ENVIRONMENTAL ASSESSMENT OF THE EXPANSION OF THE USE OF SELF-PROTECTION CHAFF AND FLARES AT THE UTAH TEST AND TRAINING RANGE HILL AIR FORCE BASE, UTAH

January 2000

HEADQUARTERS AIR FORCE RESERVE COMMAND
ENVIRONMENTAL DIVISION

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
388 FW	388th Fighter Wing
419 FW	419th Fighter Wing
ACC	Air Combat Command
ACHP	Advisory Council on Historic Preservation
AFB	Air Force Base
AFI	Air Force Instruction
AFOSH	Air Force Occupational and Environmental Safety, Fire Protection, and Health
AFPD	Air Force Policy Directive
AFRC	Air Force Reserve Command
AGL	Above Ground Level
AIRFA	American Indian Religious Freedom Action of 1978
Al_2O_3	aluminum oxide
ARPA	Archeological Resources Protection Act
AUM	Animal Unit Month
BASH	Bird Aircraft Strike Hazard
BLM	Bureau of Land Management
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FY	Fiscal Year
HAP	High Accident Potential
HQ	Headquarters
IFR	Instrument Flight Rules
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
IMC	Instrument Meteorological Conditions
IR	Instrument Route
km^2	square kilometers
LANTIRN	Low Altitude Navigation and Targeting Infrared for Night
mg/L	milligrams per liter
MOA	Military Operations Area
MSL	Mean Sea Level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NEPA	National Environmental Policy Act of 1969
NFDRS	National Fire Danger Rating System
NHPA	National Historic Preservation Act
NM	Nautical Miles (1.15 statute miles)
NOTAM	Notice to Airmen
NRHP	National Register of Historic Places
NVG	Night Vision Goggle
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppm	parts per million
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
R	Restricted Area
RANS	Range Support Squadron
RAWS	Remote Automated Weather Stations
RF	radio frequency
SHPO	State Historic Preservation Officer
SiO_2	silicon dioxide
SIP	State Implementation Plan
SOP	Special Operating Procedures
U.S.	United States
U.S.C.	United States Code
UDWR	Utah Division of Wildlife Resources
USACOE	United States Army Corps of Engineers
USAF	United States Air Force
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UTTR	Utah Test and Training Range
VFR	Visual Flight Rules
VR	Visual Route
WSA	Wilderness Study Area
$\mu g/m^3$	micrograms per cubic meter

ENVIRONMENTAL ASSESSMENT
OF THE
EXPANSION OF THE USE OF
SELF-PROTECTION
CHAFF AND FLARES AT THE
UTAH TEST AND TRAINING RANGE
HILL AIR FORCE BASE, UTAH

January 2000

HEADQUARTERS AIR FORCE RESERVE COMMAND
ENVIRONMENTAL DIVISION
155 2ND STREET
ROBINS AFB, GA 31098-1635

**ENVIRONMENTAL ASSESSMENT OF THE
EXPANSION OF THE USE OF SELF-PROTECTION
CHAFF AND FLARES AT THE
UTAH TEST AND TRAINING RANGE
HILL AIR FORCE BASE, UTAH**

CONTENTS

CONTENTS (continued)

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (continued)

TABLE	TITLE	PAGE

1.0 INTRODUCTION

1.1 BACKGROUND

The Utah Test and Training Range (UTTR) is the Department of Defense's (DoD) largest contiguous network of special use airspace within the continental United States. The UTTR encompasses 16,651 square miles with airspace available from the surface to 58,000 feet above mean sea level (MSL) over various locations. DoD components use the range for testing munitions and propellants up to the most powerful intercontinental ballistic missile rocket motors and non-nuclear explosive components. Available to squadrons of all military services, the UTTR is capable of supporting more than 30,000 training sorties annually. Two principal users of the UTTR are the 388th Fighter Wing (388 FW) of the Air Combat Command (ACC) and the 419th Fighter Wing (419 FW) of the Air Force Reserve Command (AFRC), both of which are located at Hill Air Force Base (AFB), Utah.

Training sorties at the UTTR include a wide range of mission profiles. Training activities are designed, to the maximum extent possible, to simulate anticipated wartime conditions. Many of the training sorties involve the use of chaff and flares so that aircrews can attain the skills needed to avoid enemy radar-guided and heat-seeking weapons. Combat and training experiences establish that the coordinated use of self-protection chaff and flares is a highly effective countermeasure against many of the modern radar-guided and heating-seeking weapons. The extremely demanding cockpit workloads aircrews encounter while executing difficult aerial maneuvers lead to a requirement that pilots repeatedly practice and sharpen their skills in the deployment of chaff and flares.

At present, pilots may discharge chaff at any altitude within defined airspace boundaries, but only where the UTTR airspace is underlain by DoD-controlled lands (approximately one-fifth of the UTTR). They may discharge flares at any altitude within defined airspace boundaries when above DoD-controlled lands, and only above 1,500 feet above ground level (AGL) within the remainder of the UTTR airspace. These limitations on the use of chaff and flares do not permit full development of the skills that pilots need for success and survival in modern air combat. The 388 FW and 419 FW propose to change the restrictions governing use of chaff and flares at the UTTR to allow for more realistic training for all military aircraft utilizing the airspace. Prior to making final decisions concerning a major change in training operations, however, the United

States Air Force (USAF) will fully comply with the spirit and intent of the National Environmental Policy Act of 1969 (NEPA)

This Environmental Assessment (EA) has been prepared to support the decision-making process associated with NEPA. It addresses the proponents' (i.e., the 388 FW's and the 419 FW's) Proposed Action and reasonable alternatives to the Proposed Action. This EA has been developed to analyze and document potential environmental consequences associated with the proposed activities. If the analyses presented in the EA indicate that implementation of the Proposed Action would not result in significant environmental or socioeconomic impacts, then a Finding of No Significant Impact (FONSI) will be issued. If significant environmental effects result that cannot be mitigated to insignificant, an Environmental Impact Statement (EIS) will be required or the Proposed Action will be abandoned and no action will be implemented.

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to expand the use of chaff and flares within the UTTR by reducing the altitudes and increasing the locations at which these self-protective countermeasures are authorized. The need for the Proposed Action is to ensure military readiness through realistic training for pilots. In response to threats in combat, pilots must disperse both chaff and flares simultaneously. In conjunction with the size, configuration, and use of the UTTR, however, the present restrictions on use of chaff and flares result in pilots' development of threat responses that are inadequate.

1.2.1 Background Information on Use of Military Airspace

A variety of aircraft and aircrew training activities can occur within military airspace. During a single training flight, or *sortie*, an aircraft may transit several Military Training Routes (MTRs) and Military Operations Areas (MOAs) while performing a variety of training activities. A *sortie* consists of the takeoff, all of the training events performed while in flight, and the landing of a single aircraft.

General Airspace Descriptions

The Federal Aviation Administration (FAA) manages and controls all airspace in the United States for commercial, civil, and military aircraft use. To ensure safe and efficient airspace use, the FAA defines types of airspace, horizontal and vertical boundaries of each type and the nature of activities that each type can accommodate.

The FAA designates airspace away from congested areas for certain military training activities. One such type airspace is designated a MOA. A MOA consists of an airspace with defined vertical and lateral boundaries in which aircraft can perform military training activities separated from instrument flight rules (IFR) traffic. Training activities in a MOA include aircraft intercepts, turning and evasive maneuvers, and air combat training. A MOA is designated by the FAA and serves to warn visual flight rules (VFR) traffic that military activities may be taking place in the airspace. The floor of a MOA may be near ground level and the ceiling up to, but not including, 18,000 feet above MSL. A variety of military aircraft and aircrew training can take place in a MOA. During a single training flight, a combination of airspace training events are typically accomplished in several MOAs between takeoff and landing. Civilian and general aviation aircraft can traverse MOAs and MTRs unrestricted while on a VFR flight plan. To maximize safety, pilots desiring to traverse military airspace should call the local flight service station to determine if military aircraft are scheduled to use the airspace during the anticipated transit time.

A second type of designated airspace is a Restricted Area. This is airspace within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Restricted areas are designated when necessary to confine or segregate activities considered to be hazardous to non-participating aircraft.

Another type of airspace, an MTR, is a military air traffic corridor designated by the FAA for low-altitude military aircraft operating at airspeeds in excess of 250 knots. MTRs are typically 100 to 350 nautical miles (NM) long, 3 to 20 NM wide. They usually extend vertically from near ground level up to 5,000 feet AGL. MTRs provide airspace to practice navigational skills over a variety of terrain and serve as aircraft corridors to MOAs, ranges, and other destinations. Separation of MTRs from commercial air routes enhances general aviation safety. MTRs are identified as either Instrument Routes (IRs) or Visual Routes (VRs) followed by a numerical designation. IR denotes IFR may be used along the route, whereas VR denotes that VFR apply.

The use of an air-to-surface gunnery range is typically one of several training objectives included in a single training flight. Training accomplished in a MOA or along an MTR typically culminates and integrates with gunnery range training events. Gunnery range training includes releasing practice, inert, and/or live ordnance on targets that simulate actual wartime targets. This activity is only conducted within restricted airspace under controlled conditions to eliminate hazards to non-participating aircraft and to ensure the safety of persons on the ground.

Airspace and Operational Training Requirements

Multi Command Handbook 11-F16 Volume V prescribes tactical flight training requirements for F-16 aircraft fighter units. These requirements are complemented by Air Force Instruction (AFI) 11-2F-16 Volume I, *F-16 Aircrew Training*; AFI 11-2F-16 Volume III, *F-16 Operations Procedures*; AFI 11-214 *Aircrew, Weapons Director, and Terminal Attack Controller Procedures for Air Operations*; and Multi Command Instruction 11-F16 Volume 3, *F-16 Pilot Operational Procedures*. The purpose of these regulations is to provide guidance for each unit to achieve and maintain aircrew proficiency at a level that would meet expected wartime tasking and contingency operations. The *DoD Airspace Master Plan*, *U.S. Air Force (USAF) Airspace Master Plan*, and *Air Combat Command Airspace Master Plan* document airspace requirements. They address USAF airspace requirements in each area of the country for every mission involving airspace acquisition, usage, modification, and retention. In particular, these plans, in conjunction with other military service plans, establish the basis for a comprehensive analysis of total DoD requirements to help airspace managers develop a coherent overall airspace plan.

Airspace Criteria

Universal criteria for training airspace are identified in several military and FAA documents, such as Air Force Policy Directive (AFPD) 13-2, *Air Traffic Control, Airspace and Range Management*; AFI 13-201, *Air Force Airspace Management*; and *FAA Handbook for Special Military Operations*. These criteria are designed and used to minimize the impact of military training airspace on the National Airspace System. When considering requirements for training airspace, the criteria are applied in the following order of priority: existing training airspace, modifications to existing training airspace, and new training airspace.

1.2.2 Summary of Special Operating Procedures and Flying Restrictions

The USAF routinely employs a variety of special operating procedures (SOPs) to minimize potential impacts on communities and other sensitive noise receptors (e.g., hospitals, schools, churches, and ranches) that lie beneath military airspace the USAF uses. These SOPs would apply to any alternative selected for implementation. The USAF has established the following avoidance criteria when operating near areas sensitive to low-altitude flight:

- Restrict F-16 aircraft to fly no lower than 500 feet AGL regardless of the published minimum altitude of the airspace, except for pilots who have entered step-down training and who are designated for flights at lower altitudes. However, training in the 300 feet to 100 feet AGL altitude block is required to be conducted in short segments consistent with real-world risks and realistic tactical considerations. Furthermore, for night and Instrument Meteorological Conditions (IMC) operations, the minimum altitude is 1,000 feet above the highest obstacle within 5 nautical miles of course unless operating under Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) and Night Vision Goggle (NVG) training procedures (AFI 11-2F-16 Volume III).
- Avoid areas known to be populated by potentially sensitive species by increasing separation distances determined through appropriate discussions with Federal and state agencies.

The following are examples of other relevant FAA and military flying restrictions that are applicable to the proposal.

- Avoid structures or persons in isolated areas by 500 feet AGL and maintain a minimum altitude of 1,000 feet AGL over populated areas.
- Avoid charted, uncontrolled airports by at least 1,500 feet vertically when within 3 NM.

In addition, *AFI 13-212, UTTR Supplement 2 (Training)*, prescribes specific locations that are to be avoided by training flights within the UTTR airspace. Overflights are prohibited below 3,000 feet above the highest obstacle with a horizontal radius of 1.5 nautical miles (i.e., 1.7 statute miles) of populated areas and also below 3,000 feet AGL over the entire Fish Springs National Wildlife Refuge, which is wholly contained within the southern portion of the UTTR. Flight avoidance areas within the northern portion of the range include the towns of Park Valley, Grouse Creek, Etna, Montello, and Wendover, as well as the Morris Ranch complex. Flight avoidance areas within the southern portion of the UTTR include the towns of Gandy, Partoun, Trout Creek, Ibapah, Callao, Gold Hill, Goshute, as well as Pleasant Valley, Ibapah Airfield, Six Mile Ranch and Timm's Ranch. In addition, several U.S. Army facilities located within the southern portion of the UTTR (i.e., Baker Lab, Carr Facility, Ditto Facility, Defensive Test Chamber, English Village, Fries Park, and Sand Island) are restricted from flights below 3,00 feet AGL within 1 nautical mile (i.e., 1.2 statute miles).

1.2.3 Location

Figure 1-1 shows the location of the UTTR in northwestern Utah approximately 50 miles west of Hill AFB and Salt Lake City, Utah. The western portion of the UTTR extends into eastern Nevada. From north to south the UTTR is nearly 240 miles long, and from east to west it is more than 100 miles wide. A commercial airline corridor separates the northern and southern portions of the UTTR. An interstate highway (I-80) is on land below the commercial airline corridor. The UTTR overlies ground components managed by the USAF, as well as lands managed by the U.S. Army (i.e., Dugway Proving Ground) and other nearby public lands managed primarily by the Bureau of Land Management (BLM).

Figure 1-1. General Location of the Study Area

The UTTR is composed of both military airspace and lands withdrawn from public use by the DoD. The military airspace comprising the northern portion of the UTTR consists of four Restricted Areas (i.e., R-6404A, R-6404B, R-6404C, and R-6404D) and three MOAs (i.e., the Lucin A, B, and C MOAs). The military airspace comprising the southern portion of the range consists of six Restricted Areas (i.e., R-6402, R-6405A, R-6405B, R-6406A, R-6406B, and R-6407) and five MOAs (i.e., the Gandy MOA, and Sevier A, B, C, and D MOAs). The Lucin C MOA (up to 9,000 feet MSL) links the northern and southern portions of the UTTR. Two low-level MTRs (VRs 1445 and 1446) also link the two portions of the range.

The UTTR ground components managed by the USAF that are overlain by a portion of the military airspace include the Hill Air Force Range (within the northern portion of the UTTR) and the Wendover Air Force Range (within the southern portion of the UTTR). Ground facilities at Dugway Proving Ground also support activities within the UTTR. Elevations of the UTTR vary from 4,300 feet MSL on the desert floor to over 12,000 feet MSL in the mountains.

During Government Fiscal Year (FY) 1997 (i.e., October 1, 1996 through September 30, 1997), the USAF and other military users conducted 13,278 sorties within the UTTR. Table 1-1 summarizes the FY 1997 sortie utilization of the airspace components associated with the UTTR. As shown in Table 1-1, a majority of the training sorties flown within the UTTR airspace were performed by F-16 aircraft. Table 1-2 provides a summary of the F-16 aircraft sorties conducted by the 388 FW, 419 FW, and other military units within the UTTR during FY 1997. As shown in Table 1-2, the sorties flown by the 388 FW and the 419 FW account for the greatest number of F-16 sorties flown within the UTTR airspace.

1.2.4 Use of Self-Protection Chaff and Flares During Training

In August 1997, ACC finalized an in-depth summary of the types of chaff and flares used within ACC-controlled military airspace, and the general effects of their use on the environment entitled *Environmental Effects of Self-Protection Chaff and Flares*

Table 1-1. Summary of the FY 1997 Sortie Utilization within the Airspace Components Associated with the UTTR [1]

Aircraft Type	FY 1997 Sorties
F-16	10,145
F-15	185
F-18	264
B-1	1,100
B-2	66
B-52	486
Refuelers [2]	607
Others [3]	425
TOTAL	**13,278**

Notes:

1. An aircraft typically uses several airspace components during a single training flight, or sortie. A single sortie could be counted in the sortie totals for several airspace components. For example, during a single sortie, an aircraft could conduct training activities in the Lucin A MOA, R-6404C, Lucin C MOA, Gandy MOA, and R-6405. Therefore, this single sortie would be counted in the sortie totals for all five airspace components.
2. Refuelers include KC-135, KC-35, and KC-10 aircraft
3. Others include A-6, A-10, AH-64, AV-8, E-6, F-14, C-141, C-130, C-18, C-5, CH-53, H-53, Tornado, and U-2 aircraft.

Table 1-2. Summary of the FY 1997 F-16 Aircraft Sorties Conducted by the 388 FW, 419 FW, and Other Military Units within the UTTR [1]

F-16 Aircraft Unit	FY 1997 Sorties
388 FW	6,869
419 FW	2,800
Others	476
TOTAL	**10,145**

(referred to hereafter as "the 1997 ACC Report" and referenced hereafter as "ACC 1997"). A majority of the information presented in this section was adapted from the information presented in the 1997 ACC report.

Description of Chaff

The primary type of chaff used during training activities within the UTTR consists of extremely small strands (or dipoles) of aluminum-coated fiberglass. This type of chaff is composed of glass fibers, an aluminum coating on the glass fibers, and a "slip" coating to prevent end welding when the fibers are cut and to prevent clumping when they are ejected. The slip coating is a 1 percent solution of Neofat 18 (i.e., 90 percent stearic acid and 10 percent palmatic acid). Table 1-3 lists the components of the glass fibers and the aluminum coating on the fiber type chaff. The chaff strands are approximately the thickness of a human hair (i.e., generally 1 mil or 25.4 microns in diameter), and range in length from 0.3 to over 2 inches. Chaff is made as small and light as possible so that it will remain in the air long enough to confuse enemy radar.

Table 1-3. Components of the Glass Fibers and the Aluminum Coating of Chaff

Element	Chemical Symbol	Percent (by weight)
Glass Fiber		
Silicon dioxide	SiO_2	52-56
Alumina	Al_2O_3	12-16
Calcium Oxide and Magnesium Oxide	CaO and MgO	16-25
Boron Oxide	B_2O_3	8-13
Sodium Oxide and Potassium Oxide	Na_2O and K_2O	1-4
Iron Oxide	Fe_2O_3	1 or less
Aluminum Coating (Typically Alloy 1145)		
Aluminum	Al	99.45 minimum
Silicon and Iron	Si and Fe	0.55 maximum
Copper	Cu	0.05 maximum
Manganese	Mn	0.05 maximum
Magnesium	Mg	0.05 maximum
Zinc	Zn	0.05 maximum
Vanadium	V	0.05 maximum
Titanium	Ti	0.03 maximum
Others		0.03 maximum

Source: ACC 1997

When released from an aircraft, chaff initially forms a sphere, then disperses widely in the air. The chaff effectively reflects radar signals in various bands (depending on the length of the chaff fibers) and forms a very large image or electronic "cloud" of reflected signals (i.e., return) on a radar screen. The aircraft is obscured from radar detection by the cloud, which allows the aircraft to safely maneuver or egress from an area. Since chaff can obstruct radar, its use is coordinated with the FAA.

Chaff is ejected from aircraft either mechanically or pyrotechnically. Pyrotechnic ejection is the primary method of chaff release utilized on the aircraft operating within the UTTR airspace. Pyrotechnic ejection uses hot gases generated by an explosive impulse charge. The gases push a small plastic piston down a chaff-filled tube. A small plastic end cap is ejected followed by the chaff fibers. Debris from a pyrotechnic ejection consists of two small, square pieces of plastic 1/8-inch thick (i.e., the piston and the end cap) and a felt spacer. The plastic tube remains within the aircraft. Table 1-4 provides a description of the two types of impulse charges (i.e., BBU-35/B and BBU-48/B) used to pyrotechnically eject chaff.

Mechanical ejection of chaff uses small foil-laminated cardboard boxes (i.e., 2.8 x 4.8 x 0.8 inches) that are torn open during ejection. Debris from a cardboard box ejection consists of the open box, two high impact polystyrene plastic support pieces (i.e., 2.75 x 4.75 x0.05 inches), and paper wrapping for each dipole cut. Cardboard specifications now require recycled Kraft paper because it biodegrades more quickly than virgin Kraft paper, which was previously used. The boxes are sealed with an aqueous type polyvinyl acetate.

USAF aircraft flown within the UTTR airspace utilize five varieties of chaff: RR-112, RR-149, RR-170, RR-180, and RR-188. RR-170 and RR-188 chaff are the most widely used chaff varieties within the UTTR airspace. Table 1-5 summarizes the attributes of the different types of chaff used by USAF aircraft. In addition, Naval aircraft utilizing UTTR airspace employ the use of RR-129 and RR-144 chaff.

Table 1-4. Description of the Impulse Charges Used to Eject Chaff

Component	BBU-35/B	BBU-48/B
Overall Size Overall Volume Total Explosive Volume	0.625 inches x 0.530 inches 0.163 $inches^3$ 0.034 $inches^3$	0.975 inches x 0.60 inches 0.448 $inches^3$ 0.0031 $inches^3$
Bridgewire	Trophet A 0.0025 inches x 0.15 inches	N/A
Initiation Charge	0.008 cubic inches 130 mg 7,650 psi boron 20% potassium perchlorate 80% *	0.0013 cubic inches 50 mg titanium 30% potassium perchlorate 44% boron nitride 25%
Booster Charge	0.008 cubic inches 105 mg 7030 psi boron 18% potassium nitrate 82%	N/A
Main Charge	0.017 cubic inches 250 mg Loose fill RDX ** pellets 38.2% potassium perchlorate 30.5% boron 3.9% potassium nitrate 15.3% super floss 4.6% Viton A 7.6%	0.018 cubic inches 50 mg nitrocellulose 88.97% dinitrotoluene 9.5% diphenylamine 0.9% potassium sulphate 0.9% graphite 0.2%

Notes:
* Previous manufactures of BBU-35/B contained 15% potassium perchlorate and 64% calcium chromate
** RDX is cyclotrimethylethylenetrinitramine (1,3,5-trinitro-hexa-hydro-s-triazine)
mg = milligrams
psi = pounds per square inch
Some values do not total 100% due to rounding.
Source: ACC 1997

RR-170A/AL, RR-180/AL, and RR-188 are all pyrotechnic chaff. RR-170A/AL is a tubular type pyrotechnic chaff that contains approximately three million dipoles per tube. RR-170A/AL is the type of chaff used in combat. RR-180/AL has the same external case dimensions as RR-170A/AL, but the interior space is divided into two

Table 1-5. Description of the Types of Chaff Used by USAF Aircraft

Attribute	Chaff Types				
	RR-112A/AL	**RR-149A/AL**	**RR-170A/AL**	**RR-180/AL**	**RR-188**
Aircraft	B-52	B-52	A-10, B-1, C-5, C-17, C-130, C-141, F-15, F-16	A-10, C-130, F-15, F-16	A-10, F-15, F-16
Composition	Aluminum coated glass	Aluminum coated glass	Aluminum coated glass	Aluminum coated glass	Aluminum coated glass
Ejection Mode	Mechanical	Mechanical	Pyrotechnic	Pyrotechnic	Pyrotechnic
Configuration	Rectangular aluminum foil laminated Kraft paper box with 2 polystyrene supports	Rectangular aluminum foil laminated Kraft paper box with 2 polystyrene supports	Rectangle tube cartridge	Rectangle tube cartridge with dual longitudinal compartments	Rectangular tube cartridge
Size	2.8 x 4.8 x 0.8 inches (10.75 cubic inches)	2.8 x 4.8 x 0.8 inches (10.75 cubic inches)	8 x 1 x 1 inches (8 cubic inches)	8 x 1 x 1 inches (8 cubic inches)	8 x 1 x 1 inches (8 cubic inches)
No. of Dipoles	11 million	Unknown	3.12 million	2.72 million	5.46 million
Dipole Size (cross-section)	1 mil (diameter)	1 mil (diameter)	1 mil (diameter)	0.7 mil (diameter)	1 mil (diameter)
Impulse Cartridge	None	None	BBU-35/B	BBU-48/B	BBU-35/B
Other Comments	Box ejected	Box ejected	Cartridge stays in aircraft	Cartridge stays in aircraft	Cartridge stays in aircraft; less interference with FAA radar (no D and E bands); has replaced RR-170 for training

Notes: Information on the RR-129 and RR-144 chaff varieties employed by Naval aircraft is classified.
Source: ACC 1997

longitudinal compartments that can be fired separately using a BBU-48/B dual impulse cartridge. Each compartment has a piston and an end cap approximately half the size of those used in RR-170A/AL. The fibers are slightly smaller in diameter (i.e., 0.7 mil vs. 1 mil), allowing the unit to hold a total of 1.36 million dipoles per side.RR-188 has been developed for use in training by aircraft that employ RR-170 (see Figure 1-2). It has D and E band dipoles removed to avoid interference with FAA radars.

RR-112 and RR-149 are mechanically ejected chaff. RR-112 is non-pyrotechnic chaff used exclusively by B-52 aircraft. It consists of an aluminum-foil-laminated kraft paper box that contains 11 million aluminum-coated glass fiber dipoles in five cuts ranging

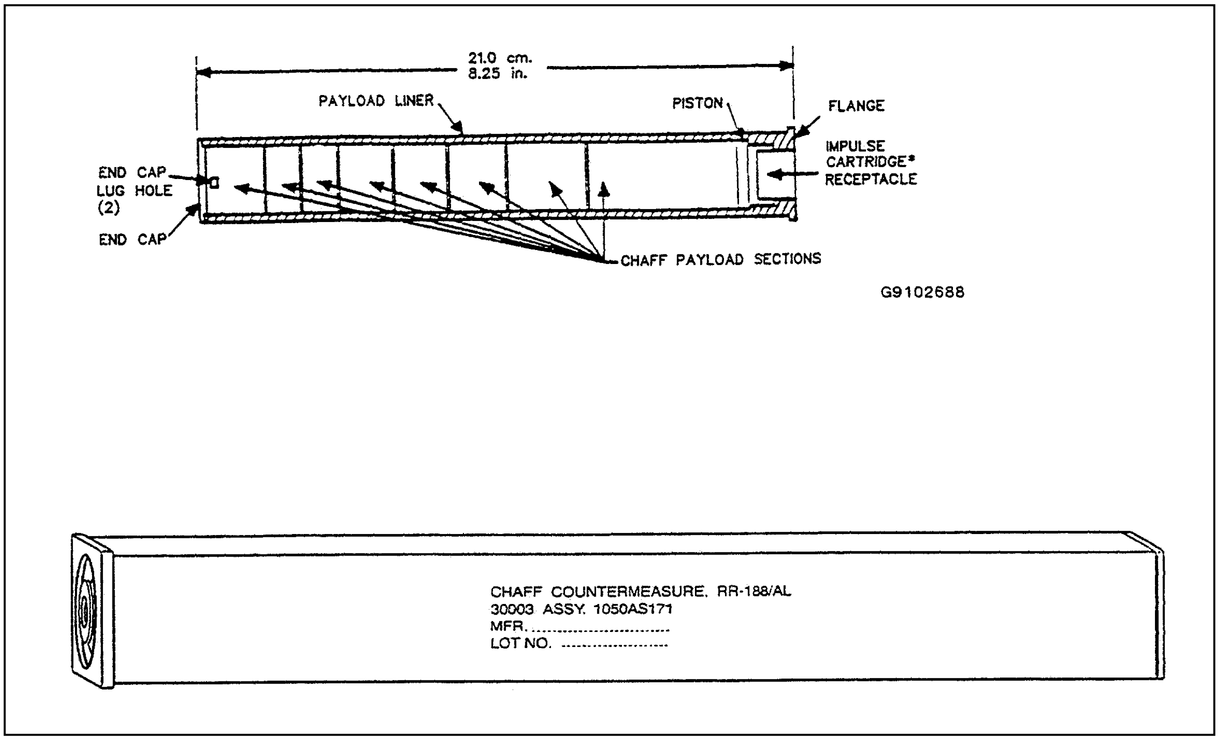


Figure 1-2. RR-188/AL Chaff Cartridge

from 0.3 to 0.6 inches in length. RR-149 is also available for use by B-52 aircraft. It is the same as RR-112 except in dipole length, which ranges from 0.35 to 2.06 inches in seven cuts.

Quality standards for chaff cartridges require that they demonstrate ejection of 98 percent of the chaff in undamaged condition, with a reliability of 95 percent at a 95 percent confidence level. They must also be able to withstand a variety of environmental conditions (see Table 1-6) that might be encountered during storage, shipment, and operation.

Description of Flares

Self-protection flares are magnesium pellets that, when ignited, burn for a short period of time (i.e., less than ten seconds) at 2,000 degrees Fahrenheit. The burn temperature is hotter than the exhaust of an aircraft and therefore attracts and decoys heat-seeking weapons targeted on the aircraft.

