PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

May 1998

AIR DROP TARGET SYSTEM PROGRAM

DEPARTMENT OF DEFENSE
BALLISTIC MISSILE DEFENSE ORGANIZATION
7100 DEFENSE PENTAGON
WASHINGTON, DC 20301-7100

TOT

AUG 2 8 1998

TO: Concerned Public, Organizations, and Commenting Agencies:

SUBJECT: Final Programmatic Environmental Assessment for the Short Range Air Drop Target System

Attached is a copy of the Final Programmatic Environmental Assessment (PEA) for the Short Range Air Drop Target System Program. The government official responsible for the distribution and content of the PEA is:

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If you have any further questions, please forward to the above address.

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AIR DROP TARGET SYSTEM PROGRAM

May 1998

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1.0 PURPOSE OF AND NEED FOR ACTION

This programmatic environmental assessment (PEA) examines the potential for impact on the human environment from developing a short-range Air Drop Target System that could provide realistic, threat-representative targets for testing Theater Missile Defense (TMD) systems. This document has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) (42 U.S. Code [U.S.C.] Sections 4321-4347), the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508), Air Force Instruction (AFI) 32-7061, Ballistic Missile Defense Organization (BMDO) Directive 6050, and Department of Defense (DOD) Directive 6050.1 implementing NEPA within DOD. Since many tests using the Air Drop target are likely to be conducted either wholly, or at least partially, in the global commons, over ocean areas outside the 12-mile limit of United States jurisdiction, the potential environmental impacts of the Proposed Action have also been evaluated pursuant to Executive Order (EO) 12114 for federal actions and their environmental effects abroad, and its implementing regulation DOD Directive 6050.7. Appendix A presents the acronyms and abbreviations used in this document.

1.1 PURPOSE

This PEA assesses the potential environmental impacts of the Air Drop Target System, from launch to intercept of the target. It also serves as a foundation from which future environmental documentation can be prepared, if needed. This PEA incorporates by reference the impact analysis for the refurbishment and production of the Hera target missile and the assessment of potential life cycle environmental impacts included in the Theater Missile Defense Hera Target Systems Environmental Assessment (EA). The Air Drop Target System uses the same ballistic target vehicle as the first stage of the Hera Target System.

The Air Drop Target System program is designed to provide a realistic target for TMD interceptors. Its purpose is to provide threat-representative target missiles to support the development and test requirements needed to validate system design and operational effectiveness of TMD missile and sensor systems. The targets are used to validate the capabilities of individual TMD interceptors. The targets must simulate the expected threat and be realistic in size and performance.

The Air Drop Target System would provide an air launch target delivery system using standard C-130 cargo aircraft, rather than a fixed land-based site. The Air Drop program would provide a highly flexible, short-range target system allowing multi-shot engagements with high azimuth variability. The maximum range of the Air Drop target is 580 kilometers (km) (360 miles).

1.2 BACKGROUND

The Air Drop Target System may be used to support multiple programs within the TMD. The TMD programs include research into theater defense technology necessary for protection of United States forces, as well as United States friends and allies, from future missile threats. The BMDO has been designated the management office for the TMD, with various elements of the TMD program delegated to the Army, Air Force, Navy, and Marine Corps. Each service will participate in the defense acquisition process in developing and acquiring its respective TMD program systems elements.

The TMD program is designed to develop a variety of weapon systems to mitigate the effects of short- and medium-range, offensive ballistic missiles, such as the Subsonic Cruise Unarmed Decoy (SCUD) missiles that Iraq fired at Saudi Arabia and Israel during the 1991 Gulf War. The Air Drop Target System would be used to help test the effectiveness of TMD systems, both while they are under development and after they are deployed.

Testing of the Air Drop Target System was conducted in 1996 and early 1997, concluding with a live test fire over the Point Mugu Sea Test Range in January 1997. This action was analyzed in the AltAir Short Range Ballistic Target Test Demonstration Overseas EA produced by the Navy in December 1996.

1.3 NEED FOR ACTION

Available ground-launched targets cannot simulate all types of threats that DOD intercept missiles must face. The most effective target scenarios are those that provide multiple engagement threats. No current system can provide Theater Ballistic Missile (TBM) targets at any location worldwide without the expense and limitations involved in the construction of fixed launch sites at specific locations. Given that the majority of testing is conducted over water for safety considerations, development of fixed launch sites would require a unique cluster of islands at each test location. Additionally, the cost of building and maintaining such a launch complex over time is overwhelmingly expensive, based upon maintenance costs of existing test sites. Air Drop targets could provide DOD ranges with an inexpensive means to supplement, or perhaps even replace, costly to build and maintain fixed-target launching sites. Air Drop targets could also provide enhanced flexibility to DOD's TMD test programs and ranges, allowing targets to be launched from varying distances (up to a maximum range of 580 km [360 miles]), and widely varied azimuths.

