and world-wide contingencies that require aerial refueling. As host wing, the 43 ARW provides total base support. The 341 MW, an Air Force Space Command unit reporting to the 20th Air Force at F.E. Warren AFB, Wyoming, provides combat-ready crews and 200 Minuteman II and III intercontinental ballistic missiles (ICBMs) in accordance with emergency war orders in support of SIOP. The missile wing provides national nuclear threat deterrence through quick retaliatory ability. The flying organizations at Malmstrom AFB fly the KC-135R refueling aircraft, the C-12 training aircraft, and the UH-1N "Huey" helicopter.

2.1.1 91st and 97th Air Refueling Squadrons (AREFS)

In support of the 43 ARW, the 91 and 97 AREFS provide global aerial refueling support for bombers, airlift, fighters and air defense and special mission aircraft as directed by the Department of Defense. In addition, these squadrons conduct training missions throughout the continental United States to maintain operational effectiveness and to provide the capability of projecting its force worldwide in a minimum amount of time.

2.1.2 Companion Training Program (CTP)

The Companion Training Program is a cost effective method to provide Air Force copilots increased flying and decision-making opportunities before becoming aircraft commanders. Copilots assigned to the 43 ARW at Malmstrom AFB participate in this program using the C-12 aircraft. While participating in this program, copilots fly a variety of missions to develop their judgement, maturity, and decision-making skills.

2.1.3 Detachment 5, 341st Operations Group (OG)

The primary mission of Det. 5, 341 OG is aerial security for the 341 MW's 23,000 square mile ICBM complex, with overall surveillance of missile convoy movements throughout Montana. Det. 5, 341 OG provides airlift support for missile maintenance, security, and operation. Additionally, the detachment provides a search and rescue function for the local area. In its nineteen years of continuous service, the detachment has performed more than 270 rescues in adverse conditions and mountainous terrain.

2.2 Economic Impact

Malmstrom AFB occupies over 3,570 acres within the political boundaries of Cascade County, Montana, approximately two miles east of the city of Great Falls. The base's economic impact region (EIR) is the geographic area subject to significant base-generated economic impacts. It is assumed to cover a radius of fifty miles around the base and includes all or parts of Cascade, Judith Basin, Lewis and Clark, Teton, Pondera, and Chouteau Counties.

The available modes of transport for people, goods, and raw materials has aided development and commerce in Great Falls. Early development was directly affected by the navigational potential of the Missouri River. Today, however, the upper Missouri River is used more for other purposes such as power generation and recreation. The Great Falls area is serviced by several commercial airlines with daily arrivals and departures via the Great Falls International Airport. Road transportation to and from Great Falls is provided by Interstate 15, and U.S. Highways 87, 89, and 91. In addition, rail freight transport through the Great Falls area is provided by rail lines from the Burlington Northern, Inc.

In a predominantly rural area dominated by agricultural interests, Malmstrom AFB employs nearly seven percent of the county's population and is the largest single employer in the region. During 1992, the base employed a total of 4,251 active duty personnel, 1,962 of which rent or own housing off-base. In addition, 488 appropriated fund and 577 non-appropriated fund civilian personnel were employed by Malmstrom AFB during 1992. In sum, Malmstrom AFB personnel received over $144 million in payroll, providing an indirect economic benefit, from the respending of payroll dollars in the local area, of approximately $87 million. To maintain and ensure operational effectiveness during 1992 and beyond, Malmstrom AFB spent over $19 million on construction and services and nearly $27 million on materials, equipment and supplies. These expenditures resulted in a contribution to the local economy of approximately $114 million. These figures are tabulated in Tables 2.1 and 2.2 on the following pages.

In an area which has experienced a loss in its population base and whose economy is largely dependent upon the fluctuations of an agricultural market, the presence of Malmstrom AFB provides economic stability to the city and the region. Implementation of appropriate land use controls in the areas affected by Malmstrom AFB's flying operations will help assure the viability of the installation in years to come.

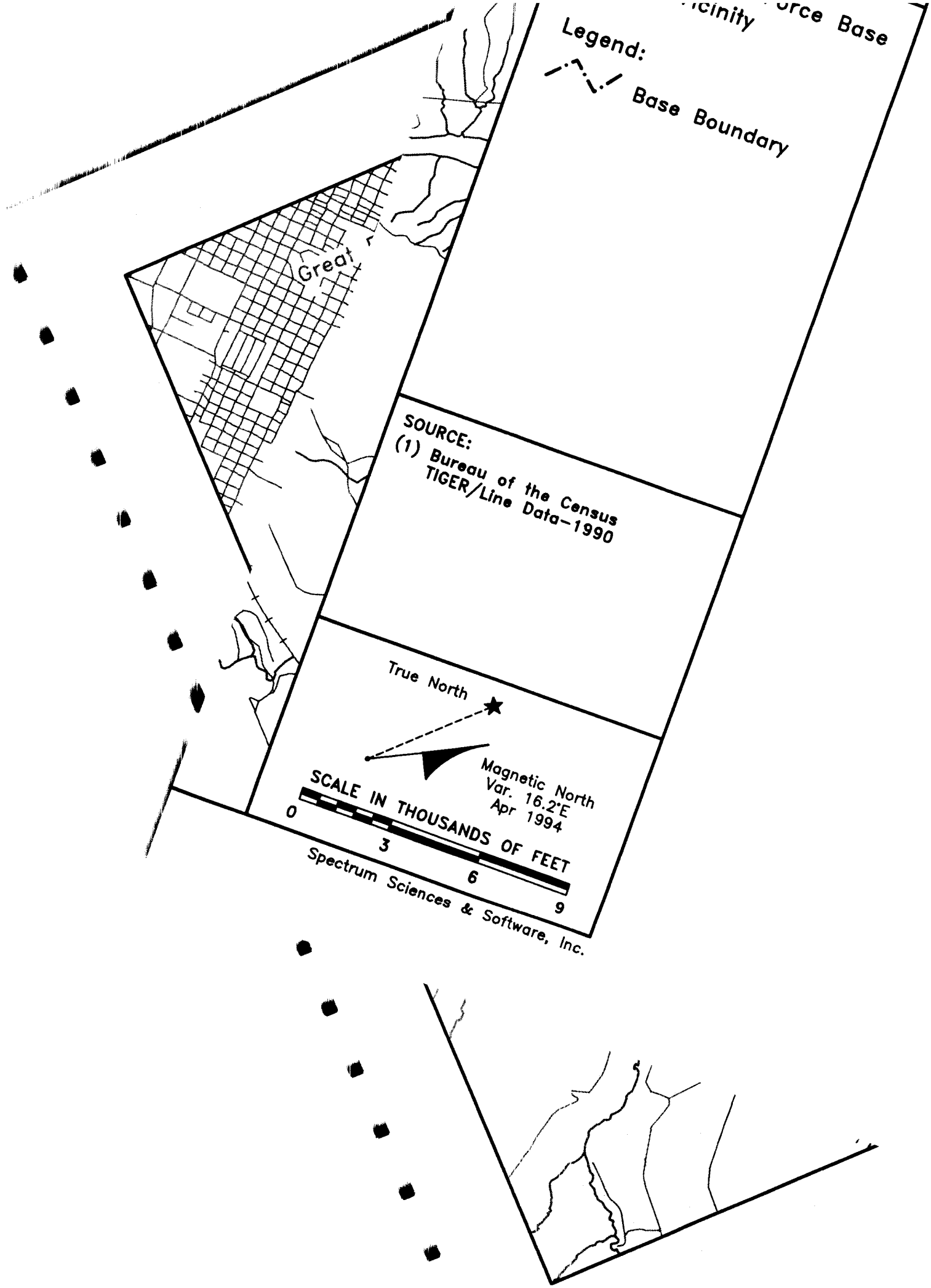
Table 2.1 FISCAL YEAR 1992 PERSONNEL BY CLASSIFICATION AND HOUSING

CLASSIFICATION	LIVING ON-BASE	LIVING OFF-BASE	TOTAL
ACTIVE DUTY MILITARY	2,289	1,962	4,251
APPROPRIATED FUND CIVILIAN			488
NONAPPROPRIATED FUND CIVILIAN			
CIVILIAN NAF		165	165
CIVILIAN AAFES		105	105
CONTRACT		275	275
PRIVATE BUSINESS AND OTHER		32	32
TOTAL CIVILIAN			1,065
TOTAL PERSONNEL			**5,316**

Table 2.2 FISCAL YEAR 1992 EXPENDITURES

CLASSIFICATION	AMOUNT
PAYROLL EXPENDITURES	
ACTIVE DUTY MILITARY	$124,646,136
APPROPRIATED FUND CIVILIAN	$15,946,128
NONAPPROPRIATED FUND CIVILIAN	$3,461,093
CONSTRUCTION AND SERVICE EXPENDITURES	
CONSTRUCTION	$6,406,385
SERVICES	$12,867,134
COMMISSARY/AAFES	$274,690
HEALTH, EDUCATION & TDY	$6,722,907
MATERIALS, EQUIPMENT, AND SUPPLIES EXPENDITURES	$26,999,103
TOTAL EXPENDITURES	**$197,323,576**
TOTAL LOCAL ECONOMIC IMPACT*	**$114,737,668**

*Based on multipliers provided by the 43 ARW/PA.
SOURCE: 43 ARW/PA, 1993.


Vicinity Force Base
Legend:
Base Boundary
Great
SOURCE:
(1) Bureau of the Census
TIGER/Line Data-1990
True North
Magnetic North
Var. 16.2°E
Apr 1994
SCALE IN THOUSANDS OF FEET
0
3
6
9
Spectrum Sciences & Software, Inc.

2.3 Flying Activity

To describe the relationship between aircraft operations and land use, it is necessary to fully evaluate the exact nature of flying activities. An inventory has been made of such things as the types of aircraft based at Malmstrom AFB, where those aircraft fly, how high they fly, how many times they fly over a given area, and at what time of day they operate.

The principal aircraft operating from Malmstrom AFB and the average number of daily operations for each aircraft are shown below. An operation is defined as one departure, one approach, or half a closed pattern. A closed pattern consists of both a departure portion and an approach portion--i.e. two operations.

TYPE OF AIRCRAFT	AVERAGE DAILY OPERATIONS
KC-135R	50
C-12	20
UH-1N	56

In addition to these assigned aircraft, numerous transient aircraft from other military installations land and take-off from Malmstrom AFB. Noise impacts from these transient aircraft have been included in this study.

Malmstrom AFB aircraft use the following basic flight patterns:

- Straight out/in departure/approach.
- Overhead landing pattern.
- Instrument flight rules (IFR) or radar closed pattern.
- Visual flight rules (VFR) or closed pattern.
- Re-entry VFR pattern.

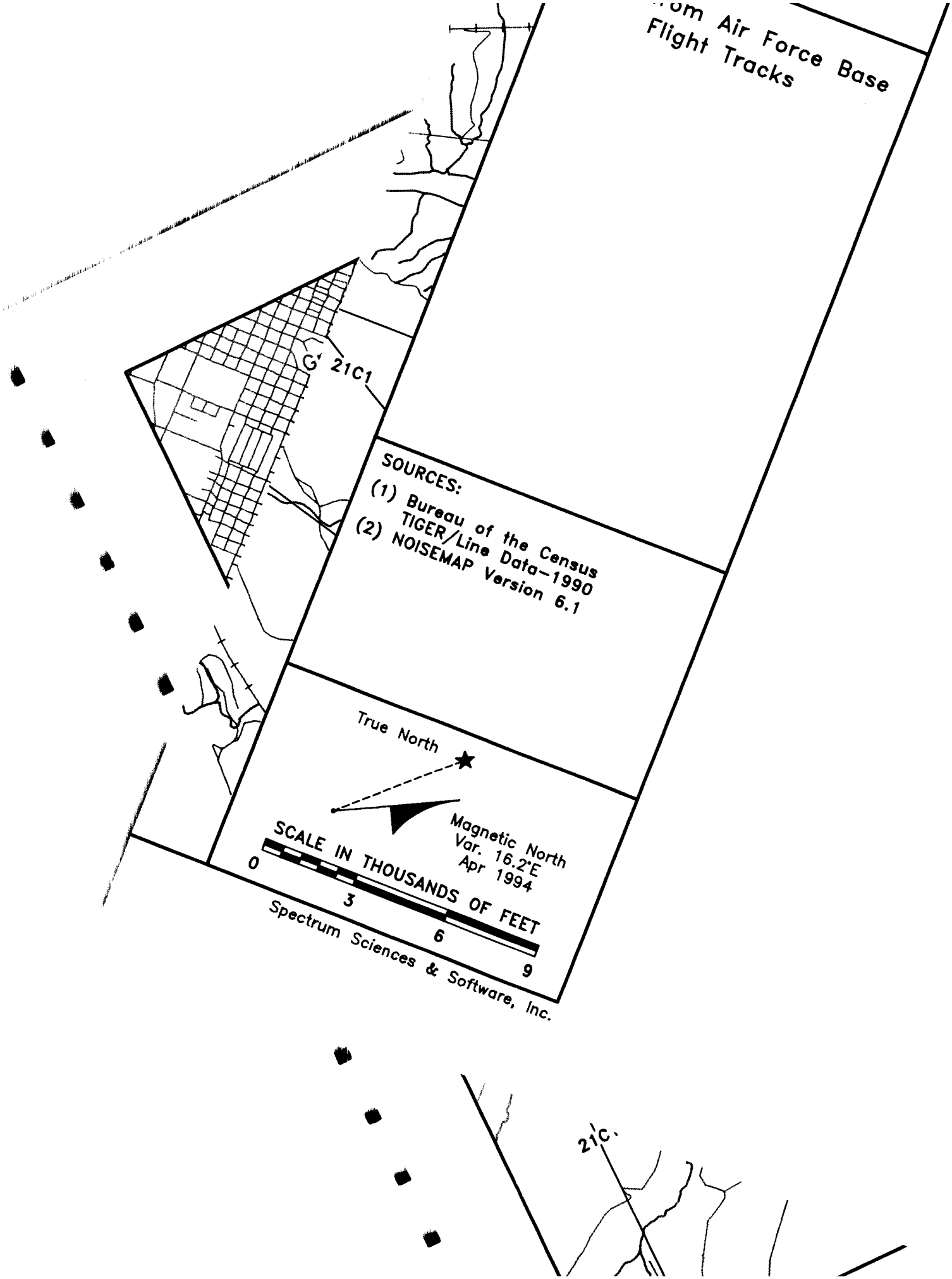
Malmstrom AFB flight patterns (Figure 2) result from several considerations, including:

- Takeoff patterns routed to avoid heavily populated areas as much as possible.
- Air Force criteria governing the speed, rate of climb, and turning radius for each type of aircraft.
- Efforts to control and schedule missions to keep noise levels low, especially at night.
- Coordination with the Federal Aviation Administration (FAA) to minimize conflicts with civilian aircraft operations, especially those related to Great Falls International Airport.