Table 1-6. Environmental Performance Requirements for Chaff Testing

Condition	Performance Requirement	
High Temperature	Up to +165 degrees Fahrenheit (°F)	
Low Temperature	Down to –65 °F	
Temperature Shock	Shock from –70 °F to +165 °F	
Temperature Altitude	Combined temperature altitude conditions up to 70,000 feet	
Humidity	Up to 95 percent relative humidity	
Fungus	Fungi encountered in the tropics and subtropics	
Salt Fog	Salt fog encountered in coastal regions, sea locations, and during ocean transport	
Sand and Dust	Sand and dust encountered in desert regions subject to high sand dust conditions and blowing sand and dust particles	
Accelerations/Axis	**G-Level**	**Time (minute)**
Transverse-Left (X)	9.0	1
Transverse-Right (-X)	3.0	1
Transverse (Z)	4.5	1
Transverse (-Z)	13.5	1
Lateral-Aft (-Y)	6.0	1
Lateral-Forward (Y)	6.0	1
Shock (Transmit)	Shock encountered during aircraft flight	
Vibration	Vibration encountered during aircraft flight	
Free Fall Drop	Shock encountered during unpackaged item drop	
Vibration (Repetitive)	Vibration encountered during rough handling of packaged item	
Three Foot Drop	Shock encountered during rough handling of packaged item	

Note: Cartridge must be capable of total ejection of chaff from the cartridge liner under these conditions.
Source: ACC 1997

Typically, flares are wrapped with an aluminum-filament-reinforced tape and inserted into an aluminum (0.03 inches thick) case that is closed with a felt spacer and a small plastic end cap. The top of the case has a pyrotechnic impulse cartridge that is activated electrically to produce hot gases that push a piston, the flare material, and the end cap out of the aircraft into the airstream. Typical flare composition and debris are summarized in Table 1-7 for the types of flares used by USAF aircraft within the UTTR airspace (i.e., ALA-17, MJU-7A/B, M-206, MJU-10/B, and MJU-23/B). The MJU-7A/B and the M-206 flare types are the most commonly used flare within the UTTR airspace. The varying types of flares differ primarily in their size and the type of ignition (see Table 1-8), which is categorized as parasitic, semi-parasitic, or non-parasitic. In addition, Navy MJU-2, MJU-8, and Mark 46 flares are used within the UTTR airspace.

Table 1-7. Typical Composition and Debris of Self-Protection Flares

Part	Components	
Combustible		
Flare Pellet	Polytetrafluoroethylene (Teflon) (-$[C_2F_4]_n$ – n=20,000 units Magnesium (Mg) Fluoroelastomer (Viton, Fluorel, Hytemp)	
First Fire Mixture [1]	Boron (B) Magnesium (Mg) Potassium perchlorate ($KClO_4$) Barium chromate ($BaCrO_4$) Fluoroelastomer	
Immediate Fire/Dip Coat	Polytetrafluoroethylene (Teflon) (-$[C_2F_4]_n$ – n=20,000 units) Magnesium (Mg) Fluoroelastomer	
Primer Assembly (in Safety and Initiation Device) [2]	**Initiation Charge (15 mg)**	**Output Charge (40 mg)**
	Lead styphnate	Zirconium (Zr)
	Lead azide (N_6Pb)	Molybdenum trioxide (MoO_3)
	Barium nitrate (N_2O_6Ba)	Potassium perchlorate ($KClO_4$)
	Antimony trisulfide (Sb_2S_3)	
	Tetracene ($C_{18}H_{12}$)	
Assemblage (Debris)		
Aluminum Wrap	Mylar or filament tape bonded to aluminum tape	
End Cap	Plastic (nylon) or aluminum [3]	
Felt Spacers	Felt pads (0.25 inches by cross section of flare)	
Piston	Plastic (nylon, tefzel, zytel) or aluminum [6]	
Slider Assembly [4]	2 plastic pieces, 0.5 x 0.825 x 2 inches (delrin) 2 springs 0.625 x 0.125 inches (steel) 1 roll pin (steel)	
Safety and Initiation Device [5]	G-weight (steel) Locking bar and fork (steel) Push button and spring (steel) Fire pin (steel) Primer assembly	

Note: Generally applies only to M-206, MJU-7A/B, and MJU-10/B flares, except as noted below.

1. MJU-10/B does not have a first fire mix, all other types do.
2. Within safety and initiation device used by MJU-23/B only.
3. Aluminum used in MJU-10 and MJU-23/B only. MJU-23/B end cap has 0.5 inches of black rubber potting compound for shock absorption.
4. MJU-10/B only.
5. Used in MJU-23/B only.
6. Aluminum used in MJU-23/B only.

Source: ACC 1997

Table 1-8. Description of the Types of Flares Used by USAF Aircraft

Attribute	Flare Types				
	ALA-17	MJU-7A/B	M-206	MJU-10/B	MJU-23/B
Aircraft	B-52	F-4, F-15, F-16, C-130	A-10, AC-130, C-17, F-16	F-15	B-1
Mode	Parasitic	Semi-parasitic	Parasitic	Semi-parasitic	Non-parasitic
Configuration	2 cylindrical cartridge in series	Rectangular	Rectangle	Rectangle	Cylindrical
Size	Each cylinder 4.75 x 2.25 inches (diameter)	1 x 2 x 8 inches (16 cubic inches)	1 x 1 x 8 inches (8 cubic inches)	2.66 x 2 x 8 inches (42.6 cubic inches)	10.5 x 2.75 inches (diameter) (19.8 cubic inches)
Impulse Cartridge	None, electrically activated M-2 squib	BBU-36/B; MJU-7(T-1) simulator uses M-796	M-796	BBU-36/B; MJU-10(T-1) simulator uses M-796	BBU-46/B
Safety and Initiation Device	None	Slider assembly	None	Slider assembly	Mechanical mechanism with ignition charge
Weight (nominal)	Pellet: 18 oz Canister: 10 oz	13 oz (T-1 type: 4.8 oz)	6.8 oz	40 oz (T-1 type: 7.2 oz)	43 oz
Other Comments	Canister ejected with first unit	Simulator version (T-1) uses potassium chlorate, powdered sugar, and yellow dye smoke charge	Simulator version (T-1) uses potassium chlorate, powdered sugar, and yellow dye smoke charge	Simulator version (T-1) uses potassium chlorate, powdered sugar, and yellow dye smoke charge	

Notes: oz = ounces
Source: ACC 1997

A parasitic type flare is ignited in the aluminum case before it leaves the aircraft. Holes in the piston permit igniter gases to contact the first fire mixture on top of the flare pellet. The non-parasitic type flare incorporates a mechanical mechanism (i.e., a safety and initiation device) to prevent ignition of the pellet in the case. This mechanism includes a G-weight, a locking bar and fork, a push button and spring, a firing pin, and a primer assembly. When ignited by the firing pin, the primer assembly fires the initiation charge, which fires the output charge, which ignites the flare pellet. A semi-parasitic type of ignition provides a middle ground by igniting a small pellet inside the case, rather than the flare itself, thereby reducing both the safety risk and the quantity of debris. The parasitic type flare is less likely to produce duds and its only debris is the plastic end cap and the remains of the piston. However, there is an increased risk of fire damage to the aircraft, compared with the non-parasitic flare. The non-parasitic flare can be expected to produce the largest number of duds and the most debris, due to the complexity of the ignition process. The semi-parasitic flare falls between these two extremes in terms of fire risk, quantity of debris, and the likelihood of duds.

The ALA-17A/B flares consist of two independently fired aluminum cylinders, each 4.75 inches long and 2.25 inches in diameter, crimped together end-to-end. When the top cylinder is fired, the flare pellet is ejected from the aircraft, along with the entire bottom cylinder. Impulse cartridges are not used; the flares are fired directly with an electrically activated squib set in a potting compound. The M-2 squib weighs 64.8 milligrams and is composed of 40 percent potassium chlorate, 32 percent lead thiocyanate, 18 percent charcoal, and 10 percent Egyptian lacquer. The debris includes the entire bottom cylinder assembly, as well as the end cap and felt spacers from the top of the flare. The M-206 flare is the same length as the MJU-7A/B (i.e., 8 inches), but half the cross-section (i.e., 1 square inch). Figure 1-3 presents a schematic of a M-206 flare. It uses a M-796 impulse cartridge that ignites the first fire mix simultaneously. The M-206 (T-1) is the simulator version of the M-206 flare.

The MJU-23 has a non-parasitic type of ignition that uses the complex mechanical mechanism described above. It is a cylindrical flare used in small quantities on the B-1 aircraft. It is 10.5 inches long and 2.75 inches in diameter. It has an aluminum end cap with 0.5 inches of black rubber potting compound designed to absorb the shock of hitting spring-loaded doors on the aircraft. It uses an aluminum piston and includes strips of felt spacers on the side and circular felt spacers in the cylinder. The MJU-23 uses the BBU-46/B impulse cartridge.

The MJU-7A/B and MJU-10/B are semi-parasitic flares. The MJU-7A/B flare configuration measures 1 by 2 by 8 inches and has a nominal weight of 13 ounces. It uses a BBU-36/B impulse cartridge (see Table 1-9). The MJU-7A/B was designed to reduce the complexity of the non-parasitic type flare, improve its reliability, and reduce its debris. In this flare, the mechanical mechanism is replaced with a slider assembly that incorporates an ignition pellet (i.e., 640 milligrams of magnesium, Teflon, and Viton A or Fluorel binder). This pellet is ignited by the impulse cartridge, but its hot

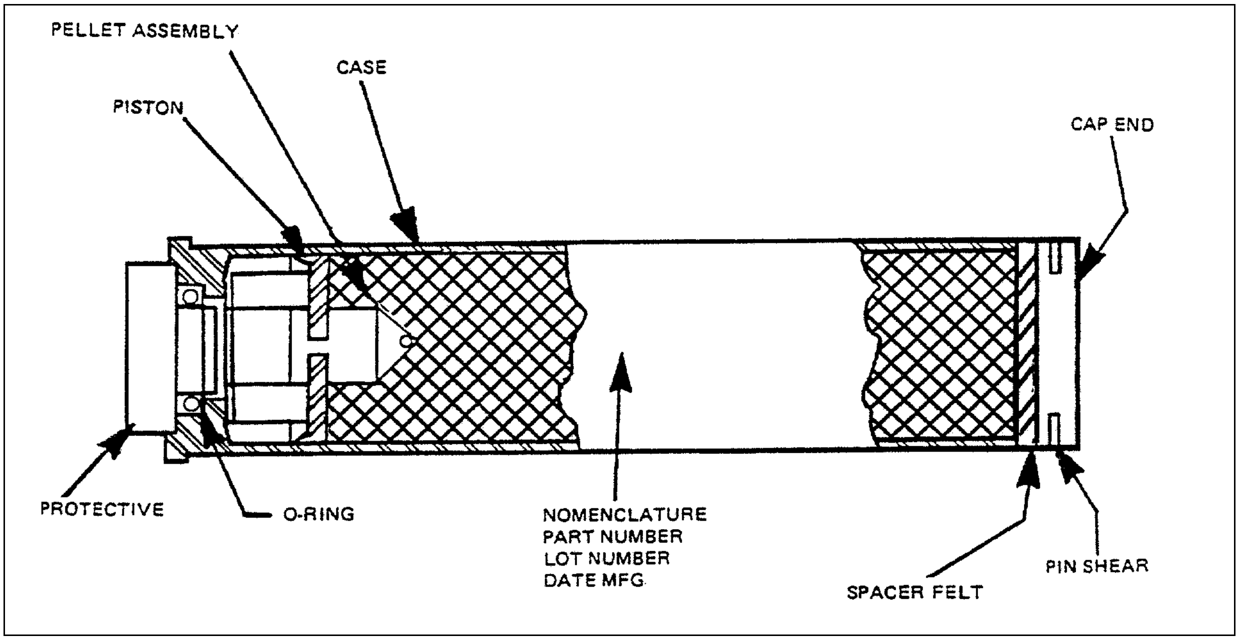


Figure 1-3. M-206 Flare

gases do not reach the flare until the slider exits the case, exposing a passage for fire from the initiation pellet to the first fire mixture on top of the flare pellet. The MJU-10/B configuration is identical to the MJU-7A/B (containing the slider assembly), except that the MJU-10/B is thicker (i.e., 2.66 inches versus 1 inch), and it does not have a first fire mix. The MJU-10/B uses the BBU-36/B impulse cartridge.

The MJU-7 (T-1) is a simulator version of the MJU-7A/B. It replaces the magnesium flare pellet with a smoke charge. The smoke charge is smaller than the flare (i.e., 5 inches versus 8 inches long) and is held in place inside the flare case by cardboard spacers. It is composed of 0.5-inch thick doughnut-shaped pellets 0.75 inches in diameter with a 0.37 inch hole encased in a cardboard tube. The charge material is 20 percent powdered sugar, 36 percent potassium chlorate, 42 percent yellow dye (Chinoline Yellow-5), and 2 percent binder (i.e., Goodrich Hightemp – a dry rubber and Teflon). It uses a M-796 impulse charge, which generates hot gases that push the piston down the case and simultaneously ignite a wick (i.e., Quick Match cord MIL-Q-378) in the center of the pellets. Resulting debris includes the plastic end cap and the remains of the cardboard spacers and piston.

Table 1-9. Impulse Charges Used with Flare Units

Component	BBU-36/B	BBU-46/B	M-796
Overall Size Overall Volume Total Explosive Volume	0.740 x 0.550 inches 0.236 cubic inches 0.081 cubic inches	1.224 x 0.520 inches 0.612 cubic inches 0.294 cubic inches	0.449 x 0.530 inches 0.104 cubic inches 0.033 cubic inches
Bridgewire	Trophet A	Trophet A	Trophet A 0.0025 inches (diameter)
Closure Disk	scribed disc, washer	polyester film disc and plain discs for main charge and initiator	scribed disc, washer
Initiation Charge			
Volume	0.01 cubic inches	0.017 cubic inches	0.011 cubic inches
Weight	100 mg	to fill cavity	100 mg
Compaction	6,200 psi	5,100 psi	5,500 psi
Composition	42.5% boron 52.5% potassium perchlorate 5.0% Viton A	49.5% potassium perchlorate 49.5% titanium with potassium dichromate 1.0% Viton A or Fluorel	20% boron 80% calcium chromate
Booster Charge			
Volume	0.01 cubic inches	0.138 cubic inches	0.011 cubic inches
Weight	150 mg	290 mg	70 mg
Compaction	5,100 psi	loose fill	5,500 psi
Composition	20% boron 80% potassium nitrate	23.7% boron 70.3% potassium nitrate 6% laminac binder	18% boron 82% potassium nitrate
Main Charge			
Volume	0.061 cubic inches	0.138 cubic inches	0.011 cubic inches
Weight	655 mg	490 mg	185 mg
Compaction	Loose fill	Loose fill	Loose fill
Composition	Hercules #2400 smokeless powder *	Hercules green dot powder	Hercules HPC-1 (~40% nitrocellulose)

Notes: * Hercules #2400 smokeless powder contains nitrocellulose (50-77%), nitroglycerine (15-43%), and trace quantities of other materials.
psi = pounds per square inch

Source: ACC 1997

Two Navy flares could be used within the UTTR airspace: the MJU-8A/B and the Mark 46. The MJU-8A/B is 5.8 inches long and 1.42 inches in diameter. Its composition is similar to USAF flares, except that the end cap is aluminum instead of plastic, and a small aluminum cap (i.e., less than 0.5 inches in diameter) is used to contain the igniter composition. The inside diameter of the case forms a positive piston stop that reduces debris. The Mark 46 is identical to the MJU-8A/B except for the burn time.

Flares are tested to ensure they meet performance requirements in terms of ejection, ignition, and effective radiant intensity. For example, the MJU-7A/B flares must operate under the following conditions:

- Temperature – 65 to 250 ºF
- Altitude – sea level up to 35,000 feet
- Humidity – up to 100 percent
- Shock – test specified in MIL-STD-810B
- Vibration – test specified in MIL-STD-810B
- Crash Safety – load factors of 40 Gs longitudinal, 20 Gs vertical, 11 Gs in any direction, and
- Drop Test – free-fall from 20 feet to hard surface.

Training with Self-Protection Chaff and Flares

The effective use of chaff and flares during combat requires training and frequent use by aircrews to master the capabilities of these devices. As previously stated, pilots currently may discharge chaff within defined airspace boundaries at any altitude only over portions of the DoD-withdrawn land underlying the UTTR airspace. They may discharge flares at any altitude over DoD- withdrawn lands and only above 1,500 feet AGL within the remainder of the UTTR. Figure 1-4 depicts the locations of the DoD-withdrawn lands and the current chaff deployment areas underlying the UTTR military airspace.

Chaff and flares are used by a number of aircraft that operate within the UTTR airspace. As shown in Table 1-1, pilots flying fighter (e.g., F-16) and bomber (e.g., B-52) aircraft conduct a majority of the training within the UTTR airspace. These aircraft

Figure 1-4. DoD Withdrawn Lands and Chaff Deployment Areas within the UTTR– Existing Conditions

operate over a wide range of altitudes and perform a variety of maneuvers and tactics. Deployment of chaff and flares does not interfere with the flight characteristics of the dispensing aircraft. Fighter aircraft can deploy chaff or flares at any approved altitude during flight maneuvers (i.e., turns, climbs, descents), airspeed, and G-loading. Bomber aircraft can also deploy chaff and flares at any approved altitude while in a turn, climb, or descent. Bomber aircraft conducting low and high ordnance deliveries may deploy chaff or flares to defeat ground-based radar and airborne radar systems. Specific descriptions of how chaff and flares are deployed during training for combat situations are classified.

Fighter aircraft flight profiles are generally more diverse in vertical movement than bomber aircraft profiles. Fighter aircraft may ingress to a target area at low-level (i.e., 500 feet AGL), climb to 4,000 to 5,000 feet AGL, release a weapon, execute a hard turn while descending back to 500 feet AGL, and perform multiple hard turns while exiting from the target area. Chaff may be released during the initial climb, prior to release of the weapon, post weapon release, and as hard turns are executed. One to four bundles of chaff over a period of one to two seconds are released in conjunction with a sudden change in the aircraft direction. This type of evasive change in aircraft direction is termed "jink." This cycle is repeated as the aircraft is maneuvered to and from the target, past simulated threats. High altitude ingress to a target area may require a "combat descent" to a target or to a lower approach altitude. Depending on the defensive capabilities of the target area, chaff and/or flares may be used in descent.

During air-to-air combat tactics, the altitude envelope typically increases. Chaff and flares may be deployed while conducting a number of different training profiles, including those in which one aircraft opposes another, two aircraft oppose two aircraft, or when any number of aircraft oppose a number of different aircraft. As previously discussed, F-16 aircraft conduct the majority of training operations within the UTTR airspace. Table 1-10 lists the current F-16 aircraft training missions that potentially involve the use of chaff and flares within the UTTR airspace.

Table 1-10. Chaff Training Sortie Descriptions

Training Sortie	Number of Aircraft Involved	General Description
Surface Attack (Special Agent)	2-4	An air-to-ground mission involving the actual release of inert ordnance as bombs or during strafing.
Close Air Support (CAS)	2-4 per target area	The CAS mission involves an air strike that is controlled by personnel on the ground or a forward air controller (FAC) controlling within 2 kilometers of friendly ground forces (FGF).
Surface Attack Tactics (SAT)	2-4	An air-to-ground mission that includes tactical high or low ingress and egress into a target area, and the release of training, inert, or live ordnance. This mission may also include surface-to-air threats and air-to-air barons (dissimilar aircraft simulating enemy aircraft).
Low Altitude Awareness Training (LOWAT)	2-4	This mission involves a combination of low-altitude tactical flying and threat reactions training.
Intercepts (INCPTS)	2-4	Air-to-air training to intercept another aircraft or formation of aircraft to allow weapons employment. INCPTS are restricted to limited maneuvering (i.e., 180 degrees of turn at the merge point between aircraft).
Basic Fighter Maneuvers (BFM)	2-8	This mission is a simulated combat situation involving the maneuvering of one aircraft against another.
Air Combat Maneuvering (ACM)	2	This mission is similar to a BFM, except that two aircraft maneuver against each other.
Air Combat Tactics (ACT)	3-8	This mission involves unrestricted maneuvering of typically two formations of aircraft to achieve a position where weapons can be employed to destroy the opposing formation's aircraft. Maneuvering is limited below 5000-feet AGL, but is unlimited above 5000-feet AGL.
Dissimilar Air Combat Tactics (DACT)	3-8	This mission is similar to the ACT mission, except that the aircraft involved are dissimilar.
Large Force Employment (LFE)	8-100+	This mission involves a large formation of aircraft ingressing a target area while a large force of barons attempts to destroy the formation before reaching its target. Maneuvering is limited below 5000-feet AGL, but is unlimited above 5000-feet AGL.
Combined Force Training (CFE)	4-100+	This mission involves aircraft conducting three different roles (i.e., Strike [air-to-ground], Escort [air-to-air protecting the Strikers], and Barons [air-to-air protecting the target]). Maneuvering is limited below 5000-feet AGL, but is unlimited above 5000-feet AGL.

Of the 13,278 sorties flown within the UTTR airspace during FY 1997 (see Table 1-1), 11,395 sorties were flown over the areas in which chaff deployment is authorized. Of that total, 7,811 sorties were flown over the Hill Air Force Range (i.e., northern portion of the UTTR). The remaining 3,584 sorties were flown over the Wendover Air Force Range (i.e., southern portion of the UTTR). F-16 aircraft sorties accounted for over 93-percent of the total number of sorties flown (i.e., 9,481 sorties) in the areas in which chaff deployment is authorized.

Though most USAF fighter aircraft are capable of carrying 60 or 120 bundles of chaff, typical training missions load no more than 30 bundles. It should be noted that chaff is not required nor loaded on aircraft for all training sorties. When chaff is required as part of a training sortie profile, total chaff used on a typical sortie varies from 5 to 15 bundles, though, on occasion, as many as 30 bundles are used. If the target areas contain defenses with infrared capabilities, flares will be dispensed in place of chaff.

The carrying capacity and usage of flares for most USAF aircraft are the same as chaff carrying capacities and usage. However, USAF units are limited, based on their respective annual allotments of chaff and flares, as to the amount of chaff and flares they are able to deploy while training.

As shown in Table 1-2, the majority of F-16 aircraft sorties flown within the UTTR airspace are conducted by aircraft assigned to the 388 FW and the 419 FW. Both the 388 FW and 419 FW conduct approximately 90-percent of their aircraft training within the UTTR airspace. On average, the 388 FW is allotted 24,469 bundles of chaff annually, while the 419 FW is allotted approximately 9,875 bundles of chaff annually. The annual allotment of individual flares to the 388 FW and the 419 FW are equivalent to the number of chaff bundles allotted to each unit (i.e., 24,269 flares for the 388 FW and 9,875 flares for the 419 FW). Table 1-11 presents a summary of the estimated amount of chaff deployed by the 388 FW, the 419 FW, and other USAF F-16 aircraft within the UTTR airspace during FY 1997. In addition, approximately 34,144 flares were deployed within the UTTR airspace during FY 1997.

Table 1-11. Estimated Amount of Chaff Deployed by F-16 Aircraft within the UTTR During FY 1997

Chaff Deployment Area	No. of Sorties	No. of Chaff Bundles Deployed [1]	Weight/Chaff Bundle [2] (ounces)	Total Amount of Chaff Deployed (pounds)
Hill Air Force Range – Northern UTTR	3,491 [3]	14,122	6.4	5,649
Wendover Air Force Range – Southern UTTR	5,990 [4]	20,356	6.4	8,142
TOTAL	9,481	34,478	6.4	13,791

Notes:

1. Based on 90-percent of the 388 FW's and 419 FW's average annual allotment of chaff. An average of 8 bundles of chaff per sortie was used for other USAF F-16 units utilizing the UTTR airspace.
2. Both RR-170A/AL and RR-188 type chaff weigh 6.4 ounces per bundle.
3. Of the 3,491 sorties conducted over the Hill Air Force Range, the 388 FW conducted 2,363 sorties, the 419 FW conducted 964 sorties, and other USAF units conducted 164 sorties.
4. Of the 5,990 sorties conducted over the Wendover Air Force Range, the 388 FW conducted 4,055 sorties, the 419 FW conducted 1,653 sorties, and other USAF units conducted 282 sorties.

Training with Self-Protection Chaff and Flares Utilizing F-16 Aircraft

In training for use of chaff and flares, F-16 aircraft pilots are taught to depress a button on the control stick (on the right side of the cockpit) with the little (i.e., "pinkie") finger of their right hand (see Figure 1-5), which dispenses a single bundle of chaff and a single flare simultaneously. Alternatively, they may depress a toggle switch (see Figure 1-5) on a panel next to the throttle (on the left side of the cockpit) with their left elbow to disperse either chaff or flares (preselected before flight). Both of these movements allow the pilot to maintain complete control of the control stick and throttle. A third button, forward of the elbow button, activates dispersion of either chaff or flares (indicated as the "chaff/flare dispense button" in Figure 1-5). This button is normally set for the deployment of flares. Use of this button requires the pilot to remove his left hand from the throttle. Restrictions on use of chaff and flares at the UTTR result in pilots' having to use this third button because their altitude or location dictates use only of flares. This defeats one of the primary goals of training – to train under the most realistic scenarios possible to maximize the combat readiness of pilots.

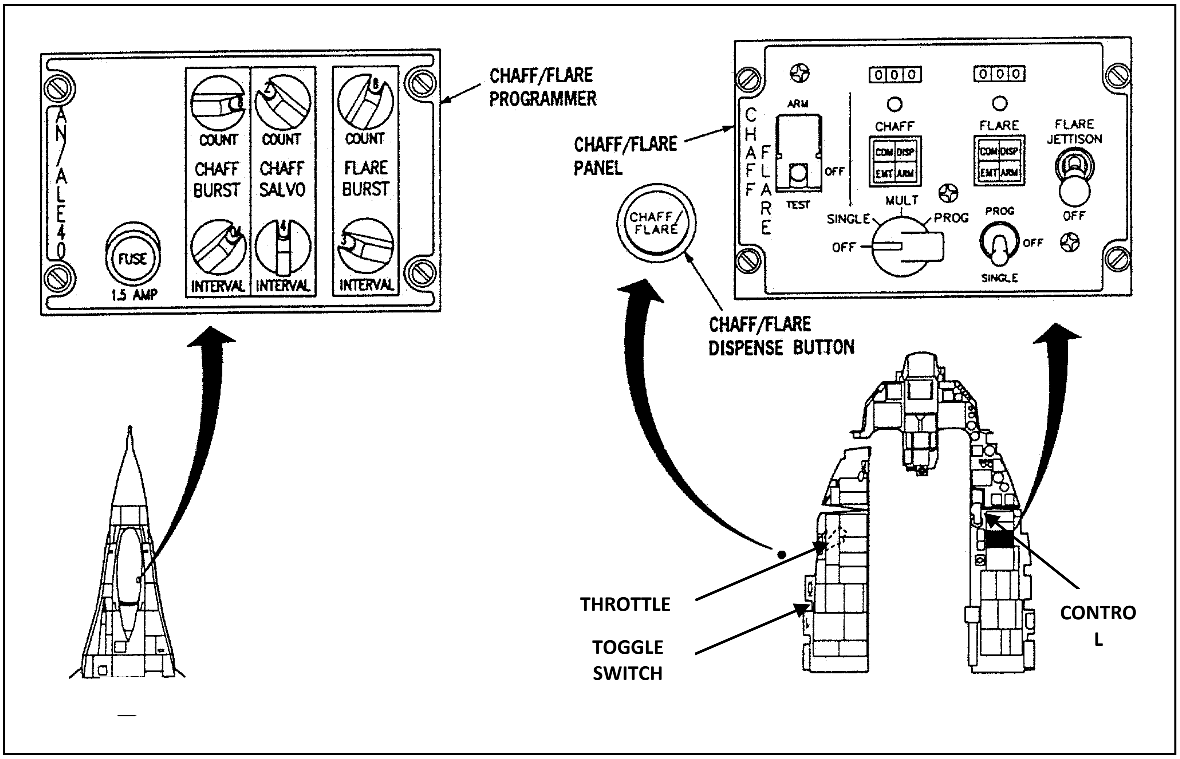


Figure 1-5. Chaff and Flare Controls within the Cockpit of the F-16 Aircraft

1.3 ENVIRONMENTAL COMPLIANCE REQUIREMENT

The following section provides a brief summary of laws, regulations, and other requirements that are considered in the analysis of the Proposed Action presented in this document.

1.3.1 Environmental Policy

The National Environmental Policy Act, commonly known as NEPA, is a Federal statute requiring the identification and analysis of potential environmental impacts of proposed Federal actions before those actions are taken. NEPA legislated a structured approach to environmental impact analysis that requires Federal agencies to use an interdisciplinary and systematic approach in their decision-making process. This process evaluates potential environmental consequences associated with the Proposed Action and considers alternative courses of action. The intent of NEPA is to protect, restore, or enhance the environment through well-informed Federal decisions.

The process for implementing NEPA is codified in Title 40 of the Code of Federal Regulations (CFR), Parts 1500-1508, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee Federal policy in this process. To this end, the CEQ regulations specify that an EA be prepared to:

- Briefly provide evidence and analysis for determining whether to prepare an EIS or a FONSI,
- Aid in an agency's compliance with NEPA when an EIS is unnecessary, and
- Facilitate preparation of an EIS when one is necessary.

AFPD 32-70, *Environmental Quality*, states that the Air Force will comply with applicable Federal, state, and local environmental laws and regulations, including NEPA. The Air Force implementing regulation for NEPA is AFI 32-7061, *Environmental Impact Analysis Process*.

Executive Order (EO) 11514, *Protection and Enhancement of Environmental Quality*, as amended by EO 11991, sets policy directing the Federal government in providing leadership in protecting and enhancing the quality of the Nation's environment.