1.4 DECISIONS TO BE MADE

The decision to be made by BMDO, Director, supported by information contained in this PEA, is whether to develop a short-range Air Drop Target System that would provide a realistic and flexible alternative target system for use in the TMD system testing.

1.5 SCOPE OF ANALYSIS

The objective of this PEA is to provide sufficient evidence and analysis for determining the need for an environmental impact statement (EIS) or a Finding of No Significant Impact in accordance with CEQ regulations for implementing NEPA (40 CFR Part 1508.9). The PEA also forms a basis for evaluating potential environmental issues to be addressed in future range-specific environmental documentation for future testing activities.

Resources Analyzed. The scope of the analysis presented in this PEA is defined by the range of potential environmental impacts that would result from implementation of the Proposed Action and alternatives. Resources that could be affected by the Proposed Action were identified early in the process and included in that analysis. These resources are land use and aesthetics, transportation, hazardous materials and waste management, airspace, health and safety, noise, air quality, upper atmosphere, water resources, biological resources, cultural resources, socioeconomics and environmental justice. The affected environment and the potential environmental consequences relative to the affected resources are described in Chapters 3.0 and 4.0, respectively.

Initial analysis indicates that the Air Drop program would not result in impacts to geology, soils, transportation, or utilities. The ranges would be able to accommodate the Air Drop Target System program with existing support facilities and infrastructure. Therefore, no ground-disturbing activities from construction would occur. Minimal to no short-term increases in traffic volumes, utility consumption, and ground disturbance would be expected on the range and containment areas. Therefore, no geology, soils, transportation, or utility impacts are expected. These resources are excluded from further analysis in this PEA.

Future Environmental Documentation. This PEA addresses the potential range of impacts associated with the Air Drop Target System program. As specific activities and their locations are identified, some may cause environmental impacts. Additional environmental documentation will be required to address specific test programs at candidate test ranges. EAs or EISs will be prepared as required for future testing. These environmental analyses may tier from this PEA. Current environmental documentation for specific test ranges include the supplemental EIS for the TMD Extended Test Range - Eglin Gulf Test Range, the Point Mugu Sea Range EIS, and the Pacific Missile Range Facility Enhanced Capability EIS. BMDO will continue

to ensure that environmental considerations are part of the decision-making process of all TMD research and test activities.

Related Environmental Documentation. A variety of environmental documents has already been prepared to support BMDO activities. Additional details relevant to aspects of the TMD program, including target systems, may be found in the following documents, which are incorporated by reference into this PEA:

- Battelle Environmental Management Operations, Space Systems Division, Pegasus Air Launched Space Booster Environmental Assessment, 1989.
- U.S. Army Space and Strategic Defense Command, Theater Missile Defense High-Explosive Rocket-Assisted HERA Target Systems Environmental Assessment, January 1994
- U.S. Army Space and Strategic Defense Command, Theater Missile Defense Extended Test Range Final Environmental Impact Statement, November 1994
- U.S. Department of the Navy, Overseas Environmental Assessment, AltAir Short Range Ballistic Target Test Demonstration, Point Mugu, California, December 1996.

1.6 FEDERAL, STATE, AND LOCAL AGENCY RELATIONSHIPS

Certain aspects of the Proposed Action would require permits, approval, and consultation with other federal, state, and local agencies. A list of potential laws and directives is presented in Appendix B. Actions undertaken in connection with the Proposed Action would meet all regional, state, and local laws and regulations.

1.7 TREATY COMPLIANCE

The Air Drop short-range target booster has been reviewed by DOD treaty compliance authorities and determined to be consistent with all relevant arms control agreements. Each proposed use of the short-range target booster would be reviewed separately by DOD treaty compliance authorities within the context of the particular experiment plan to ensure the proposed use is also consistent with all relevant arms control agreements.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