To the maximum extent possible, engine runup locations have been established in areas that minimize noise for people on-base, as well as for those in the surrounding areas. Normal base

operations do not include late night engine runups, but heavy work loads or unforeseen contingencies sometimes require a limited number of nighttime engine runups.

- Airfield environs planning is concerned with three primary aircraft operational/land use determinants: (1) accident potential to land users, (2) aircraft noise, and (3) hazards to operations from land uses (height obstructions, etc.). Each of these concerns is addressed in conjunction with mission requirements and safe aircraft operation to determine the optimum flight track for each aircraft type. The flight tracks depicted in Figure 2 are the result of such planning.


om Air Force Base
Flight Tracks
G' 21C1
SOURCES:
(1) Bureau of the Census
TIGER/Line Data-1990
(2) NOISEMAP Version 6.1
True North
Magnetic North
Var. 16.2°E
Apr 1994
SCALE IN THOUSANDS OF FEET
0
3
6
9
Spectrum Sciences & Software, Inc.
21C.

SECTION 3 LAND USE COMPATIBILITY GUIDELINES

3.1 Introduction

The Department of Defense (DoD) developed the Air Installation Compatible Use Zone (AICUZ) program for military airfields. Using this program, DoD works to protect aircraft operational capabilities at its installations and to assist local government officials in protecting and promoting the public health, safety, and quality of life. The goal is to promote compatible land use development around military airfields by providing information on aircraft noise exposure and accident potential.

AICUZ reports describe three basic types of constraints that affect, or result from, flight operations. The first constraint involves areas which the Federal Aviation Administration (FAA) and DoD have identified for height limitations (see Height and Obstruction Criteria in Volume II, Appendix D). Air Force obstruction criteria are based upon those contained in Federal Aviation Regulation Part 77 under Subpart C.

The second constraint involves noise zones produced by the computerized Day-Night Average A-Weighted Sound Level (DNL) metric and the DoD NOISEMAP methodology. Using the NOISEMAP noise modeling program, which is similar to FAA's Integrated Noise Model, DoD produces noise contours showing the noise levels generated by current aircraft operations. The AICUZ report contains noise contours plotted in increments of 5 dB, ranging from DNL 65 dB to DNL ≥80 dB (Figure 3). Additional information on noise methodology is contained in Volume II, Appendix C of this report.

The third constraint involves accident potential zones based on statistical analysis of past DoD aircraft accidents. DoD analysis has determined that the areas immediately beyond the ends of runways and along the approach and departure flight paths have significant potential for aircraft accidents. Based on this analysis, DoD developed three zones that have high relative potential for accidents. The clear zone, the area closest to the runway end, is the most hazardous. The overall risk is so high that DoD generally acquires the land through purchase or easement to prevent development. Accident potential zone I (APZ I) is an area beyond the clear zone that possesses a significant potential for accidents. Accident potential zone II (APZ II) is an area beyond APZ I having measurable potential for accidents. While aircraft accident potential in APZs I and II does not warrant acquisition by the Air Force, land use planning and controls are strongly encouraged in these areas for the protection of the public. A sample population density standard for use in APZs is provided in Volume II, Appendix F. The clear zones at Malmstrom AFB are 3,000 feet wide by 3,000 feet long. APZ I is 3,000 feet wide by 5,000 feet long, and APZ II is 3,000 feet wide by 7,000 feet long (Figure 3). Additional information on accident potential is contained in Volume II, Appendix B of this report.

3.2 Land Use Compatibility

Each AICUZ report contains land use guidelines. Figure 4 lists land uses versus all possible combinations of noise exposure and accident potential at Malmstrom AFB, showing land uses that are compatible or incompatible. Noise guidelines are essentially the same as those published by the Federal Interagency Committee on Urban Noise in the June 1980 publication, *Guidelines for Considering Noise in Land Use Planning and Control.* The U.S. Department of Transportation publication, *Standard Land Use Coding Manual (SLUCM)*, has been used for identifying and coding land use activities.

3.3 Participation In The Planning Process

As local communities prepare their land use plans, the Air Force must be ready to provide additional inputs. The Base Civil Engineer is the official liaison with the local community on all planning matters. This office is prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by, Malmstrom AFB.

Figure 4

LAND USE COMPATIBILITY

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-70	70-75	75-80	80+
10	Residential							
11	Household units							
11.11	Single units; detached	N	N	Y[1]	A[11]	B[11]	N	N
11.12	Single units; semidetached	N	N	N	A[11]	B[11]	N	N
11.13	Single units; attached row	N	N	N	A[11]	B[11]	N	N
11.21	Two units; side-by-side	N	N	N	A[11]	B[11]	N	N
11.22	Two units; one above the other	N	N	N	A[11]	B[11]	N	N
11.31	Apartments; walk up	N	N	N	A[11]	B[11]	N	N
11.32	Apartments; elevator	N	N	N	A[11]	B[11]	N	N
12	Group quarters	N	N	N	A[11]	B[11]	N	N
13	Residential hotels	N	N	N	A[11]	B[11]	N	N
14	Mobile home parks or courts	N	N	N	N	N	N	N
15	Transient lodgings	N	N	N	A[11]	B[11]	C[11]	N
16	Other residential	N	N	N[1]	A[11]	B[11]	N	N
20	Manufacturing							
21	Food & kindred products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
22	Textile mill products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
23	Apparel and other finished products made from fabrics, leather, and similar materials; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
24	Lumber and wood products (except furniture); manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-70	70-75	75-80	80+
25	Furniture and fixtures; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
26	Paper & allied products; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
27	Printing, publishing, and allied industries	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
28	Chemicals and allied products; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
29	Petroleum refining and related industries	N	N	Y	Y	Y[12]	Y[13]	Y[14]
30	Manufacturing							
31	Rubber and misc. plastic products, manufacturing	N	N[2]	N[2]	Y	Y[12]	Y[13]	Y[14]
32	Stone, clay and glass products manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
33	Primary metal industries	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
34	Fabricated metal products;manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks manufacturing	N	N	N[2]	Y	A	B	N
39	Miscellaneous manufacturing	N	Y[2]	Y[2]	Y	Y[12]	Y[13]	Y[14]
40	Transportation, communications and utilities							
41	Railroad, rapid rail transit and street railroad transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
42	Motor vehicle transportation	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
43	Aircraft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
44	Marine craft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-70	70-75	75-80	80+
45	Highway & street right-of-way	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
46	Automobile parking	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
47	Communications	N[3]	Y[4]	Y	Y	A[15]	B[15]	N
48	Utilities	N[3]	Y[4]	Y	Y	Y	Y[12]	Y[13]
49	Other transportation communications and utilities	N[3]	Y[4]	Y	Y	A[15]	B[15]	N
50	Trade							
51	Wholesale trade	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
52	Retail trade-building materials, hardware and farm equipment	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
53	Retail trade-general merchandise	N	N[2]	Y[2]	Y	A	B	N
54	Retail trade-food	N	N[2]	Y[2]	Y	A	B	N
55	Retail trade-automotive, marine craft, aircraft and accessories	N	Y[2]	Y[2]	Y	A	B	N
56	Retail trade-apparel and accessories	N	N[2]	Y[2]	Y	A	B	N
57	Retail trade-furniture, home furnishings and equipment	N	N[2]	Y[2]	Y	A	B	N
58	Retail trade-eating and drinking establishments	N	N	N[2]	Y	A	B	N
59	Other retail trade	N	N[2]	Y[2]	Y	A	B	N
60	Services							
61	Finance, insurance and real estate services	N	N	Y[6]	Y	A	B	N
62	Personal services	N	N	Y[6]	Y	A	B	N
62.4	Cemeteries	N	Y[7]	Y[7]	Y	Y[12]	Y[13]	Y[14,21]
63	Business services	N	Y[8]	Y[8]	Y	A	B	N
64	Repair services	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
65	Professional services	N	N	Y[6]	Y	A	B	N

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-70	70-75	75-80	80+
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y[6]	Y	Y	A	B	N
67	Governmental services	N	N	Y[6]	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N
69	Miscellaneous services	N	N[2]	Y[2]	Y	A	B	N
70	Cultural, entertainment and recreational							
71	Cultural activities (including churches)	N	N	N[2]	A*	B*	N	N
71.2	Nature exhibits	N	Y[2]	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheaters	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y[17]	Y[17]	N	N
73	Amusements	N	N	Y[8]	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y[8,9,10]	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y[8]	Y[8]	Y*	Y*	N	N
79	Other cultural, entertainment and recreation	N	Y[9]	Y[9]	Y*	Y*	N	N
80	Resources production and extraction							
81	Agriculture (except livestock)	Y[16]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]
81.5 to 81.7	Livestock farming and animal breeding	N	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-70	70-75	75-80	80+
82	Agricultural related activities	N	Y[5]	Y	Y[18]	Y[19]	N	N
83	Forestry activities and related services	N[5]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]
84	Fishing activities and related services	N[5]	Y[5]	Y	Y	Y	Y	Y
85	Mining activities and related services	N	Y[5]	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y[5]	Y	Y	Y	Y	Y

LEGEND

SLUCM - Standard Land Use Coding Manual, U.S. Department of Transportation.

Y - (Yes) - Land use and related structures are compatible without restriction.

N - (No) - Land use and related structures are not compatible and should be prohibited.

Y[x] - (yes with restrictions) - Land use and related structures generally compatible; see notes 1-21.

N[x] - (no with exceptions) - See notes 1-21.

NLR - (Noise Level Reduction) - NLR (outdoor to indoor) to be achieved through incorporation of noise attenuation measures into the design and construction of the structures. See Appendix E, Vol II.

A, B, or C - Land use and related structures generally compatible; measures to achieve NLR for A (DNL 66-70), B (DNL 71-75), or C (DNL 76-80) need to be incorporated into the design and construction of structures. See Appendix E, Vol II.

A*, B*, and C* - Land use generally compatible with NLR. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.

***** - The designation of these uses as "compatible" in this zone reflects individual federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

NOTES

1. Suggested maximum density of 1-2 dwelling units per acre, possibly increased under a Planned Unit Development (PUD) where maximum lot coverage is less than 20 percent.
2. Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures (See Vol 2, Appendix F).
3. The placing of structures, buildings, or above-ground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See AFR 19-9 and AFR 86-14 for specific guidance.
4. No passenger terminals and no major above-ground transmission lines in APZ I.
5. Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
6. Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.
7. Excludes chapels.
8. Facilities must be low intensity.
9. Clubhouse not recommended.
10. Areas for gatherings of people are not recommended.
11. a. Although local conditions may require residential use, it is discouraged in DNL 66-70 dB and strongly discouraged in DNL 71-75 dB. An evaluation should be conducted prior to approvals, indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones, and that there are no viable alternative locations.
    b. Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) for DNL 66-70 dB and DNL 71-75 dB should be incorporated into building codes and considered in individual approvals. See Appendix E for a reference to updated NLR procedures.
    c. NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.
12. Measures to achieve the same NLR as required for facilities in the DNL 66-70 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
13. Measures to achieve the same NLR as required for facilities in the DNL 71-75 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
14. Measures to achieve the same NLR as required for facilities in the DNL 76-80 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
15. If noise sensitive, use indicated NLR; if not, the use is compatible.
16. No buildings.
17. Land use is compatible provided special sound reinforcement systems are installed.
18. Residential buildings require the same NLR required for facilities in the DNL 66-70 dB range.
19. Residential buildings require the same NLR required for facilities in the DNL 71-75 dB range.
20. Residential buildings are not permitted.
21. Land use is not recommended. If the community decides the use is necessary, hearing protection devices should be worn by personnel.

SECTION 4 LAND USE ANALYSIS

4.1 Introduction

Land use planning and control is a dynamic process. The specific characteristics of land use determinants will always reflect, to some degree, the changing conditions of the economic, social, and physical environment of a community, as well as changing public concerns. The planning process accommodates this fluidity in that decisions are normally not based on boundary lines, but rather on more generalized area designations.

Malmstrom AFB was built in a relatively undeveloped area to the east of Great Falls. Currently, the base is bordered on three sides by agricultural land uses, with mixed commercial, residential, and open land uses to the west. Commercial development along 10th Avenue South has increased, and new residential development is occurring southwest of the base. While incompatible land uses have not impacted the base's flying mission, should incompatible development occur within the accident potential and noise zones, the base's flying mission could be affected.

Computer technology has enabled Malmstrom AFB to more precisely display its flight tracks and noise contours for land use planning purposes. This same technology has revealed that the base's region of influence extends generally northeast and southwest of the base, along and beyond the runway centerline.

For the purposes of this study, land use and zoning classifications are as follows:

- Residential. Includes all types of residential activity, such as single and multi-family residences, and mobile homes, at unit densities of one per acre and greater.
- Commercial. Offices, retail establishments, restaurants, etc..
- Industrial. Manufacturing, warehouses, power production, and other similar uses.
- Public/Quasi-Public. Publicly owned lands and lands open to public access; including military reservations, public buildings, schools, churches, cemeteries, and hospitals.
- Recreational. Land designated for recreational activity, including parks, golf courses, and state and national parks.
- Open/Agricultural/Low Density. Undeveloped lands, agricultural areas, grazing lands, and low density residential activity of less than one dwelling unit per acre.

4.2 Existing Land Use

The city of Great Falls is located west of Malmstrom AFB along the shores of the Missouri River, near its confluence with the Sun River. Great Falls, platted in 1883 and incorporated in 1888, has played an important role in the settlement of the region, serving as the county seat and as the civic and commerce center of the area. It contains a grid-like road system, with north/south streets and east/west avenues. Great Falls is one of the largest cities in Montana, containing approximately 55,000 of Cascade County's 77,000 residents. As such, the city and adjacent unincorporated lands contain significant amounts of residential, commercial, industrial, and recreational development that provide housing, employment, services, and recreational opportunities. Development density within the city is quite concentrated, diminishing to the east as it approaches Malmstrom AFB. The bulk of development near Malmstrom AFB occurs on the western side, within and adjacent to Great Falls, with the remainder being mostly open farm and range lands.