1.3.2 Integration of Other Environmental Statutes and Regulations

To comply with NEPA, the planning and decision-making process for actions proposed by Federal agencies involves a study of other relevant environmental statutes and regulations. The NEPA process, however, does not replace procedural or substantive requirements of other environmental statutes and regulations. It addresses them collectively in the form of an EA or EIS, which enables the decision-maker to have a comprehensive view of major environmental issues and requirements associated with the action proposed. According to CEQ regulations, the requirements of NEPA must be integrated "with other planning and environmental review procedures required by law or by agency so that all such procedures run concurrently rather than consecutively."

This EA examines potential effects of the Proposed Action and alternatives on seven resource areas, including: human health and safety, air quality, soil and water resources, biological resources, land use, cultural resources, and environmental justice/protection of children. The following subsections present examples of relevant laws, regulations, and other requirements that are often considered as part of the analysis.

Human Health and Safety

AFI 91-202, *The USAF Mishap Prevention Program*, implements AFPD 91-2, *Safety Programs*. It establishes mishap prevention program requirements (including the Bird Aircraft Strike Hazard [BASH] Program), assigns responsibilities for program elements, and contains program management information. This instruction applies to all Air Force personnel, including Air Force Reserve members.

AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program*, implements AFPD 91-3, *Occupational Safety and Health* by outlining the AFOSH Program. The purpose of the AFOSH Program is to minimize loss of Air Force resources and to protect Air Force people from occupational deaths, injuries, or illnesses by managing risks. In conjunction with the *USAF Mishap Prevention Program* (AFI 91-202), these standards ensure all Air Force workplaces meet Federal safety and health requirements. This instruction applies to all Air Force activities, including those of Air Force Reserve.

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

Air Quality

The Clean Air Act (CAA) establishes Federal policy to protect and enhance the quality of the nation's air resources to protect human health and the environment. The CAA requires that adequate steps be taken to control the release of air pollutants and prevent significant deterioration in air quality.

In addition to compliance with NEPA, Federal agencies are required to determine the conformity of their Proposed Actions to State Implementation Plans (SIPs) for attainment of air quality standards. Under the Clean Air Act Amendments of 1990, the U.S. Environmental

Protection Agency (USEPA) has set forth regulations (40 CFR 51, Subpart W) that require the proponent to determine if implementation of the Proposed Action would conform to the SIP.

Soil and Water

The Clean Water Act of 1977 (33 U.S.C. [United States Code] 1344) and the Water Quality Act of 1987 (33 U.S.C. 1251, et seq., as amended) establish Federal policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters and, where attainable, to achieve a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water.

Biological Resources

The Endangered Species Act requires Federal agencies that fund, authorize, or implement actions to avoid jeopardizing the continued existence of Federally-listed threatened or endangered species, or destroying or adversely affecting their critical habitat. Federal agencies must evaluate the effects of their actions through a set of defined procedures, which can include preparation of a Biological Assessment and formal consultation with the U.S. Fish and Wildlife Service (USFWS).

EO 11990, *Protection of Wetlands*, requires that Federal agencies provide leadership and take actions to minimize or avoid the destruction, loss, or degradation of wetlands and the preserve and enhance the natural and beneficial values of wetlands.

The Clean Water Act, under Section 404, contains provisions for protection of wetlands and establishes a permitting process for activities having potential effects in wetland areas. Wetlands, riverine, and open water systems are considered waters of the United States and, as such, fall under the regulatory jurisdiction of the United States Army Corps of Engineers (USACOE).

Land and Cultural Resources

The National Historic Preservation Act (NHPA) of 1966 provides the principal authority used to protect historic properties, establishes the National Register of Historic Places, and defines, in

Section 106, the requirements for Federal agencies to consider the effects of an action on properties on or eligible for the National Register.

Protection of Historic and Cultural Properties (36 CFR 800 [1986]) provides an explicit set of procedures for Federal agencies to meet their obligations under the NHPA, including inventorying of resources and consultation with State Historic Preservation Officers (SHPOs).

The Archeological Resources Protection Act (ARPA) of 1979 ensures that Federal agencies protect and preserve archeological resources on Federal or Native American lands and establishes a permitting system to allow legitimate scientific study of such resources.

EO 13007, *Indian Sacred Sites*, requires that, to the extent practicable, Federal agencies accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites.

EO 13084, *Consultation and Coordination with Indian Tribal Governments*, requires that each Federal agency shall have an effective process to permit elected officials and other representatives of Indian tribal governments to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.

Environmental Justice/Protection of Children

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs Federal agencies to assess the effects of their actions on minority and low-income populations within their region of influence. Agencies are encouraged to include demographic information related to race and income in their analysis of the environmental and economic effects associated with their actions.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, directs Federal agencies to 1) identify and assess environmental health risks and safety risks that may disproportionately affect children and 2) ensure that policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

1.3.3 *Interagency and Intergovernmental Coordination for Environmental Planning Process*

NEPA requirements help ensure that environmental information is made available to the public during the decision-making process prior to actions being taken. The premise of NEPA is that the quality of Federal decisions will be enhanced if proponents provide information to the public and involve the public in the planning process. CEQ regulations implementing NEPA specifically state, "There shall be an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. This process shall be termed scoping." The Intergovernmental Coordination Act and EO 12372, *Intergovernmental Review of Federal Programs*, require Federal agencies to cooperate with and consider state and local views in implementing a Federal proposal. AFI 32-7061 requires the proponents to implement a process known as Interagency and Intergovernmental Coordination for Environmental Planning (IICEP), which is used for the purpose of agency coordination and implements scoping requirements.

Through the IICEP process, the proponents notify relevant Federal, state, and local agencies of the Proposed Action and allow them sufficient time to make known their environmental concerns specific to the action. It also provides the USAF the opportunity to cooperate with and consider state and local views in implementing a Federal proposal. Upon receipt, agency responses provided during the IICEP process will be incorporated into the analysis of potential environmental impacts conducted as part of the EA. Copies of the IICEP letters and agency responses will be included in the EA as an appendix. During the IICEP process, the USAF coordinated with agencies such as the BLM, FAA, USEPA, USFWS, USACOE, Utah Department of Natural Resources, the Utah and Nevada SHPO, and other local, state, and Federal agencies. A copy of the IICEP letter mailed to agencies for this action, the IICEP distribution list, and agency responses are included in Appendix A.

This page left blank.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

Regulations for the UTTR (i.e., *AFI 13-212, UTTR Supplement 2 [Training]*) specify the locations and altitudes at which chaff and flares can be deployed. At present, the use of chaff is authorized within defined airspace boundaries at any altitude only over DoD-withdrawn lands. The use of flares is authorized at any altitude over DoD-withdrawn lands, and only above 1,500 feet AGL over lands other than those held by DoD. The 388 FW and 419 FW propose to change these restrictions by expanding the locations and altitudes where chaff and flares may be employed by all military aircraft utilizing the UTTR airspace. Various combinations of possible changes are described in this Section.

The Proposed Action and alternatives represent expansions of present authority for use of chaff and flares. For instance, adoption of the Proposed Action would include continued authorization to disperse chaff over DoD-withdrawn lands from surface levels upwards.

This EA considers the Proposed Action and several alternatives to the Proposed Action. Figures are provided to assist the reader in understanding the location and altitude of each possible change to existing practices. In addition, Table 2-1 summarizes and compares the Proposed Action and the alternatives to the Proposed Action.

2.2 PROPOSED ACTION

The Proposed Action would be to authorize use of chaff by military aircraft at 500 feet AGL or higher outside the DoD-withdrawn lands throughout the entire UTTR airspace. The use of flares would be authorized at 1,000 feet AGL or higher throughout the entire UTTR airspace. The use of flares would be authorized down to 500 feet AGL over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands (See Figure 2-1). The amount of chaff and flares deployed within the UTTR would not

Table 2-1. Summary and Comparison of the Proposed Action and Alternatives

Chaff and Flare Use Description	Chaff and Flare Deployment Altitude (feet AGL)				
	Proposed Action	Alternative 1	Alternative 2	Alternative 3	No Action
Chaff over DoD Lands	Surface	Surface	Surface	Surface	Surface
Chaff in Restricted Areas	500	1,000	1,500	500	No
Chaff in UTTR Authorized Areas	500	1,000	1,500	No	No
Chaff over Mudflats	500	500	500	No	No
Flares over DoD Lands	Surface	Surface	Surface	1,000	Surface
Flares in Restricted Areas	1,000	1,000	1,500	1,000	1,500
Flares in Entire UTTR	1,000	1,000	1,500	1,000	1,500
Flares over Mudflats	500	500	500	500	1,500

change under the Proposed Action. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace.

2.3 ALTERNATIVES TO THE PROPOSED ACTION

2.3.1 Alternative 1

Alternative 1 would be to authorize use of chaff and flares by military aircraft down to 1,000 feet AGL outside the DoD-withdrawn lands throughout the entire UTTR airspace. In addition, the use of flares would be authorized down to 500 feet AGL over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands (See Figure 2-2). The amount of chaff and flares used within the UTTR would not change under Alternative 1. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace.

Figure 2-1. Chaff and Flare Deployment Areas Under the Proposed Action

Figure 2-2. Chaff and Flare Deployment Areas Under Alternative 1

2.3.2 Alternative 2

Alternative 2 would be to authorize use of chaff by military aircraft down to 1,500 feet AGL outside the DoD-withdrawn lands throughout the entire UTTR airspace. In addition, the use of flares would be authorized down to 1,500 feet AGL throughout the entire UTTR airspace. The use of flares would be authorized down to 500 feet AGL or higher over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands (See Figure 2-3). The amount of chaff and flares used within the UTTR would not change under Alternative 2. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace.

2.3.3 Alternative 3

Alternative 3 would be to authorize use of chaff by military aircraft down to 500 feet AGL within Restricted Airspace outside the DoD-withdrawn lands. The use of flares would be authorized down to 1,000 feet AGL throughout the entire UTTR airspace. In addition, the use of flares would be authorized down to 500 feet AGL over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands (See Figure 2-4). The amount of chaff and flares used within the UTTR would not change under Alternative 3. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace.

2.3.4 Alternative 4

Changes in altitudes at which chaff and flares would be authorized could be achieved by Hill AFB pilots' use of other ranges and airspace in proximity to Hill AFB. Under this alternative, pilots and aircrews could transit to Nellis Range or Fallon Range in Nevada or to Sailor Creek/Mountain Home Range in Idaho. Use of other ranges by pilots and aircrews based at Hill AFB would require additional fuel to travel between the base and these ranges. Once at the range, training exercises would be truncated because of this

Figure 2-3. Chaff and Flare Deployment Areas Under Alternative 2

Figure 2-4. Chaff and Flare Deployment Areas Under Alternative 3

additional fuel usage. As a result, the quality and amount of training would be diminished. For these reasons, use of other ranges is not feasible. Accordingly, this alternative is not to be evaluated in detail in the EA.

2.4 THE NO ACTION ALTERNATIVE

The baseline that will be used to evaluate potential environmental consequences of the Proposed Action and alternatives is the present environment within the UTTR. The continuation of these existing environmental conditions without implementation of the Proposed Action is referred to as the No Action Alternative. Adoption of this alternative would mean that existing conditions would continue "as is" and implementation of the Proposed Action or another alternative would not occur. The No Action Alternative serves as the benchmark against which Federal actions can be evaluated. Inclusion of the No Action Alternative is prescribed by the CEQ regulations and, therefore, it will be carried forward for further analysis in the EA.

3.0 ENVIRONMENTAL CONDITIONS AND CONSEQUENCES

3.1 INTRODUCTION

This section of the EA presents the environmental conditions and consequences related to the proposed expansion of the use of self-protection chaff and flares as described in Sections 1.0 and 2.0. Following a definition of the resource areas and a discussion of the significance determinations is an analysis of potential environmental effects pertinent to the Proposed Action. This combined presentation of existing conditions and analysis of effects is intended to aid the reader's understanding of potential effects.

Discussions pertaining to existing conditions provide information to serve as a baseline from which to identify and evaluate environmental and socioeconomic changes likely to result from implementation of the Proposed Action. In compliance with NEPA, CEQ guidelines, and AFI 32-7061, the description of the affected environment focuses on those resources and conditions potentially subject to impacts. Additionally, the EA identifies and eliminates from detailed study issues which are not significant in the context of the Proposed Action and narrows the discussion of these issues to a brief presentation of why they will not have a significant effect on the environment and are, therefore, dismissed from further analysis.

As previously stated, ACC's August 1997 report presents a summary of an in-depth study of the types of chaff and flares used within ACC-controlled military airspace, and the general effects of their use on the environment. The report is entitled *Environmental Effects of Self-Protection Chaff and Flares* (ACC 1997). Furthermore, ACC developed guidelines to assist in the assessment of the environmental impacts of proposals with chaff and flare use and to prepare documentation to comply with NEPA. The guidelines are based on the findings and conclusions of the study concerning the potential effects of chaff and flares on health, safety, air quality, physical resources (i.e., soil and water resources), biological resources, land use and visual resources, and cultural resources. Fire risk associated with flare use was also addressed. Table 3-1 summarizes the conclusions reached as part of the study on the potential environmental

Table 3-1. Summary of the Potential for Impacts from Chaff and Flare Use

Table 3-1. Summary of the Potential for Impacts from Chaff and Flare Use (continued)

impacts caused by chaff and flare use. Issues that were documented in the study that were found to have little or no potential for significant environmental impact are incorporated into this EA by reference. However, the findings of the ACC study are briefly presented in the following sections. In addition, issues that require further site-specific information or analyses are also discussed in the following sections.

A second report, published in August 1999, presents an assessment of the environmental effects specific to radio-frequency (RF) chaff, entitled *Environmental Effects of RF Chaff – A Select Panel Report to the Undersecretary of Defense for Environmental Security* (referred to hereafter as "the 1999 Select Panel Report"). A complete copy of this report is included as Appendix C of this EA. A select panel of university-based research scientists, each with published expertise in a relevant field of study, determined the findings of this report. The analytical approach was to use the models from environmental toxicology and related disciplines, "upper bounds" or worst case estimates based on the amounts and areas of chaff use, analysis of known literature data to the related effects of chaff, and reasonable, prudent extrapolations and derivations from these data. The report states, "The Panel concludes that widespread environmental, human, and agricultural impacts of RF chaff as currently used in training are negligible, and far less than those from other man-made emissions, based on the available data, analyses, estimations, and related information. Empirical information is lacking concerning the extent to which chaff abrades and is resuspended to the atmosphere and actual exposure in populated areas near release. However, upper limit calculations suggest that those impacts are also negligible." This report is, therefore, incorporated into this EA by reference. However, the findings of this Select Panel Report are briefly presented in the following sections.

3.2 RESOURCE AREAS: DEFINITIONS AND SIGNIFICANCE CRITERIA

Resource Areas. The term "resource areas" refers to those aspects of the human environment that may be affected by a proposed action. Resource areas are organized into broad groupings of environmental assets, such as soil and water resources or biological resources. Some aspects of the environment reflect conditions imposed by humans. These include land use and cultural resources.

Significance Determinations. The significance of an action is measured in terms of its context and intensity. The extent to which a proposed action may affect an environmental resource depends on many factors. In some cases, environmental resources may be affected directly, in others they may be affected indirectly, and in some cases, not affected at all.

> *Context*. The significance of an action is analyzed in several contexts, such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance may vary with the setting of a proposed action.
>
> *Intensity*. Intensity refers to the severity of impact. Impacts may be beneficial or adverse. Consideration must be given to whether an impact affects public health or safety and whether it affects areas having unique characteristics such as historical or cultural resources, wetlands, or ecologically critical areas. The significance of impacts may also depend on the degree of their being controversial or posing highly uncertain, unique, or unknown risks. Significance may be found where an action sets a precedent for future actions having significant effects, as well as in cases involving cumulative impacts. In considering intensity, consideration must be given to the degree to which the action may adversely affect resources or items or places listed in the National Register of Historic Places (NRHP) or animal or plant species or their habitat listed as endangered or threatened. Finally, in evaluating intensity, consideration must be given to whether an action threatens a violation of a law or regulation imposed for the protection of the environment.

Principal Resource Areas. Analysis of potential environmental effects focuses on those resource areas that are appropriate for consideration in light of a proposed action. All resource areas are initially considered, but some may be eliminated from detailed examination because of their inapplicability to a particular proposal. Pursuant to the guidelines established in the 1997 ACC Report, the following resource areas evaluated for chaff and flare proposals include human health and safety, air quality, soil and water resources, biological resources, land use and visual resources, and cultural resources. Environmental justice and the protection of children will also be evaluated as part of this EA. The following discussions identify major aspects of the resources areas and conditions and indicate environmental aspects typically grouped under the major headings.

3.2.1 Human Health and Safety

Chaff is used to counter an aircraft's detection by radar by masking the aircraft, or by providing confusing false radar returns to defeat radar-guided anti-aircraft defensive systems. When used, chaff forms a large cloud of fibers that disperses slowly so as to create radar interference for as long as possible. The processes used to eject chaff and the effects chaff produces have the potential to create safety impacts. Any situation that could result in interference with or disruption of a communications or radar system has the potential to create impacts on the environment. Furthermore, any situation that has the potential to damage aircraft or injure or incapacitate aircrews could result in adverse environmental impacts if there is a risk of catastrophic aircraft mishap of if it could cause serious injury or damage to persons or property on the ground in areas underlying airspace where chaff is employed (ACC 1997).

Self-protection flares are pyrotechnic devices deployed by aircraft to mislead or confuse heat-sensitive or heat-seeking anti-aircraft systems. They burn rapidly, at high temperatures, providing a heat source other than the aircraft's engine to defeat surface-to-air and air-to-air missiles that use heat to guide to their target. Both ground support maintenance personnel and aircrews require regular training in flare system use and flare employment to maintain combat effectiveness and efficiency. Furthermore, aircrew training must simulate combat conditions to the maximum extent practicable. These training requirements, plus the need to frequently validate flare and flare system operational reliability requirements, create the potential for safety concerns and impacts due to the explosive and incendiary characteristics of the components. Effects that could result from these issues have the potential to impact both the human and natural environment. Any situation having the potential to injure personnel, damage aircraft or other property, or create risks to persons on the ground would also have the potential to generate adverse environmental impacts in areas underlying airspace approved for flare use if it created a high risk of catastrophic aircraft or explosive mishaps (ACC 1997).

Fires resulting from flare use have the potential to cause impacts on a variety of resources. The degree of the impact of the fire will depend on the extent and intensity of the fire, the sensitivity of the resources to damage by fire, and the value of the affected resource. Fire is part of the natural ecosystem of most plant communities, including those found within the area underlying the UTTR airspace, and is the major force in all arid, temperate, boreal, and austral zones. The more fire-prone the ecosystem, the greater the role of natural fire in shaping the ecosystem. Land managers use techniques such as controlled burning as a way to lessen the build up of fuels to reduce the potential for large fire, and to reinvigorate the growth of grasses where undesirable species have invaded. However, the potential consequences for unplanned fires caused by other than natural causes are not desirable in any situation (ACC 1997).

3.2.2 Air Quality

The USEPA defines air quality in terms of concentration of various pollutants in the atmosphere. Under authority of the CAA, the USEPA has established standards for ambient air quality. Known as the National Ambient Air Quality Standards (NAAQS), these criteria apply to six pollutants: ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and particulate matter less than 10 microns in diameter (see Table 3-2). National primary standards are set at levels of pollutant concentration which, with an adequate margin of safety, provide for the protection of the health of even the most sensitive portion of the population. Secondary standards have been set for some pollutants in order to protect public welfare (i.e., to protect against damage to plants, animals, and materials).

Concentration levels of pollutants are measured in parts per million (ppm) and micrograms per cubic meter ($\mu g/m^3$). The NAAQS take into account both the concentration level of the pollutant and the duration of exposure, and they are expressed in terms of concentration levels averaged for a certain period of time. Concentrations below the standards are considered acceptable. Each state performs the monitoring and maintenance of NAAQS and regulates discrete areas by means of a SIP submitted to USEPA for approval.

Table 3-2. National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards	
		Primary	Secondary
Ozone (O_3)	1 hour	0.12 ppm (235 μg/m³)	Same as Primary
	8 hours	0.08 ppm (157 μg/m³)	Same as Primary
Carbon Monoxide (CO)	1 hour	35.00 ppm (40,000 μg/m³)	Same as Primary
	8 hours	9.00 ppm (10,000 μg/m³)	
Sulfur Dioxide (SO_2)	3 hours	N/A	0.50 ppm (1300 μg/m³)
	24 hours	0.14 ppm (365 μg/m³)	N/A
	1 year	0.03 ppm (80.0 μg/m³)	N/A
Nitrogen Dioxide (NO_2)	1 year	0.05 ppm (100 μg/m³)	Same as Primary
Suspended Particulate Matter (PM_{10})	24 hours	150.00 μg/m³	Same as Primary
	1 year	50.00 μg/m³	N/A
Particulate Matter ($PM_{2.5}$)	24 hours	65.00 μg/m³	Same as Primary
	1 year	15.00 μg/m³	Same as Primary
Lead (Pb)	3 months	1.50 μg/m³	Same as Primary

Notes: National standards are from 40 CFR 81-323.

Units are expressed in micrograms per cubic meter (μg/m³) and parts per million (ppm).

National standards, other than those for ozone and those based on annual averages or annual geometric means, are not to be exceeded more than once per year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

The ozone 1-hour standard applies only to areas that were designated as being in nonattainment

USEPA rules require that each SIP contain a provision requiring that proponents of Federal actions comply with the General Conformity Rule requirements of the CAA Amendments. Pursuant to that rule, conformity determinations are required to ensure that state air quality standards would not be exceeded and that the action would comply fully with the SIP. The proponent compares the emissions levels of a proposed action to current baseline emissions. Where increases in emission levels exceed thresholds established in the conformity rule, a conformity determination must be prepared. In support of the conformity determination, additional air quality modeling may be required to show more precisely the action's impacts on air quality in the region.

Compliance with the General Conformity Rule of the CAA Amendments is not the end of consideration of air quality. The analysis necessary to satisfy the General Conformity Rule differs from traditional analysis under the NEPA. A written conformity determination is required only for the preferred alternative, not for all alternatives identified for a proposed action, and is limited to the criteria pollutant(s) for which an area fails to attain the NAAQS.

The CAA prohibits Federal agencies from performing projects that do not conform to a USEPA-approved SIP. In 1993, the USEPA developed final rules for determining air quality conformity. Under these rules, certain actions are exempted from conformity determinations, while others are assumed to be in conformity if total project emissions are below *de minimis* levels established under 40 CFR Part 93.153. Total project emissions include both direct and indirect emissions that can be regulated by a Federal agency.

The USAF currently employs the use of two types of chaff dispensers: pyrotechnic dispensers, which use hot gasses generated from exploding cartridges to expel chaff, and non-pyrotechnic dispensers which use high pressure gas to expel chaff. Consequently, for the pyrotechnic chaff, air quality and health impacts could occur from both chaff material and the explosive charges, while for the non-pyrotechnic chaff, impacts could arise only from the chaff material (ACC 1997).

Flares are comprised mainly of magnesium which, when ignited, provides a more intense heat source than an aircraft engine. Air quality impacts could occur from both the flare materials and the explosive charges used to eject and ignite the flares (ACC 1997).

3.2.3 Soil and Water Resources

Soils are the unconsolidated materials overlying bedrock or other parent material. Soils typically are described in terms of their complex type, slope, and physical characteristics. Differences among soil types in terms of their structure, elasticity, strength, shrink-swell potential, and erosion potential affect their abilities to support certain applications or uses.

Water resources include surface water and groundwater. Evaluation identifies the quantity and quality of the resource and its demand for potable, irrigation, and industrial purposes. Surface water resources consist of lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale. Groundwater consists of the subsurface hydrologic resources. It is an essential resource often used for potable water consumption, agricultural irrigation, and industrial applications. Groundwater typically may be described in terms of its depth from the surface, aquifer or well capacity, water quality, surrounding geologic composition, and recharge rate.

Factors that influence the potential for chaff to change the soil and water chemistry include the chemical composition of the chaff, the concentration of chaff deposited in a given area, the rate of chaff decomposition ion the environment, the propensity of chaff to leach toxic chemicals under various soil and water conditions, and the background soil and water chemistry and conditions. Alteration of the natural soil chemistry of an area has the potential to affect vegetation and vegetative cover and, consequently, the stability of soil conditions, as well as the type and quality of habitat. Changes in soil composition can also affect groundwater and surface water bodies through chemical leaching and runoff. If chemicals leach from chaff, deposition in water bodies, such as rivers or creeks, may have the potential to alter the chemical composition of the water and/or sediments, and, consequently, the habitat value.

Factors that influence the potential for flares and flare ash to affect soils and water chemistry include the chemical composition of flare material and ash, the chemical reactions that those materials may have with moisture, the density of flare duds, the quantities of flare ash produced by burning flares and its distribution on the ground, and the background environmental conditions in areas where flares and flare ash are deposited. Chemical changes, particularly in water bodies, affect habitat conditions and aquatic organisms. Chemical changes in soils can affect vegetative cover and result in increased erosion and sedimentation.

3.2.4 Biological Resources

Biological resources consist of naturally occurring and cultivated vegetative species and domestic and wild animal species and their habitats. Determining which species occur in an area affected by a proposed action may be accomplished through literature reviews and coordination with appropriate Federal and state regulatory agency representatives, resource managers, and other knowledgeable experts.

Sensitive biological resources include plant and animal species listed as threatened or endangered by the Secretary of the Interior under the Endangered Species Act (ESA) or by a state agency pursuant to state law or regulation. An endangered species is defined as any species in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as any species likely to become an endangered species in the foreseeable future. Sensitive species also includes those species identified as candidates for possible listing as threatened or endangered pursuant to the ESA. Candidate species are those for which substantial information has been obtained on biological vulnerability preparatory to action to list the species as either threatened or endangered.

Biological resources also includes wetlands. Wetlands are important because of the many functions they perform. Wetlands provide essential breeding, spawning, nesting, and wintering habitats for a major portion of the Nation's fish and wildlife species. Wetlands are important also for water quality improvement, groundwater recharge and discharge, pollution mitigation, nutrient cycling, unique flora and fauna niche provision, stormwater attenuation and storage, sediment detention, and erosion protection. Wetlands are protected as a subset of the "waters of the U.S." identified in Section 404 of the Clean Water Act. USACOE defines wetlands as those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The primary pathways for potential effects of chaff on biological resources include inhalation, ingestion, and direct body contact. Chemical alteration of the soil and/or water resulting from chemical decomposition of chaff could also affect vegetation and aquatic life (ACC 1997).

Flares have the potential to affect biological resources directly through visual responses in wildlife and indirectly through vegetation loss and habitat modification resulting from fires started by flares. The significance of flare impacts on biological resources vary in relation to the sensitivity of the environment affected including the presence of threatened and endangered species (ACC 1997).

3.2.5 Land Use and Visual Resources

The term "land use" refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws. There is, however, no nationally recognized convention or uniform terminology for describing land use categories. As a result, the meanings of various land use descriptions, "labels," and definitions vary among jurisdictions.

Natural conditions of property can be described or categorized as unimproved, undeveloped, conservation or preservation area, and natural or scenic area. There is a wide variety of land use categories resulting from human activity. Descriptive terms often used include residential, commercial, industrial, agricultural, institutional, and recreational.

Two main objectives of land use planning are to ensure orderly growth and compatible uses among adjacent property parcels or areas. Compatibility among land uses fosters the societal interest of obtaining the highest and best uses of real property. Tools supporting land use planning include written master plans/management plans and zoning regulations. In appropriate cases, the locations and extent of proposed actions need to be evaluated for their potential effects on project site and adjacent land uses. The foremost factor affecting a proposed action in terms of land use is its compliance with any applicable land use or zoning regulations. Other relevant factors include matters such as existing land use at the project site, the types of land uses on adjacent properties and their proximity to a proposed action, the duration of a proposed activity, and its "permanence."

Land use impacts result when an existing, designated, or planned land use is altered or displaced, due to changes to attributes that make it suitable for such use. Land can be owned or controlled by Federal entities (such as BLM, USFWS, DoD), states or local jurisdictions, or by individuals. These entities have the obligation and authority to determine suitable land use and management objectives. The goals and benefits can be economic, ecological, or social (public). Therefore the primary factors to considering land use effects are the physical changes that could affect the use and/or the management objectives of the owner/custodian of the land. Specifically in this case, the measure of impact on land use is the degree to which chaff and associated debris accumulate and alter the attributes of the land or interfere with its management or use (ACC 1997). Table 3-3 identifies the potential sensitivity of land uses and specially designated areas to various types of effects. It includes the sensitivity of specific related resources, as well as the land use itself.

The potential sensitivity of particular land uses to the effects from flares is summarized in Table 3-4. The sensitivity of various land uses to flares would be similar to that described for chaff debris. If a dud flare were found and improperly handled by an untrained person, it could ignite and cause injury or damage to property (ACC 1997). Fire could have a significant adverse effect on any land use, therefore, the sensitivity to fire presented in Table 3-4 is related primarily to the potential for hazard to people or ecological damage.

Visual resources are affected by changes in the environment that impact personal visual perceptions of a place. Particular visual attributes of the environment may be valued for the feelings they tend to evoke in the majority of people. Places that are highly valued for their aesthetic quality are considered important visual resources.