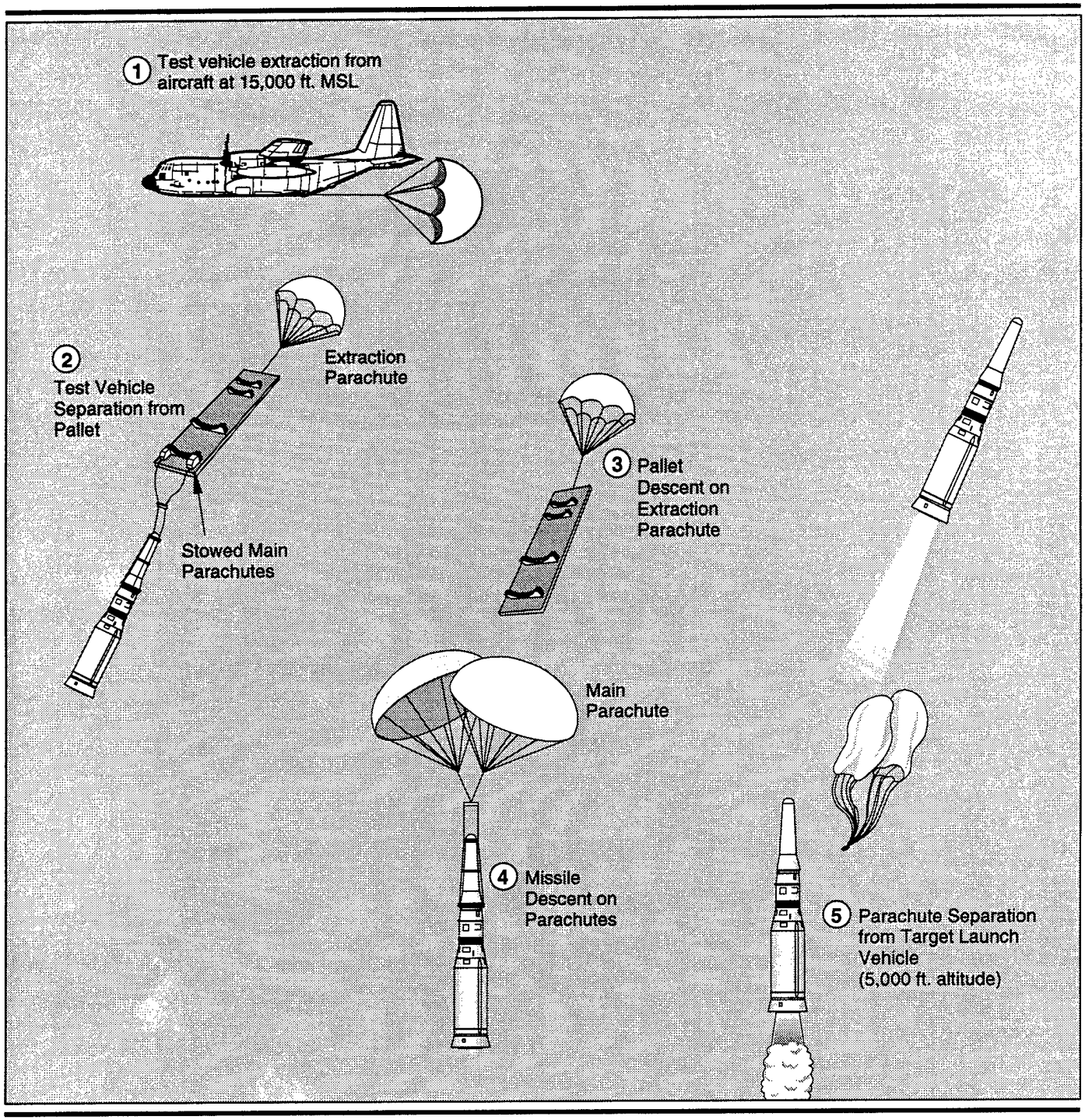
The alternatives to be considered in this PEA are the Proposed Action and the No-Action Alternative. This section provides a description of the Proposed Action including the system description, launch operations, range support requirements, system safety provisions, and potential launch anomalies. A description of the No-Action Alternative is also provided. Other alternatives that were identified, but eliminated from further consideration, are briefly described. The potential environmental impacts of the Proposed Action and the No-Action Alternative are summarized in table form.

2.2 DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action is to provide the capability to produce, deploy, and maintain a short-range Air Drop Target System that would provide a realistic threat simulation for testing TMD systems. The Air Drop Target System includes the build-up of the Air Drop target missile on a standard cargo pallet and specialized sled. The integrated target/pallet assembly would be loaded into a C-130 aircraft and flown to a predetermined drop point. The target/pallet assembly would be extracted from the aircraft via parachute and dropped at 15,000 feet above mean sea level (MSL). The target would separate from the pallet, then, for launches over water, descend via parachutes to approximately 5,000 feet above MSL. At about 5,000 feet above MSL, the parachutes would release the target. Motor ignition would occur during freefall. For launches over land, the launch altitude would have to be recalculated for each individual range, depending on the range's elevation. After firing, the target would follow its flight path to interception or to land within a designated impact area (Figure 2-1).