The 10th Avenue South corridor, on the south side of Great Falls, is one of the most significant areas of commercial development in Great Falls and supports a diverse array of commercial uses. Commercial development is primarily restricted to the immediate road front, with extensive amounts of residential development dominating to the north, and residential development followed by open land to the south. Less than a quarter of a mile south of 10th Avenue South, at the 50th Street block, a Kampgrounds of America (KOA) campground is sited overlooking Gibson Flats. This campground is west of the Malmstrom AFB DNL 65 dB noise zone and west of the southern APZ I.

Directly west and northwest of the base, land is used for mixed purposes including industrial, commercial, residential, agricultural, and public use. Between 10th Avenues North and South, and east of 15th Street, the primary land use is single-family residential, although there are also several apartment complexes, schools, neighborhood parks, and, toward the east, vacant land parcels. Mixed land uses are present along 2nd Avenue North, the primary access route to Malmstrom AFB. These uses include large and small retail outlets, small restaurants, single-family residences, and open areas, all being low intensity uses. The intersection of 57th Street Bypass and 2nd Avenue North contains commercial uses on three corners, with the southwest corner remaining vacant. Loy School, a public land use, is on the east side of 57th Street Bypass and adjacent to Malmstrom AFB housing. North of 10th Avenue North, and northwest of Malmstrom AFB, land areas are primarily open with a few industrial uses. Further north, along the Missouri River, recreational uses are associated with Great Springs Heritage Park and Fish Hatchery. These areas are not impacted by Malmstrom AFB noise and accident potential zones.

Areas north, east, and south of Malmstrom AFB are currently being used for growing grain, predominantly wheat. Due to the lack of development demand and economic benefits of maintaining the land in agricultural production, this use is expected to continue.

Malmstrom AFB AICUZ noise zones do not extend over the Great Falls corporate boundaries and impact no developed land areas. AICUZ noise zones from Malmstrom AFB's flying operations impact approximately 800 acres of private agricultural land used for grain production.

The only development within Malmstrom AFB accident potential zones exists within the southeast corner of the southern APZ II. Large lots of the Eaton Addition, in Gibson Flats, contain uninhabited structures impacted by aircraft overflight. The majority of these lots are undeveloped and used for grazing and farming purposes, with one area being used for light industrial uses. Intensive development of this area is unlikely due to natural development constraints. The Eaton Addition is within a floodplain that restricts utility service and its development potential. Current land uses are portrayed in Figure 5.

4.3 Current Zoning

The city of Great Falls has adopted conventional zoning ordinances designating land uses within the city limits and beyond for a distance of four and a half miles. The Great Falls City-County Planning Board retains zoning jurisdiction within this area. Much of the Malmstrom AFB region of influence extends over undeveloped, agricultural land areas of unzoned Cascade County.

Zoning within the Great Falls area follows the same pattern as the existing land uses. Areas designated for commercial uses occur along 10th Avenue South, 2nd Avenue North, and 57th Street Bypass. North and east of Malmstrom AFB, between the railroad tracks and the riverfront recreational area, land is zoned for industrial purposes. Remaining land areas within Great Falls are predominantly designated for residential purposes. Land along the river to the north of the base, and in an area west and south of the base containing the Mount Olivet Cemetary, are zoned for suburban uses, allowing low intensity, open air uses.

Two small areas beyond the southeast corner of Great Falls' corporate limits, and either adjacent to the west of Malmstrom AFB or within the southern APZ I, are impacted by the DNL 65 dB noise zone. Although these areas are currently undeveloped, zoning allows commercial uses north of 10th Avenue South and residential uses south of 10th Avenue South.

Land areas beyond the jurisdiction of the Great Falls City-County Planning Board, where the majority of the Malmstrom AFB impact exists, are unzoned. Great Falls zoning ordinances do not address height restrictions within runway approach and departure zones and no building codes exist which address noise level reduction in building construction. However, insulation from the winters in this part of Montana significantly reduce interior noise levels from outdoor sources. Zoning in the Malmstrom AFB/Great Falls vicinity are depicted in Figure 6.

4.4 Future Land Use

Most of the land area within Great Falls has been built up, with no change in land use expected. However, 57th Street Bypass and the eastern end of 2nd Avenue North contain significant amounts of vacant land. Vacant land north and south of 2nd Avenue North, and fronting 57th Street Bypass

to the east, is expected to be developed for commercial uses, with a small area to remain in agricultural use. Vacant properties south of 10th Avenue North are expected to remain in agricultural use, while industrial uses to the north are expected to expand.

Croplands north, east, and south of Malmstrom AFB are expected to remain in agricultural production for the foreseeable future. Great Falls has experienced a population decline in the past few years, as has the state of Montana, and it is unlikely that development demands will warrant the conversion of prime cropland to other uses. However, should conditions change, land use controls in these areas would ensure development compatible with Malmstrom AFB operations. A generalized future land use map, as depicted in the *Year 2000 Great Falls Land Use Plan* of 1981, is provided by Figure 7.

4.5 Incompatible Land Uses

Incompatible land uses within AICUZ environs are generally characterized in two ways: land uses within accident potential zones which exceed development or population density guidelines, and/or; land uses which expose large numbers of people to high levels of sound.

4.5.1 Clear Zones and Accident Potential Zones

Malmstrom AFB clear zones and accident potential zones extend over open lands used for agricultural purposes. Control of clear zone areas which extend off-base has been accomplished by Malmstrom AFB through perpetual easements that restrict incompatible land uses. Beyond the clear zones, Malmstrom AFB accident potential zones contain agricultural land. This use, provided it does not attract large amounts of birds or release vision obscuring dust hazardous to air operations, is compatible with Malmstrom AFB operations. The southern APZ II contains un-inhabited farming and ranching structures compatible with Malmstrom AFB flying operations.

4.5.2 Noise Zones

No developed off-base areas in the Malmstrom AFB environs are impacted by noise greater than DNL 65 dB. As such, there are currently no areas containing incompatible land uses.

4.6 Planning Considerations

AICUZ noise contours describe the noise characteristics of a specific operational environment and, as such, will change if a significant operational change is made. If the local communities that make up the Malmstrom AFB environs attempt to use AICUZ noise contours as boundary lines for zoning districts, it is conceivable that problems would result. Should a new mission be established at Malmstrom AFB, adding a larger number of airplanes or additional model types, the AICUZ could be amended.

Additionally, the Air Force recommends that AICUZ data be utilized with all other planning data. Therefore, specific land use control decisions should not be based solely on AICUZ boundaries.

With these thoughts in mind, Malmstrom AFB has revised the 1978 AICUZ Study and has provided flight track, accident potential zone, and noise contour information in this report that reflect the most current and accurate representation of aircraft activities.

SECTION 5 IMPLEMENTATION

Implementation of the AICUZ Study must be a joint effort between the Air Force and adjacent communities. The Air Force's role is to minimize the impact on the civilian community by Malmstrom AFB operations. The role of the civilian community is to ensure that development in its environs is compatible with accepted planning and development principles and practices.

5.1 Air Force Responsibilities

In general, the Air Force perceives its AICUZ responsibilities as encompassing the areas of flying safety, noise abatement, and participation in the land use planning process.

Well maintained aircraft and well trained aircrews do much to assure that aircraft accidents are avoided. Despite the best training of aircrews and maintenance of aircraft, however, history makes it clear that accidents do occur. It is imperative that flights be routed over sparsely populated areas as much as possible to reduce the exposure of lives and property to a potential accident.

By Air Force regulation, commanders are required to periodically review existing traffic patterns, instrument approaches, weather minima, and operating practices, and evaluate these factors in relationship to populated areas and other local situations. This requirement is a direct result and expression of Air Force policy that all AICUZ plans must include an analysis of flying and flying related activities designed to reduce and control the effects of such operations on surrounding land areas. Noise is generated from aircraft both in the air and on the ground. At Malmstrom AFB, noise mitigation practices implemented include routing flight tracks to avoid heavily populated areas, adjusting power settings and climb rates to minimize noise, and restricting night ground engine maintenance and flight operations to a minimum.

The preparation and presentation of the 1994 Malmstrom AFB AICUZ update is one phase of the continuing Air Force participation in the local planning process. It is recognized that as the local community updates its land use plans, the Air Force must be ready to provide additional inputs.

It is also recognized that the AICUZ program will be an ongoing activity even after compatible development plans are adopted and implemented. Base personnel are prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by, Malmstrom AFB. Base personnel will also be available to provide information, criteria, and guidelines to state, regional, and local planning bodies, civic associations, and similar groups.

5.2 Local Community Support

The residents of Cascade County and the personnel of Malmstrom AFB have a long history of working together for mutual benefit. Installation leaders at Malmstrom AFB feel that adoption of the following recommendations will strengthen this relationship, increase the health and safety of the public, and help protect the integrity of the base's flying mission:

- Incorporate AICUZ policies and guidelines into comprehensive plans in the city of Great Falls and Cascade County. Use overlay maps of the AICUZ noise contours and Air Force Land Use Compatibility Guidelines to evaluate existing and future land use proposals.

- Ensure zoning ordinances and subdivision regulations support the compatible land use guidelines outlined in this study.

- Implement height and obstruction ordinances which reflect current Air Force and Federal Aviation Regulation (FAR) Part 77 requirements.

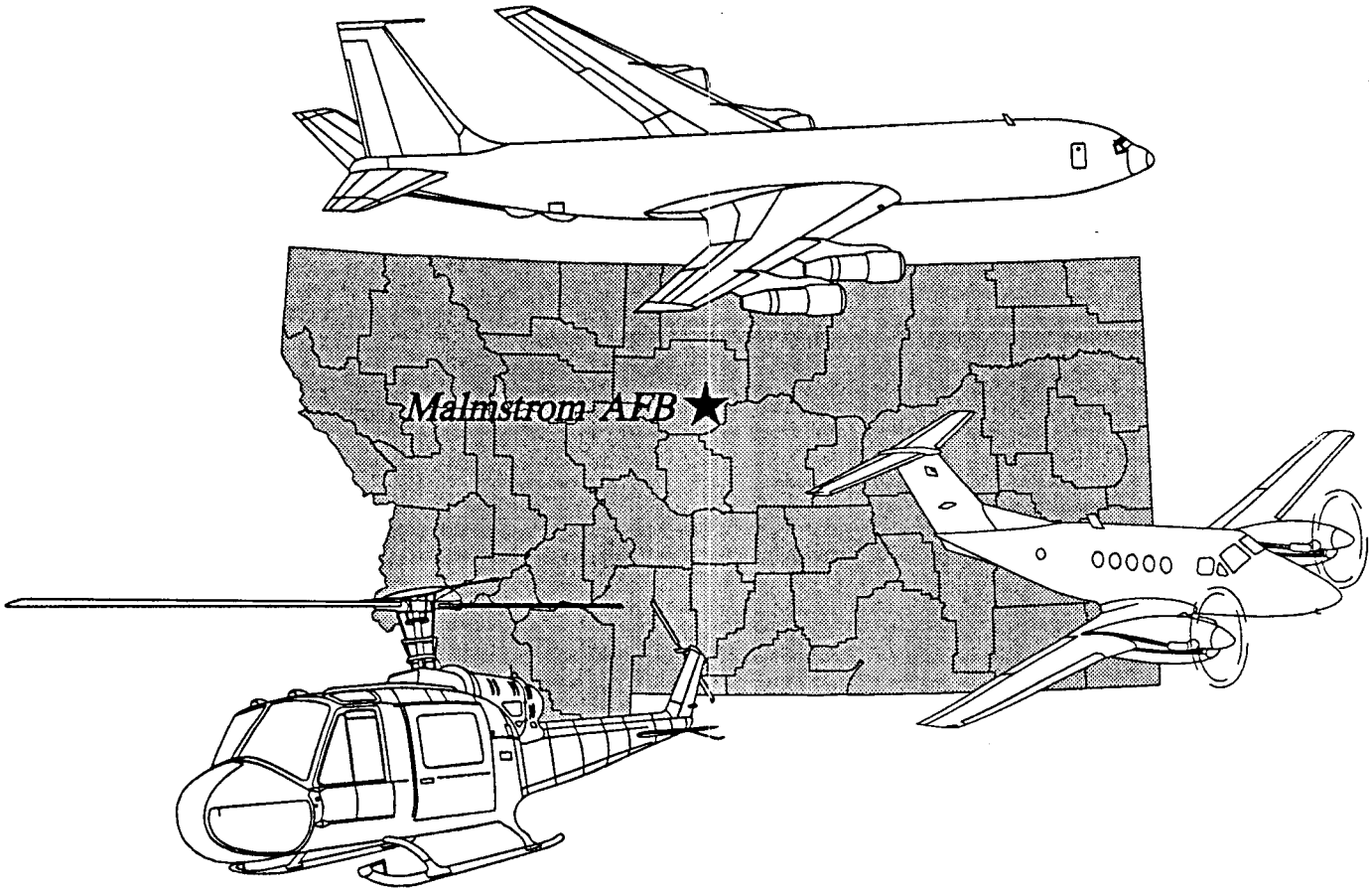
- Ensure that building codes are compatible with the AICUZ study and that recommended noise level reductions are incorporated into the design and construction of facilities.

- Apply to the DoD Office of Economic Adjustment (OEA) for matching funds to develop a Joint Land Use Study (JLUS). The JLUS is a cooperative effort between the installation and local governments to develop an enforceable airport-compatible land use plan. The development of such a plan will facilitate compatible future development near the base and minimize encroachment.

- Continue to inform Malmstrom AFB of planning and zoning actions that have the potential of affecting base operations. Develop a working group representing city planners, county planners, and base planners to meet at least quarterly to discuss AICUZ concerns and major development proposals that could affect airfield operations.

AICUZ STUDY

Volume II
APPENDICES



UNITED STATES AIR FORCE
MALMSTROM AFB, MONTANA
1994

MALMSTROM AFB AICUZ STUDY

VOLUME II:

APPENDICES

This is the companion document to Volume I of the follow-on Air Installation Compatible Use Zone (AICUZ) Study prepared for Malmstrom AFB, Montana in 1994. It contains supplemental AICUZ information.