Table 3-3. Sensitivity of Land Uses to Chaff Impacts

Land Use or Specially Designated Area	Potential Resource Effect					
	Wildlife	Livestock	Crops	Water Resources	Management Objectives	Aesthetics
Wilderness	L	L	N/A	L	M/H	M/H
Wild and Scenic River	L	N/A	N/A	M	M/H	M/H
Coastal Zone	L	L	L	M	M	M/H
Wildlife Protection Area/Refuge	M	N/A	N/A	M	M	L
Wellhead Protection Area/Sole Source Aquifers	L	N/A	N/A	M	L	L
Area of Critical Environmental Concern	L	N/A	N/A	M	M	L
Visual Resource Area	L	L	L	L	M/H	M/H
National Park/ Monument	L	N/A	N/A	L	M/H	M/H
Military	L	L	L	L	L	L
Forest	L	L	L	L	L	L
Agricultural	L	L	L	L	L	L
Recreation	L	L	N/A	L	M	M
Industrial	L	N/A	N/A	L	L	L
Residential	L	N/A	L	L	M	M
Commercial	L	N/A	L	L	L	L

Source: ACC 1997

Notes: H - High
M - Medium
L - Low
N/A - Not Applicable

When visual attributes are altered sufficiently to elicit altered feelings about a space and its aesthetic quality, a visual impact results. The primary factors to be considered in evaluating visual effects are the visual quality of the area and the visibility of accumulated chaff and related debris. Only the foreground visual environment is expected to be affected, due to the small size of chaff debris (ACC 1997).

The degree to which a fire affects land uses and visual resources depends on the damage caused by the fire, land use objectives, aesthetic value, and the number of people exposed to the hazard. Federal land managers usually set fire management objectives for different vegetative areas, based on the propensity of fires to start and spread and the sensitivity of

Table 3-4. Sensitivity of Land Uses to Flare Impacts

Land Use or Specially Designated Area	Potential Resource Effect			
	Debris Accumulation	Duds	Physical Flare Damage [1]	Aesthetic Flare Damage [1]
Wilderness	M/H	M	M/H	M/H
Wild and Scenic River	M/H	M	M/H	M/H
Coastal Zone	M	L	M/H	M/H
Wildlife Protection Area/ Refuge	M	L	M/H	M
National Park/Monument	M	H	M/H	M/H
Wellhead Protection Area	L	L	M/H	L
Areas of Critical Environmental Concern	L	L	M/H	M
Forest	L	L	M	M
Cropland	L	L	M	L
Rangeland	L	L	M	L
Recreational	M	M/H	M/H	M/H

Source: ACC 1997

Notes: H - High

M - Medium

L - Low

[1] Effects depend on the extent of the fire damage and the time it takes for vegetation to recover.

the sensitivity of resources to fire damage. Impacts of fire on visual resources depend upon the scenic quality of the area, size and intensity of the fires, and noticeability of the burned area. In addition, smoke from fires may obscure views and reduce scenic quality, but those impacts would be temporary and not result in permanent changes to visual resources. Smoke damage to structures (other than cultural resources) may have an economic consequence, but is not expected to affect enduring land use or visual attributes (ACC 1997).

3.2.6 Cultural Resources

Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, and any other physical evidence of human activities considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: prehistoric and historic archaeological resources, architectural resources, and traditional cultural resources.

> *Prehistoric and historic archaeological resources*. These are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., arrowheads or pottery). Prehistoric resources range from scatter composed of a few artifacts to village sites and rock art that predate written records in a region. Historic archaeological resources include campsites, roads, fences, trails, dumps, battlegrounds, mines, and a variety of other features.
>
> *Architectural resources*. These include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. In general, architectural resources must be more than 50 years old to be considered for protection under laws protecting cultural resources. Structures such as military buildings from the Cold War era may warrant protection if they manifest the potential to gain significance in the future.
>
> *Traditional cultural resources*. These resources can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other ethnic groups consider essential for the preservation of their traditional culture.

The Secretary of the Interior has issued regulations to establish criteria by which cultural resources may be considered significant for inclusion on the NRHP. The regulations provide that the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and: (1) that are associated with events that have made a significant contribution to the broad patterns of our history; or (2) that are associated with the lives or persons significant in our past; or (3) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (4) that have yielded, or may be likely to yield, information important in prehistory or history.

Several Federal laws have been enacted to manage cultural resources. These include the National Historic Preservation Act (NHPA), Archeological and Historic Preservation Act of 1974, American Indian Religious Freedom Action of 1978 (AIRFA), Archeological Resource Protection Act of 1979, and Native American Graves Protection and Repatriation Act of 1990 (NAGPRA).

The NHPA requires "consultation" when an undertaking will have an adverse effect on historic properties eligible or listed on the National Register. The proponent must consult with the Advisory Council on Historic Preservation (ACHP), the SHPO, and interested parties to determine what actions will be taken regarding the property. The results of these consultations must be taken into consideration as part of the evaluation process concerning a proposed action.

AIRFA and NAGPRA may also trigger consultation. AIRFA establishes a policy to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise traditional religions, including but not limited to access to sites. Compliance with AIRFA implies a need to consult with Native American and Hawaiians about traditional religious and cultural sites on lands directly affected by a proposed action and to examine ways to protect and provide access to such sites. NAGPRA established that Native Americans (Indian tribes and Native Hawaiians) own the remains of their ancestors, certain goods associated with ancestral graves, and some artifacts that bear significance to their entire society (called "cultural patrimony"). This law requires consultation with Native American groups about any excavation of remains these groups own under the law. In the event such items are discovered during construction, work in the vicinity must halt for at least 30 days while further consultation occurs.

The effects of chaff on cultural resources relate to the potential for accumulation of chaff debris to alter the aesthetic setting and context of significant cultural resources. Also, the effects of chaff are related to the potential for chaff physically or chemically impact cultural resources by deposition, accumulation, clumping, decomposition, leaching, and drifting (ACC 1997).

Under the NHPA and implementing regulations, impacts from flare use could result in the damage or alterations to cultural resources that meet National Register criteria occurred as a result of flare-caused fire. In addition, the presence (and potential hazard) of dud flares on land or sites with traditional or ceremonial uses or values may restrict Native Americans from believing, expressing, or exercising religions under the AIRFA (ACC 1997).

3.2.7 Environmental Justice/Protection of Children

On February 11, 1994, President Clinton issued EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This EO requires that Federal agencies' actions substantially affecting human health or the environment do not exclude persons, deny persons benefits, or subject persons to discrimination because of their race, color, or national origin. The essential purpose of the EO is to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, tribal, and local programs and policies. Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations in the vicinity of where a proposed action would occur. Such information aids in evaluating whether a proposed action would render vulnerable any of the groups targeted for protection in the EO.

On April 21, 1997, the President issued EO 13045*, Protection of Children from Environmental Health Risks and Safety Risks*. This EO requires Federal agencies, to the extent permitted by law and mission, to identify and assess environmental health and safety risks that might disproportionately affect children. The EO further requires Federal agencies to ensure that their policies, programs, activities, and standards address these disproportionate risks. The order defines environmental health and safety risks as "risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink and use for recreation, the soil we live on, and the products we use or are exposed to)." Such information aids in evaluating whether a proposed action would render vulnerable children targeted for protection in the EO.

An analysis of the socioeconomic and demographic characteristics of an area is necessary to determine the potential for environmental justice impacts and impacts to children. Socioeconomics are defined as the basic attributes and resources associated with the human environment, particularly population and economic activity. Regional birth and death rates and immigration and emigration affect population levels. Economic activity typically encompasses employment, personal income, and industrial or commercial growth. Changes in these two fundamental socioeconomic indicators may be accompanied by changes in other components such as housing availability and the provision of public services. Socioeconomic data at county, state, and national levels permits characterization of baseline conditions in the context of regional, state, and national trends.

> *Regional economic activity*. Data in three areas provide key insights into socioeconomic conditions that might be affected by a proposed action. Data on employment may identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on personal income in a region can be used to compare the "before" and "after" effects of any jobs created or lost as a result of the proposed action. Data on industrial or commercial growth or growth in other sectors provides baseline and trend line information about the economic health of a region.
>
> *Demographics*. Demographics identifies the population levels and changes to population levels of a region. Demographics data may also be obtained to identify, as appropriate to evaluation of a proposed action, its characteristics in terms of race, ethnicity, poverty status, educational attainment level, and other broad indicators.
>
> *Quality of life*. Quality of life data identify both necessities and amenities a population may have at its disposal. Quality of life typically pertains to availability of housing, type of housing (homeowner or rental), and costs of housing. Data may also be obtained to indicate the number of public and private schools, including trade schools and institutions of higher learning. Information may also be provided

regarding the availability and proximity to population centers of shopping and community services. Finally, data may indicate the availability and type of recreational opportunities available to a community to indicate a region's quality of life.

3.3 EXPANSION OF THE USE OF SELF-PROTECTION CHAFF AND FLARES

This section of the EA presents the environmental conditions and consequences of the expansion of the use of chaff and flares within the UTTR. It addresses the Proposed Action that would occur within the UTTR for the following resource areas: human health and safety, air quality, soil and water resources, biological resources, land use, cultural resources, and environmental justice/protection of children.

3.3.1 Human Health and Safety

Existing Conditions

The USAF has defined four classifications of mishaps: Classes A, B, C, D, and High Accident Potentials (HAPs). A Class A mishap results in a total cost in excess of $1 million for injury, occupational illness, and property damage; a fatality or permanent total disability; or destruction or damage beyond economical repair to USAF aircraft. A Class B mishap results in a total cost in excess of $200,000 (but less than $1 million) in property damage; permanent partial disability; or, hospitalization of five or more personnel. A Class C mishap results in total damage that costs in excess of $10,000 (but less than $200,000), or an injury or occupational illness that results in a loss of workers productivity greater than eight hours. A Class D mishap results in total damage of $2,000 or more (but less than $10,000); a loss of worker productivity of more than 1 hour, but less than 8 hours; or a nonfatal injury that does not result in loss of worker productivity. Class D mishaps are not applicable to aircraft-related mishaps. Mishaps not meeting the definitions of Classes A, B, C, and D, but, because of damage or injury necessitate USAF reporting, are classified as HAPS. Table 3-5 details Class A and B mishaps that have occurred in the past 7 years for the F-16 aircraft.

Historic mishaps involving chaff systems have occurred. From January 1983 through February 1993, there were no Class A, B, C, or D mishaps during flight operations. There were 53 HAP occurrences (involving a variety of types of USAF aircraft), an average of 5.3 per year. The frequency of these mishaps (by year) is shown in Table 3-6. None of the recorded mishaps resulted in significant damage to aircraft (ACC 1997).

Table 3-5. F-16 Mishap History

Fiscal Year	Class A	Class B	Destroyed Aircraft	Fatalities		Flight Hours
	Number	Number	Number	Pilot	All	
1992	18	1	18	8	9	445,201
1993	18	2	18	4	5	433,960
1994	16	2	15	3	27	400,484
1995	9	2	9	1	1	386,445
1996	8	5	7	0	1	374,530
1997	11	1	11	1	1	360,738
1998	14	1	12	4	6	360,245

Table 3-6. Flight Operations Involving Chaff Mishaps

Mishap Class	Year										
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
HAP	4	4	15	14	6	3	1	5	1	0	0

Source: ACC 1997

In recent years, the FAA has placed more stringent restrictions on DoD use of any type of chaff that operates within the bands used by air traffic control radar and navigational systems. The FAA has limited or placed restrictions on the locations, altitudes, and/or time periods within which specific types of chaff can be employed (ACC 1997). The 1997 ACC Report states that very few reported incidents of interference with FAA radar systems that were attributable to chaff operations.

AFI 13-212, UTTR Supplement 2 (Training) requires FAA coordination/approval for all chaff deployments within the UTTR, and, furthermore, requires all units deploying chaff to adhere to FAA regulations. The RR-170 chaff can potentially interfere with FAA equipment, while the RR-188 chaff does not interfere with the affected frequency bands. The Spectrum Management Office (ASM-500) at FAA Headquarters in Washington, DC is the approving agency for USAF chaff requests. These requests are forwarded through the USAF Frequency Management Center to this FAA office where they are reviewed relative to the types of chaff to be used, requested area and altitudes, dates and times of employment, and other operational data accompanying the military request. After considering the requested action's potential to interfere with any of the air traffic control equipment frequency bands, each request is either approved, denied, or approved with certain restrictions, such as time or altitude limitations. Once the request has been acted upon and approved to any extent, a copy of the request is provided to FAA Air Traffic Management (ATM-400) for coordination and appropriate action by the affected air traffic control facility. In some cases, Notice to Airmen (NOTAM) may be required to advise the flying public that certain air traffic control equipment or services may be affected during a specified period of time by chaff operations (ACC 1997).

The probability of debris from an F-16 chaff system hitting a person on the ground is difficult to quantify, as it would be dependent on numerous variables (e.g., location of use, population density beneath the airspace, frequency of use). Ejected debris consists of the chaff itself, a small plastic piston, and a small plastic end cap. Under normal circumstances, all of those elements weigh so little, or create so much drag in comparison to their weight, no injury would be anticipated even if a person were impacted. No incidences of injuries from falling chaff debris have ever been recorded (ACC 1997).

Historic mishaps involving flares and flare systems have occurred. From 1983 to February 1993, there were no Class A or B F-16 aircraft-related mishaps involving flares. During the same period, there were three Class C mishaps and 101 HAPs involving flares that were aircraft-related (i.e., a variety of types of USAF aircraft). This constitutes a yearly average of 0.3 Class C and 10.1 HAP mishaps. The frequency of these mishaps (by year) is shown in Table 3-7. None of those incidents resulted in serious injury (ACC 1997).

Dud flares pose several safety concerns. If flares are ejected from the aircraft and do not ignite, or ignite and burn improperly, risks may arise from accidental ignition on the ground, improper handling, or the possibility of striking a person on the ground. There

Table 3-7. Flight Operations Involving Flare Mishaps

Mishap Class	Year										
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Class C	0	0	1	0	1	0	0	1	0	0	0
HAP	9	14	13	19	14	6	9	5	7	4	0

Source: ACC 1997

are direct and indirect safety concerns related to the recovery of dud flares. Of the data analyzed as part of the 1997 ACC Report, only one case of personnel injury resulting in from activities involving a dud flare was documented. As with chaff components, the probability of flare components hitting someone on the ground is difficult to quantify. Of all the system components, dud flares pose the greatest concern of causing injury as a result of hitting a person on the ground due to their weight. Under normal circumstances, much of the debris ejected from aircraft when flares are employed weighs so little, and creates so much drag in comparison to its weight, no serious injury would be anticipated, even if a person were hit. No incidences of injuries from falling flares or debris have ever been recorded.

Dud flares that remain on the ground and that could be found months or even years later, pose a continuing potential hazard that could last for an undetermined amount of time. While it is theoretically possible that all dud flares released over land could be picked up and pose a risk of injury, there has only been one recorded incidence of injury from a dud flare (ACC 1997). There have been no recorded incidences of injury as a result of handling a dud flare within the land area underlying the UTTR. The vast majority of flares deployed within the UTTR are done so over DoD-controlled lands. Explosive Ordnance Disposal (EOD) personnel recover duds on Hill and Wendover Air Force Ranges. Although the historic data do not indicate a risk, the potential for a dud flare to be picked up by a person who could be substantially injured should be taken into consideration for flare use over non-DoD lands. Over DoD lands within the UTTR, appropriate corrective actions have been instituted including the education of all personnel on the proper procedures when encountering dud flares, and ensuring that flare use areas are regularly surveyed by EOD personnel and that all duds are disposed of properly (ACC 1997).

Fires resulting from flare use have the potential to cause impacts on a variety of resources. As previously stated, training with flares is conducted primarily on DoD-controlled lands within the UTTR. The majority of the areas outside DoD-controlled lands consist of agricultural, uninhabited forests, or rangelands. Fires from flares in dense residential or urban areas are not considered a significant issue, except as a result of wildland fire spreading into populated areas (ACC 1997). Avoidance of adverse impacts is a consideration in the selection of areas for training in air operations, so only incidentally should fire starts be possible under training areas. Specific restrictions and procedures have been established for flare use to minimize the potential for fire starts including minimum ground clearance levels for dispensing flares to ensure that adequate time for complete combustion and consumption of the flare pellet before reaching the ground. AFI 11-214/ACC Supplement 1 provides a minimum altitude for flare employment from F-16 aircraft over government-owned or operated property of 700 feet AGL. However, there are several situations that could result in a self-protection flare reaching the ground, including:

- The flare could be released at too low an altitude with inadequate surface clearance.
- The flare could descend unexpectedly at a rapid pace due to wind shear or wind burst.
- The flare could burn at an unexpectedly slow rate due to a manufacture error.
- The igniter could malfunction, causing the flare to ignite late in the air or fall to the ground as a dud and ignite later.
- The flare could land on dead vegetation, such as a tree top, while still burning (ACC 1997).

Flares are known to have caused fires. The effects of flare-caused fires depends on a number of factors, including how far the fire spreads and the composition of the environment that is burned. If a fire starts and spreads, it can have a variety of environmental effects, including:

- Immediate fire effects.
  - Destruction of surface vegetation
  - Morbidity and mortality of standing shrubs and trees
  - Demise of insects, small mammals, and eggs
  - Effects on seeds, spores, and microbes in duff and soil

  - Temporary disruption of local surface travel, both by animals and humans
  - Smoke

- Delayed fire effects.

  - Altered mineral nutrient levels and soil pH
  - Altered suitability of site to invasion by offsite vegetation
  - Increase in site vulnerability to wind and water erosion
  - Changed surface runoff quantity and content of water, including effects on biota downstream
  - Loss of food and/or shelter for local and migratory wildlife
  - Altered vulnerability to opportunistic insects and diseases

- Long-term fire effects.

  - Change in landscape, along with changes in patterns of land use by animals and humans
  - Long-term changes in the distribution of plant community species
  - Loss of critical habitat for threatened and endangered species
  - Changed productivity patterns due to topsoil transport
  - Permanent landform alteration by erosion (ACC 1997).

In addition to physical effects, fires can damage property and commercial resources, such as crops and forests, and can threaten the safety of the public and fire suppression crews.

A system of national scope is in place that numerically gauges the relative danger of fire wildland starts in terms of the susceptibility of various wildland fuels to ignition and fire spread. This system, the National Fire Danger Rating System (NFDRS), is employed by Federal, state, and local agencies with land management and fire protection responsibilities. The system uses historical and real-time weather data collected by the National Weather Service from a system of Remote Automated Weather Stations (RAWS) and manned weather stations. It also uses historic information about fire occurrences in areas where information is available. All Federal land management agencies (i.e., U.S. Forest Service, BLM, National Park Service) and state agencies with responsibility for fire suppression collect data on fire starts. The NFDRS calculates fire hazards on a daily basis for the entire country. The system uses a selection of wildland fuel types that together can be used to characterize most forest and rangeland vegetation cover found in the continental U.S. and Alaska. The NFDRS is used primarily for presuppression planning over large geographic regions. Its indices give an early assessment of the daily fire potential through the fire season, based on weather observations taken over a network of weather stations forecasts form the National Weather Service. Fire weather observations are achieved in a national database that provides climatology of fire weather for use in analyzing and comparing different fire years. The system's indices are sensitive to the phenology of the vegetative communities; historical precipitation, temperature, and humidity; and current temperature, humidity, and wind speed (ACC 1997).

The probability of any single flare starting a fire cannot be predicted to any level of statistical significance, particularly since it would depend on so many variables as to be totally situationally dependent. For a flare to start a fire, it must reach a fuel source (e.g., vegetation) while still burning. The actual burn times for flares are classified.

Environmental Consequences

There is little safety risk to aircrews, aircraft, or the public anticipated from the use of chaff. Combat chaff (i.e., RR-170 chaff) currently in use within the UTTR has the potential to interfere with FAA radars. However, the RR-188 chaff, which includes no dipoles cut to RF bands used by FAA radars, is also currently in use within the UTTR. Aircraft using chaff types other than RR-188 must obtain frequency clearance from the FAA prior to use. There is no safety risk as a result of falling chaff debris.

The 1999 Select Panel Report concluded that size of chaff dipoles is too large to be easily inhaled by humans. Furthermore, airborne chaff fibers have not been epidemiologically associated with human disease. The aerodynamic diameter of a chaff dipole cross section is approximately 40 micrometers (μm). Most particles larger than 10 μm are removed in the mouth or nose prior to entering the body. Ten to 60 percent of the particles passing the trachea with aerodynamic diameters less than 10 μm may deposit in the lung where they might cause harm. However, extreme abrasion would be needed to reduce chaff to these size ranges. The most probable breakup of a dipole would be perpendicular to its length, with remaining particles having a diameter similar to the dipole radius, with an aerodynamic diameter of approximately 40 μm. However, the 1999 Select Panel Report concluded that the tiny number of fibers that could be inhaled because they are of respirable size or have degraded to such a size are insufficient to produce disease (NRL 1999).

The 1999 Select Panel Report also assessed chaff toxicity to humans with studies on fibrous glass and aluminum due to the fact that no human data on chaff toxicity exist. The Report stated that persons heavily exposed (due to their occupation) to the components of chaff (i.e., glass and aluminum) do not have any proven fibrogenic or carcenogenic potential. This is very different from certain types of asbestos fibers, which are both fibrogenic and carcenogenic. The 1999 Select Panel Report concluded that chaff and its components fail to show an increased incidence of lung disease (NRL 1999).

The 1997 ACC Report concluded that it would be reasonable to consider flare reliability to be at least 99 percent, although it is probably higher. Most safety risks associated with flare use are either low in probability or manageable through corrective action (ACC 1997). Civilian impacts are minimal or nonexistent. The relatively low number of incidents involving aircraft indicate that there is a minimal risk to aircrews, aircraft, and the public from an aircraft mishap being caused by a malfunction involving flares or the flare dispensing system.

Although death or serious injury could result if a person on the ground were hit by a dud flare or some of the flare system debris, the very low probability of such an event occurring indicates that the level of risk is acceptable, and no specific measures are required. However, the risk of a person being injured by a dud flare recovered on the ground is of more concern. The probability of such an event depends on how many dud flares are discovered by persons unknowledgeable about their risks and proper handling. Because a majority of the flares dispensed within the UTTR are done so over DoD-controlled lands, corrective actions have been taken to reduce the hazard to most personnel (i.e., education and periodic cleanup). The potential hazard to members of the general public in areas underlying the UTTR airspace outside of DoD-controlled lands where flares are used should be addressed. In the areas outside of DoD-controlled lands frequented by the general public, a public information program should be initiated to alert people of the risks associated with dud flares and to define safe procedures should a dud flare be found.

Remote computer links to a local office of a Federal or state agency can access the NFDRS. It can also be implemented locally on a desktop computer. Using this system, the 388th Range

Support Squadron (RANS), the Hill AFB unit responsible for managing UTTR activities, could devise "no constraint" and "no flare release" guidelines for the various airspace components that make up the UTTR. Under conditions when a fire would be expected to spread rapidly and/or burn with high intensity, any risk of ignition may be deemed unacceptable, leading to a "no flare release" constraint. A balance can be struck between the risk of an unwanted fire start, possible consequences of an unwanted fire, and disruption of training operations. Furthermore, joint agreements between Hill AFB and local land management agencies should be developed to address flare use considerations and fire risk. In all cases, flare use should be curtailed during periods identified as high or extreme fire risk (ACC 1997).

However, under normal weather conditions, lowering the minimum altitude for flare employment from 1,500 feet AGL to 1,000 feet AGL would have no significant impact. As previously stated, the minimum altitude established in AFI 11-214/ACC Supplement 1 for F-16 aircraft flare employment over DoD-controlled lands is 700 feet AGL. The "buffer" of an additional 300 feet ensures that there would be adequate time for complete combustion and consumption of the flare pellet before reaching the ground and provides for the added protection of resources within the UTTR.

3.3.2 Air Quality

Existing Conditions

Activities within the UTTR are governed by the CAA, which is largely implemented by the Utah Air Conservation Act and Air Conservation Regulations, and by any portion of the CAA that have not been adopted or implemented by the State. The State of Utah has been delegated authority by USEPA for implementation and enforcement of the CAA regulations. The Utah and Nevada SIPs contain emission controls to ensure state air quality control areas meet the NAAQS. All of the counties underlying the UTTR are in attainment for all criteria pollutants as specified by Federal and state air quality standards (UDEQ 1999 and NBAQ 1999).

An air emission study was conducted over a 2-year period between 1993 and 1995 at four air quality/meteorological stations located on Hill Air Force Range. Air samples were analyzed for PM_{10}. No substantive amounts of PM_{10} were identified (HAFB 1996).

As previously stated, approximately 13,791 pounds (or approximately 6.9 tons) of chaff is currently deployed over DoD-controlled lands within the UTTR. In addition, approximately 34,144 flares are deployed within UTTR airspace.

Environmental Consequences

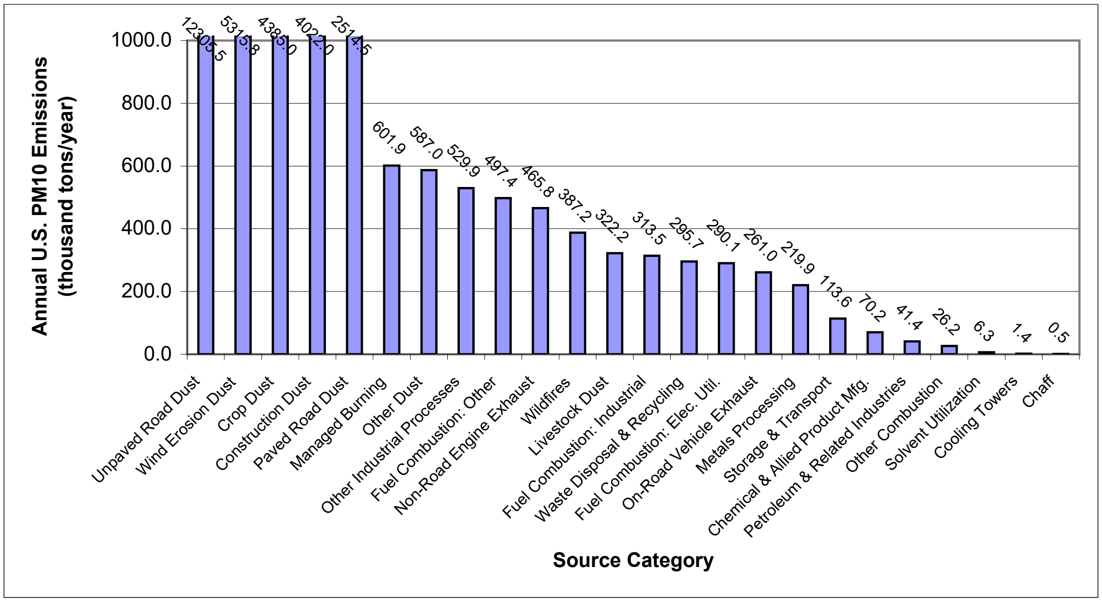
The potential for release of hazardous air pollutants is not an issue with chaff deployment because the BBU-35/B impulse cartridges no longer contain calcium chromate (clacium chromate was replaced by potassium perchlorate). In addition, chaff dipoles are greater than 10 μm in size, and, therefore, would not affect the PM_{10} NAAQS. The 1997 ACC Report stated that test results indicate that dipoles are unlikely to fracture upon ejection, and, furthermore, that any fractured dipoles would not be likely to increase PM_{10} emissions (see Appendix B). In addition, chaff dipoles settle to the ground quickly and, therefore, would not impact the prevention of significant deterioration (PSD) Class I standards (ACC 1997).

The 1999 Select Panel Report presented a comparison of the amount of chaff released nationwide to the total U.S. particulate emissions of PM_{10} and $PM_{2.5}$. On a national basis, the total nationwide chaff emissions constitute an extremely small fraction of directly emitted particulate emissions. PM_{10} and $PM_{2.5}$ emission are estimated and their concentrations are monitored because they are able to be inhaled and, thus, have the potential to produce negative human health effects. Particulates in the PM_{10} and $PM_{2.5}$ ranges are 10- to 100-times smaller than chaff dipoles (NRL 1999). The 1999 Select Panel Report states that if all chaff released nationwide were PM_{10}, it would constitute 0.0016 percent of the national PM_{10} releases. If all the chaff released nationwide were in the $PM_{2.5}$ range, the fraction would rise to 0.006 percent. These levels are much lower than the PM_{10} and $PM_{2.5}$ releases from any other source category as estimated by the USEPA (NRL 1999). Figures 3-1 and 3-2 summarize the U.S. particulate emissions from different source categories as estimated by the USEPA.

Applying this analogy to the Region of Influence for the Proposed Action (i.e., the counties underlying the UTTR airspace), Figure 3-3 presents a comparison of the recorded PM_{10} emissions within the ROI to the chaff emissions within the UTTR airspace.

Therefore, no significant adverse impacts to air quality would be expected as a result of the expansion of chaff deployment throughout the entire UTTR.