As many as 330 SR-19-AJ-1 (modified) rocket motors could be available to support the Air Drop Target System program. All activities associated with the Air Drop program would occur within special use airspace and over existing ranges, extended ranges, and/or over temporarily designated open ocean areas. Specific locations and schedules for the Air Drop Target System are not addressed in this PEA. Future analysis and appropriate site-specific environmental documentation will support decisions regarding the Air Drop system deployment for specific test programs and candidate locations.

This PEA incorporates by reference the impact analysis for the refurbishment, production, and the disposal/decommissioning of the HERA target missile included in the TMD HERA Target Systems EA. The Air Drop Target System uses the same ballistic target vehicle as the first stage of the HERA target system. Both target systems require limited production because of the reuse



Air Drop Launch Deployment Scenario

Figure 2-1

of existing government rocket boosters and components from other decommissioned rocket programs.

The following sections provide a description of the Air Drop Target System, the launch operations and potential scenarios, the range support and logistical requirements, system safety, and potential launch anomalies to be analyzed under the Proposed Action.

2.2.1 System Description

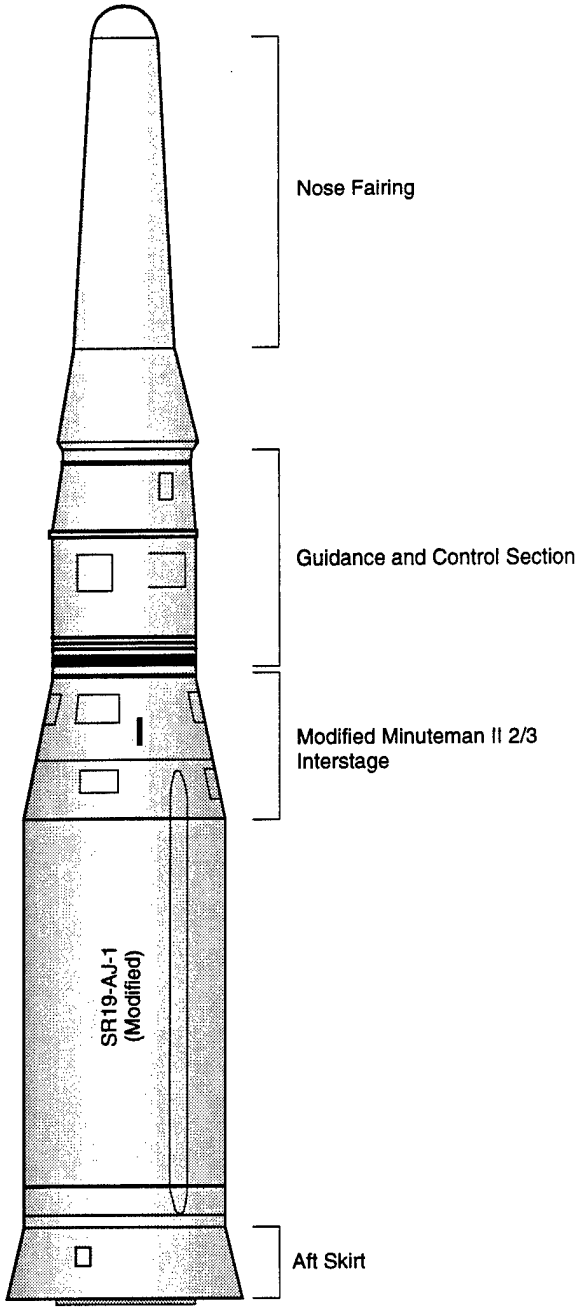
The Air Drop Target System would consist of a target vehicle, pallet and sled assembly, support equipment, parachutes, and a flight termination system.

Target Vehicle. The Air Drop target vehicle consists of a re-entry vehicle, a guidance and control module, an interstage assembly (Minuteman II 2/3 interstage), an SR-19-AJ-1 rocket motor, and an aft skirt assembly (fabricated from a Minuteman II 1/2 interstage) (Figure 2-2). The target vehicle is 28 feet long with a maximum diameter of 60.5 inches. The vehicle weighs approximately 20,000 pounds. The launch vehicle includes a guidance and control system, an inertial navigation system, a global positioning system (GPS) receiver, and a telemetry system. The vehicle contains ordnance in the form of a solid-rocket motor propellant, parachute reefing cutters, Flight Termination System (FTS), and 11 explosive bolts.