TABLE OF CONTENTS

LIST OF FIGURES ii

LIST OF TABLES iii

APPENDIX A

THE AICUZ CONCEPT, PROGRAM, METHODOLOGY, AND POLICIES . . . . . A - 1

APPENDIX B

ACCIDENT POTENTIAL ZONES . . . . . B - 1

APPENDIX C

DESCRIPTION OF THE NOISE ENVIRONMENT . . . . . C - 1

APPENDIX D

HEIGHT AND OBSTRUCTIONS CRITERIA . . . . . D - 1

APPENDIX E

NOISE LEVEL REDUCTION GUIDELINES . . . . . E - 1

APPENDIX F

SAMPLE POPULATION DENSITY GUIDELINES . . . . . F - 1

LIST OF FIGURES

Figure B-1 DISTRIBUTION OF AIR FORCE AIRCRAFT ACCIDENTS . . . . . B - 3

Figure B-2 AIR FORCE AIRCRAFT ACCIDENT DATA (1968-1972) . . . . . B - 4

Figure B-3 AIR FORCE AIRCRAFT ACCIDENT DATA (1968-1985) . . . . . B - 4

Figure C-1 DAY-NIGHT AVERAGE A-WEIGHTED SOUND LEVEL (DNL) . . . . . C - 1

Figure C-2 SOUND EXPOSURE LEVEL (SEL) . . . . . C - 2

Figure D-1 AIRSPACE CONTROL SURFACE PLAN . . . . . D - 4

LIST OF TABLES

Table B.1 LOCATION ANALYSIS . . . . . B - 2

Table B.2 ACCIDENT TO AREA RATIO . . . . . B - 5

Table B.3 ADDITIONAL ACCIDENT DATA . . . . . B - 6

Table F.1 PERSONS PER ACRE . . . . . F - 2

APPENDIX A

THE AICUZ CONCEPT, PROGRAM, METHODOLOGY, AND POLICIES

A.1 Concept

Federal legislation, national sentiment, and other external forces which directly affect the United States Air Force mission have served to greatly increase the Air Force's role in environmental and planning issues. Problems of airfield encroachment from incompatible land uses surrounding installations, as well as air and water pollution and socio-economic impact, require continued and intensified USAF involvement. The nature of these problems dictates direct USAF participation in comprehensive community and land use planning. Effective, coordinated planning that bridges the gap between the federal government and the community requires the establishment of good working relationships with local citizens, local planning officials, and state and federal officials. This depends upon creating an atmosphere of mutual trust and helpfulness. The Air Installation Compatible Use Zone (AICUZ) concept has been developed in an effort to:

- Protect local citizens from the noise exposure and accident potential associated with flying activities.
- Prevent degradation of the Air Force's capability to achieve its mission by promoting compatible land use planning.

The land use guidelines developed herein are a composite of a number of other land use compatibility studies that have been refined to fit the Malmstrom AFB aviation environment.

A.2 Program

Installation commanders establish and maintain active programs to achieve the maximum feasible land use compatibility between air installations and neighboring communities. The program requires that all appropriate government bodies and citizens be fully informed whenever AICUZ or other planning matters affecting the installation are under consideration. This includes positive and continuous programs designed to:

- Provide information, criteria, and guidelines to federal, state, regional, and local planning bodies, civic associations, and similar groups.
- Inform such groups of the requirements of the flying activity, noise exposure, aircraft accident potential, and AICUZ plans.
- Describe the noise reduction measures that are being used.

- Ensure that all reasonable, economical, and practical measures are taken to reduce or control the impact of noise-producing activities. These measures include such considerations as proper location of engine test facilities, provision of sound suppressors where necessary, and adjustment of flight patterns and/or techniques to minimize the noise impact on populated areas. This must be done without jeopardizing safety or operational effectiveness.

A.3 Methodology

The AICUZ consists of land areas upon which certain land uses may obstruct the airspace or otherwise be hazardous to aircraft operations and land areas which are exposed to the health, safety, or welfare hazards of aircraft operations. The AICUZ includes:

- Accident potential zones (APZ) and clear zones (CZ) based on past Air Force aircraft accidents and installation operational data (Appendix B).
- Noise zones (NZ) produced by the computerized Day-Night Average A-Weighted Sound Level (DNL) metric (Appendix C).
- The area designated by the Federal Aviation Administration and the Air Force for purposes of height limitations in the approach and departure zones of the base (Appendix D).

The APZ, CZ, and NZ are the basic building blocks for land use planning with AICUZ data. Compatible land uses are specified for these zones, and recommendations on building materials and standards to reduce interior noise levels inside structures are provided in Appendix E.

As part of the Air Installation Compatible Use Zone program, the only real property acquisition for which the Air Force has requested and received congressional authorization and the base and major commands request appropriation are the areas designated as the clear zone. Land use control through restrictive easements has been acquired by Malmstrom AFB for all developable property within the clear zones, giving the base control over the use of the property. Compatible land use controls for the remaining airfield environs should be accomplished through the community land use planning processes.

A.4 AICUZ Land Use Development Policies

The basis for any effective land use control system is the development of, and subsequent adherence to, policies which serve as the standard by which all land use planning and control actions are evaluated. Malmstrom AFB recommends the following policies be considered for incorporation into the comprehensive plans of agencies in the vicinity of the base environs:

A.4.1 Policy 1. In order to promote the public health, safety, peace, comfort, convenience, and general welfare of the inhabitants of airfield environs, it is necessary to:

- Guide, control, and regulate future growth and development.
- Promote orderly and appropriate use of land.

- Protect the character and stability of existing land uses.
- Prevent the destruction or impairment of the airfield and the public investment therein.
- Enhance the quality of living in the areas affected.
- Protect the general economic welfare by restricting incompatible land use.

A.4.2 Policy 2. In furtherance of Policy 1, it is appropriate to:

- Establish guidelines of land use compatibility.
- Restrict or prohibit incompatible land use.
- Prevent establishment of any land use which would unreasonably endanger aircraft operations and the continued use of the airfield.
- Incorporate the Air Installation Compatible Use Zone concept into community land use plans, modifying them when necessary.
- Adopt appropriate ordinances to implement airfield environs land use plans.

A.4.3 Policy 3. Within the boundaries of the AICUZ, certain land uses are inherently incompatible. The following land uses are not in the public interest and must be restricted or prohibited:

- Uses that release into the air any substance, such as steam, dust, or smoke, which would impair visibility or otherwise interfere with the operation of aircraft.
- Uses that produce light emissions, either direct or indirect (reflective), which would interfere with pilot vision.
- Uses that produce electrical emissions which would interfere with aircraft communication systems or navigation equipment.
- Uses that attract birds or waterfowl, such as operation of sanitary landfills, maintenance or feeding stations, or growth of certain vegetation.
- Uses that provide for structures within ten feet of aircraft approach-departure and/or transitional surfaces.

A.4.4 Policy 4. Certain noise levels of varying duration and frequency create hazards to both physical and mental health. A limited, though definite, danger to life exists in certain areas adjacent to airfields. Where these conditions are sufficiently severe, it is not consistent with public health, safety, and welfare to allow the following land uses:

- Residential.
- Retail business.
- Office buildings.
- Public buildings (schools, churches, etc.).
- Recreation buildings and structures.

A.4.5 Policy 5. Land areas below takeoff and final approach flight paths are exposed to significant danger of aircraft accidents. The density of development and intensity of use must be limited in such areas.

A.4.6 Policy 6. Different land uses have different sensitivities to noise. Standards of land use acceptability should be adopted, based on these noise sensitivities. In addition, a system of Noise Level Reduction guidelines (Appendix E) for new construction should be implemented to permit certain uses where they would otherwise be prohibited.

A.4.7 Policy 7. Land use planning and zoning in the airfield environs cannot be based solely on aircraft-generated effects. Allocation of land used within the AICUZ should be further refined by consideration of:

- Physiographic factors.
- Climate and hydrology.
- Vegetation.
- Surface geology.
- Soil characteristics.
- Intrinsic land use capabilities and constraints.
- Existing land use.
- Land ownership patterns and values.
- Economic and social demands.
- Cost and availability of public utilities, transportation, and community facilities.
- Other noise sources.

Each runway end at Malmstrom AFB has a 3,000 foot by 3,000 foot clear zone and two accident potential zones (Appendix B). Accident potential on or adjacent to the runway or within the clear zone is so high that the necessary land use restrictions would prohibit reasonable economic use of land. As stated previously, it is Air Force policy to request Congress to authorize and appropriate funds for the necessary real property interests in this area to prevent incompatible land uses. At Malmstrom AFB, land use control within clear zones is compatible with AICUZ recommendations.

Accident potential zone I is less critical than the clear zone, but still possesses a significant risk factor. This 3,000 foot by 5,000 foot area has land use compatibility guidelines which are sufficiently flexible to allow reasonable economic use of the land, such as industrial/manufacturing, transportation, communication/utilities, wholesale trade, open space, recreation, and agriculture. However, uses that concentrate people in small areas are not acceptable.

Accident potential zone II is less critical than accident potential zone I, but still possesses potential for accidents. Accident potential zone II, also 3,000 feet wide, is 7,000 feet long extending to 15,000 feet from the runway threshold. Acceptable uses include those of accident potential zone I, as well as low density single family residential and those personal and business services and commercial/retail trade uses of low intensity or scale of operation. High density functions such as multi-story buildings, places of assembly (theaters, churches, schools, restaurants, etc.), and high density office uses are not considered appropriate.

High people densities should be limited to the maximum extent possible. The optimum density recommended for residential usage (where it does not conflict with noise criteria) in accident potential zone II is one dwelling per acre. For most non-residential usage, buildings should be limited to one story and the lot coverage should not exceed 20%.

A.5 Basic Land Use Compatibility

Research on aircraft accident potential, noise, and land use compatibility is ongoing at a number of federal and other agencies. One such effort is the Concentrations of Persons per Acre Standard developed by the Sacramento Area Council of Governments for incorporation into the land use planning process (Appendix F). These and all other compatibility guidelines must not be considered inflexible standards. They are the framework within which land use compatibility questions can be addressed and resolved. In each case, full consideration must be given to local conditions such as:

- Previous community experience with aircraft accidents and noise.
- Local building construction and development practices.
- Existing noise environment due to other urban or transportation noise sources.
- Time period of aircraft operations and land use activities.
- Specific site analysis.
- Noise buffers, including topography.

These basic guidelines cannot resolve all land use compatibility questions, but they do offer a reasonable framework within which to work.

A.6 Accident Potential

Land use guidelines for the two APZs are based on a hazard index system which compares the relationship of accident occurrence for five areas:

- On or adjacent to the runway.
- Within the clear zone.
- In APZ I.
- In APZ II.
- In all other areas within a 10 nautical mile radius of the runway.

Accident potential on or adjacent to the runway or within the clear zone is so high that few uses are acceptable. The risk outside APZ I and APZ II, but within the 10 nautical mile radius area, is significant, but is acceptable if sound engineering and planning practices are followed.

Land use guidelines for APZs I and II have been developed. The main objective has been to restrict all people-intensive uses because there is greater risk in these areas. The basic guidelines aim at prevention of uses that:

- Have high residential density characteristics.
- Have high labor intensity.
- Involve above-ground explosive, fire, toxic, corrosive, or other hazardous characteristics.
- Promote population concentrations.
- Involve utilities and services required for area-wide population, where disruption would have an adverse impact (telephone, gas, etc.).
- Concentrate people who are unable to respond to emergency situations, such as children, elderly, handicapped, etc.
- Pose hazards to aircraft operations.

There is no question that these guidelines are relative. Ideally, there should be no people-intensive uses in either of these APZs. The free market and private property systems prevent this where there is land development demand. To go beyond these guidelines, however, substantially increases risk by placing more people in areas where there may ultimately be an aircraft accident.

A.7 Noise

Nearly all studies analyzing aircraft noise and residential compatibility recommend no residential uses in noise zones above DNL 75 dB. Usually, no restrictions are recommended below noise zone DNL 65 dB. Between DNL 65-75 dB there is currently no consensus. These areas may not qualify for federal mortgage insurance in residential categories according to the Department of Housing and Urban Development (HUD) Regulation 24 CFR 51B. In many cases, HUD approval requires noise attenuation measures, the Regional Administrator's concurrence, and an Environmental Impact Statement. The Department of Veterans Affairs also has airfield noise and accident restrictions which apply to their home loan guarantee program. Whenever possible, residential land use should be located below DNL 65 dB according to Air Force land use recommendations.

Most industrial/manufacturing uses are compatible in the airfield environs. Exceptions are uses such as research or scientific activities which require lower noise levels. Noise attenuation measures are recommended for portions of buildings devoted to office use, receiving the public, or where the normal background noise level is low.

The transportation, communications, and utilities categories have a high noise level compatibility because they generally are not people-intensive. When people use land for these purposes, the use is generally very short in duration. Where buildings are required for these uses, additional evaluation is warranted.

The commercial/retail trade and personal and business services categories are compatible without restriction up to DNL 70 dB; however, they are generally incompatible above DNL 80 dB. Between

DNLs 70-80 dB, noise level reduction measures should be included in the design and construction of buildings.

The nature of most uses in the public and quasi-public services category requires a quieter environment, and attempts should be made to locate these uses below DNL 65 dB (an Air Force land use recommendation), or else provide adequate noise level reduction.

Although recreational use has often been recommended as compatible with high noise levels, recent research has resulted in a more conservative view. Above DNL 75 dB, noise becomes a factor which limits the ability to enjoy such uses. Where the requirement to hear is a function of the use (i.e., music shell, etc.), compatibility is limited. Buildings associated with golf courses and similar uses should be noise attenuated.

With the exception of forestry activities and livestock farming, uses in the resources production, extraction, and open space category are compatible almost without restrictions.

APPENDIX B

ACCIDENT POTENTIAL ZONES

B.1 Guidelines For Accident Potential

Urban areas around airports are exposed to the possibility of aircraft accidents even with well-maintained aircraft and highly trained aircraft crews. Despite stringent maintenance requirements and countless hours of training, past history makes it clear that accidents are going to occur.

When the AICUZ program began there were no current comprehensive studies on accident potential. In support of the program, the Air Force completed a study of Air Force accidents that occurred between 1968 and 1972 within 10 nautical miles of airfields. The study of 369 accidents revealed that 75 percent of aircraft accidents occurred on or adjacent to the runway (1,000 feet to each side of the runway centerline) and in a corridor 3,000 feet (1,500 feet either side of the runway centerline) wide, extending from the runway threshold along the extended runway centerline for a distance of 15,000 feet.

Three zones were established based on crash patterns: The clear zone, accident potential zone (APZ) I, and accident potential zone (APZ) II. The clear zone starts at the end of the runway and extends outward 3,000 feet. It has the highest accident potential of the three zones. The Air Force has adopted a policy of acquiring property rights to areas designated as clear zones because of the high accident potential. APZ I extends from the clear zone an additional 5,000 feet. It includes an area of reduced accident potential. APZ II extends from APZ I an additional 7,000 feet in an area of further reduced accident potential.