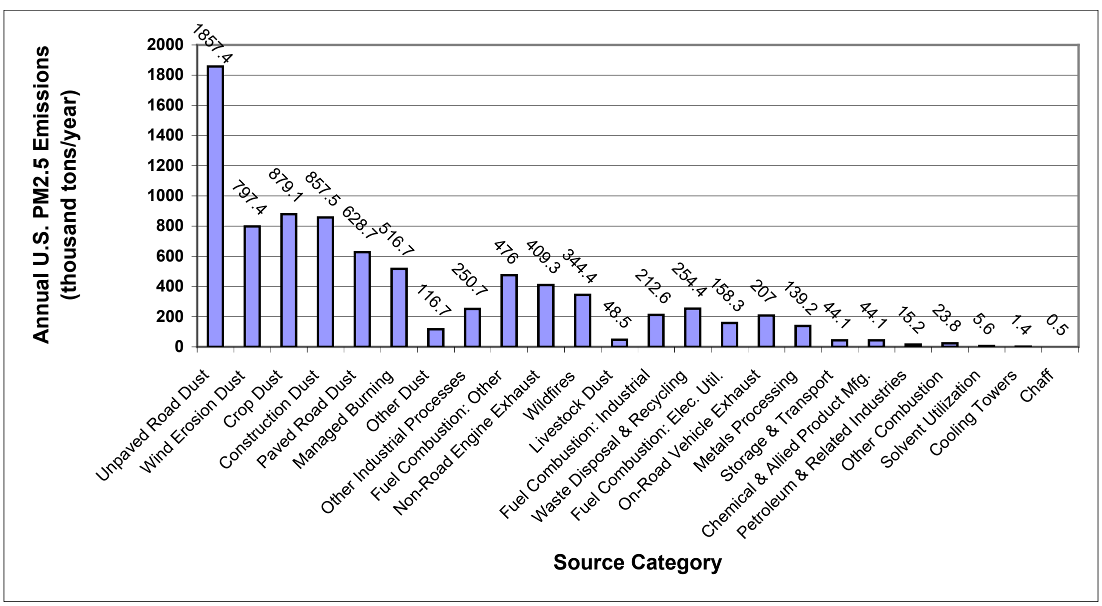
The 1997 ACC Report stated that the results of health screening assessments for flare use determined that up to 67,000 flares could be released within a peak hour over a given area with no affect on human health. This is nearly double the amount of flares deployed within the UTTR airspace during any given year (as compared to the 34,144 flares released in FY 1997). Furthermore, the 1997 ACC Report stated that at 400 feet AGL, for a typical target area of 10,000 acres, 220,000 flares could be released annually without significantly increasing short- and long-term health risks for hexavalent chromium or lead. The UTTR airspace overlies approximately 10,656,640 acres, 1,065 times greater than the area of concern presented in the 1997 ACC Report. Using the standard established as part of the 1997 ACC Report, approximately 234 million flares could be deployed within the UTTR airspace annually without significantly increasing short- and long-term health affects if distributed evenly throughout the entire UTTR.



Source: NRL 1999

Note: The chaff category is included as an upper limit assuming that all chaff released nationwide abrades to the PM_{10} size fraction.

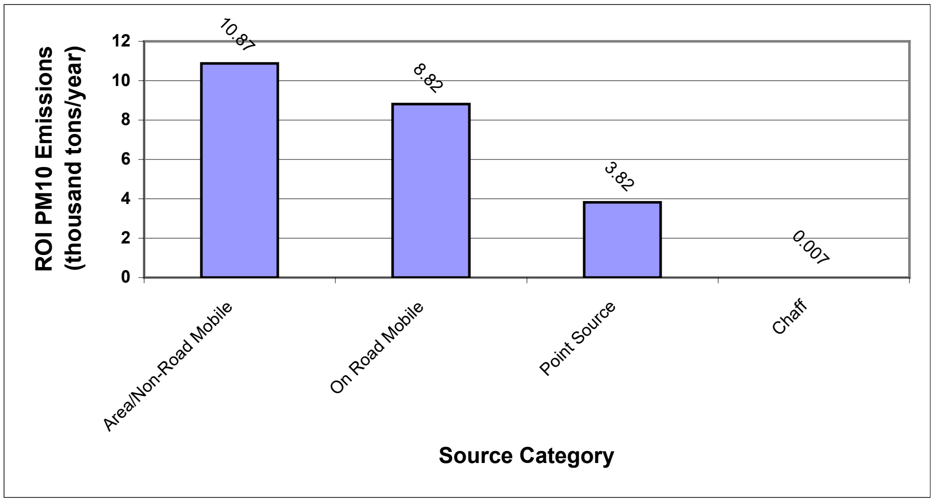
Figure 3-1. U.S. National Emission in 1997 for PM_{10}



Source: NRL 1999

Note: The chaff category is included as an upper limit assuming that all chaff released nationwide abrades to the $PM_{2.5}$ size fraction.

Figure 3-2. U.S. National Emission in 1997 for $PM_{2.5}$



Source: UDEQ 1999
Note: The chaff category is included as an upper limit assuming that all chaff released within the UTTR abrades to the PM_{10} size fraction. The data presented reflects information obtained from the counties within the State of Utah (i.e., Beaver, Box Elder, Juab, Millard, and Tooele) that underlie the UTTR airspace. No data was available for the counties in the State of Nevada (i.e., Elko and White Pine) that underlie the UTTR airspace.

Figure 3-3. ROI Emission in 1996 for PM_{10}

However, the amount of flares deployed within the UTTR airspace would remain the same under the Proposed Action, and, therefore, would have no significant, adverse affect on air quality even with the allowable deployment elevation being lowered to 1,000 feet AGL.

3.3.3 Soil and Water Resources

Existing Conditions

The land underlying the UTTR airspace boundaries is within the Great Basin region of the Basin and Range Physiographic Province (Figure 3.2-1). The Basin and Range Physiographic Province is characterized by fault-block mountain ranges that generally trend north-south and that are separated by flat desert basins. During the late Pleistocene, the area was covered by a large fresh-water lake called Lake Bonneville. At its maximum extent, Lake Bonneville covered an area of approximately 50,000 square kilometers (km^2) and had a depth of more than 330 meters (HAFB 1996).

Soils. The land underlying the UTTR airspace boundaries is primarily covered by Playa and Playa-Saltair Complex soils. These soils are found primarily in the low-lying, flat portions of the ranges. The playas consist of barren undrained basins that are subject to repeated inundation by salt water and salinization by evaporation of the accumulated water. The surfaces of playas are often thinly covered by salt crystals and patterned by cracks when dry. The soil materials are strongly calcareous, stratified lacustrine sediments of silt, clay, and sand containing sufficient amounts of salt to prohibit the growth of vegetation. The Playa soils have low permeability and drain slowly. Their available water capacity is very low.

The Saltair soil is formed in alluvium and lacustrine sediments derived from mixed rock sources. The surface layer is typically very pale brown, strongly saline silt loam 8 inches thick. The underlying material to a depth of 60 inches or more is white, strongly saline silt loam and silty clay loam. The Saltair soils have low permeability and drain slowly. Their available water capacity is very low to low.

Most of the remaining soils are found covering the slopes and upland areas. These consist primarily of silt loam, sand, gravelly-sandy loam, thin cobbly loams, and rock outcrops. Most of these soils are alkaline and covered with sparse vegetation. Very few of the soils that cover the area underlying the UTTR airspace boundaries are suitable for livestock grazing, rangeland seeding, cropland, or roads and building site development. Both the Playa and Saltair soils are poorly suited to livestock grazing, rangeland seeding, recreational uses, or homesite development due to low forage quality, alkalinity, and frequent flooding. Less than 6 percent of the soils on the Hill Air Force Range (Hiko Peak Gravelly Loam, Izamatch-Cliffdown Alkali Complex, Timpie Silt Loam, Tooele Fine Sandy Loam, Yenrab Fine Sand, Yenrab Badlands Complex) are considered fair or good for livestock grazing. Less than 0.5 percent (Hiko Peak Gravelly Loam) are considered fair for range seeding. Nine percent (Cliffdown Gravelly Sandy Loam, Hiko Peak Gravelly Loam, Timpie Silt Loam, Timpie Silt Loam - Saline, Tooele Fine Sandy Loam, Tooele Fine Sandy Loam - Saline) are considered suitable for irrigated crops. Less than 0.5 percent of the soils (Hiko Peak Gravelly Loam) are considered suitable for road or building sites. All of these soils are concentrated along the slopes of the northeastern corner of Hill Air Force Range (HAFB 1996).

Of the soils on Wendover Air Force Range, less than 6 percent (Checkett-Rock Outcrop Complex, Cliffdown Gravelly Sandy Loam, Edra Silt Loam, Izamatch-Cliffdown Alkali Complex, Kanosh-Saltair-Logan Complex, Skumpah Silt Loam, Tooele Fine Sandy Loam, Yenrab Fine Sand, Yenrab-Tooele Complex-Saline) are considered fair or better for livestock grazing. Less than 1 percent (Edra Silt Loam, Kanosh-Saltair-Logan Complex) are considered fair or better for range seeding.

Less than 1 percent (Cliffdown Gravelly Sandy Loam, Edra Silt Loam, Timpie Silt Loam, Tooele Fine Sandy Loam, Tooele Fine Sandy Loam-Saline) are considered suitable for irrigated crops. Only 0.01 percent (Edra Silt Loam) are suitable for road or building sites. All of these soils are concentrated along the slopes and upland areas on the east and west sides of Wendover Air Force Range. Approximately 3.5 percent of Wendover Air Force Range is covered with dune sand, which occurs only in its northeast corner (HAFB 1996).

Surface Water. No perennial streams originate on the Hill and Wendover Air Force Ranges, although there are perennial streams in the Deep Creek Mountains to the southwest. The only flows in the stream channels on Hill and Wendover Air Force Ranges are found just below perennial springs and generally infiltrate within a short distance. Most of the precipitation that falls on the area is quickly discharged by evapotranspiration or is stored temporarily as soil moisture and then discharged by evapotranspiration (HAFB 1996). Some water runs off the steep consolidated-rock slopes of the mountains during and immediately after intense summer thunderstorms and during periods of rapid snow melt. Very little of this runoff reaches the basin lowland below the consolidated areas (HAFB 1996).

The Great Salt Lake borders on the northeast side of Hill Air Force Range. It is a shallow saline remnant of Lake Bonneville that is confined in a low depression within the Great Basin. The waters that flow into the lake are trapped within the closed basin and can leave only by evaporation. The water level of the lake has fluctuated greatly over recorded time (HAFB 1996). Most recently, the water level rose significantly in the years 1983 to 1986, causing considerable property damage (HAFB 1996). The fluctuating water level can cause flooding along the east flank of Lakeside Mountains on Hill Air Force Range and flooding of the low-lying mud flats that extend into Hill Air Force Range between the north end of the Lakeside Mountains and the south end of the Hogup Ridge. Flooding of the mud flats on Hill Air Force Range is impeded by the embankment of the Southern Pacific Railroad’s Lucin Cutoff and the Threshold, a slight rise between Hogup Ridge and the Lakeside Mountains. Within the Hill Air Force Range boundaries, there are two springs in the Lakeside Mountains and a number of springs east of Hill Air Force Range in the Grassy Mountains and in the southern extension of the Lakeside Mountains. On the west side of Wendover Air Force Range are two large springs surrounded by extensive wetlands, the only known perennial springs on the range. The water in Blue Lake is relatively high in dissolved solids; concentrations in the water at Mosquito Willy's are expected to be similar.

Groundwater. Groundwater occurs in both the unconsolidated and consolidated rocks beneath Hill Air Force Range and Wendover Air Force Range. The major groundwater reservoir is the unconsolidated to partially consolidated basin fill. This material is more than 1,000 feet thick, possibly ranging up to 2,000 feet thick beneath some areas of Hill and Wendover Air Force Ranges. This reservoir has been divided into three major aquifers in the region—shallow brine, alluvial fan, and basin fill (HAFB 1996). It is best known in the vicinity of Wendover and the three aquifers defined there may be discontinuous throughout the Great Salt Lake Desert.

The shallow-brine aquifer consists of lake bed clay and silt and crystalline salt, and underlies the mud flat area of playa soils. The extent of the mud flat area is shown on Figure 1-1. Although these sediments extend to a considerable depth, only the upper 25 feet act as an aquifer. Brine moves through the crystalline salt and the fractures in the underlying clay. Recharge to the aquifer is primarily from infiltration of precipitation and lateral inflow from adjacent basins. Discharge from the aquifer occurs by evaporation and by flow into brine-collection ditches. Groundwater flows from the highlands into the mud flats where it evaporates. The total dissolved solids in the water of this aquifer are generally greater than 35,000 milligrams per liter (mg/L) (HAFB 1996).

The alluvial-fan aquifer consists primarily of sand and gravel. Recharge to the aquifer is primarily from infiltration of precipitation and subsurface inflow. Discharge occurs by evapotranspiration where the aquifer is shallow, by pumping and flow from wells, and by subsurface outflow. It is not known whether this aquifer is present beneath Hill or Wendover Air Force Ranges. If present, it would be found along the flanks of the Newfoundland and Lakeside Mountains (HAFB 1996).

The basin-fill aquifer consists of older alluvial sediments that underlie most of Hill and Wendover Ranges. These deposits consist of conglomeratic deposits of clay, sand, and gravel that are unconsolidated to well cemented. Recharge to this aquifer is probably entirely by subsurface inflow from adjacent aquifers in the alluvial fans and bedrock. Discharge is primarily from pumping wells.

Information on groundwater is provided by data from two wells completed in the basin-fill aquifer for the Hill Air Force Range Oasis Complex in the northern subarea of Sink Valley. These wells were completed in the early 1960s and reach a depth of between 300 feet and 723 feet below ground surface, with a depth to water at the time of drilling of 180 feet to 190 feet below ground surface. When completed, the wells yielded 300 gallons per minute. As of August 1990, the depths to water were 200 feet to 204 feet below ground surface and the total dissolved solids in the water ranged from 5,300 to 9,300 milligrams/liter (mg/L). The water from these potable wells is treated in reverse osmosis units prior to discharge to the water distribution system (HAFB 1996). Improvements to the water treatment system eliminating excessive sodium from drinking water as well as providing an additional water tank and new water supply lines to improve fire suppression capabilities will be part of a major facility improvement scheduled to begin at Oasis in late 1996 or early 1997 (HAFB 1996).

Environmental Consequences

The environmental fate of chaff includes alterations that may occur between its release and its deposition on the ground, and the long-term degradation and burial processes that it experiences after hitting the ground. Chaff fibers experience little breakup before reaching the ground due to the fact that breakup of fibers would degrade the effectiveness of chaff. Chaff ejection systems result in minimal breakup. Because ejection of chaff appears to subject the fibers to much larger forces than would atmospheric turbulence, it is unlikely that fibers that survive ejection intact subsequently break up during their fall to earth (NRL 1999).

Chaff is approximately 60 percent glass fibers and 40 percent aluminum by weight. The 1999 Select Panel Report compared the deposition of chaff with airborne dusts in the high desert environment. The comparison to desert dust is relevant because the composition of dust is dominated by silicon dioxide (SiO_2) and aluminum oxide (Al_2O_3), which are the most common minerals in the Earth's crust (NRL 1999).

Literature on the effects of chaff on water quality and aquatic habitats is limited. However, the available literature concludes that chaff, including its coating materials, is insoluble in water. If settled on a water body, it would either sink to the bottom or be driven across the surface by wind and deposited along the shoreline. Also, chaff introduced into public drinking water sources would be readily filtered out by standard screens and settling tanks (ACC 1997). The 1997 ACC Report presented the findings of a 13-day experiment in which salt water from the Chesapeake Bay was spiked with chaff. No appreciable increases in aluminum, cadmium, iron, or zinc levels were detected. Furthermore, any detectable increases were in the parts per trillion range (ACC 1997). Therefore, the expansion of the use of self-protection chaff within the UTTR would not have any significant, adverse affects on soil and water resources.

The effects of dud flares and flare ash on the soil and water resources depend on the quantity of material deposited in a particular environment, the characteristics of the receiving environment (e.g., pH), and the sensitivity of the environment to the contaminants of concern. Dud flares are rare and incidental events, so it is extremely unlikely that any given location would experience long-term cumulative effects from a buildup of flare material. Flare ash is widely distributed by wind, and the likelihood that a sufficient quantity would accumulate in a particular water body to measurably affect its chemical makeup is also remote. Therefore, the use of self-protection flares within the UTTR, especially the lowering of the allowable release altitude, would not have any significant, adverse affects on soil and water resources.

3.3.4 Biological Resources

Existing Conditions

The UTTR is within the Great Basin Floristic Province and the Bonneville Basin Section (Bailey 1995). This area is characterized by the presence of broad, low basins, numerous small mountain ranges, alkaline soils, and predominately shadscale-vegetated valleys. The Great Salt Lake Desert is comprised of barren salt and clay flats and is almost completely devoid of vegetation. Interspersed between valleys are several small and irregularly shaped mountain ranges that rise abruptly from the valley floor at elevations of approximately 4,200 feet to elevations above 10,000 feet. (HAFB 1996).

The predominant cover type on both the Hill and Wendover Air Force Ranges is mudflat that is either barren or covered by water. This cover type covers over 59 percent of the Hill Air Force Range, 34 percent of the Wendover Air Force Range, and 44 percent of the ranges collectively. Next in overall abundance is the pickleweed barrens cover type, which occupies 15 percent of Hill Air Force Range, 41 percent of Wendover Air Force Range, and 31 percent of the ranges collectively. Salt desert scrub is the final cover type on the ranges, occupying 22 percent of Hill Air Force Range, 23 percent of Wendover Air Force Range, and 23 percent of the ranges collectively (HAFB 1996).

The mudflats occur primarily in the western and northwestern portions of both ranges in low lying areas with low relief, while pickleweed grows primarily on the interface between the mud flats and more upland, less saline soils. The mounds of pickleweed adjacent to the barrens accumulate soil to form slightly higher areas that are gradually invaded by greasewood and Nuttall's saltbush. Within upland soils, salt desert scrub is the predominant cover type, but is interspersed with other shrub types (sagebrush, greasewood) or grasses depending on the soil type, topography and elevation, or previous disturbances within various upland areas of both ranges. Diversity among cover types on Hill Air Force Range is related to the greater topographic diversity provided by the Lakeside Mountains. On Wendover Air Force Range, Kittycat and Wildcat Mountains provide topographic relief; however, they are too rocky and abrupt to support much other than salt desert scrub. Although less abundant, the scattered pinion-juniper/mountain shrub cover type, represented primarily by juniper in highly dispersed locations in the Lakeside Mountains on Hill Air Force Range and wetlands present only on Wendover Air Force Range are other critical habitats within the UTTR (HAFB 1996).

The vegetation types on the 366,539 acres of Hill Air Force Range are predominantly salt flats/playas/barrens (53 percent), sparse salt-tolerant vegetation (11 percent), desert brush mixes (11 percent), and sand barrens (8 percent) (HAFB 1996). On the 576,157 acres of Wendover Air Force Range, the vegetation types are predominantly mud flats barrens (34 percent), sand barrens (28 percent), sparse salt-tolerant vegetation (26 percent), and shadscale/kochia (4 percent) (HAFB 1996). The cheatgrass vegetation type, prevalent as a result of overgrazing, seems to be maintained as climax vegetation in some areas due to annual fires (HAFB 1996).

Due to ground disturbing land practices at Hill Air Force Range, naturally vegetated areas often become barren, undergo natural revegetation over a long period of time, and/or are revegetated by land managers. The general quality of the range wildlife habitat is indicated, at least for grazing animals, by the animal unit month (AUM) values for BLM grazing lands surrounding the ranges. An AUM is the amount of range needed to support one cow and calf or five sheep grazing for 1 month. For the Hill Air Force Range, these values range from 1.15 acres per AUM in the Lakeside Mountain grazing allotment in the southeast to 35.3 acres per AUM in the Basin Land and Livestock allotment in the north. Grazing allotments on the west and east flanks of the Grassy Mountains, in North Puddle Valley, and in the Newfoundland Mountains range between 10.7 and 17.1 acres per AUM. For the Wendover Air Force Range, five of the six grazing allotments in the vicinity are to the west and southwest; the sixth is due east. These allotments have values that range between 14.2 and 17.1 acres per AUM, except for the Deep Creek and Dutch Mountain allotments, which are 24.7 and 36.4 acres per AUM, respectively. Although neither range is grazed by domestic livestock as part of a grazing allotment, these AUM values provide a measure of the forage available to native species of grazing animals that are present on both ranges. In addition, sheep move along the west side of the Lakeside Mountains, crossing Hill Air Force Range between grazing allotments (HAFB 1996).

Wildlife surveys of birds and mammals, including specific surveys of the bald eagle, other raptors, and antelope, have been conducted on both Hill and Wendover Air Force Ranges. Wildlife and habitat inventory studies were a component of a series of quarterly and annual reports that also provide data on the avoidance of birds by aircraft. These reports are from a 5-year investigation that began in July 1984 and emphasized observations of gulls, pelicans, and raptors, as well as insects, mammals, and vegetation on Hill AFB, Hill Air Force Range, and Wendover Air Force Range.

Birds. Waterfowl, raptors, rails, shorebirds, phalaropes, gulls, doves, nighthawks, woodpeckers, and other numerous perching birds are commonly observed within the UTTR (HAFB 1996). Other species to note include the peregrine falcon, prairie falcon, golden eagle, bald eagle, red-tailed hawk, ferruginous hawk, Swainson's hawk, and osprey (HAFB 1996).

Raptor migration observation sites were established at the north end of the Newfoundland Mountains, at the north end of the Grassy Mountains, and at the south end of the Lakeside Mountains. The closest observation site to the Wendover Air Force Range was on the south end of the Toana Range in Nevada. Raptors migrating southward down the Promontory Mountains tend to turn east when they reach the Great Salt Lake. However, some continue south along the ridges of Fremont and Antelope Islands or turn along the Lakeside Mountains, passing just east of Hill Air Force Range, though few pass directly over the range (HAFB 1996). Raptors tend to hunt from perches during the winter and by soaring during the summer, when they pose a greater hazard to aircraft and are at greater risk themselves. Raptor populations are supported by Townsend ground squirrels, horned larks, rabbits, and meadowlarks, the most consistently abundant prey items found on the ranges. The cyclical fluctuation of rabbit numbers tends to influence the numbers and nesting success of raptors, including golden eagles, red-tailed hawks, and especially ferruginous hawks, for which jackrabbits may provide 79 to 80 percent of their forage biomass (HAFB 1996). Prairie falcons tend to take smaller prey, such as horned larks, meadowlarks, and mourning doves. Fledglings of these species provide important prey for young inexperienced falcons, which fledge at about the same time (HAFB 1996). Raptor nest sites were surveyed during 1984, 1985, and 1986 in the Newfoundland Range, on Wildcat Mountain, and elsewhere within a 956-square-mile study area extending from the Nevada state line to the Great Salt Lake and north of the Great Salt Lake latitudinal baseline, but not including the mud flats, which are generally not used by raptors. Within this area, 400 raptor nests were mapped. From these, 70 nests in a smaller area, including the southeastern half of Hill Air Force Range and the mountains south and east of Hill Air Force Range, were chosen for productivity studies of the 4 major raptor species (i.e., golden eagle, ferruginous hawk, red-tailed hawk, and prairie falcon) (HAFB 1996). All the nests were found in a cheatgrass/shrub habitat type, which sometimes has a juniper component. More of the nests with predator access failed, presumably from predation by coyotes, kit foxes, bobcats, and badgers, whose tracks were seen in the vicinity. Prairie falcon reproduction levels were normal in 1985 and 1986, while golden eagle, ferruginous hawk, and red-tailed hawk reproduction was lower than in previous years in this area and lower than observed in other areas with similar habitat; rabbit populations were also very low during 1985 and 1986 (HAFB 1996).

Mammals. The most widespread mammals on the ranges are the black-tailed jackrabbit, desert cottontail, antelope ground squirrel, great basin pocket mouse, Ord kangaroo rat, western harvest mouse, deer mouse, desert woodrat, and porcupine. Other mammals, which are significant as game species or top carnivores, are the badger, kit fox, coyote, bobcat, mule deer, and pronghorn. Feral horses are also present (HAFB 1996).

Aquatic Species and Habitats. Three wetland types have been identified on Hill and Wendover Ranges: a pickleweed-saltgrass-glasswort community, a saltgrass (or rabbitfoot beardgrass) community, and a bulrush-phragmites community. The saltgrass and bulrush-phragmites communities were categorized as jurisdictional wetlands, the pickleweed-saltgrass-glasswort community was tentatively categorized as jurisdictional. The boundary between wetlands and mudflats was based on plant distribution, with wetlands having greater than 10 percent plant cover and mudflats having plants spaced at least 10 meters apart (HAFB 1996).

At Hill Air Force Range, 99 percent of the 22,576 acres categorized as jurisdictional wetland was vegetated by the pickleweed-saltgrass-glasswort community. A total of 238,551 acres of mudflats were calculated by remote sensing data; this acreage equals 65 percent of the range (HAFB 1996). At the eastern edge of Hill Air Force Range , the range extends out into the Great Salt Lake. There are no wetlands associated with this portion of the lake's shoreline, and no USAF use of the highly saline water of the lake, which is very shallow in this area. Extension of the Hill Air Force Range boundary into the lake serves primarily to provide a spatial buffer for the testing and training uses of the land on the east side of the Lakeside Mountains. Due to the high salinity of the Great Salt Lake and the absence of any substantive freshwater inflow from the east side of the Hill Air Force Range, there are no well-developed aquatic ecosystems along the eastern shore of the lake.

At Wendover Air Force Range, 90 percent of the 22,425 acres categorized as jurisdictional wetland was vegetated by the pickleweed-saltgrass-glasswort community. A total of 428,185 acres of mudflats were calculated by remote sensing data; this acreage equals 75 percent of Wendover Air Force Range (HAFB 1996). On the western edge of Wendover Air Force Range, there are two spring complexes, Blue Lake and Mosquito Willy's, that have extensive wetlands surrounding the springs. The wetlands in the vicinity of Blue Lake and Mosquito Willy's are characterized by saltgrass, rushes, and sedges (HAFB 1996). This is primarily where the saltgrass and bulrush-phragmites communities identified in the recent management plan were found (HAFB 1996). These springs are fed by water from the Goshute Mountains and Lead Mine Hills to the west. The largest spring in the Blue Lake complex is about 60 feet deep, 550 feet wide, and 1,000 feet long (HAFB 1996). The Blue Lake area has historically been used by hunters, fishermen, trappers, bird watchers, and scuba divers. Recently, bird watching and scuba diving have increased, contributing up to 3,000 user days per year (HAFB 1996). The overall wetlands associated with these springs have been reported to total between 4,436 and 15,000 acres. A more recent study of these wetlands documented 15,800 acres of wetlands in and around Blue Lake (HAFB 1996). In 1974, 216 acres of the Blue Lake area were deeded to the State of Utah (HAFB 1996), which manages this plot through the Utah Division of Wildlife Resources (UDWR). In addition, the UDWR manages the wildlife resources on 15,800 surrounding acres still owned by the USAF under a memorandum of understanding that is currently being modified (HAFB 1996).

Threatened and Endangered Species. Pursuant to the requirements of the Endangered Species Act (16 U.S.C. 1536, the USFWS, UDWR, and Nevada Department of Conservation and Natural Resources – Natural Heritage Program were contacted regarding the presence of threatened and endangered species within the area of the Proposed Action. Table 3-8 presents Federal- and state-listed threatened and endangered species that may occur in or migrate through the UTTR airspace boundaries.

Table 3-8. Listed Species That May Occur Within or Migrate Through the UTTR

Common Name	Species Name	Status[1]
Fish		
Lahontan Cutthroat Trout	*Oncorynchus (=Salmo) clarki*	T, UTT, NVP
Birds		
Bald eagle	*Haliaeetus leucocephalus*	T, UTT, NVP
Mammals		
Utah Prairie Dog	*Cynomys parvidens*	T, UTT
Clams		
Fat-whorled Pondsail	*Stagnicola bonnevillensis henshawi*	C, USSC
Plants		
Ute Ladies'-tresses	*Spiranthes diluvialis*	T

Note: [1]Status: E = Federally listed Endangered
T = Federally listed Threatened
C = Federally listed Candidate Species
UTT = Listed as Threatened in the State of Utah
USSC = Listed as a Species of Special Concern in the State of Utah
NVP = Protected by State of Nevada law

Source: (USFWS 1999, UDWR 1999, NNHP 1999)

Environmental Consequences

The 1997 ACC Report stated that the literature revealed few conclusive studies concerning the effects of chaff on wildlife. Two studies on the effects of chaff ingestion by cows concluded that chaff presented no health hazards to farm animals. The 1999 Select Panel Report stated that the maximum amount of aluminum ingested by cows from chaff would only be 1/100,000 of the maximum tolerable level of soluble AL in the diet (based on the areal depositions of chaff previously discussed). In addition, no toxic effects were found in feeding massive doses of chaff to calves. Toxic effects are unlikely through the rumen due to pH effects within this portion of the digestive tract. Negative pulmonary effects are unlikely due to the non-respirability of chaff fibers (as previously discussed in humans) (NRL 1999). Relative to the background concentrations of dust in the air, the amount of additional particles contributed by chaff fibers would be negligible, and no adverse effects on wildlife would be expected from inhalation of the fibers (ACC 1997).

Although field surveys performed were of a limited duration and scope, areas selected for survey were chosen specifically to include locations with a high use of chaff. The areas were chosen to increase the probability that any potential wildlife use of chaff debris would be found. A study on the effects of chaff on the Chesapeake Bay ecosystem concluded that there were no environmental impacts from chaff on that system. Decomposition of chaff in aquatic environments is expected to have no adverse impacts on water chemistry and aquatic life (ACC 1997). In alkaline to neutral waters, decomposition would be very slow. Under acidic conditions, decomposition would be faster, but the amount of chaff expected to accumulate in the water would produce an incremental increase in aluminum relative to natural sources in these waters (ACC 1997). Deleterious effects on marine and freshwater organisms are unlikely because siliceous spicules, similar to chaff particles, are already part of marine and freshwater sponges that are natural to those ecosystems (NRL 1999). Furthermore, results from toxicity tests using marine organisms presented in the 1999 Select Panel Report showed no deleterious effects at appropriate exposure levels.

In arid areas, the slow chemical decomposition of chaff is expected to have no adverse effects on soil chemistry and plant growth. In wet, acidic environments, chemical decomposition is more rapid, but no adverse effects are expected for several reasons. The small quantity of chaff accumulating on the ground would release minute amounts of chemicals, primarily aluminum and silicon dioxide, that are abundant in the soil. The trace amounts of the other chemicals in the chaff fibers would be released in such small quantities that no effects would be anticipated (ACC 1997).

The dispersal and decomposition of chaff fibers on land would limit the exposure of grazing animals to chaff, making it unlikely that ingestion of quantities large enough to have adverse physiological effects. Plastic caps and cartridges are not likely to be eaten by wildlife and would have no effect on them (ACC 1997).

The low visible accumulation of chaff fibers on the ground, even in arid environments, makes it unlikely that wildlife would have enough direct contact to cause skin irritation. Low visibility and low concentrations would also limit the likelihood of selective collection of chaff fibers for nesting material. The exposure of young animals with no hair or feather covering to chaff fibers would be minimal (ACC 1997).

Chaff interference with wildlife activities is expected to be negligible due to the amount of chaff use, characteristics of chaff, and field observations of chaff accumulation. Since there is no evidence of heavy chaff accumulation on the ground or water, even in heavy use areas, avoidance of foraging areas by wildlife due to chaff is unlikely (ACC 1997).

Startle effects of flares on wildlife are expected to be negligible (ACC 1997). Noise from aircraft is more likely to elicit a startle response than would ignition of flares, although data support that startle effects from aircraft noise are also negligible (Ellis 1981, Fraser et al. 1985, Gladwin et al. 1998, USDA 1992). Chemical effects of flare debris on vegetation are expected to be negligible due to the small amount of debris reaching the ground and the generally low toxicity of residues (ACC 1997). Therefore, the expansion of the use of self-protection chaff and flares within the UTTR would have no significant, adverse impacts to biological resources.

3.3.5 Land Use and Visual Resources

Existing Conditions

Land Ownership. Federal lands within the airspace boundaries of the UTTR, other than DoD-controlled lands, are managed primarily by BLM. A large block of land adjacent to the southern boundary of Wendover Air Force Range is managed by DoD as Dugway Proving Ground. Portions of Dugway Proving Ground's 801,000 acres are used by the USAF on a share-use basis through an agreement with the U.S. Army. The land base of Hill and Wendover Air Force Ranges is approximately 928,000 acres (Hill Air Force Range – 351,539 acres; Wendover Air Force Range – 576,157 acres). The Wendover Air Force Range shares approximately 30 miles of common boundary with Dugway Proving Ground. Together, these land areas comprise over 1,700,000 acres, while the air space of the UTTR occupies approximately 3,000,000 acres (HAFB 1996). When these areas are used collectively, they provide a very large contiguous area with a variety of support facilities and resources available for military testing and training functions. BLM lands within the UTTR airspace boundaries are managed for multiple use, as directed under the Federal Land Policy and Management Act of 1976. These uses include livestock grazing, support of wildlife, dispersed and developed recreation, and mining.

Eleven parcels of Federal land within Utah and within the airspace boundaries of the UTTR have been identified as Wilderness Study Areas (WSAs) for potential inclusion in the National Wilderness Preservation System (HAFB 1996). Of the 11 WSAs, the 50,500-acre Cedar Mountains area approximately 13 miles southeast of Hill Air Force Range and 5 miles east of Wendover Air Force Range; the 52,500-acre Fish Springs area approximately 34 miles south of Wendover Air Force Range; and the 68,910-acre Deep Creek Mountains area approximately 18 miles south of Wendover Air Force Range are within the UTTR airspace boundaries (HAFB 1996). The Swasey Mountain, Howell Peak, Conger Mountain, Notch Peak, King Top and Wah Wah Mountain WSAs are also all within the UTTR airspace. The closest WSAs in Nevada, the Goshute Mountains WSA and Bluebell WSA, are about 60 miles north of Ely in the Cherry Creek Mountain portion of the Egan Range, and less than 2 miles west of Wendover Air Force Range (HAFB 1996). Other nearby areas, which were considered as WSAs but did not meet all the wilderness characteristics criteria, also exhibit many wilderness qualities. These areas include the Newfoundland Mountains, the North Salt Desert, Big Creek, Dry Canyon, Big Hollow, the Onaqui Mountains, North Cedar Mountains, the Silver Island Mountains, the Dugway Mountains, and areas partially in Nevada, such as Ferber Flat (HAFB 1996).

The Fish Springs National Wildlife Refuge, administered by the USFWS, and a portion of the Wasatch-Cache National Forest, administered by the U.S. Forest Service, are located within the UTTR airspace boundaries.

The State of Utah owns four sections of land (each is 1 square mile, or 640 acres) within most of the townships of public land (BLM) in west-central Utah. These sections are known as state school lands, and they are managed by the State for the benefit of the State's public schools. In general, these sections are offered, mostly through leases, for enterprises (e.g., mining, forestry) to generate income for the State's schools. While there were state school trust inholdings on Hill and Wendover Air Force Ranges at one time, all of these inholdings have been acquired by DoD and there are currently no school trust inholdings within the ranges (HAFB 1996). In addition, there are some state lands adjacent to the Great Salt Lake near the eastern boundary of Hill Air Force Range (HAFB 1996).

Land Uses. There is public access to the ranges in the immediate vicinity of Blue Lake at the western edge of Wendover Air Force Range and from a country road that traverses the eastern edge of Hill Air Force Range. Near the ranges, there are some developed land uses and recreation land uses.

In the immediate vicinity of Hill and Wendover Air Force Ranges there is little industrial, commercial, or residential development. Some industrial uses on lands adjacent to the ranges include mineral extraction and processing, mining, landfills/waste incineration, and brine shrimp collection. The companies involved in mineral extraction from the waters of the Great Salt Lake include AMAX and Morton. Facilities relating to these operations include processing plants, evaporation ponds, canals, and settling basins. Mining activity occurs just south of DoD lands, and areas of known mineralization are common. Current operations include gold, silver, barite, fluorospar, and beryllium (HAFB 1996). Solid waste landfill and waste incineration facilities owned by Laidlaw, the Aptus incinerator owned by Westinghouse, and Envirocare, a low-level nuclear waste landfill, are located between Hill and Wendover Air Force Ranges along the I-80 corridor. There are currently no producing oil or gas fields or wells in the area. A few test holes have been drilled, but exploration activity has been sporadic (HAFB 1996).

The only significant commercial development in the immediate vicinity of Hill and Wendover Air Force Ranges is at Wendover. Casinos, hotels and motels, service stations, stores, recreational vehicle camps, and related tourist facilities are found here. (Wendover is divided by the Utah-Nevada state line into Wendover, Utah (population: 1,127) and West Wendover, Nevada (population: 2,007). Gambling is allowed in West Wendover.) The city is mostly known for its casinos and entertainment, and much of the trade and economic activity here is related to gambling (HAFB 1996).

Other settlements in the area include a number of small communities near Hill Air Force Range. Although official census estimates are unavailable, population estimates are as follows: Park Valley (200), Grouse Creek (175), Lin (10), Etna (15), Montello (200), Oasis (west of Wendover; 400–500). Near Wendover Air Force Range are Ibapah (100), the Goshute Indian Reservation (100), Gold Hill (12), Callao (50), Trout Creek (35), Partoun (200 on weekdays; 9 on weekends), Gandy (4), Pleasant Valley (also known as Uvada; 25), and Eskdale (utopian community; 300). Several ranches and agricultural and mining operations may be found near these small communities.

Recreation on lands adjacent to and near the Hill and Wendover Air Force Ranges boundaries is generally associated with the mountain ranges, springs, and seeps in the basin. The Deep Creek Mountain Range, administered by the BLM, has been developed as a recreational area and now offers primitive camping, trails, and off-road vehicle access for public use. The Knolls is a BLM recreational area along the north boundary of Wendover Air Force Range. Some encroachment of all-terrain vehicles from this area into the range occurs. There have been no major conflicts regarding the use of Hill and Wendover Air Force Ranges for recreational activities because the ranges are remote, the nearby population is sparse, and there are large tracts of nearby land available for public access. Specific areas that are popular for outdoor recreation, such as the Blue Lake area (on the western edge of Wendover Air Force Range), have been separated out of the range boundaries and made available for public recreational activities. In general, however, Hill and Wendover Air Force Range lands have been closed to public use for decades.

The Bonneville Salt Flats in Tooele County are also managed by the BLM. This area is internationally renowned as a speedway, and numerous land speed records have been set here. The Salt Flats are found approximately 9 miles southwest of Hill Air Force Range (the race track extends even closer) and are accessed from Interstate Highway 80. Hunting is a popular recreational activity in Utah, and the mountains near Hill and Wendover Air Force Ranges, such as the Stansbury and Cedar Mountains, are used very often by hunters during hunting season (usually several weeks in October). In addition, the marshes, sloughs, and wetlands near the Great Salt Lake and the boundaries of Hill Air Force Range offer opportunities to waterfowl hunters. Some upland game bird hunting may also occur near the outer fringes of the area, but this use is probably minimal.

Some livestock grazing occurs on adjacent BLM lands, and some roads on Hill Air Force Range are used for access to these grazing allotments. No grazing, except for this limited-access use, is permitted within the range boundaries. However, cattle and sheep are grazed over much of the public land in the vicinity of Hill and Wendover Air Force Ranges.

Visual Resources. The visual resources of the lands within the UTTR airspace boundaries are typical of the Great Salt Lake Desert. The scenic character is one of isolation, remoteness, expansive open space, and dramatic basin and range landforms. There is little evidence indicative of human settlement in the region. Visible manmade elements in the region skirt the boundaries of Hill and Wendover Air Force Ranges and bisect the two ranges along the I-80 corridor, which lies between and parallel to the boundaries of the two ranges (approximately 9 miles south of Hill Air Force Range and approximately 6 miles north of Wendover Air Force Range). It encompasses the highway, major electric transmission lines, the Union Pacific Railroad tracks, various fences demarcating grazing areas, and occasional development (industrial and commercial) usually associated with highway exits. Narrow paved roads and associated electric and telephone lines traverse the bases of the mountain ranges; basin lands outside of Hill and Wendover Air Force Ranges are crisscrossed by dirt roads (HAFB 1996).

The Great Salt Lake Desert vegetation is limited to scattered shrubs and grasses, low-growing sedges and rushes along the banks of seasonal water bodies, and salt-tolerant plants such as pickleweed and saltbrush in saline soils adjacent to bodies of salt water. The mud flats, which cover large expanses, are virtually devoid of vegetation except at their peripheries (HAFB 1996).

The lowest elevation in this region is the Newfoundland Evaporation Basin, which lies north of Hill Air Force Range. From this low elevation to the foothills of the Deep Creek Mountains beyond Wendover Air Force Range and approximately 75 miles to the south, the basin elevation increases from a mere 100 feet to 4,300 feet MSL. The topography is so flat in places that the curvature of the earth is visible. The relatively flat basin, however, is punctuated with isolated mountain peaks such as Wildcat Mountain in the eastern portion of Wendover Air Force Range and the narrow, long mountain ranges on the periphery of Hill and Wendover Air Force Ranges. The peaks of the Deep Creek Mountains, approximately 55 miles south of the Bonneville Salt Flats and southwest of Wendover Air Force Range, are particularly noteworthy because numerous peaks exceed 10,000 feet (over 5,800 feet above the basin floor).

The water features in this arid basin and range topography add significantly to its visual qualities where they occur. Two key salt-water bodies in the region are the Great Salt Lake and the Newfoundland Evaporation Basin. Seasonal freshwater streams drain from the many mountain ranges and isolated peaks and disappear into desert soils well outside the ranges. The region also contains a few isolated freshwater springs. Each of these water features contribute to the visual interest, especially in locations where the water is accented by seasonally lush vegetation (HAFB 1996).

Considering the relative lack of topographic and vegetation features, north and south views from I-80 are expansive. Travelers driving westward along I-80, the only major roadway in the region, round the north end of the Stansbury Mountains (30 miles east of the eastern boundaries of Hill and Wendover Air Force Ranges) and alternately have views to the north and south of wide-open, flat valleys and dramatic isolated peaks and mountain ranges. Within the 70 miles between the Stansbury Mountains and Wendover on the Utah-Nevada border, the northern views encompass the Lakeside Mountains, Puddle Valley, the Grassy Mountains, the Newfoundland Evaporation Basin, the Bonneville Salt Flats, Floating Island, and the Silver Island Mountains. Similarly, views to the south of I-80 include the north Stansbury Mountains, Skull Valley, the Cedar Mountains, and a wide basin with the Dugway, Thomas, Fish, and Deep Creek Mountain Ranges to the south of WAFR and Dugway. This basin and range landform pattern continues westward across the Nevada desert (HAFB 1996).

The visual resources of Hill and Wendover Air Force Ranges are largely devoid of the significant scenic qualities present in the north Stansbury Mountains and the Deep Creek Mountains. The lands comprising Hill and Wendover Air Force Ranges are almost entirely the open, flat basins of the Great Salt Lake Desert. However, the northern Lakeside Mountains and parts of the Grassy Mountains are in the northeastern portion of Hill Air Force Range and the Newfoundland Mountains extend into the northwestern portion. Wildcat Mountain and Kittycat Mountain on Wendover Air Force Range provide topographically interesting relief to the otherwise flat landscape (HAFB 1996).

Activities occurring within Hill and Wendover Air Force Ranges may affect the public's appreciation of visual resources in adjacent accessible areas. For example, supersonic flights (and the noise that draws attention to the use of the area for low-level flights), the distant silhouette of an airplane, and the vapor trails of airplanes conducting training maneuvers are visible from locations such as the Stansbury, Cedar, and Deep Creek Mountain Ranges. Although those seeking a wilderness experience such as hiking, backpacking, or camping in these areas may be distracted by the aircraft activity, the remoteness of the region limits the number of users that could be affected (HAFB 1996).

Environmental Consequences

Based on the field studies presented in the 1997 ACC Report, frequency of sighting chaff fibers and other chaff debris are related to the intensity of chaff use. In areas where chaff deployment is permissible over non-DoD controlled lands outside of restricted airspace overlying air-to-surface ranges, chaff and flare use in MOAs is less intense than in range areas as would be the case within the UTTR airspace. Chaff debris has low visibility and little effect on the aesthetic quality of the environment. Chaff debris does not accumulate in quantities that make it objectionable, or even noticeable to most persons in low-use areas. Chaff debris is only visible in the foreground and would not affect the attributes that contribute to the outstanding visual quality using BLM and U.S. Forest Service methodologies (ACC 1997).

Chaff debris is only visible in fairly open spaces where vegetation is sparse, such as along a road, trail, or pathway, or in cleared or maintained areas. These types of areas provide access for pedestrians and unobstructed line-of-sight to the ground. Chaff fibers and debris may be noticed occasionally by outdoor recreationists but would not attract attention due to their small size or to their similarity to other familiar natural or manmade objects. However, in areas specifically protected to preserve naturalness and pristine qualities, such as WSAs or National Wildlife Refuges, users (both the public and land managers) are more likely to perceive chaff debris as undesirable and unattractive since it conflicts with the expectations of primeval character and management objectives to preserve naturalness (ACC 1997).

It is unlikely that chaff debris could accumulate in quantities that would be noticeable by private owners. It is also unlikely that if it did it would reduce the value of land for a specific use (e.g., residential, commercial, agricultural, or industrial) although it may be perceived as annoying or intrusive. Furthermore, chaff use is not expected to affect agricultural, industrial, or commercial land uses. Based on the studies presented previously on the effects of chaff on livestock (see Section 3.3.4), incidental ingestion of chaff does not affect health, weight gain, or reproductive capability. In addition, chemicals potentially leaching from chaff would not adversely affect food sources. Chaff that may be deposited on cropland would be easily washed off and is not anticipated to affect the quality or safety of agricultural products. Should chaff fibers become imbedded in the fur of livestock (e.g., wool) these would be removed during standard cleaning operations (ACC 1997). No adverse affects of the expanded use of self-protection chaff within the UTTR are anticipated.

Flare debris, such as end caps, are not easily detected and would not affect the overall scenic quality or outdoor experiences. Because dud flares are more easily noticed and attract attention in natural settings, they are more likely to be picked up and could pose a hazard to hikers and recreationalists. For example, campfires would provide an external heat source, hot enough to ignite a dud flare. In addition, dud flares may be stored in plastic bags with other trash, which could create explosive conditions, or carried home and transported into other environments, increasing the likelihood of the dud flare eventually being ignited or improperly mishandled. Similarly, dud flares could attract attention and be picked up if they landed in rural agricultural and residential areas (ACC 1997). Dud flares could pose a safety hazard in areas where people congregate or where human activity covers large areas of land (e.g., cattle ranching). Impacts to land uses would depend on the probability of exposure and the resultant safety risk (ACC 1997).

Flare debris would not accumulate in quantities that would result in significant visual impacts. However, it could be more noticeable and undesirable in areas specifically protected to preserve naturalness and pristine qualities, such as WSAs or National Wildlife Refuges, where the discovery of any human-made object would be unexpected, and where people walking, camping, and hiking would be within viewing distances of debris items on the ground (ACC 1997).

The visual illumination of flares would be short term and temporary and would not be expected to significantly affect sensitive visual resources, unless large numbers of flares were dispensed over scenic areas on a frequent basis. Impacts to scenic resources are not generally a concern at night. However, flares dispensed at night could be perceived as an intrusion and disturbing to people in recreation areas (ACC 1997).

The most sensitive land uses and areas of outstanding visual quality are often in remote locations where access to fire suppression is difficult and response times are longer. These areas often have timber vegetation types with high fuel loads that can produce large fires with high intensity, causing damage to these areas (ACC 1997). As previously mentioned, significant areas within the UTTR airspace boundaries are dominated by cheatgrass, which is very vulnerable to wildland fire because there is usually an abundance of fine fuels to carry a fire (Wisely 1999). Fires can cause significant economic damage and pose a safety hazard in agricultural and residential areas. Residential pockets in remote areas are particularly susceptible to hazards from fires (ACC 1997).

Areas specifically designated for preservation of natural qualities have a low tolerance for changes brought on by non-ecological conditions, including litter and fires. While fire is a part of ecological cycles, fires originating from non-natural sources can be ill-timed and limit land managers' abilities to implement fire management programs aimed at balancing ecological necessity with human safety. Over areas with high fire ratings and high recreational use, scenic value, or protective goals, acceptable operating parameters should be developed in coordination with appropriate land managers (i.e., the appropriate BLM representatives).

As stated in Section 3.3.1, the 388 RANS should establish a remote computer link to a local office of a Federal or state agency (e.g., BLM) that can access the NFDRS, or dedicate a desktop computer to run the system. Using this system, the 388 RANS should devise "no constraint" and "no flare release" guidelines for the various airspace components that make up the UTTR. Under conditions when the fire would be expected to spread rapidly and/or burn with high intensity, any risk of ignition may be deemed unacceptable, leading to a "no flare release" constraint. Furthermore, joint agreements between Hill AFB and local land management agencies should be developed to address flare use considerations and fire risk. In all cases, flare use should be curtailed during periods identified as high or extreme fire risk. Should coordination with BLM and utilization of the NFDRS be initiated, no significant adverse affects would be expected as a result of the lowering of the minimum altitude allowable for flare deployment to 1,000 feet AGL.

3.3.6 Cultural Resources

Existing Conditions

Regional History. Early Native Americans are thought to have migrated over an extended period of time to the Utah region from Siberia approximately 10,000 years ago. These early Americans were the Paleo-Indians followed by the Desert Archaic people. Archeological evidence found in caves surrounding the Great Lake suggests sizable settled populations of Native Americans along the Great Lake's shore and other waterways. Native Americans of the Great Lake used weapons called atlatl which were used as a spear-like weapon to hunt small game and antelope. In addition, they fashioned holding pens to keep animals for additional food supplies, constructed duck decoys, and supplemented their diet with cattail roots and other salt-tolerant plants (Scholl and Camoin 1998). Approximately 1500 B.C., the Great Lake water level drastically rose to cover critical marsh and lake-edge areas which were critical to the Desert Archaic people. The Desert Archaic people failed to adapt to their changing environment and disappeared from the area.

Approximately 500 B.C., the Fremont culture group inhabited Utah's waterways. Cultural advancements such as bow and arrows, pit houses built below ground using poles and dirt for roofs, food storage structures, coiled pottery, and the addition of maize, beans, and squash to their diet, distinguishes this group of Native Americans from their predecessors. Pictographs left on Utah rock walls depict the Fremont people living in extended family groups or clans which traded freely among groups.

During the same period as the Fremont group, another complex culture was developing, the Anasazi. This group established themselves in southern Utah. The Anasazi culture transitioned from a hunting-and-food-gathering lifestyle into a horticultural system based on maize. Villages of sophistication were evident through political, religious, and architectural aspects. Although speculated, the Anasazi were believed to have migrated into New Mexico and Arizona establishing the present Pueblo communities along the Rio Grande River and west of Zuni and Hopi pueblos (Scholl and Camoin 1998).

The Numic group appeared in northern Utah in approximately 1100 A.D. This group's lifestyle was based on hunting and gathering allowing them to be very mobile and adaptive to changing climate and environment. The Northern and Western Shoshonie, Goshute, Southern Paiute, and Ute people, all Numic speaking groups, quickly distributed across Nevada, Utah, Colorado, Idaho, and Wyoming. At the time of European contact in the 18th century, Utah was predominantly occupied by Numic tribes (Scholl and Camoin 1998).

The Mexicans and Spaniards were the first known non-Indian group to explore Utah and document the landscape and culture of the Indian groups. These early expeditions led to increased use of Utah for fur trapping and trade with the Indians. As fur competition increased, trappers explored further into Utah's vast areas, scouting passages over the Rocky Mountains to the east which later led thousands of immigrants into Utah (USHS 1998).

In 1847, Brigham Young led the Church of Jesus Christ of Latter-day Saints or Mormons into Utah and settled in the Great Salt Lake Valley. Between 1847 and 1900, the Mormons founded 500 settlements in Utah and surrounding states. Mormon settlements consisted of planned communities of farmers and tradesmen, which included central residential areas and farms and farm buildings extending beyond the villages (USHS 1998).

The Treaty of Guadalupe Hidalgo ended the Mexican War in 1848, offering the majority of the Southwest (including Utah) to the United States. Taking into account this change, the Mormons formed a political government and created the State of Deseret. Deseret was not admitted into the Union; however, Congress created the Territory of Utah, led by Territorial Governor Brigham Young, which included most of present Nevada, part of present Wyoming, and Colorado. Utah remained a territory for 45 years and expanded through the immigration and settlement of non-Mormons, development of transportation, communication, and economic growth (USHS 1998).

Between 1850 and 1870, communication between the East and West became increasingly important. The Pony Express was established in April 1860 and provided mail service between St. Joseph, Missouri, and Sacramento, California. During its operation, 20 of the 190 stations were located in Utah and Utah-based companies supplied many of the horses used for relay service. Although the Pony Express ran smoothly, mail relay carried by horseback could not compete with the telegraph, which was established in April 1861. During a period between 1869 and the 1870s, the transcontinental railroad was established connecting settlements and increasing commerce in the Utah area (USHS 1998).

Between 1860 and 1890, the population of Utah expanded from 40,000 to more than 200,000. The population of Utah was 90 percent Mormon, which dominated Utah's politics, economics, and social life. After Congress passed several Acts restricting polygamy and the dissolve of the church corporation in 1887, the Mormon church began working towards resolving issues with the Federal government. In 1891, two national political parties were organized in Utah. Teamwork between Mormon and non-Mormon representatives in Washington, D.C. led to statehood for Utah in 1896.

Regional Conditions. A wide range of prehistoric and historic resources occur within the area underlying the UTTR airspace boundaries. Approximately 25 cultural resource surveys have been conducted in the vicinity of the Hill and Wendover Air Force Ranges. These surveys, along with less formalized efforts (e.g., general local knowledge), have resulted in the identification of more than 130 archeological sites within 30 miles of the boundaries of the ranges.

Properties listed on the NRHP that occur in areas underlying the UTTR are representative of historic eras that have influenced the State of Utah. A listing of NRHP sites for the counties that underlie the UTTR is presented in Table 3-9.

Two Native American Reservations underlie the UTTR including Skull Valley Indian Reservation in Toele County, Utah and the Goshute Indian Reservation which transverses two States including White Pine County, Nevada and Juab County, Utah.

Environmental Consequences

Significant adverse impacts to cultural resources would not be expected in areas underlying the UTTR. Under the Proposed Action, aircraft would not exceed subsonic speeds or induce long-term or permanent intrusion into the visual or audible settings of sites listed on the NRHP. Therefore, no direct impact due to noise related vibrations would adversely affect the NRHP sites underlying the UTTR. The use of chaff during training operations within the UTTR would not be expected to adversely impact cultural

Table 3-9. Properties Listed By State and County in National Register of Historic Places That May Underlie or Occupy Areas In Close Proximity to the UTTR

State	County	Description	Location
Utah	Box Elder	Central Pacific Railroad Grade Historic District	87 mile segment between Umbria and Golden Spike NHS Park Valley
		Tanner, A.N., House	Grouse Creek
	Tooele	Bonneville Salt Flats Race Track	3 mi. East of Wendover of U.S. 40 Wendover
		Danger Cave	1 mi. East of Wendover on U.S. 40 Wendover
		Lincoln Highway Bridge	In Dog Area on 2nd St. over Government Creek Dugway Proving Ground
		Wendover Air Force Base	South of Wendover off U.S. 40 Wendover
	Juab	Fish Springs Caves Archeological District	Callao

Source: NPS 1999

resources. Deployment of chaff would only be executed in authorized areas overlying the UTTR. Chaff debris has low visibility and little effect on the aesthetic quality of the environment. Furthermore, it would be unlikely that chaff debris would accumulate in significant objectionable quantities (ACC 1997). Potential minor adverse impacts could occur as the result of the deployment of flares in areas overlying the UTTR. Although existing ACC procedures require employment of flares at or above altitudes selected to ensure complete consumption of the flare before contacting the ground surface, a potential exists for inadvertent low releases of flares, and under certain conditions, fires could start (ACC 1997). Cultural resources could be damaged by activities to suppress fires and rehabilitate burned areas and from smoke which could temporarily or permanently impact the context and setting of historic buildings, Native American traditional use areas, and archaeological sites. The likelihood of possible flare-related impacts to cultural resources in a particular location is directly related to the probability of unintentional fires (ACC 1997).

3.3.7 Environmental Justice/Protection of Children

Existing Conditions

Population. Table 3-10 presents population characteristics, including population in 1980, 1990 and 1996, percent change, and population density, for the affected counties underlying the UTTR. Population increased in most of the counties from 1980 to 1996. In comparison, the total population for the 7-county area increased 42.52 percent, and the population for the States of Utah and Nevada increased 58.51 percent. Population in the counties underlying UTTR is less than 5 percent of the total population of the States of Utah and Nevada. The average population densities for the 7 counties and the States of Utah and Nevada are 2.83 and 19.12 persons per square mile, respectively. Table 3-10 presents a summary of relevant regional and state population information.

Table 3-10. Population Characteristics for the Region of Influence 1980, 1990, and 1996

County and State	1980	1990	1996	Percentage Change 1980-1996	Percent of 1996 State Population	1996 Population Density (Persons per Sq. MI)
Elko, NV	17,550	34,148	43,535	148.06%	2.72%	2.53
White Pine, NV	8,289	9,379	10,278	24.00%	0.64%	1.16
State of Nevada	810,215	1,218,651	1,600,810	97.58%	100.00%	14.48
Beaver, UT	4,408	4,767	5,694	29.17%	0.28%	2.20
Box Elder, UT	33,455	36,579	40,087	19.82%	1.99%	5.96
Millard, UT	9,080	11,312	12,221	34.59%	0.61%	1.79
Tooele, UT	26,225	26,675	30,144	14.94%	1.49%	4.13
Juab, UT	5,547	5,813	7,051	27.11%	0.35%	2.07
State of Utah	1,472,595	1,729,772	2,017,573	37.01%	100.00%	23.77

Source: USDOC 1998

Income. Table 3-11 presents earnings by industry for the 7-county area and the States of Utah and Nevada. The total combined earnings for the 7 counties, and the States of Utah and Nevada is $44 billion and $61 billion, respectively. The earnings for the 7 counties underlying the UTTR comprises 72 percent of the industry earnings for the States of Utah and Nevada. Services, manufacturing, wholesale and retail trade, and government represent the four largest industry sectors for counties that are crossed by the UTTR. These industrial categories are also the average leading industry sectors for the States of Utah and Nevada, and comprise approximately 73.86 percent of total industry earnings for Utah and Nevada.

Table 3-11. 1996 Earnings by Industry for the Affected Counties

Industry Sector	Earnings by Industry for the Affected Counties			
	7 County Area		Utah and Nevada	
	($ in thousands)	Percentage	($ in thousands)	Percentage
Farming & Agriculture	414	0.94%	537	0.88%
Mining	568	1.29%	1,248	2.04%
Construction	3,438	7.81%	5,828	9.55%
Manufacturing	6,429	14.60%	6,055	9.93%
Transportation and Public Utilities	3,191	7.25%	4,046	6.63%
Wholesale & Retail Trade	8,352	18.97%	9,252	15.17%

Finance, Insurance, & Real Estate	3,124	7.10%	4,296	7.04%
Services	11,858	26.93%	20,698	33.93%
Government	6,649	15.10%	9,048	14.83%
Total	44,024	100.00%	61,008	100.00%

Source: USDOC 1998

Housing. Housing units and vacancy rates are presented in Table 3-12. Similar to the increasing population figures, most of the counties crossed by UTTR have experienced growth between 1980 and 1990 in the number of housing units. The average combined growth in the number of housing units for the counties underlying UTTR and the States of Utah and Nevada is 27.39 percent and 34.62 percent, respectively. In 1990, the combined average homeowner and rental vacancy rates for the 7 counties were 4.12 percent and 6.51 percent, respectively. In comparison, the average homeowner and rental vacancy rates for the States of Utah and Nevada were 1.35 and 3.39 percent, respectively.