The Air Force research work in accident potential was the first significant effort in this subject area since 1952 when the President's Airport Commission published "The Airport and Its Neighbors," better known as the "Doolittle Report." The recommendations of this earlier report were influential in the formulation of the accident potential zone concept.

The risk to people on the ground of being killed or injured by aircraft accidents is small. However, an aircraft accident is a high consequence event and when a crash does occur, the result is often catastrophic. Because of this, the Air Force does not attempt to base its safety standards on accident probabilities. Instead, the Air Force approaches this safety issue from a land use planning perspective.

B.2 Accident Potential Analysis

Military aircraft accidents differ from commercial air carrier and general aviation accidents because of the variety of aircraft used, the type of missions, and the number of training flights. In 1973, the

U.S. Air Force (USAF) performed a service-wide aircraft accident hazard study in order to identify land near airfields with significant accident potential. Accidents studied occurred within ten nautical miles of airfields and were related airfield-associated in-flight mishaps.

The study reviewed 369 major USAF accidents during 1968-1972, and found that 61 percent of the accidents were related to landing operations and 39 percent were takeoff related. It also found that 70 percent occurred in daylight, and that fighter and training aircraft accounted for 80 percent of the accidents.

Because the purpose of the study was to identify accident hazards, the study plotted each of the 369 accidents in relation to the airfield. This plotting found that the accidents clustered along the runway and its extended centerline. To further refine this clustering, a tabulation was prepared which described the cumulative frequency of accidents as a function of distance from the runway centerline along the extended centerline. This analysis was done for widths of 2,000, 3,000, and 4,000 total feet. The location analysis found the following:

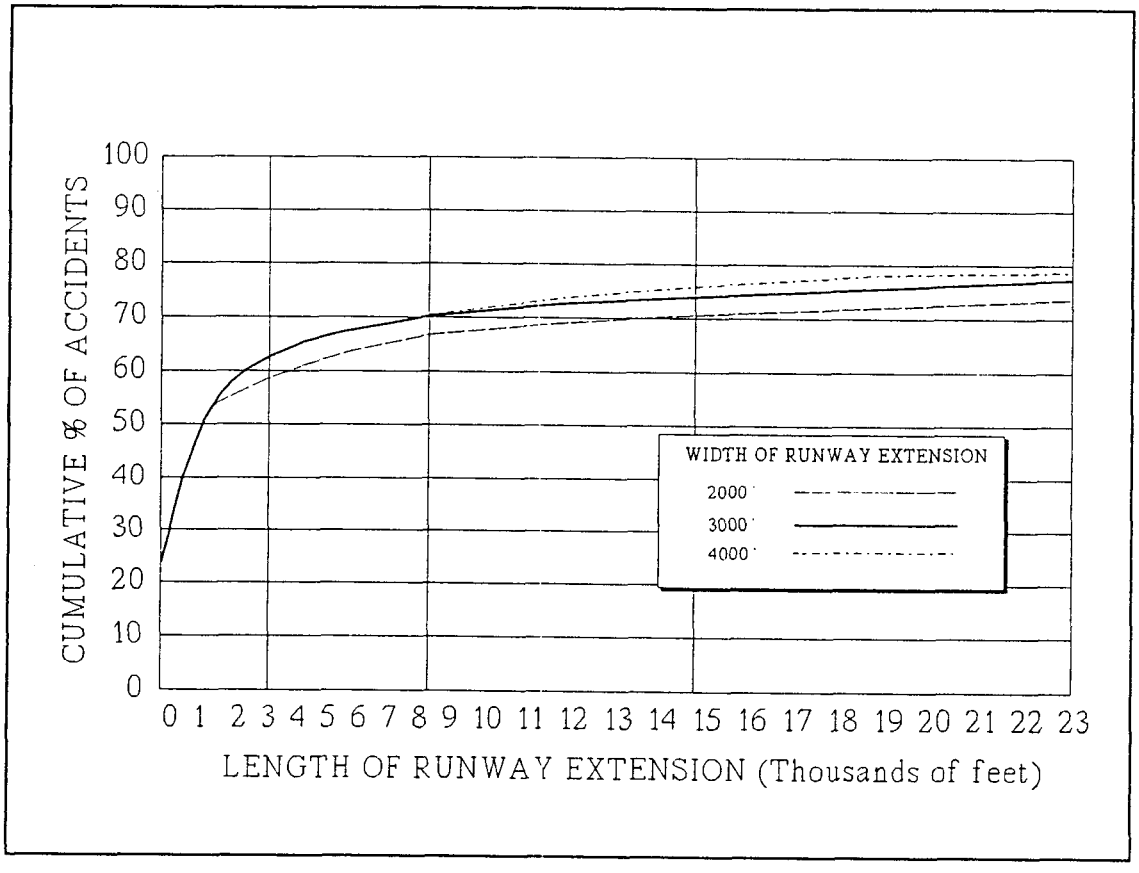
Table B.1 LOCATION ANALYSIS

	Width of Runway Extension (Feet)		
Length From Both Ends of Runway (feet)	2,000	3,000	4,000
Percent of Accidents			
On or Adjacent to Runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	35	39	39
3,000 to 8,000	8	8	8
8,000 to 15,000	5	5	7
Cumulative Percent of Accidents			
On or Adjacent to Runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	58	62	62
3,000 to 8,000	66	70	70
8,000 to 15,000	71	75	77

Figure B-1 indicates that the cumulative number of accidents rises rapidly from the end of the runway to 3,000 feet, rises more gradually to 8,000 feet, then continues at about the same rate of increase to 15,000 feet, where it levels off. The location analysis also indicates that the optimum width of the runway extension, which would include the maximum percentage of accidents in the smallest area, is 3,000 feet.

Figure B-1

DISTRIBUTION OF AIR FORCE AIRCRAFT ACCIDENTS

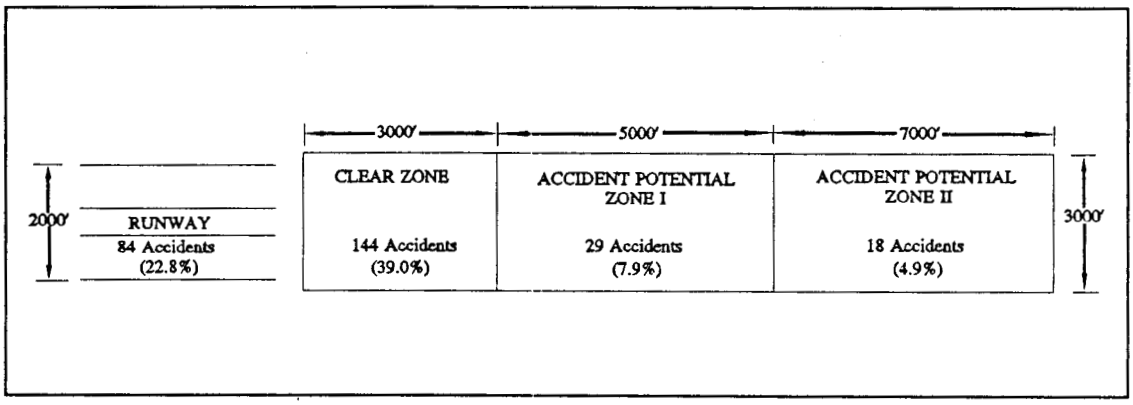


Using the optimum runway extension width, 3,000 feet, and the cumulative distribution of accidents from the end of the runway, zones were established which minimized the land area included and maximized the percentage of accidents included. The zone dimensions and accident statistics for the 1968-1972 study are shown in Figure B-2.

Figure B-2

AIR FORCE AIRCRAFT ACCIDENT DATA

(369 Accidents - 1968-1972)



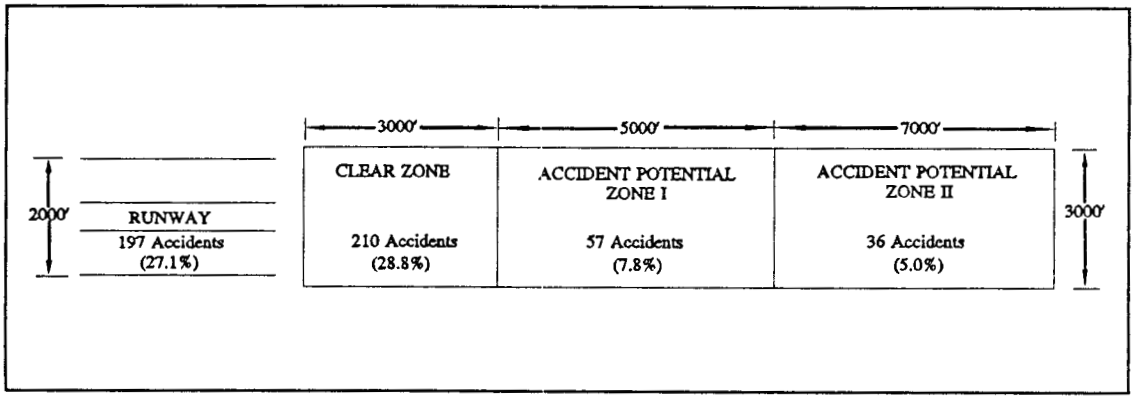
Other Accidents Within 10 Nautical Miles
94 Accidents
25.4%

The original study was updated to include accidents through 1985. The updated study now includes 728 accidents during the 1968-1985 period. Using the optimum runway extension width of 3,000 feet, the accident statistics of the updated study are shown below.

Figure B-3

AIR FORCE AIRCRAFT ACCIDENT DATA

(728 Accidents - 1968-1985)



Other Accidents Within 10 Nautical Miles
228 Accidents
31.3%

Using the designated zones and accident data, it is possible to calculate a ratio of percentage of accidents to percentage of area size. These ratios indicate that the clear zone, with the smallest area size and the highest number of accidents, has the highest ratio, followed by the runway and adjacent area, APZ I, and then APZ II.

Table B.2 **ACCIDENT TO AREA RATIO**

Ratio of Percentage of Accidents to Percentage of Area (Air Force Accident Data 1968 - 1985)						
	Area[1] (acres)	Number[2] Accident	Accident Per Acre	% Total Area	% Total Accident	Ratio:[3] Accident to Area
Runway Area	487	197	1 Per 2.5	0.165	27.1	164
Clear Zone	413	210	1 Per 1.9	0.140	28.8	206
APZ I	689	57	1 Per 12.1	0.233	7.8	33
APZ II	964	36	1 Per 26.7	0.327	5.0	15
Other	292,483	228	1 Per 1282.8	99.135	31.3	.3

1. Area includes land within 10 nautical miles of runway.

2. Total number of accidents is 728 (through 1985).

3. Percent total accidents divided by percent total area.

Additional accident data for 1986 through July 1990 has been analyzed. Specific locational data for some of the 1986-1990 accidents was not available, and these were not included in the analysis. The following is a comparison of data through 1985 and data through July 1990:

Table B.3 **ADDITIONAL ACCIDENT DATA**

ZONE	1968-1985	1968-1990
On-Runway	197-27.1 %	199-24.7 %
Clear Zone	210-28.8 %	226-28.1 %
APZ I	57-7.8 %	84-10.4 %
APZ II	36-5.0 %	45-5.6 %
Other (Within Ten NM)	228-31.3 %	251-31.2 %

Analysis has shown that the cumulative changes evident in accident location through July 1990 reconfirm the dimensions of the clear zones and accident potential zones.

B.3 Definable Debris Impact Areas

The Air Force also determined which accidents had definable debris impact areas, and in what phase of flight the accident occurred. Overall, 75 percent of the accidents had definable debris impact areas, although they varied in size by type of accident.

The Air Force used weighted averages of impact areas, for accidents occurring only in the approach and departure phase, to determine the following average impact areas:

Average Impact Areas for Approach and Departure Accidents

Overall Average Impact Area	5.06 acres
Fighter, Trainer, and Misc. Aircraft	2.73 acres
Heavy Bomber and Tanker Aircraft	8.73 acres

B.4 Findings

- Designation of safety zones around the airfield and restriction of incompatible land uses can reduce the public's exposure to safety hazards.
- Air Force accident studies have found that aircraft accidents near Air Force installations occurred in the following patterns:
  - 61% were related to landing operations.
  - 39% were related to takeoff operations.

- 70% occurred in daylight.
- 80% were related to fighter and training aircraft operations.
- 27% occurred on the runway or within an area extending 1,000 feet out from each side of the runway.
- 29% occurred in an area extending from the end of the runway to 3,000 feet along the extended centerline and 3,000 feet wide, centered on the extended centerline.
- 13% occurred in an area between 3,000 and 15,000 feet along the extended runway centerline and 3,000 feet wide, centered on the extended centerline.

- U.S. Air Force aircraft accident statistics found that 75% of aircraft accidents resulted in definable impact areas. The size of the impact areas were:
  - 5.1 acres overall average.
  - 2.7 acres for fighters and trainers.
  - 8.7 acres for heavy bombers and tankers.

APPENDIX C

DESCRIPTION OF THE NOISE ENVIRONMENT

C.1 Noise Contours

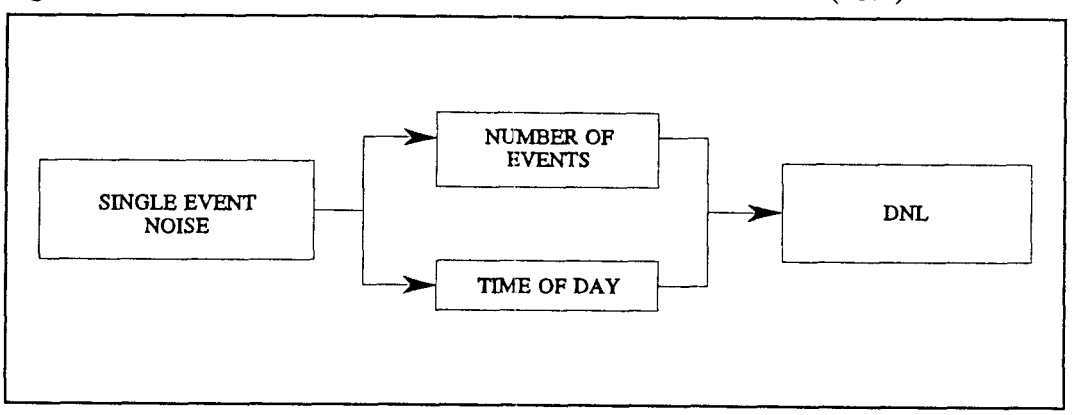
The following paragraphs describe the methodologies used to produce the noise contours contained in this AICUZ Study.

C.2 Noise Environment Descriptor

The noise contour methodology used herein is the Day-Night Average A-Weighted Sound Level (DNL) metric for describing the noise environment. Efforts to provide a national uniform standard for noise assessment have resulted in adoption by the Environmental Protection Agency of DNL as the standard noise prediction metric for this procedure. The Air Force uses the DNL descriptor as the method to assess the amount of exposure to aircraft noise and predict community response to the various levels of exposure. The DNL values used for planning purposes are 65, 70, 75, and 80+ dB. Land use guidelines are based on the compatibility of various land uses with these noise exposure levels. DNL is a measurable quantity and can be measured directly.

It is generally recognized that a noise environment descriptor should consider, in addition to the annoyance of a single event, the effect of repetition of such events and the time of day in which these events occur. DNL begins with a single event descriptor and adds corrections for the number of events and the time of day. Since the primary development concern is residential, nighttime events are considered more annoying than daytime events and are weighted accordingly. DNL values are computed from the single event noise descriptor, plus corrections for number of flights and time of day (Figure C-1).

Figure C-1 DAY-NIGHT AVERAGE A-WEIGHTED SOUND LEVEL (DNL)

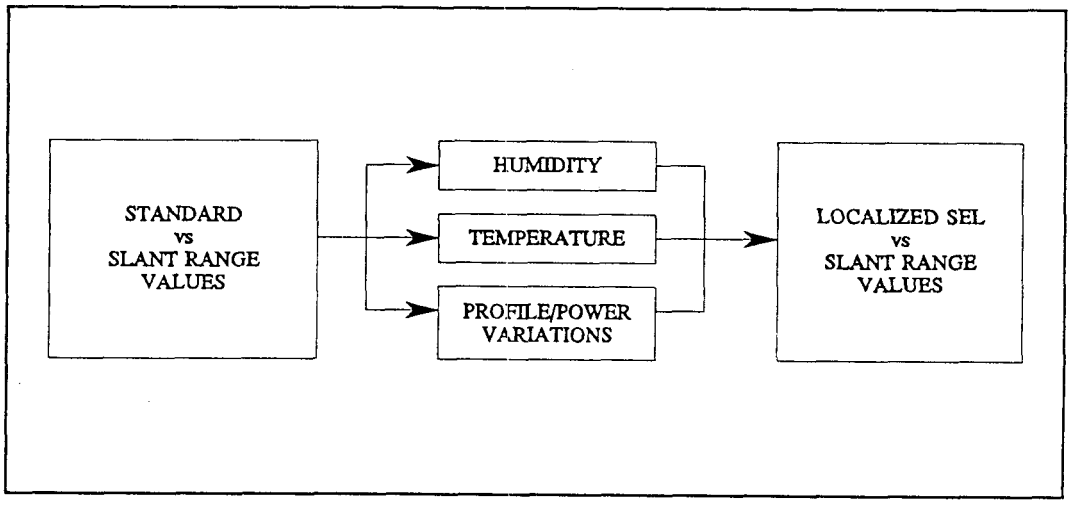


As part of the extensive data collection process, detailed information is gathered on the type of aircraft and number and time of day of flying operations for each flight track during a typical day. This information is used in conjunction with the single event noise descriptor to produce DNL values. These values are combined on an energy summation basis to provide single DNL values for the mix of aircraft operations at the base. Equal value points are connected to form the contour lines.

C.3 Noise Event Descriptor

The single event noise descriptor used in the DNL system is the Sound Exposure Level (SEL). The SEL measure is an integration of an "A" weighted noise level over the period of a single event, such as an aircraft flyover, in dB. Frequency, magnitude, and duration vary according to aircraft type, engine type, and power setting. Therefore, individual aircraft noise data are collected for various types of aircraft/engines at different power settings and phases of flight. The following diagram shows the relationship of the single event noise descriptor (SEL) to the source sound energy.

Figure C-2 SOUND EXPOSURE LEVEL (SEL)



SEL vs. 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 Air Force's Armstrong Laboratory (AL), and carried out by AL. These standard day, sea level values form the basis for the individual event noise descriptors at any location and are adjusted to the location by applying appropriate corrections for temperature, humidity, and variations from standard profiles and power settings.

Ground-to-ground sound propagation characteristics are used for altitudes up to 500 feet absolute with linear transition between 500 and 700 feet and air-to-ground propagation characteristics above 700 feet.

In addition to the assessment of aircraft flight operations, the DNL system also incorporates noise resulting from engine/aircraft maintenance checks on the ground. Data concerning the orientation of the noise source, type of aircraft or engine, number of test runs on a typical day, power settings used and their duration, and use of suppression devices are collected for each ground run up or test position. This information is processed and the noise contribution added (on an energy summation basis) to the noise generated by flying operations to produce noise contours reflecting the overall noise environment with respect to aircraft air and ground operations.

C.4 Noise Contour Production

Data describing flight track distances and turns, altitudes, airspeeds, power settings, flight track operational utilization, maintenance locations, ground runup engine power settings, and number and duration of runs by type of aircraft/engine is assembled by each AFB. The data is screened by the Major Command (MAJCOM) and Headquarters, Air Force Center for Environmental Excellence (HQ AFCEE/DGP). Trained personnel process the data for input into a central computer. Flight track maps are generated for verification and approval by the base/MAJCOM. After any required changes have been incorporated, DNL contours are generated by the computer using the supplied data and standard source noise data corrected to local weather conditions. These contours are plotted and prepared for photographic reproduction. A set of these contours is provided in the body of the report.

Additional technical information on the DNL procedures are available in the following publications:

- *Community Noise Exposure Resulting from Aircraft Operations: Applications Guide for Predictive Procedure*, AMRL-TR-73-105, November 1974, from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151.
- *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with Adequate Margin of Safety*, EPA Report 550/9-74-004, March 1974, from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

APPENDIX D

HEIGHT AND OBSTRUCTIONS CRITERIA

D.1 Height And Obstructions Criteria

D.1.1 General

This appendix establishes criteria for determining whether an object or structure is an obstruction to air navigation. Obstructions to air navigation are considered to be:

- Natural objects or man-made structures that protrude above the planes or surfaces as defined in the following paragraphs, and/or;
- Man-made objects that extend more than 500 feet above the ground at the site of the structure.

D.1.2 Explanation of Terms

The following will apply (see Figure D-1):

- Controlling Elevation. Whenever surfaces or planes within the obstructions criteria overlap, the controlling (or governing) elevation becomes that of the lowest surface or plane.
- Runway Length. Malmstrom AFB has one runway with 11,500 feet of pavement designed and built for sustained aircraft landings and takeoffs.
- Established Airfield Elevation. The elevation, in feet above mean sea level, for Malmstrom AFB is 3,526 feet.
- Dimensions. All dimensions are measured horizontally unless otherwise noted.

D.1.3 Planes and Surfaces.

Definitions are as follows:

- Primary Surface. This surface defines the limits of the obstruction clearance requirements in the immediate vicinity of the landing area. The primary surface comprises surfaces of the runway, runway shoulders, and lateral safety zones and extends 200 feet beyond the runway end. The width of the primary surface for a single class "B" runway is 2,000 feet, or 1,000 feet on each side of the runway centerline.
- Clear Zone Surface. This surface defines the limits of the obstruction clearance requirements in the vicinity contiguous to the end of the primary surface. The

length and width (for a single runway) of a clear zone surface is 3,000 feet by 3000 feet.

- Approach-Departure Clearance Surface. This surface is symmetrical about the extended runway centerline, begins as an inclined plane (glide angle) 200 feet beyond each end of the primary surface of the centerline elevation of the runway end, and extends for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 along the extended runway (glide angle) centerline until it reaches an elevation of 500 feet above the established airfield elevation. It then continues horizontally at this elevation to a point 50,000 feet from the start of the glide angle. The width of this surface at the runway end is 2,000 feet; it flares uniformly, and the width at 50,000 feet is 16,000 feet.
- Inner Horizontal Surface. This surface is a plane, oval in shape at a height of 150 feet above the established airfield elevation. It is constructed by scribing an arc with a radius of 7,500 feet above the centerline at the end of the runway and interconnecting these arcs with tangents.
- Conical Surface. This is an inclined surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation. The slope of the conical surface is 20:1.
- Outer Horizontal Surface. This surface is a plane located 500 feet above the established airfield elevation. It extends for a horizontal distance of 30,000 feet from the outer periphery of the conical surface.
- Transitional Surfaces. These surfaces connect the primary surfaces, clear zone surfaces, and approach-departure clearance surfaces to the outer horizontal surface, conical surface, other horizontal surface, or other transitional surfaces. The slope of the transitional surface is 7:1 outward and upward at right angles to the runway centerline. To determine the elevation for the beginning of the transitional surface slope at any point along the lateral boundary of the primary surface, including the clear zone, draw a line from this point to the runway centerline. This line will be at right angles to the runway axis. The elevation at the runway centerline is the elevation for the beginning of the 7:1 slope.

The land areas outlined by these criteria should be regulated to prevent uses which might otherwise be hazardous to aircraft operations. The following uses should be restricted and/or prohibited.

- Uses which release into the air any substance which would impair visibility or otherwise interfere with the operation of aircraft (i.e. steam, dust, or smoke).
- Uses which produce light emissions, either direct or indirect (reflective), which would interfere with pilot vision.
- Uses which produce electrical emissions which would interfere with aircraft communications systems or navigational equipment.
- Uses which would attract birds or waterfowl, including but not limited to, operation of sanitary landfills, maintenance of feeding stations, or the growing of certain vegetation.
- Uses that provide for structures within ten feet of aircraft approach-departure and/or transitional surfaces.

D.2 Height Restrictions

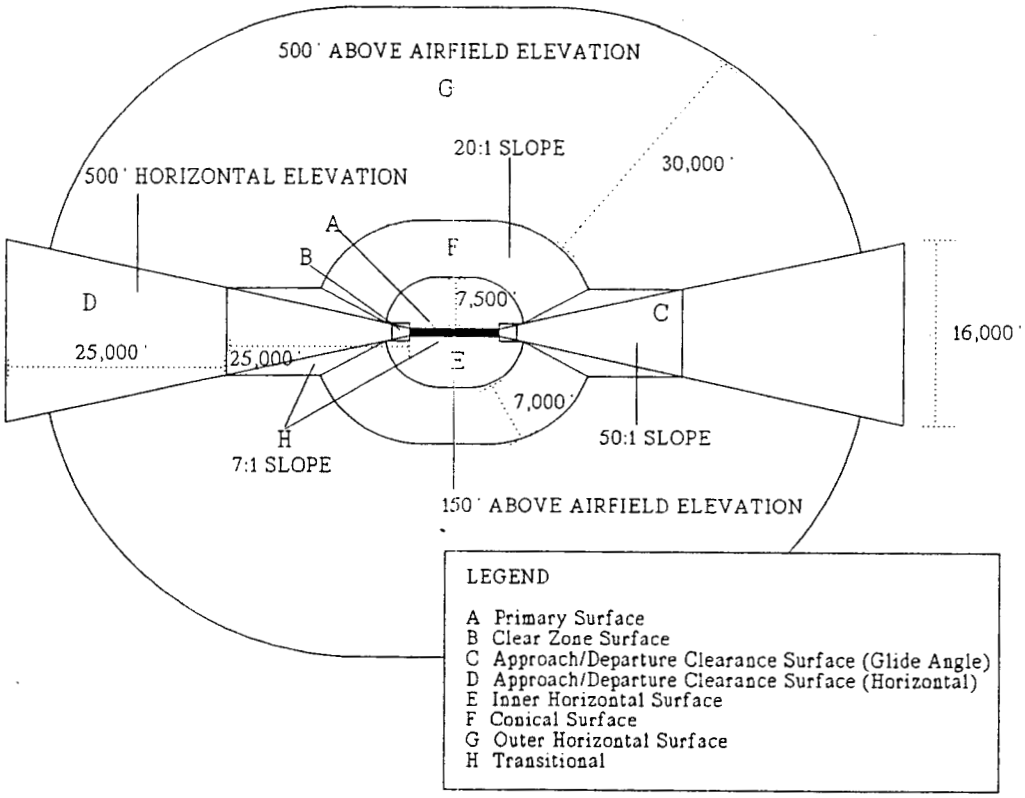
City/County agencies involved with approvals of permits for construction should require developers to submit calculations which show that projects meet the height restriction criteria of FAR Part 77 as described, in part, by the information contained in this Appendix.

Malmstrom AFB, Montana

Coordinates and Elevations

Airport Elevation		3,526 Ft. MSL
Coordinates	RUNWAY 03/21	Lat. 47° 29′ 39.3″ N Long. 111° 11′ 58.9″ W
		Lat. 47° 31′ 3.1″ N Long. 111° 10′ 6.1″ W

Figure D-1
AIRSPACE CONTROL SURFACE PLAN



For a more complete description of airspace control surfaces, refer to FAR Part 77, Subpart C or AFR 86-14.

APPENDIX E

NOISE LEVEL REDUCTION GUIDELINES

A study which provides in-depth, state-of-the-art noise level reduction guidelines was completed for the Naval Facilities Engineering Command and the Federal Aviation Administration, by Wyle Laboratories in November 1989. The study title is *Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations*, Wyle Research Report WR 89-7. A copy of this study may be obtained by calling the Defense Technical Information Center at 1-800-225-3842.

APPENDIX F

SAMPLE POPULATION DENSITY GUIDELINES

Uses are compatible if they do not result in a gathering of individuals in an area that would result in an average density of greater than 25 persons per acre per hour during a 24 hour period, not to exceed 50 persons per acre at any time. Population density guidelines where developed by the Sacramento Area Council of Governments.

F.1 Average Density

Average densities of persons per hour during a 24-hour period are determined by calculating the number of persons per acre expected on a site, multiplying by the number of hours they will be on the site, and dividing the total by 24.

- Example #1. One 8-hour shift of 30 workers on a one acre site.
  Avg. density = 30 persons expected X 8-hours on site = 240
  Then 240/24=10: Thus avg. density = 10 persons per acre per hour per a 24-hour period.

- Example #2. Two 8-hour shifts of 30 workers on a one acre site.
  Avg. density = 30 persons expected X 16 hours on site = 480
  Then 480/24=20: Thus avg. density = 20 persons per acre per hour per a 24-hour period.