Table 3-12. Housing Characteristics for the Affected Counties

County and State	Housing Units		Percentage Growth	Portion of State's Housing (%)	Vacancy Rates (%)		Vacancy Rates	
	(1980)	(1990)		(1990)	For Sale	For Rent	For Sale	For Rent
Elko, NV	7,667	13461	75.57%	2.59%	188	522	1.40%	3.88%
White Pine, NV	3,664	3982	8.68%	0.77%	96	118	2.41%	2.96%
State of NV	339,949	518858	52.63%	100.00%	6116	21220	1.18%	4.09%
Beaver, UT	1,817	2200	21.08%	0.37%	67	92	3.05%	4.18%
Box Elder, UT	10,298	11890	15.46%	1.99%	158	241	1.33%	2.03%
Millard, UT	3,290	4125	25.38%	0.69%	100	146	2.42%	3.54%
Tooele, UT	8,566	9510.00	11.02%	1.59%	147.00	413.00	1.55%	4.34%
Juab, UT	1,969	2311.00	17.37%	0.39%	63.00	31.00	2.73%	1.34%
State of UT	490,006	598388	22.12%	100.00%	9102	16126	1.52%	2.69%
U.S.	86,882,978	102,263,678	17.70	N/A	2.98	1.23	3,046,638	1,260,233

Source: U.S. Bureau of the Census 1990

Environmental Justice. Table 3-13 includes details of the race characteristics of the counties underlying the UTTR. The average percentage of minority residents in the counties underlying the UTTR is lower than the average percentage of minority residents in the States of Utah and Nevada, and the U.S. The average combined percentage of minority residents in the 7 counties, the States of Utah and Nevada, and the U.S. is 6.45 percent, 10.97 percent and 19.71 percent, respectively.

Table 3-13. Race Characteristics for the Affected Counties

County and State	White	Black	American Indian, Eskimo, or Aleut	Asian or Pacific Islander	Other Race
Elko, NV	86.40%	0.79%	6.35%	0.83%	5.63%
White Pine, NV	91.26%	2.03%	3.17%	0.38%	3.16%
State of Nevada	84.26%	6.55%	1.63%	3.17%	4.38%
Beaver, UT	97.52%	0.10%	0.82%	0.40%	1.15%
Box Elder, UT	95.20%	0.05%	1.07%	1.12%	2.56%
Millard, UT	95.28%	0.02%	1.62%	0.93%	2.15%
Tooele, UT	91.53%	0.86%	1.47%	0.77%	5.38%
Juab, UT	97.64%	0.03%	1.46%	0.17%	0.69%
State of Utah	93.79%	0.67%	1.41%	1.94%	2.19%
U.S.	80.29%	12.06%	0.79%	2.92%	3.94%

Source: U.S. Bureau of the Census 1990

The counties underlying the ROI have a higher population percentage below the poverty level than the States of Utah and Nevada and the entire U.S. Based on the 1990 U.S. Bureau of the

Census Data (see Table 3-14), the population percentage below the poverty level for the 7 counties underlying the UTTR is 11.0 percent. In comparison, the population percentage below the poverty level for the States of Utah and Nevada and the U.S. is 10.76 percent and 13.12 percent, respectively.

Table 3-14. Poverty in the Affected Counties

	Population Above Poverty Level	Population Below Poverty Level	Portion of Population Below Poverty
Elko, NV	29,725	3,089	9.41%
White Pine, NV	7,584	924	10.86%
State of Nevada	1,058,736	119,660	10.15%
Beaver, UT	4,071	631	13.42%
Box Elder, UT	33,701	2,629	7.24%
Millard, UT	9,639	1,569	14.00%
Tooele, UT	23,261	3,012	11.46%
Juab, UT	5,095	604	10.60%
State of Utah	1,501,942	192,415	11.36%
U.S.	210,234,995	31,742,864	13.12%

Source: U.S. Bureau of the Census 1990

As shown in Table 3-15, the average percent of children in the counties underlying UTTR and the States of Utah and Nevada, at 36.40 percent and 30.56 percent, respectively, is higher than the U.S. percentage of children at 25.57 percent.

Table 3-15. Children in the Affected Counties

	Children Under 18	% Children
Elko, NV	10,810	32.24%
White Pine, NV	2,565	27.69%
State of Nevada	296,948	24.71%
Beaver, UT	1,730	36.31%
Box Elder, UT	14,807	40.58%
Millard, UT	4,867	42.95%
Tooele, UT	9,621	36.17%
Juab, UT	2,263	38.90%
State of Utah	627,444	36.42%
U.S.	63,604,432	25.57

Source: U.S. Bureau of the Census 1990

Environmental Consequences

To comply with EO 12898, ethnicity, poverty status, and the age of individuals in the ROI have been examined and compared to state and national statistics to determine if any minority, low-income groups, or children could be disproportionately affected by the Proposed Action. This review indicates the percentage of residents below the poverty level in the counties underlying UTTR is higher than the state percentages and lower than the U.S. percentages. Also, the percentage of minority residents in the counties underlying UTTR is lower than the state and U.S. percentages. In addition, the percentage of children in the counties underlying UTTR is greater than the States of Utah and Nevada and U.S. percentages. However, the combined population of the 7 counties in the ROI represents less than 5 percent of the population of the States of Utah and Nevada. Therefore, no minority or low-income groups or populations of children would be disproportionately impacted. In addition, because there would be no environmental impacts associated with the Proposed Action, there would be no environmental justice issues, and therefore, further analysis is not warranted.

3.4 ALTERNATIVE 1

Under Alternative 1 use of chaff and flares by military aircraft would be authorized down to 1,000 feet AGL outside the DoD-withdrawn lands throughout the entire UTTR airspace. In addition, the use of flares would be authorized down to 500 feet AGL over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands (See Figure 2-2). The amount of chaff and flares used within the UTTR would not change under Alternative 1. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace.

Adoption of this alternative would improve the overall training environment of the UTTR as compared to existing conditions, but would not achieve the same level of training as compared to the Proposed Action. The failure to fully address the need for the Proposed Action could result in degradation of abilities to carry out the Air Force mission. Given the inherent risks involved in flight activities, failure to provide the training that would be accomplished by use of the locations proposed in this EA could affect the safety of personnel and could result in damage to property, injury to personnel, and possibly death. The degree of mission degradation or potential for threats to safety cannot be reliably quantified.

The potential effects on each of the resource areas relevant to the Proposed Action that could occur as a result of adoption of Alternative 1 are the same as those assessed as part of the

Proposed Action. There would be no significant, adverse impacts associated with the implementation of Alternative 1.

3.5 ALTERNATIVE 2

Under Alternative 2, use of chaff by military aircraft would be authorized down to 1,500 feet AGL outside the DoD-withdrawn lands throughout the entire UTTR airspace. In addition, the use of flares would be authorized down to 1,000 feet AGL throughout the entire UTTR airspace. The use of flares would be authorized down to 500 feet AGL or higher over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands (See Figure 2-3). The amount of chaff and flares used within the UTTR would not change under Alternative 2. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace.

Adoption of this alternative would improve the overall training environment of the UTTR as compared to existing conditions, but would not achieve the same level of training as compared to the Proposed Action. The failure to fully address the need for the Proposed Action could result in degradation of abilities to carry out the Air Force mission. Given the inherent risks involved in flight activities, failure to provide the training that would be accomplished by use of the locations proposed in this EA could affect the safety of personnel and could result in damage to property, injury to personnel, and possibly death. The degree of mission degradation or potential for threats to safety cannot be reliably quantified.

The potential effects on each of the resource areas relevant to the Proposed Action that could occur as a result of adoption of Alternative 2 are the same as those assessed as part of the Proposed Action. There would be no significant, adverse impacts associated with the implementation of Alternative 2.

3.6 ALTERNATIVE 3

Under Alternative 3, use of chaff by military aircraft would be authorized down to 500 feet AGL within Restricted Airspace outside the DoD-withdrawn lands. The use of flares would be authorized down to 1,000 feet AGL throughout the entire UTTR airspace. In addition, the use of flares would be authorized down to 500 feet AGL over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands (See Figure 2-4). The amount of chaff and flares used within the UTTR would not change under Alternative 3. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace.

Adoption of this alternative would improve the overall training environment of the UTTR as compared to existing condition, but would not achieve the same level of training as compared to the Proposed Action. The failure to fully address the need for the Proposed Action could result in degradation of abilities to carry out the Air Force mission. Given the inherent risks involved in flight activities, failure to provide the training that would be accomplished by use of the locations proposed in this EA could affect the safety of personnel and could result in damage to property, injury to personnel, and possibly death. The degree of mission degradation or potential for threats to safety cannot be reliably quantified.

The potential effects on each of the resource areas relevant to the Proposed Action that could occur as a result of adoption of Alternative 3 are the same as those assessed as part of the Proposed Action. There would be no significant, adverse impacts associated with the implementation of Alternative 3.

3.7 NO ACTION ALTERNATIVE

Under the No Action Alternative, the 388 FW and the 419 FW would not implement the Proposed Action within the UTTR as identified in this EA. Existing conditions within the UTTR identified to support the Proposed Action would remain as they are at present. Adoption of the No Action Alternative would result in continuation of existing conditions "as is." Pilots would be able to discharge chaff at any altitude within defined airspace boundaries, but only where the UTTR airspace is underlain by DoD-controlled lands. In addition, they would be able to discharge flares at any altitude within defined airspace boundaries when above DoD-controlled lands, and only above 1,500 feet AGL within the remainder of the UTTR airspace.

Adoption of the No Action Alternative would deny the 388 FW's and the 419 FW's responding to the purpose and need for the Proposed Action as stated in Section 2.0. The failure to address the need for the Proposed Action could result in degradation of abilities to carry out the Air Force mission. The current limitations on the use of chaff and flares do not permit full development of the skills that pilots need for success and survival in modern air combat. Failure to provide the training that would be accomplished by the expansion of the use of self-protection chaff and flares proposed in this EA could affect the safety of personnel and could result in damage to property, injury to personnel, and possibly death in combat situations. The degree of mission degradation or potential for threats to safety cannot be reliably quantified.

The following address potential effects on each of the resource areas relevant to the Proposed Action that could occur as a result of adoption of the No Action Alternative.

Human Health and Safety. Long-term minor adverse effects would be expected. Continuation of existing conditions would, to a minor extent, foreclose opportunities to train air crews in the skills necessary for execution of the Air Force mission. Without adequate training of the type contemplated to be supported by the Proposed Action, pilots may be at risk under combat conditions.

Air Quality. No effects would be expected. Existing conditions would remain as they presently are.

Soil and Water Resources. No effects would be expected. Existing conditions would remain as they presently are.

Biological Resources. No effects would be expected. Existing conditions would remain as they presently are.

Land Use and Visual Resources. No effects would be expected. Existing conditions concerning land uses and visual resources within the UTTR would remain as they presently are.

Cultural Resources. No effects would be expected. Existing conditions would remain as they presently are.

Environmental Justice/Protection of Children. No effects would be expected. Existing conditions would remain as they presently are. The conditions of minority and low-income populations identified for protection through EO 12898 would continue as at present. The condition of children identified for protection through EO 13045 would continue as at present.

3.8 CUMULATIVE EFFECTS

A cumulative effect is defined as an effect on the environment that results from the incremental effect of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

As previously stated, the UTTR is DoD's largest contiguous network of special use airspace within the continental United States. There are numerous proposed and on-going actions that pose the potential for there being cumulative effects. However, when combined with the actions proposed as part of this EA (i.e., the expansion of the use of self-protection chaff and flares), the potential cumulative effects are anticipated to be minor.

This page left blank.

4.0 FINDINGS AND CONCLUSIONS RELATED TO THE PROPOSED ACTION

4.1 INTRODUCTION

This EA has been prepared to evaluate the potential impacts on the natural and human environment from activities associated with the Proposed Action. Implementation of the Proposed Action (i.e., preferred alternative) would include the authorization of the use of chaff by military aircraft at 500 feet AGL or higher outside the DoD-withdrawn lands throughout the entire UTTR airspace. The use of flares would be authorized at 1,000 feet AGL or higher throughout the entire UTTR airspace. The use of flares would be authorized down to 500 feet AGL over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands. The amount of chaff and flares deployed within the UTTR would not change under the Proposed Action. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace. The EA has examined the Proposed Action, three alternatives to the Proposed Action, and the No Action Alternative. The No Action Alternative is prescribed by CEQ regulations to serve as the baseline against which the Proposed Action and alternatives are analyzed.

4.2 FINDINGS

Findings of the EA indicate that potential minor impacts would be expected upon implementation of the Proposed Action, as well as the implementation of the three alternatives to the Proposed Action. These potential impacts are summarized in the following text. Although no significant effects would be expected, special operating procedures would be required to limit potential adverse effects. These procedures are summarized in Section 5.0.

- No significant impacts on human health and safety would be expected. There is little safety risk to aircrews, aircraft, or the public anticipated from the use of chaff. Combat chaff currently in use within the UTTR has the potential to interfere with FAA radars. However, the RR-188 chaff, which includes no dipoles cut to RF bands used by FAA radars, is also currently in use within the UTTR. Aircraft using chaff types other than RR-188 must obtain frequency clearance from the FAA prior to use. There is no safety risk as a result of falling chaff debris. The size of chaff dipoles is too large to be easily inhaled by humans. Furthermore, airborne chaff fibers have not been epidemiologically associated with human disease. Extreme abrasion would be needed to reduce chaff to inhalable size ranges. However, the tiny number of fibers that could be inhaled because they are of respirable size or have degraded to such a size are insufficient to produce disease. Chaff and its components fail to show an increased incidence of lung disease. The probability of a person on the ground being hit by a dud flare or some of the flare system debris is very low, and no specific measures are required. However, there exists the risk of a person being injured by a dud flare recovered on the ground. Corrective actions have been taken to reduce the hazard to most personnel as a result of flare deployment within the UTTR over DoD-controlled lands (i.e., education and periodic cleanup). In the areas outside of DoD-controlled lands frequented by the general public, a public information program should be initiated to alert people of the risks associated with dud flares and to define safe procedures should a dud flare be found. Under extreme fire hazard conditions, the use of flares should be coordinated with local land managers or should curtailed. Under normal weather conditions, lowering the minimum altitude for flare employment from 1,500 feet AGL to 1,000 feet AGL would have no significant impact. The "buffer" of an additional 300 feet ensures that there would be adequate time for complete combustion and consumption of the flare pellet before reaching the ground and provides for the added protection of resources within the UTTR.

- No significant impacts on air quality would be expected. The potential for release of hazardous air pollutants is not an issue with chaff deployment because the BBU-35/B impulse cartridges no longer contain calcium chromate (clacium chromate was replaced by potassium perchlorate). In addition, chaff dipoles are greater than 10 μm in size, and, therefore, would not affect the PM_{10} NAAQS. In addition, chaff dipoles settle to the ground quickly and, therefore, would not impact the PSD Class I standards. The amount of flares deployed within the UTTR airspace would remain the same under the Proposed Action, and, therefore, would have not significantly increase short- and long-term health affects, nor have any adverse affect on air quality even with the allowable deployment elevation being lowered to 1,000 feet AGL.

- No impacts on soil and water resources would be expected. Chaff is approximately 60 percent glass fibers and 40 percent aluminum by weight. The deposition of chaff is comparable with airborne dusts in the high desert environment. The comparison to desert dust is relevant because the composition of dust is dominated by silicon dioxide (SiO_2) and aluminum oxide (Al_2O_3), which are the most common minerals in the Earth's crust. Therefore, the expansion of the use of self-protection chaff within the UTTR would not have any significant, adverse impacts on soil and water resources. Dud flares are rare and incidental events, so it is extremely unlikely that any given location would experience long-term cumulative effects from a buildup of flare material. Flare ash is widely distributed by wind, and the likelihood that a sufficient quantity would accumulate in a particular water body to measurably affect its chemical makeup is also remote. Therefore, the use of self-protection flares within the UTTR, especially the lowering of the allowable release altitude, would not have any significant, adverse affects on soil and water resources.

- No significant impacts on biological resources would be expected. There are no health hazards to farm animals as a result of chaff ingestion. Toxic effects are unlikely through the rumen due to pH effects within this portion of the digestive tract. Negative pulmonary effects are unlikely due to the non-respirability of chaff fibers. Relative to the background concentrations of dust in the air, the amount of additional particles contributed by chaff fibers would be negligible, and no adverse effects on wildlife would be expected from inhalation of the fibers. Deleterious effects on marine and freshwater organisms are unlikely because siliceous spicules, similar to chaff particles, are already part of marine and freshwater sponges that are natural to those ecosystems. Results from toxicity tests using marine organisms showed no deleterious effects at appropriate exposure levels. Chaff interference with wildlife activities is expected to be negligible due to the amount of chaff use, characteristics of chaff, and field observations of chaff accumulation. Since there is no evidence of heavy chaff accumulation on the ground or water, even in heavy use areas, avoidance of foraging areas by wildlife due to chaff is unlikely. Startle effects of flares on wildlife are expected to be negligible. Chemical effects of flare debris on vegetation are expected to be negligible due to the small amount of debris reaching the ground and the generally low toxicity of residues. Therefore, the expansion of the use of self-protection chaff and flares within the UTTR would have no significant, adverse impacts to biological resources.

- No effects on land use and visual resources. Chaff debris has low visibility and little effect on the aesthetic quality of the environment. Chaff debris does not accumulate in quantities that make it objectionable, or even noticeable to most persons in low-use areas. It is unlikely that chaff debris could accumulate in quantities that would be noticeable by private owners. It is also unlikely that if it did that it would reduce the value of land for a specific use (e.g., residential, commercial, agricultural, or industrial), although it may be perceived as annoying or intrusive. Furthermore, chaff use is not expected to affect agricultural, industrial, or commercial land uses. No adverse affects of the expanded use of self-protection chaff within the UTTR are anticipated. Flare debris, such as end caps, are not easily detected and would not affect the overall scenic quality or outdoor experiences. Because dud flares are more easily noticed and attract attention in natural settings, they are more likely to be picked up and could pose a hazard to hikers and recreationalists. Potential minor adverse impacts could occur as the result of the deployment of flares in areas overlying the UTTR. Although existing ACC procedures require employment of flares at or above altitudes selected to ensure complete consumption of the flare before contacting the ground surface, a potential exists for inadvertent low releases of flares, and under certain conditions, fires could start. Certain land use activities and/or visual resources could be damaged by fires and from smoke which could temporarily or permanently impact these resources. However, no significant adverse impacts would be expected as a result of the lowering of the allowable flare deployment altitude to 1,000 feet AGL within the UTTR.

- Significant adverse impacts to cultural resources would not be expected in areas underlying the UTTR. Chaff debris has low visibility and little effect on the aesthetic quality of the environment. Furthermore, it would be unlikely that chaff debris would accumulate in significant objectionable quantities. Potential minor adverse impacts could occur as a result of the deployment of flares in areas overlying the UTTR. Although existing ACC procedures require employment of flares at or above altitudes selected to ensure complete consumption of the flare before contacting the ground surface, a potential exists for inadvertent low releases of flares, and under certain conditions, fires could start. Cultural resources could be damaged by activities to suppress fires and rehabilitate burned areas and from smoke which could temporarily or permanently impact the context and setting of historic buildings, Native American traditional use areas, and archaeological sites. However, the likelihood of flare-related effects to cultural resources in a particular location is extremely remote.

- No effects on environmental justice or children would be expected. There would be no significant long-term impact on socioeconomic resources. No changes in population characteristics or housing patterns would be expected. No adverse impact on children, or minority, or low-income populations would be expected. Therefore, no significant or adverse impact would be expected.

4.3 CONCLUSIONS

The analyses performed in this EA reveal that implementation of the Proposed Action within the UTTR would have no significant direct, indirect, or cumulative effects on the quality of the natural or human environment.

Expansion of the use of self-protection chaff and flare under the Proposed Action would occur within the UTTR. Analyses performed in this EA show that there are no critical differences in potential environmental effects between various alternatives presented to expand the use of self-protection chaff and flares within the UTTR. There are no distinct reasons, related to environmental considerations, to prevent the expansion of the use of self-protection chaff and flares within the UTTR.

Preparation of an EIS is not required, and a FONSI may be prepared.

This page left blank.

5.0 SPECIAL PROCEDURES

Impact evaluations contained in this EA have determined that no significant environmental impacts would result from implementation of the Proposed Action. However, this determination is based on certain special procedures being completed by knowledgeable, responsible personnel from Hill AFB, the 388 FW, and the 419 FW, working through the appropriate Federal, state, and local agencies. These procedures are as follows:

- Coordination with/approval from the FAA for the use of combat type chaff as required by AFI 13-212, *UTTR Supplement 2 (Training)* for all chaff deployments within the UTTR, and adherence to FAA regulations by all units deploying chaff within the UTTR.
- The 388 RANS should establish a remote computer link to a local office of a Federal or state agency (i.e., BLM) that can access the NFDRS, or dedicate a desktop computer to run the system. Using this system, the 388 RANS should devise "no constraint" and "no flare release" guidelines for the various airspace components that make up the UTTR. Under conditions when a fire would be expected to spread rapidly and/or burn with high intensity, any risk of ignition may be deemed unacceptable, leading to a "no flare release" constraint. Furthermore, joint agreements between Hill AFB and local land management agencies should be developed to address flare use considerations and fire risk. In all cases, flare use should be curtailed during periods identified as high or extreme fire risk.
- Avoidance of areas identified in the Flight Information Publication.
- Coordination with the Utah and Nevada SHPO must be completed to obtain the final Native American organizations and Tribal Governments.
- In the areas outside of DoD-controlled lands frequented by the general public, a public information program should be initiated to alert people of the risks associated with dud flares and to define safe procedures should a dud flare be found. Continuation of EOD personnel activities on DoD-controlled lands.

This page left blank.

6.0 REFERENCES

ACC 1997 — Air Combat Command (ACC). *Environmental Effects of Self-Protection Chaff and Flares – Final Report.* U.S. Air Force, Headquarters ACC, Langley, Air Force Base, Virginia. August 1997.

Bailey 1995 — Bailey, R. *Description of the Ecoregions of the United States*. U.S. Department of Agriculture, U.S. Forest Service Miscellaneous Publication No. 1391. 1995.

Ellis 1981 — Ellis, D.H. *Responses of Raptorial Birds to Low Level Military Jets and Sonic Booms.* United States Air Force (USAF). United States Fish and Wildlife Service (USFWS). 1981.

Fraser et al. 1985 — Fraser, J.D., Frenzel, L.D., and J.G. Mathisen. *The Impact of Human Activities on Breeding Bald Eagles in North Central Minnesota.* Journal of Wildlife Management. Vol. 49. 585-592. 1985.

Gladwin et al. 1988 — Gladwin, D., Asherin, Duane, and Manci Karen. *Effects of Aircraft Noise and Sonic Booms on Fish and Wildlife: Results of a Survey of U.S. Fish and Wildlife Service Endangered Species and Ecological Services Field Offices, Refuges, Hatcheries, and Research Centers*. U.S. Fish and Wildlife Service National Ecology Research Center. NERC-88/30. 1988.

HAFB 1996 — Hill Air Force Base (HAFB). *Range Management Plan and Environmental Assessment for the Hill Air Force Range and the Wendover Air Force Range of the Utah Test and Training Range (Draft Final).* Prepared for the Environmental Management Directorate, Plans and Programs Division (EMX) Hill AFB, Utah. Prepared by Dames & Moore and Foster Wheeler Environmental Corporation. August 1996.

NBAQ 1999 — Nevada Bureau of Air Quality (NBAQ). Ambient Air Quality Trends, 1988-1997. Nevada Department of Conservation and Natural Resources, Division of Environmental Protection. Carson City, NV. Report accessed via <http://www.state.nv.us/ndep/bao>. October 1999.

NNHP 1999 — Nevada Natural Heritage Program (NNHP) – Department of Conservation and Natural Resources. List of Sensitive Species within the State of Nevada. <http://www.state.nv.us/nvnhp/spelists.htm>. Accessed October 1999.

NPS 1999 — National Park Service (NPS). *National Register Information System*. <http://www.cr.nps.gov/scripts/auto>. 1999.

NRL 1999	Naval Research Laboratory (NRL). *Environmental Effects of RF Chaff – A Select Panel Report to the Undersecretary of Defense for Environmental Security*. Transmitted via Barry J. Spargo, Ph.D., Chemistry Division, and the Assistant Secretary of the Air force, the Assistant Secretary of the Army, and the Assistant Secretary of the Navy. Publication No. NRL/PU/6110- -99-389. Washington, DC. August 31, 1999.
Scholl and Camoin 1998	Scholl, Barry and Francois Camoin. 1998. *Utah – A Guide to the State*. Gibbs Smith Publisher. Salt Lake City, Utah.
UDEQ 1999	Utah Department of Environmental Quality (UDEQ). 1996 State Emissions Summary. Division of Air Quality. Report accessed via <http://www.deq.state.ut.us/eqamc/data.htm>. October 1999.
UDWR 1999	Utah Division of Wildlife Resources (UDWR). List of sensitive species in the State of Utah. <http://www.nr.state.ut.us/dwr/sensppl.htm>. Accessed October 1999.
U.S. Bureau of the Census 1990	U.S. Bureau of the Census. Census of Population and Housing. Summary Tape File 1C and 3C1. Generated by Jennifer Norrman, Science and Engineering Associates, Inc., using 1990 Census Lookup: <http://venus.census.gov/cdrom/lookup.> Accessed February 22, 1999.
USDA 1992	U.S. Department of Agriculture (USDA), Forest Service. 1992. "Potential Impacts of Aircraft Overflights of National Forest System Wildernesses." Report to Congress.
USDOC 1998	U.S. Department of Commerce (USDOC). 1998. *Regional Economic Information System, 1969-1996*. CD-ROM. Bureau of Economic Analysis, Economics and Statistics Administration. Washington, D.C. May 1998.
USFWS 1999	U.S. Fish and Wildlife Service (USFWS). Letter from Reed E. Harris, USFWS Utah Field Office Supervisor, to Headquarters Air Force Reserve Command concerning the Expansion of the Use of Self-Protection Chaff and Flares within the Utah Test and Training Range. September 16, 1999.
USHS 1998	Utah State Historical Socity (USHS). 1998. *A Brief Summary of Utah History*. <http://www.ce.ex.state.ut.us/history/uthist.htm>. July 20, 1998
Wisely 1999	Wisely, Sally. 1999. Letter from Sally Wisely, State Director, Bureau of Land Management, Utah State Office, to Brian Hoppy, Science & Engineering Associates, Inc. presenting comments, questions, and concerns pertaining to the expansion of self-protection chaff and flares within the UTTR. September 24, 1999.

This page left blank.

7.0 LIST OF PREPARERS

PROJECT MANAGEMENT

Brian Hoppy
Certificate of Environmental Management
B.S. Biology
Years of Experience: 9

Julie Green, R.E.A.
Certificate of Environmental Management
M.B.A. Business Administration
B.S. Finance
Years of Experience: 10

Suanne Oelrich
B.S. Geology
Years of Experience: 3

TECHNICAL TEAM

Steven Mitchell, P.E.
B.S. Civil Engineering
Years of Experience: 18

Kristina Blackmore
B.S. Environmental Analysis and Planning
Years of Experience: 3

Jonathan Kocher
B.S. Environmental Engineering
Certificate Engineer-in-Training (EIT)
Years of Experience: 4

Cheryl Myers
A.A.S. Nursing
Years of Experience: 23

Jennifer Norrman
B.S. Environmental Resource Management
Years of Experience: 3

Lynn Straughan

B.S. Wildlife Management
Years of Experience: 4

Kay Torpey

Years of Experience: 16

Mike Weppner

M.S. Operations Research
B.S. Aerospace Engineering
Years of Experience: 33

APPENDIX A

Interagency and Intergovernmental Coordination for Environmental Planning Correspondence

July 16, 1999

<Contact>
<Job Title>
<Company>
<Address 1>
<Address 2>
<Address 3>
<City_State_Zip>

Dear <Contact>:

The Air Force Reserve Command is preparing an Environmental Assessment (EA) for the Expansion of the Use of Chaff and Flares within the Utah Test and Training Range (UTTR), Hill Air Force Base (AFB), Utah. Science and Engineering Associates, Inc. (SEA) has been contracted by the Air Force Reserve Command to prepare the environmental assessment.

The environmental impact analysis process for this proposal is being conducted by the Air Force Reserve Command in accordance with the Council on Environmental Quality guidelines pursuant to the requirements of the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation by reviewing the attached Description of Proposed Action and Alternatives and solicit your comments concerning the proposal and any potential environmental consequences. Please provide any comments you may have within 60 days. I have attached a listing of those Federal and state agencies that have been contacted (see Attachment 2). If there are any additional agencies that you feel should review and comment on the proposal, please feel free to include them in your distribution of this letter and the attached materials.

Written responses may be sent to the attention of Mr. Brian K. Hoppy, SEA Project Manager, at the above address. Please provide any written comments or information regarding the action at your earliest convenience or not later than September 14, 1999 *(60 days after scheduled date of letter transmittal)*. Should you have any questions concerning the proposed action or the development of the environmental assessment, please contact me at (703) 385-2800. Thank you for your assistance.

Sincerely,

SCIENCE AND ENGINEERING ASSOCIATES, INC.