F.2 Maximum Density

The maximum number of persons allowed per acre per hour is calculated by dividing the number of hours persons will be on site by 24 hours, and then dividing 25 persons per acre per hour by the result. The resulting number is the maximum number of persons allowed per acre per hour, provided it does not exceed 50. Fifty persons per acre at any one time is the maximum number of persons allowed under the standard.

- Example. Maximum density for two 8-hour shifts on a one acre site.
- 25 divided by 16/24 = 37.5 persons per acre per hour allowed.

Application of this formula results in the following table which specifies the maximum persons per acre per hour for the duration of the time that persons are expected to be on site during a 24-hour period.

Table F.1 **PERSONS PER ACRE**

HOURS OF OPERATION PER DAY	MAXIMUM PERSONS ALLOWED PER ACRE/DURING EACH HOUR
24	25
23	26
22	27
21	28
20	30
19	31
18	33
17	35
16	37
15	40
14	42
13	46
12 or Less	50*

Notes: ▪ Fractions in the maximum persons allowed column are rounded to the lowest whole number.

* Concentration of people may not exceed 50 people/acre at any time.

BIOGRAPHY

United States Air Force

91st Air Refueling Squadron
Malmstrom AFB, MT 59402-7533

COLONEL (select) SILVANUS T. GILBERT III

Lt Col Gilbert was born in Florence, South Carolina, on October 29, 1956. He was an honor graduate from the United States Air Force Academy, Colorado, in 1978 with a Bachelor of Science Degree in Civil Engineering. Upon commissioning, he entered Undergraduate Pilot Training at Reese Air Force Base, Texas. A distinguished graduate from pilot training, he remained at Reese Air Force Base as a T-38 Instructor Pilot and Flight Examiner. In 1982, he received an Olmsted Scholarship and transferred to the Defense Language Institute at the Presidio of Monterey, California, to study Mandarin Chinese.

In June 1983, Lt Col Gilbert became the first Air Force officer to attend graduate school in the Peoples Republic of China. He initially studied Chinese language at the Central Minorities Institute in Beijing, and then transferred to Shanghai where he studied economic theory at Fudan University. He completed a Masters Degree in Public Administration at Harvard University in 1986.

After transferring to Plattsburgh Air Force Base, New York, in 1986, he entered training in the FB-111 aircraft, and was subsequently assigned to the 528th Bombardment Squadron (Medium) where he served as Aircraft Commander, Chief of Scheduling, and Assistant Operations Officer. He then served as Wing Executive Officer until he was assigned to Air University in July 1990. Upon completion of Air Command and Staff College, Lt Col Gilbert was selected to be a member of the inaugural class at the School of Advanced Airpower Studies. From June 1992 to October 1993, he was assigned to the Chief of Staff's Operations Group, Headquarters, United States Air Force.

Lt Col Gilbert assumed command of the 91st Air Refueling Squadron on 28 October 1993. He is a senior pilot with over 2,300 hours in the T-38, FB-111, and KC-135R aircraft. He was a distinguished graduate of Squadron Officer School and Air Command and Staff College, and completed Marine Command and Staff College, Air War College, and National Security Management. His military decorations include the Meritorious Service Medal with two oak leaf clusters, the Aerial Achievement Medal, the Southwest Asia Service Medal and the Combat Readiness Medal.

He is married to Dores A. Candussi of Windsor, Ontario, Canada. They have a son, S. T., and a daughter, Saylor.

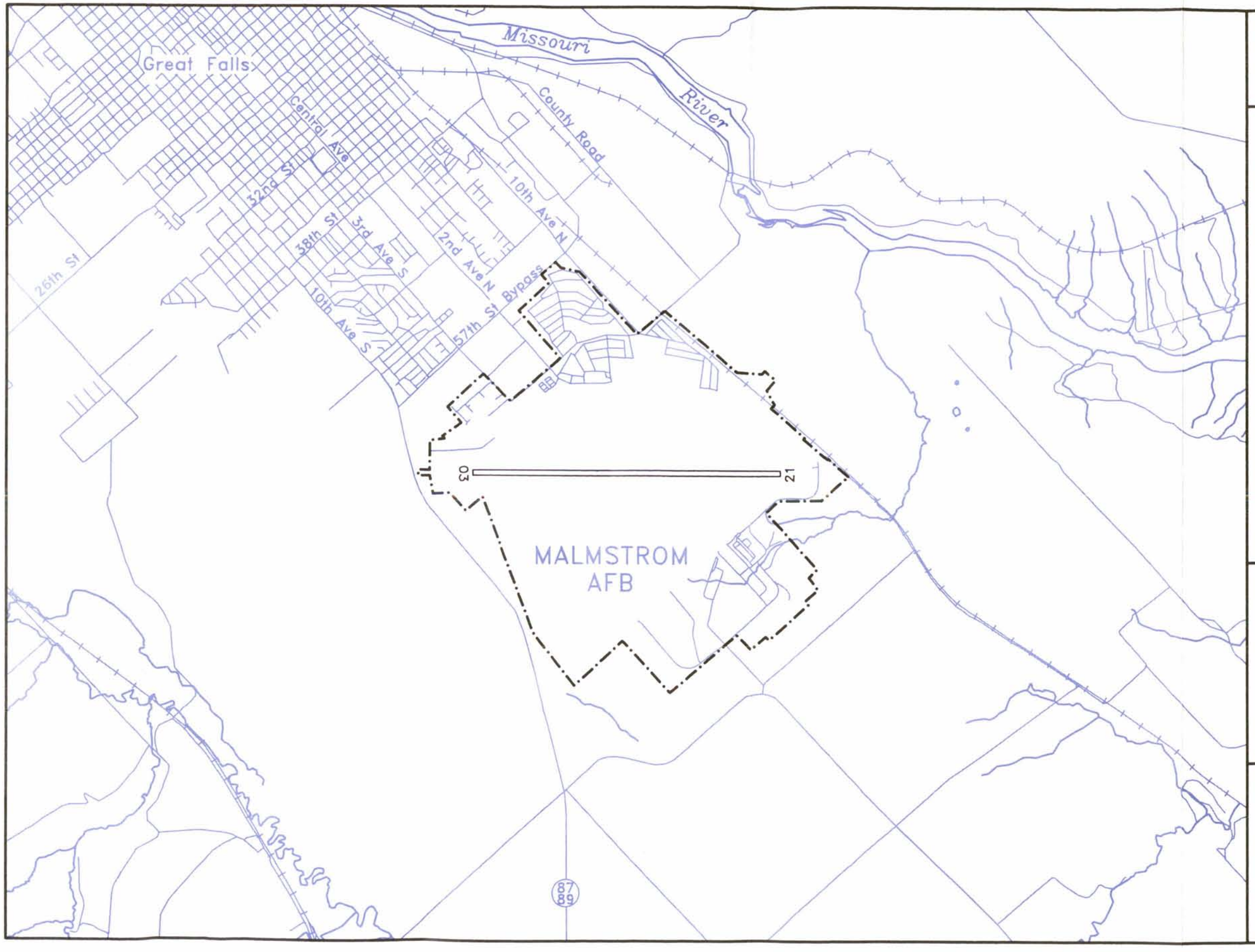


Figure 1

Malmstrom Air Force Base Vicinity

Legend:

Base Boundary

SOURCE:

(1) Bureau of the Census TIGER/Line Data–1990

True North

Magnetic North
Var. 16.2°E
Apr 1994

SCALE IN THOUSANDS OF FEET

0 3 6 9

Spectrum Sciences & Software, Inc.

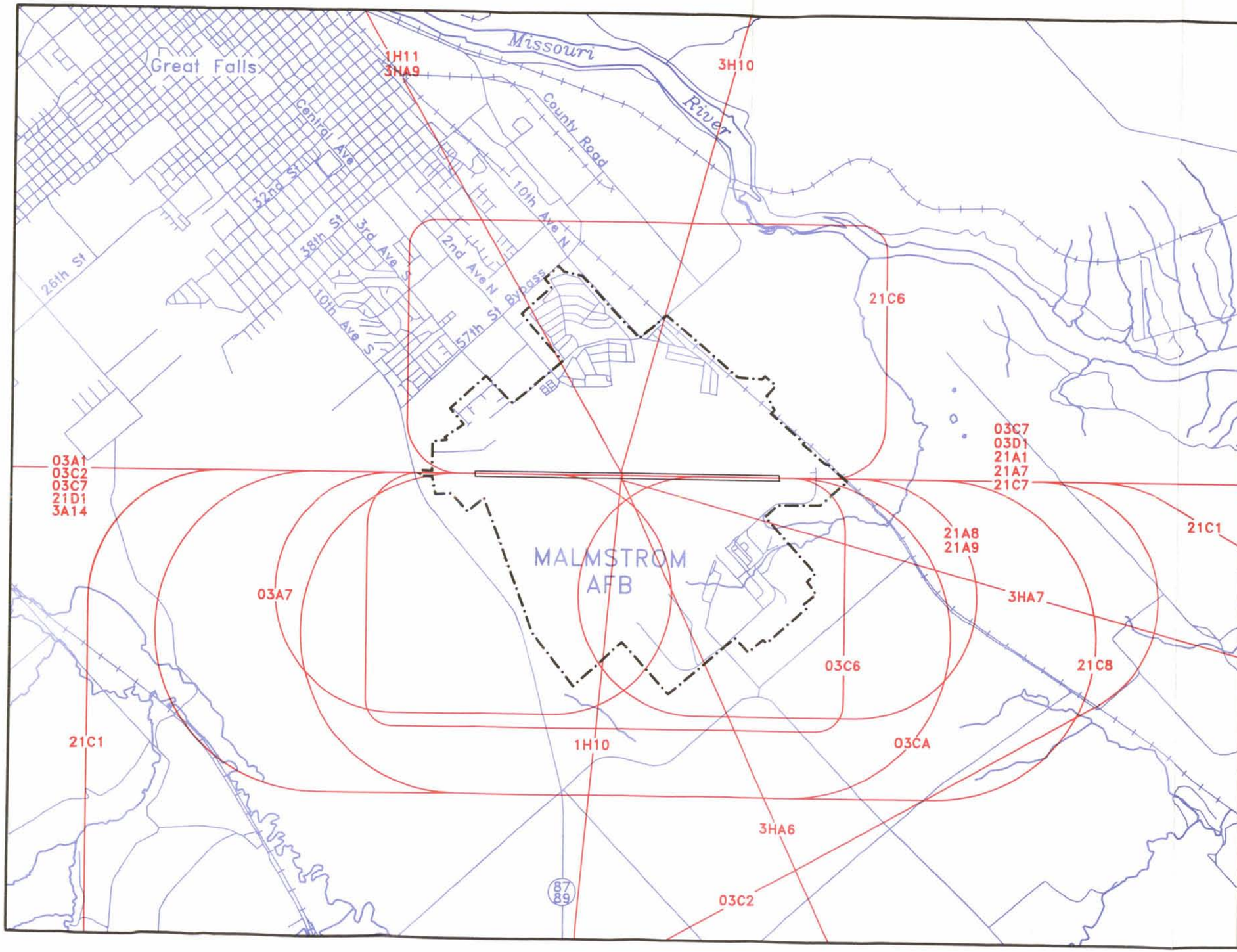


Figure 2

Malmstrom Air Force Base
Flight Tracks

SOURCES:

(1) Bureau of the Census
TIGER/Line Data–1990

(2) NOISEMAP Version 6.1

True North

Magnetic North
Var. 16.2°E
Apr 1994

SCALE IN THOUSANDS OF FEET

0 3 6 9

Spectrum Sciences & Software, Inc.

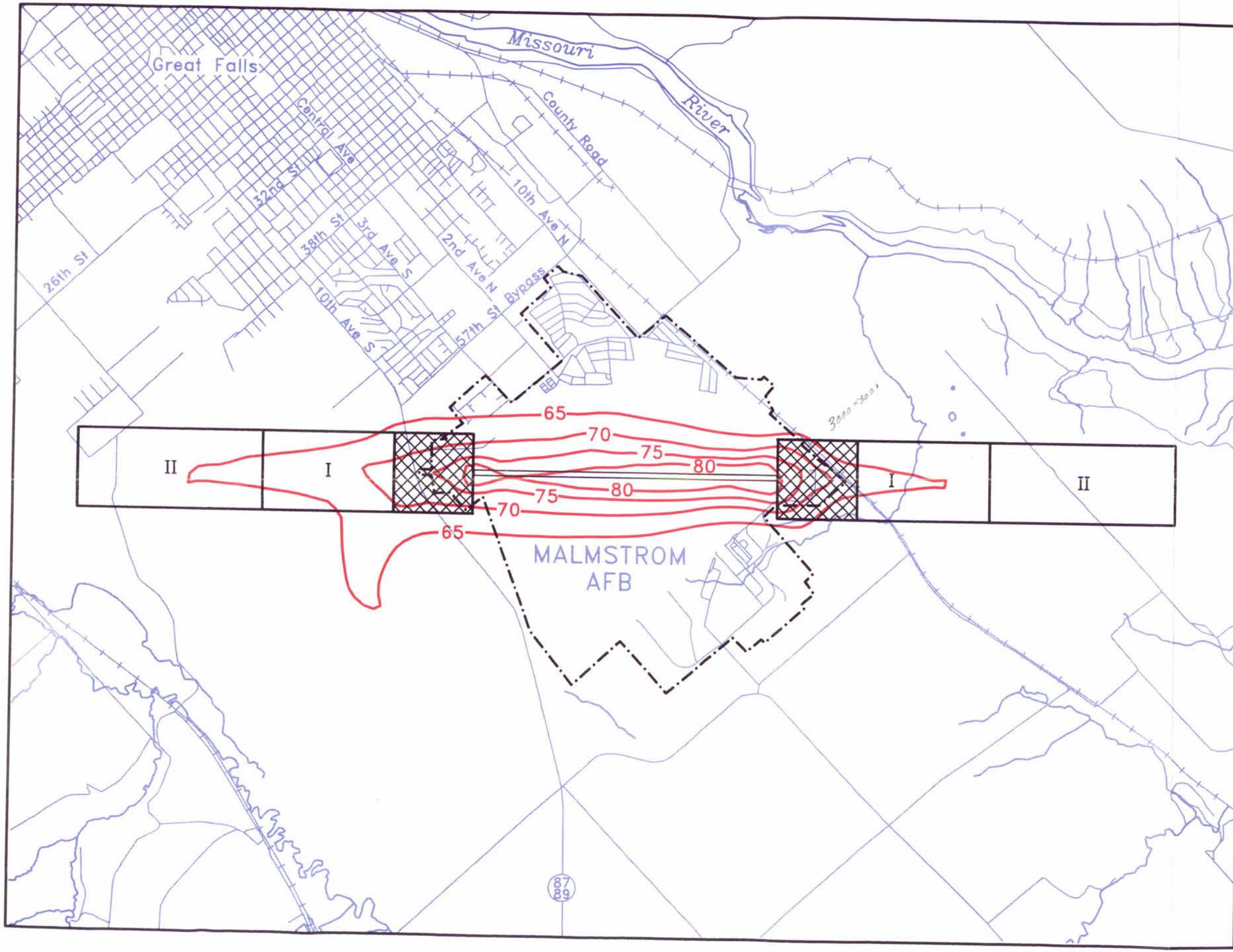


Figure 3

Malmstrom Air Force Base
Noise Zones and
Accident Potential Zones

Legend:

- Clear Zone
- I Accident Potential Zone I
- II Accident Potential Zone II

SOURCES:

(1) Bureau of the Census TIGER/Line Data-1990
(2) NOISEMAP Version 6.1

True North

Magnetic North
Var. 16.2°E
Apr 1994

SCALE IN THOUSANDS OF FEET

0 3 6 9

Spectrum Sciences & Software, Inc.

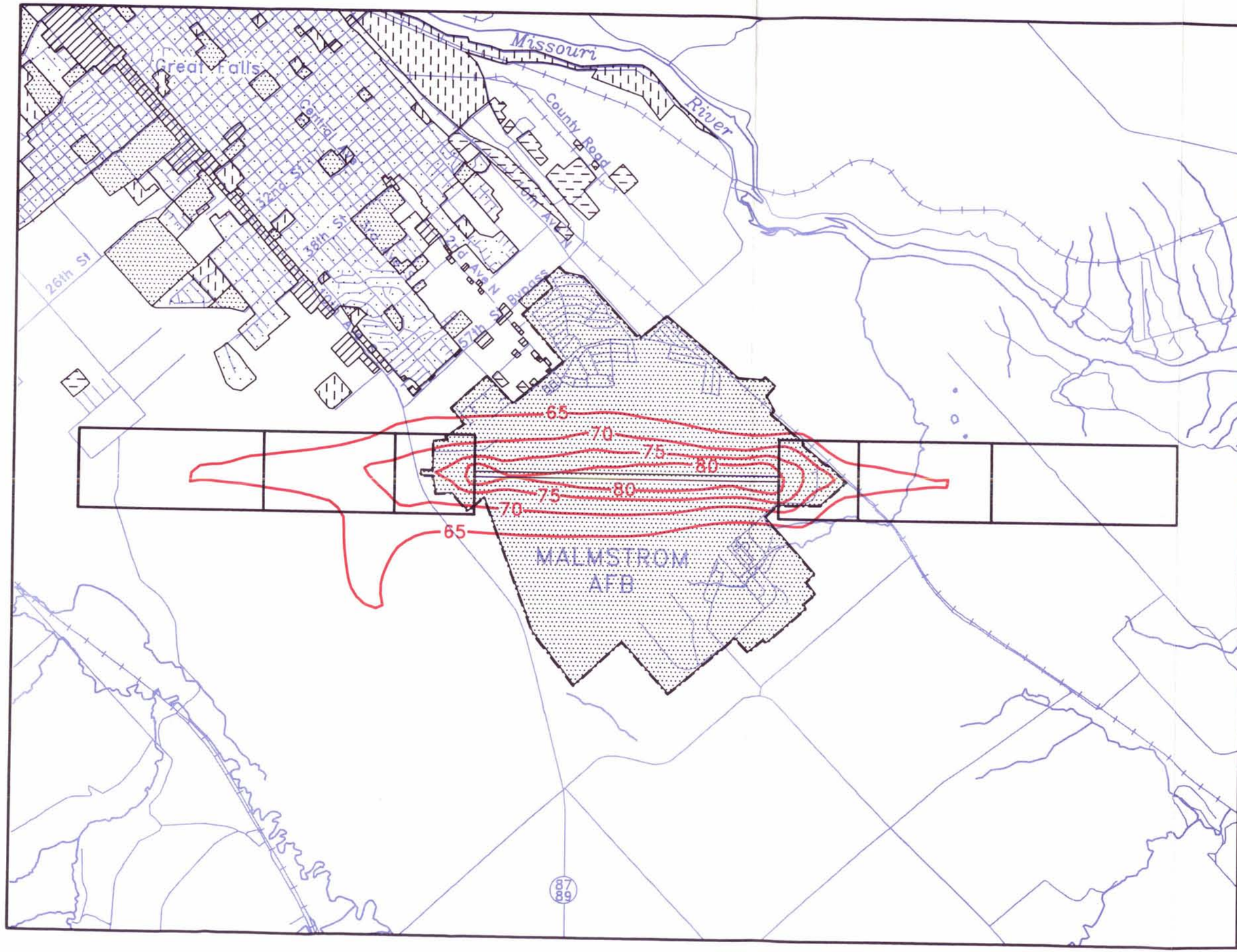


Figure 5

Malmstrom Air Force Base
Generalized
Existing Land Use

Legend:

- Residential
- Commercial
- Industrial
- Public/Quasi-Public
- Recreational
- Open/Agricultural/ Low Density

SOURCES:

(1) Bureau of the Census TIGER/Line Data-1990
(2) NOISEMAP Version 6.1
(3) Great Falls, MT Existing Land Use Map-1980, USGS 7.5' Topographic Charts-1975 Great Falls, MT & Vicinity Street Map-1991
(4) Field Survey Spectrum Sciences & Software-1993

True North

Magnetic North
Var. 16.2°E
Apr 1994

SCALE IN THOUSANDS OF FEET

0 3 6 9

Spectrum Sciences & Software, Inc.

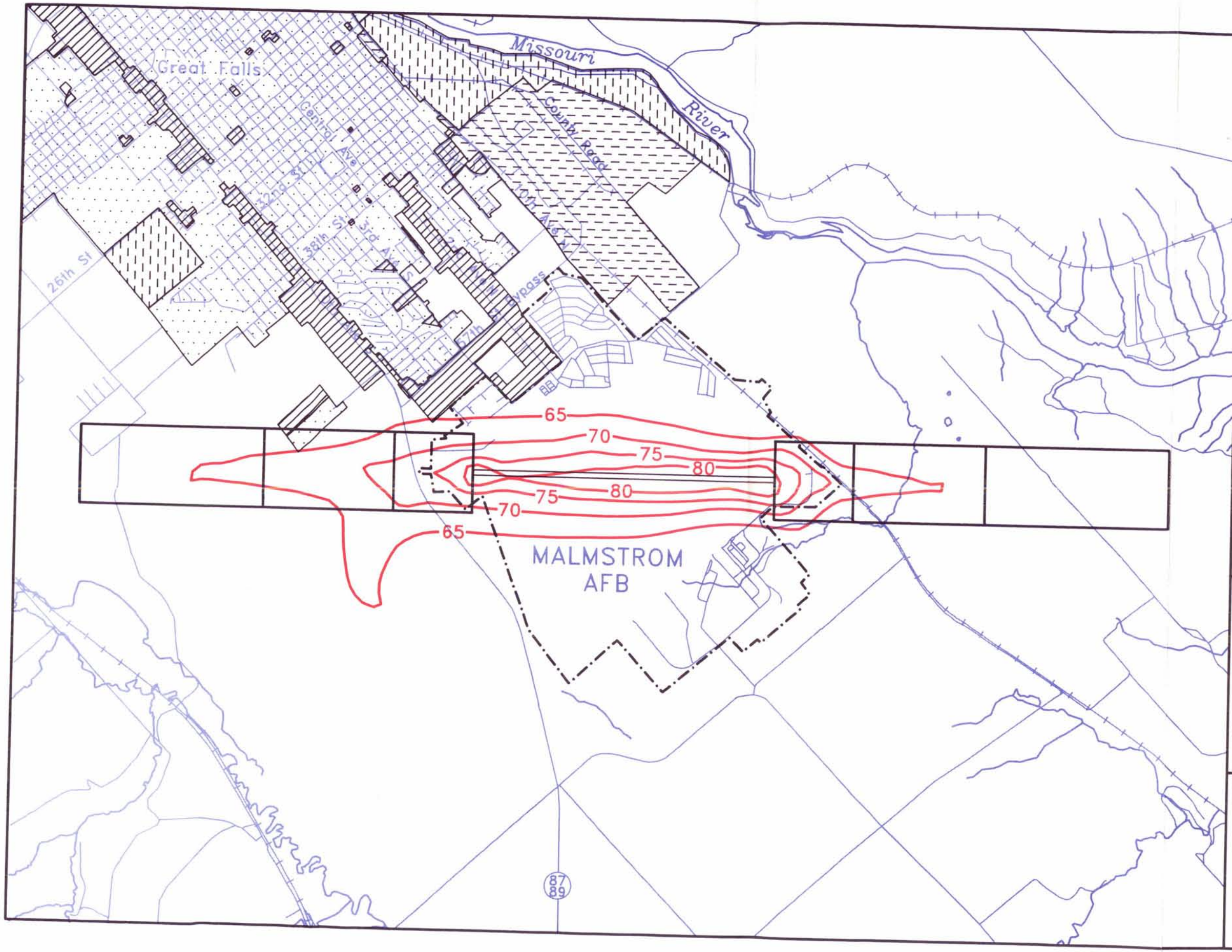


Figure 6

Malmstrom Air Force Base
Generalized
Zoning

Legend:

- Residential
- Commercial
- Industrial
- Recreational
- Open/Agricultural/ Low Density

SOURCES:

(1) Bureau of the Census TIGER/Line Data–1990
(2) NOISEMAP Version 6.1
(3) Zoning Maps:
City Of Great Falls, MT–1985
Revised–1993
Cascade County, MT–1981

True North

Magnetic North
Var. 16.2°E
Apr 1994

SCALE IN THOUSANDS OF FEET

0 3 6 9

Spectrum Sciences & Software, Inc.

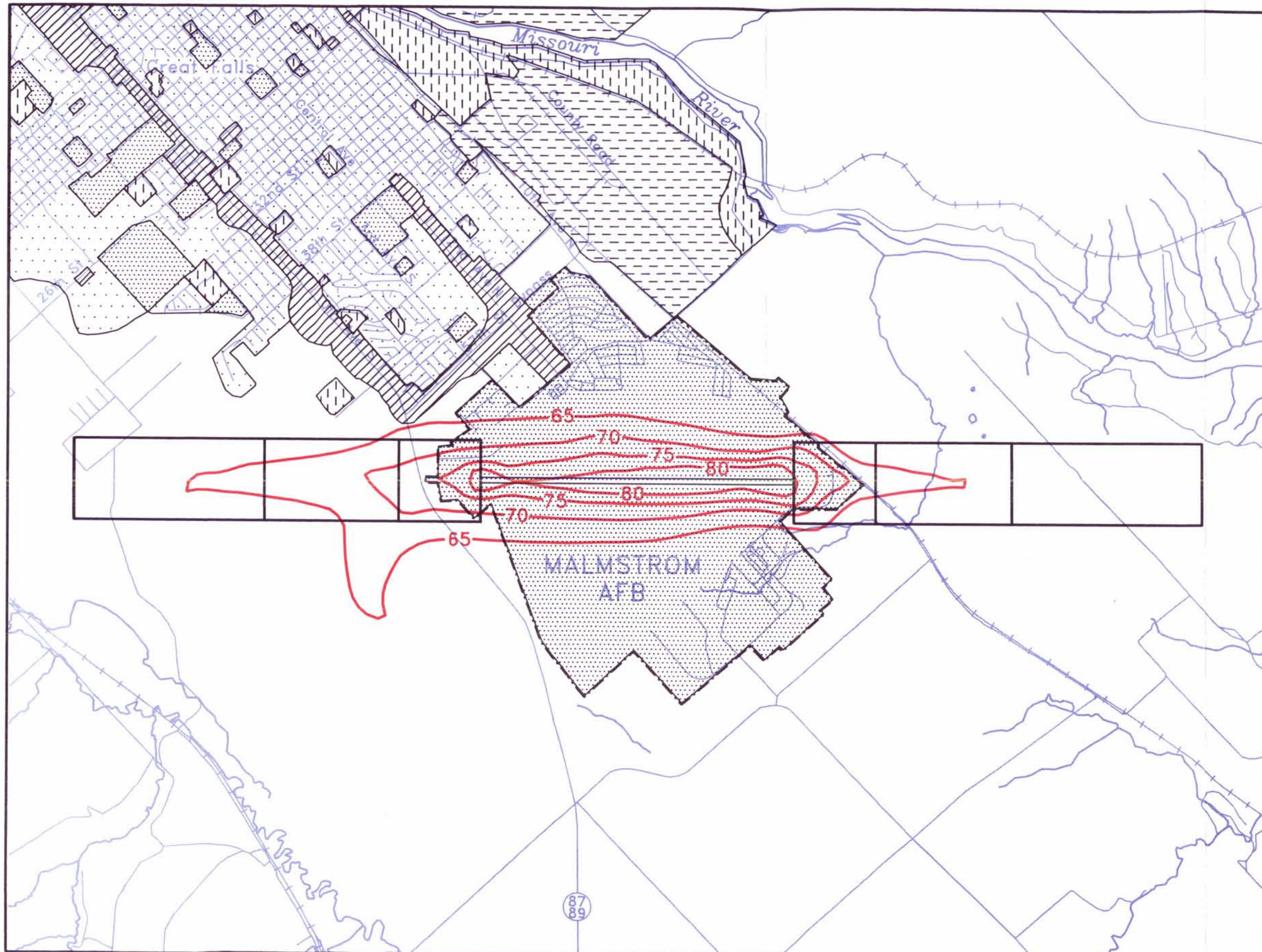


Figure 7

Malmstrom Air Force Base
Generalized
Future Land Use

Legend:

- Residential
- Commercial
- Industrial
- Public/Quasi-Public
- Recreational
- Open/Agricultural/ Low Density

SOURCES:

(1) Bureau of the Census TIGER/Line Data-1990
(2) NOISEMAP Version 6.1
(3) Year 2000 Land Use Projections-1981

True North

Magnetic North
Var. 16.2°E
Apr 1994

SCALE IN THOUSANDS OF FEET

0 3 6 9

Spectrum Sciences & Software, Inc.