Brian K. Hoppy
Senior Program Manager, Environmental Services

Attachments:
1. Description of Proposed Action and Alternatives
2. Distribution List

INTERAGENCY COORDINATION LIST
Environmental Assessment of the Expansion of the Use of Self-Protection Chaff and Flares at the UTTR, Hill AFB, Utah

FEDERAL AGENCIES

Council on Environmental Quality
360 Old Executive Office Building, NW
Washington, DC 20501

Mr. Richard Sanderson
Director, Office of Federal Activities
U.S. Environmental Protection Agency
Federal Agency Liaison Division, 2251-A
401 M Street, SW
Washington, DC 20460

Ms. Andree DuVarney
National Environmental Coordinator, Ecological Sciences Division
U.S. Department of Agriculture
Natural Resource Conservation Service
14th and Independence Ave., SW
P.O. Box 2890
Washington, DC 20013

Dr. Willie Taylor
U.S. Department of the Interior
Office of Environmental Policy and Compliance
Main Interior Building, MS 2340
1849 C Street, NW
Washington, DC 20240

Jane H. Saginaw,
Region VI Administrator
U.S. Environmental Protection Agency
1445 Ross Ave., 12^{th} Floor, Suite 1200
Dallas, TX 75202

Ms. Ann M. Hooker
Environmental Specialist, NEPA Liaison
Federal Aviation Administration
Office of Environment and Energy (AEE300)
800 Independence Avenue, SW
Washington, DC 20591

Mr. Mark Bagdovitz
Chief, Branch of Federal Activities
USFWS-Federal Activities Contact, Region 1
Eastside Federal Complex
911 N.E. 11th Ave
Portland, OR 97232-4181

Mr. Dennis G. Buechler
Federal Activities Specialist
USFWS-Federal Activities Contact, Region 6
Denver Federal Center
P.O. Box 25486
Denver, CO 80225-0486

Ms. Cynthia Cody
8EPR-EP
USEPA REGION 8
999-18th St., Suite 500
Denver, Colorado 80202-2466

Mr. David Farrel
CMD-2
USEPA REGION 9
75 Hawthorne Street
San Francisco, CA 94105

Lt. Col. Bill Frank
AFREP (AWP-910)
Western Pacific Region
PO Box 92007
Los Angeles, CA 90009-2007

Lt. Col. Jon Morrow
AFREP (ANM-900)
Northwestern Mountain Region
1601 Lind Ave SW
Renton, WA 98055-4056

FEDERAL AGENCIES (Continued)

Regional Administrator
FAA Northwest Mountain Region
1601 Lind Avenue, SW
Renton, Washington 98055-4056

U.S. Army Corps of Engineers
Office of Environmental Policy
(CECW-AR-E)
7701 Telegraph Road
Alexandria VA 22315-3861

Mr. Rhey Solomon
Director, NEPA Staff
U.S. Department of Agriculture
Forest Service
P.O. Box 96090
Washington, DC 20090-6090

Regional Administrator
FAA Western Pacific Region
5000 Aviation Boulevard
Lawndale, CA 90261

Mr. Don Klima
Director, Office of Planning and Review
Advisory Council on Historic Preservation
1100 Pennsylvania Ave., NW #809
The Old Post Office Building
Washington, DC 20004

STATE AGENCIES

UTAH

The Honorable Michael O. Leavitt
Governor of Utah
210 State Capitol
Salt Lake City, UT 84114

The Honorable Bob Bennett
U.S. Senator
431 Dirksen Bldg.
Washington, D.C. 20510-4403

The Honorable Orrin Hatch
U.S. Senator
131 Russell Senate Office Building
Washington, DC 20510

The Honorable James V. Hansen
U.S. Representative
242 Cannon House Office Building
Washington, D.C. 20515

Ms. Carolyn Wright
Governor's Office of Planning and Budget
Room 116, State Capitol Building
Salt Lake City, UT 84114

Mr. Max Evans, SHPO
Utah State Historical Society
300 Rio Grande
Salt Lake City, UT 84101

Ms. Kathleen Clarke, Executive Director
Utah Department of Natural Resources
1594 West North Temple, Suite 3710
P.O. Box 145610
Salt Lake City, Utah 84114-5610

Ms. Dianne R. Neilson, Executive Director
Utah Department of Environmental Quality
P.O. Box 144810-4810
168 North 1950 West
Salt Lake City, Utah 84114-4810

NEVADA

The Honorable Bob J. Miller
Governor of Nevada
Executive Chambers
Capitol Complex
Carson City, NV 89710

The Honorable Richard Bryan
U.S. Senator
269 Russell Senate Office Building
Washington, D.C. 20510

The Honorable Harry Reid
U.S. Senator
528 Hart Senate Office Bldg.
Washington, DC 20510

The Honorable Jim Gibbons
U.S. Representative
100 Cannon House Office Building
Washington, D.C. 20515

Clearinghouse Coordinator
Nevada State Clearinghouse
Department of Administration
209 East Musser Street, Room 200
Carson City, NV 89701-4298

Mr. Ronald Jones, SHPO
Historic Preservation Office
100N Stewart Street
Capitol Complex
Carson City, NV 89701-4285

Mr. Peter Morros, Director
Nevada Department of Conservation and Natural Resources
123 W. Nye Lane, Room 230
Carson City, Nevada 89706-0818

LOCAL AGENCIES

Mr. Royal Norman
County Commissioner Chairman
County Courthouse
1 South Main
Brigham City, UT 84302

Mr. Teryl Hunsaker
County Commissioner Chairman
47 South Main
Tooele, UT 84074

Mr. Joseph Bernini
Chairman, Board of Commissioners
County Courthouse
160 North Main
Nephi, UT 84648

Mr. John Henry
Chairman, Board of Commissioners
755 South Highway 99
Fillmore, UT 84631

Mr. Chad Johnson
Chairman, Board of Commissioners
County Courthouse
PO Box 392
Beaver, UT 84713

Mr. Mike Nannini
Chairman, Board of Commissioners
569 Court Street
Elko, NV 89801

Ms. Carol McKenzie
Chairman, Board of Commissioners
County Courthouse
953 Campton Street
Ely, NV 89301

OTHER ORGANIZATIONS

Ms. Grace Potorti
Rural Alliance for Military Accountability
6670 Peppermint Drive
Reno, NV 89506

Mr. Steve Erikson
Downwinders
961 East 600 South
Salt Lake City, UT 84102

APPENDIX B

Conformity Analysis

CONFORMITY ANALYSIS

FOR THE
EXPANSION OF THE USE OF
SELF-PROTECTION CHAFF AND FLARES
WITHIN THE UTAH TEST AND TRAINING RANGE
HILL AIR FORCE BASE, UTAH

Prepared for:

HEADQUARTERS AIR FORCE RESERVE COMMAND
ENVIRONMENTAL DIVISION
155 2ND STREET
ROBINS AFB, GA 31098-1635

Prepared by:

SCIENCE AND ENGINEERING ASSOCIATES, INC.
4031 University Drive
Suite 400
Fairfax, VA 22030

November 1999

RECORD OF NON-APPLICABILITY
for
Clean Air Act General Conformity
for the Expansion of the Use of Self-Protection Chaff and Flares Within the Utah Test and Training Range
Hill Air Force Base, Utah

CLEAN AIR ACT
RECORD OF NON-APPLICABILITY
(40 CFR Part 93)

To the best of our knowledge the information contained in this applicability analysis is correct and accurate. By signing this statement, we are in agreement with the finding that this action is below appropriate *de-minimis* values and is not regionally significant. Therefore, the preferred alternative is presumed to conform to the Utah and Nevada State Implementation Plans.

____________________________ ____________________________
Commander Date
388th Fighter Wing

____________________________ ____________________________
Commander Date
419th Fighter Wing

1.0 INTRODUCTION

The Utah Test and Training Range (UTTR) is the Department of Defense's (DoD) largest contiguous network of special use airspace within the continental United States. The UTTR encompasses 16,651 square miles with airspace available from the surface to 58,000 feet above mean sea level (MSL) over various locations. DoD components use the range for testing munitions and propellants up to the most powerful intercontinental ballistic missile rocket motors and non-nuclear explosive components. Available to squadrons of all military services, the UTTR is capable of supporting more than 30,000 training sorties annually. Two principal users of the UTTR are the 388th Fighter Wing (388 FW) of the Air Combat Command (ACC) and the 419th Fighter Wing (419 FW) of the Air Force Reserve Command (AFRC), both of which are located at Hill Air Force Base (AFB), Utah. Regulations for the UTTR (i.e., *AFI 13-212, UTTR Supplement 2 [Training]*) specify the locations and altitudes at which chaff and flares can be deployed. At present, the use of chaff is authorized within defined airspace boundaries at any altitude only over DoD-withdrawn lands. The use of flares is authorized at any altitude over DoD-withdrawn lands, and only above 1,500 feet AGL over lands other than those held by DoD (AFRC 1999).

2.0 PROPOSED ACTION

The Proposed Action would be to authorize use of chaff by military aircraft at 500 feet AGL or higher outside the DoD-withdrawn lands throughout the entire UTTR airspace. The use of flares would be authorized at 1,000 feet AGL or higher throughout the entire UTTR airspace. The use of flares would be authorized down to 500 feet AGL over mudflats devoid of vegetation within areas adjacent to DoD-withdrawn lands. The amount of chaff and flares deployed within the UTTR would not change under the Proposed Action. However, the land area over which chaff is allowed would increase, thereby reducing the number of chaff bundles deployed per acre within the areas overlain by UTTR airspace (AFRC 1999).

3.0 CONFORMITY ANALYSIS REQUIREMENTS

This analysis summarizes applicable information relevant for attainment of air quality goals. Section 176(c) of the Clean Air Act (CAA), as amended, states that Federal agencies must not engage in, approve, or support in any way, any action that does not conform to an applicable State Implementation Plan (SIP) for the purpose of attaining the National Ambient Air Quality

Standards (NAAQS). The purpose of Section 176(c) is to make emissions from Federal actions consistent with the CAA's air quality planning goals. As such, U.S. Air Force (USAF) actions cannot cause a new violation of the NAAQS, contribute to an increase in the frequency or severity of existing NAAQS violations, or delay the timely attainment of any standard, interim milestones, or other milestones toward achieving attainment.

The U.S. Environmental Protection Agency (USEPA) published its final conformity rules (amending *40 Code of Federal Regulations [CFR] 50 and 93*) in November 1993, which established procedures and requirements that Federal agencies must satisfy in determining the conformity of certain actions. The intent of these provisions is to foster long-range planning for the attainment and maintenance of air quality standards by evaluating air quality impacts of Federal actions before they are taken. Currently, the USEPA interprets Section 176(c) to be applicable only to actions in non-attainment and maintenance areas.

The conformity regulations differentiate Federal actions into transportation projects and non-transportation related projects. The transportation conformity regulations *(40 CFR Part 51, Subpart T)* govern projects developed or approved under the Federal Aid Highway Program or the Federal Transit Act. Construction and realignment actions consist of non-transportation related projects, and therefore, are regulated under the general conformity regulations *(40 CFR Part 51, Subpart W)*.

The types of USAF actions subject to the general conformity requirements include, but are not limited to, proposed construction actions carried out at the direction of the USAF and Department of Defense (DoD). The conformity rule requires that all reasonably foreseeable direct and indirect emissions from an action be addressed in the analysis of conformity, including all point, area, and mobile sources under USAF control. This includes military aircraft, on-base motor vehicles, off-base motor vehicles associated with employees' commute trips, and other sources that would not be subject to existing federally enforceable permit requirements (e.g., New Source Review Programs). If the total of direct and indirect emissions for a proposed action creates a non-conforming situation, the action cannot proceed until mitigation measures are developed and committed, and other conformity procedural requirements are met.

To focus conformity requirements on those Federal actions with the potential to have significant air quality impact, threshold *(*i.e., *de minimis)* rates of emissions were established in the general conformity rule which are presented in Table 3-1. These *de minimis* thresholds are similar, in most cases, to the definitions for major stationary sources of criteria and precursors to criteria pollutants under the CAA's New Source Review Program, and vary by the severity of the non-attainment area.

Table 3-1. Conformity De Minimis Emission Thresholds

Pollutant	Status	Classification	de minimis Limit (tons/yr)
Ozone (measured as Nitrogen Oxides (NO_x) or Volatile Organic Compounds (VOCs))	Non-attainment	Extreme	10
		Severe	25
		Serious	50
		Moderate/marginal (inside ozone transport region)	50 (VOCs)/100 (NO_x)
		All others	100
	Maintenance	Inside ozone transport region	50 (VOCs)/100 (NO_x)
		Outside ozone transport region	100
Carbon Monoxide (CO)	Non-attainment/ maintenance	All	100
Particulate Matter (PM_{10})	Non-attainment	Serious	70
		Moderate	100
	Maintenance	Not Applicable	100
Sulfur Dioxide (SO_2)	Non-attainment/ maintenance	Not Applicable	100
Nitrogen Oxides (NO_x)	Non-attainment/ maintenance	Not Applicable	100

A Conformity Determination is required when the total annual direct and indirect emissions from a Federal action equal or exceed the *de minimis* thresholds within a non-attainment or maintenance area. A Conformity Determination is also required if the total annual direct and indirect emissions are regionally significant by representing 10 percent or more of the region's total emissions for the particular pollutant in a non-attainment or maintenance area. A Conformity Analysis is performed to quantify emissions and show whether a full Conformity Determination is needed (USAF 1995).

4.0 REGIONAL AIR QUALITY SETTING

The States of Utah and Nevada have been delegated authority by the U.S. Environmental Protection Agency (USEPA) for implementation and enforcement of the CAA regulations. The Utah and Nevada State Implementation Plans (SIP) contains emission controls to ensure state air quality control areas meet the National Ambient Air Quality Standards (NAAQS). All of the counties underlying the UTTR are in attainment for all criteria pollutants as specified by Federal and state air quality standards (UDEQ 1999 and NBAQ 1999).

An air emission study was conducted over a 2-year period between 1993 and 1995 at four air quality/meteorological stations located on Hill Air Force Range. Air samples were analyzed for PM_{10}. No substantive amounts of PM_{10} were identified (HAFB 1996).

Approximately 13,791 pounds (or approximately 6.9 tons) of chaff is currently deployed over DoD-controlled lands within the UTTR. In addition, approximately 34,144 flares are deployed within UTTR airspace.

5.0 CONFORMITY ANALYSIS

Requirements for Federal proposed actions planned in non-attainment or maintenance areas for any criteria air pollutant would necessitate a conformity analysis pursuant to the CAA of 1990. However, as previously stated, all of the counties underlying the UTTR airspace are in attainment for all criteria pollutants (UDEQ 1999 and NBAQ 1999) and therefore are not required to be analyzed for Conformity. Due to the controversial nature of the Proposed Action, Conformity Analyses were performed to assess the potential air quality impacts associated with the expansion of the use of self-protection chaff and flares within the UTTR. This Conformity Analysis was based on a worst-case scenario (i.e., all chaff deployed within the UTTR abrades to the PM_{10} and $PM_{2.5}$ size fraction) to allow for the calculation of the maximum emissions possible.

In August 1997, the Air Combat Command (ACC) released a report that presents a summary of an in-depth study of the types of chaff and flares used within ACC-controlled military airspace, and the general effects of their use on the environment. The report is entitled *Environmental Effects of Self-Protection Chaff and Flares* (ACC 1997). Furthermore, ACC developed guidelines to assist in the assessment of the environmental impacts of proposals with chaff and flare use and to prepare documentation to comply with NEPA. The guidelines are based on the findings and conclusions of the study concerning the potential effects of chaff and flares on several resources, including air quality (ACC 1997).

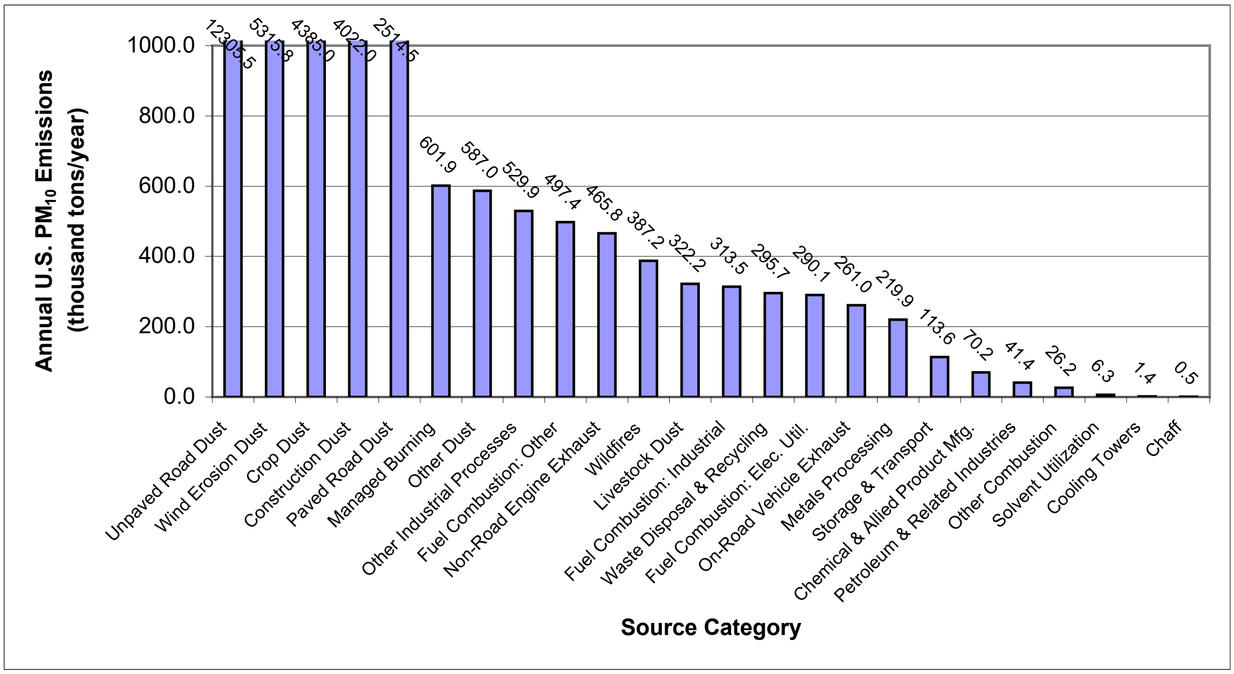
A second report, published in August 1999, presents an assessment of the environmental effects specific to radio-frequency (RF) chaff, entitled *Environmental Effects of RF Chaff – A Select Panel Report to the Undersecretary of Defense for Environmental Security* (referred to hereafter as "the 1999 Select Panel Report"). A select panel of university-based research scientists, each with published expertise in a relevant field of study, determined the findings of this report. The analytical approach was to use the models from environmental toxicology and related disciplines, "upper bounds" or worst case estimates based on the amounts and areas of chaff use, analysis of known literature data to the related effects of chaff, and reasonable, prudent extrapolations and derivations from these data (NRL 1999).

The potential for release of hazardous air pollutants is not an issue with chaff deployment because the BBU-35/B impulse cartridges no longer contain calcium chromate (calcium chromate was replaced by potassium perchlorate). In addition, chaff dipoles are greater than 10 μm in size, and, therefore, would not affect the PM_{10} NAAQS. The 1997 ACC Report stated that test results indicate that dipoles are unlikely to fracture upon ejection, and, furthermore, that any fractured dipoles would not be likely to increase PM_{10} emissions. In addition, chaff dipoles settle to the ground quickly and, therefore, would not impact the prevention of significant deterioration (PSD) Class I standards (ACC 1997).

The 1999 Select Panel Report presented a comparison of the amount of chaff released nationwide to the total U.S. particulate emissions of PM_{10} and $PM_{2.5}$. On a national basis, the total nationwide chaff emissions constitute an extremely small fraction of directly emitted particulate emissions. PM_{10} and $PM_{2.5}$ emissions are estimated and their concentrations are monitored because they are able to be inhaled and, thus, have the potential to produce negative human health effects. Particulates in the PM_{10} and $PM_{2.5}$ ranges are 10- to 100-times smaller than chaff dipoles (NRL 1999). The 1999 Select Panel Report states that if all chaff released nationwide were PM_{10}, it would constitute 0.0016 percent of the national PM_{10} releases. If all the chaff released nationwide were in the $PM_{2.5}$ range, the fraction would rise to 0.006 percent. These levels are much lower than the PM_{10} and $PM_{2.5}$ releases from any other source category as estimated by the USEPA (NRL 1999). Figures 5-1 and 5-2 summarize the U.S. particulate emissions from different source categories as estimated by the USEPA.

Applying this analogy to the Region of Influence for the Proposed Action (i.e., the counties underlying the UTTR airspace), Figure 5-3 presents a comparison of the recorded PM_{10} emissions within the ROI to the chaff emissions within the UTTR airspace.

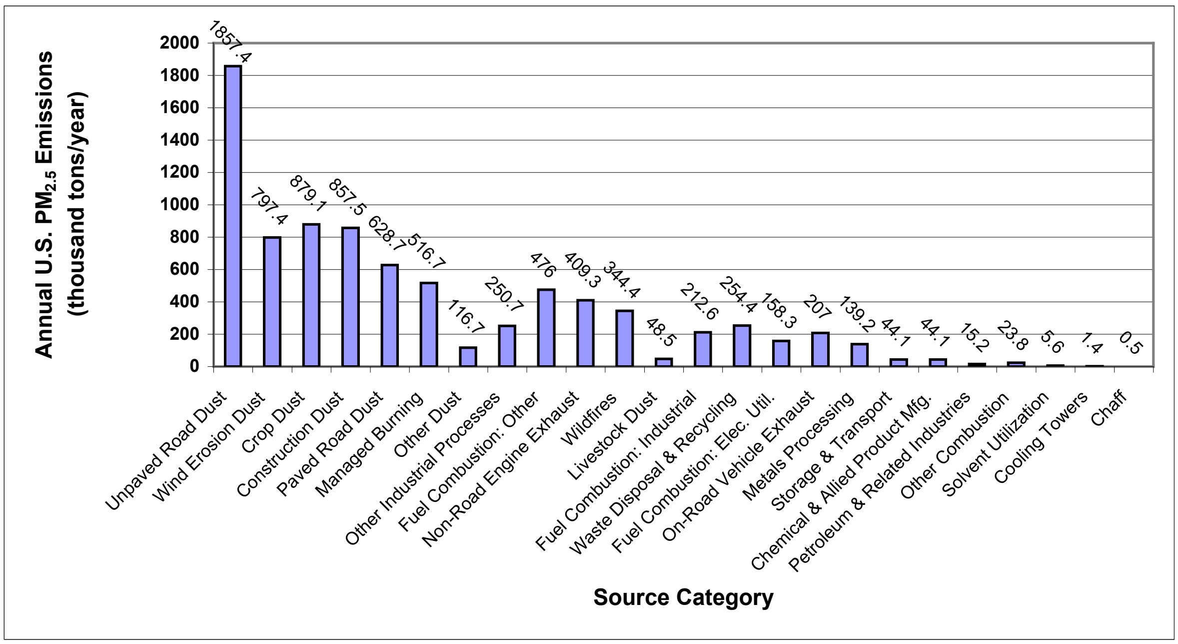
The 1997 ACC Report stated that the results of health screening assessments for flare use determined that up to 67,000 flares could be released within a peak hour over a given area with no affect on human health. This is nearly double the amount of flares deployed within the UTTR airspace during any given year (as compared to the 34,144 flares released in FY 1997). Furthermore, the 1997 ACC Report stated that at 400 feet AGL, for a typical target area of 10,000 acres, 220,000 flares could be released annually without significantly increasing short- and long-term health risks for hexavalent chromium or lead. The UTTR airspace overlies approximately 10,656,640 acres, 1,065 times greater than the area of concern presented in the 1997 ACC Report. Using the standard established as part of the 1997 ACC Report, approximately 234 million flares could be deployed within the UTTR airspace annually without significantly increasing



Source: NRL 1999

Note: The chaff category is included as an upper limit assuming that all chaff released nationwide abrades to the PM_{10} size fraction.

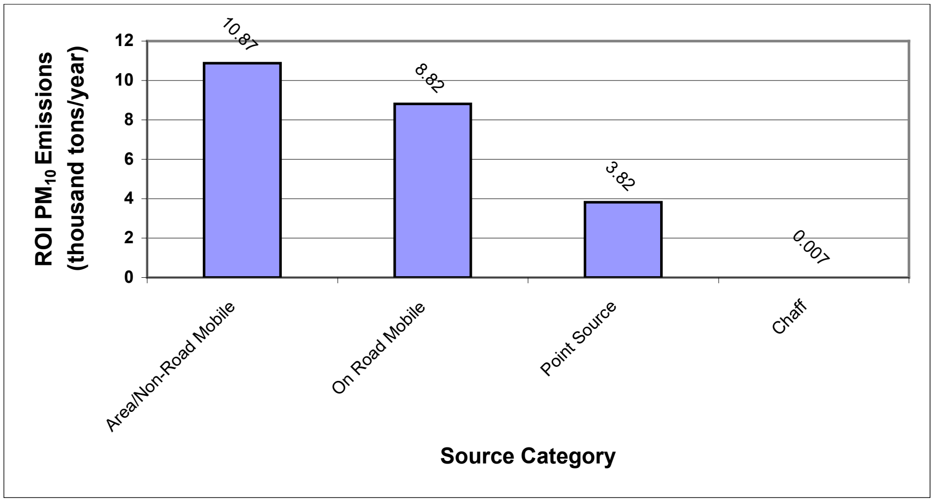
Figure 5-1. U.S. National Emission in 1997 for PM_{10}



Source: NRL 1999

Note: The chaff category is included as an upper limit assuming that all chaff released nationwide abrades to the $PM_{2.5}$ size fraction.

Figure 5-2. U.S. National Emission in 1997 for $PM_{2.5}$



Source: UDEQ 1999

Note: The chaff category is included as an upper limit assuming that all chaff released within the UTTR abrades to the PM_{10} size fraction. The data presented reflects information obtained from the counties within the State of Utah (i.e., Beaver, Box Elder, Juab, Millard, and Tooele) that underlie the UTTR airspace. No data was available for the counties in the State of Nevada (i.e., Elko and White Pine) that underlie the UTTR airspace.

Figure 5-3. ROI Emission in 1996 for PM_{10}

short- and long-term health affects if distributed evenly throughout the entire UTTR. However, the amount of flares deployed within the UTTR airspace would remain the same under the Proposed Action, and, therefore, would have no significant, adverse affect on air quality even with the allowable deployment elevation being lowered to 1,000 feet AGL.

As shown in Figure 5-3, the annual emissions from the Proposed Action would be well below the PM_{10} emissions measured for the other source categories within the UTTR. In addition, the approximate 6.9 tons of chaff emissions, if all chaff abraded to the PM_{10} size fraction, would be well below the de minimis limit of the area within the UTTR airspace boundaries if they were classified as non-attainment. Therefore, because Proposed Action emissions would be within the *de minimis* limits and would also be less than 10 percent of regional emissions, a Conformity Determination for this Proposed Action would not be required to quantify the impact on the State of Utah's and Nevada's air quality milestones stated in the Utah and Nevada SIPs, respectively. Therefore, no significant adverse impacts to air quality would be expected as a result of the expansion of chaff deployment throughout the entire UTTR.

REFERENCES

ACC 1997 — Air Combat Command (ACC). *Environmental Effects of Self-Protection Chaff and Flares – Final Report.* U.S. Air Force, Headquarters ACC, Langley, Air Force Base, Virginia. August 1997.

AFRC 1999 — Air Force Reserve Command (AFRC). *Draft Environmental Assessment of the Expansion of the Use of Self-Protection Chaff and Flares within the Utah Test and Training Range – Hill Air Force Base, Utah.* Science & Engineering Associates, Inc. November 1999.

HAFB 1996 — Hill Air Force Base (HAFB). *Range Management Plan and Environmental Assessment for the Hill Air Force Range and the Wendover Air Force Range of the Utah Test and Training Range (Draft Final).* Prepared for the Environmental Management Directorate, Plans and Programs Division (EMX) Hill AFB, Utah. Prepared by Dames & Moore and Foster Wheeler Environmental Corporation. August 1996.

NBAQ 1999 — Nevada Bureau of Air Quality (NBAQ). Ambient Air Quality Trends, 1988-1997. Nevada Department of Conservation and Natural Resources, Division of Environmental Protection. Carson City, NV. Report accessed via <http://www.state.nv.us/ndep/bao>. October 1999.

NRL 1999 — Naval Research Laboratory (NRL). *Environmental Effects of RF Chaff – A Select Panel Report to the Undersecretary of Defense for Environmental Security*. Transmitted via Barry J. Spargo, Ph.D., Chemistry Division, and the Assistant Secretary of the Air force, the Assistant Secretary of the Army, and the Assistant Secretary of the Navy. Publication No. NRL/PU/6110-99-389. Washington, DC. August 31, 1999.

UDEQ 1999 — Utah Department of Environmental Quality (UDEQ). 1996 State Emissions Summary. Division of Air Quality. Report accessed via <http://www.deq.state.ut.us/eqamc/data.htm>. October 1999.

USEPA 1999 — "Currently Designated Nonattainment Areas for All Criteria Pollutants", USEPA Greenbook, August 10, 1999. http://www.epa.gov/oar/oaqps/greenbk/aycl.html.

USAF 1995 — U.S. Air Force Conformity Guide, Directorate of Environment HQ USAF/CEV Washington, D.C. August 1995.

APPENDIX C

Environmental Effects of RF Chaff – A Select Panel Report to the Undersecretary of Defense for Environmental Security

Report No. NRL/PU/6110-99-389

August 31, 1999