The rocket motor is the second stage of a Minuteman II missile. These rocket motors, stored at Hill Air Force Base (AFB), Utah, were developed for other missile programs. The SR-19-AJ-1 (modified) rocket motor contains approximately 13,600 pounds of propellant (ANB-3066) consisting of 73 percent ammonium percholorate (NH_4ClO_4), 12 percent carboxy terminated/ polybutadiene, and 15 percent aluminum.

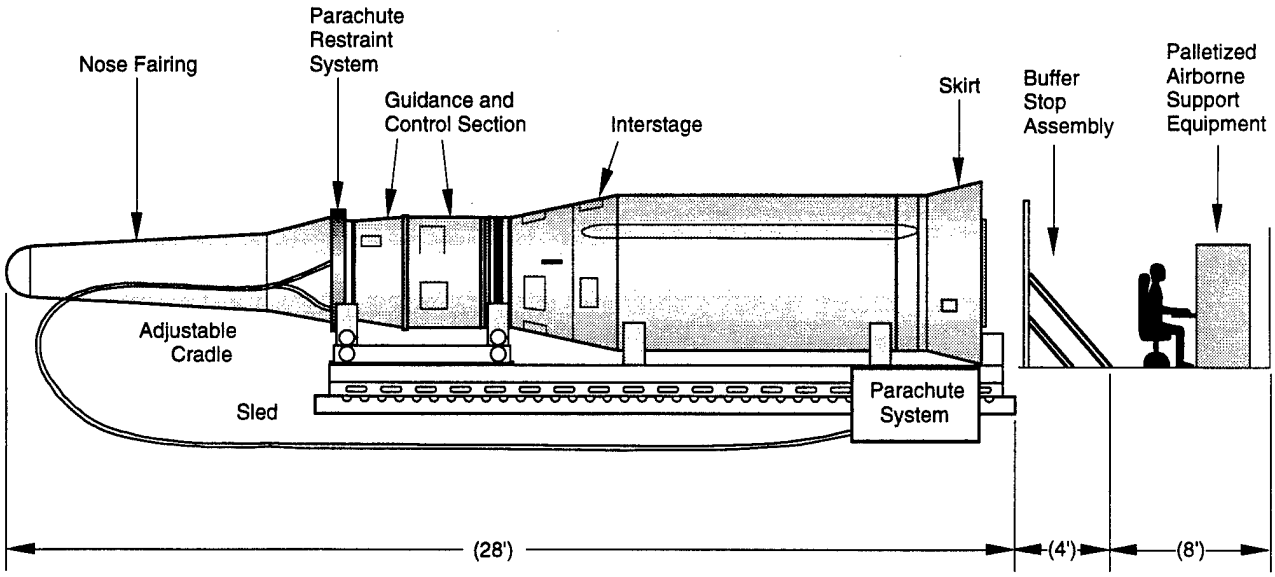
Pallet and Sled Assembly. The target vehicle would be attached to a pallet and sled assembly for buildup, loading, and dropping from the aircraft. The pallet is 24 feet long and weighs 2,264 pounds. The vehicle is supported on the pallet by a sled assembly. The sled assembly is secured to the pallet by several turnbuckle angle brackets bolted to the pallet and sled assembly. The vehicle is secured in the sled by steel straps. The pallet and sled weigh 4,350 pounds.

Support Equipment. Additional support equipment would consist of a palletized airborne support equipment (PASE) and an optimal Buffer Stop Assembly (BSA). These components would be situated in the C-130 cargo bay. The PASE would provide pre-launch power, and would check the vehicle and telemetry, transmit GPS and trajectory information, and engage the mechanism for the explosive bolts just prior to drop. The PASE consists of a rack of equipment with three crew stations mounted on the 8-foot pallet (Figure 2-3). The BSA would provide additional protection to the crew. The



Air Drop Target Vehicle

Figure 2-2



Air Drop Support Equipment

Figure 2-3

BSA would be mounted on its own 4-foot pallet, and would be situated between the sled assembly and the PASE.

Parachutes. A 28-foot-diameter ring slot parachute (referred to as the extraction parachute) attached to the sled assembly pallet would be released at the appropriate time and would extract the load from the C-130. As the target missile falls away from the pallet, the two 43.5-foot-diameter main parachutes would be extracted from packs on the sled assembly, stabilizing the Air Drop target missile. The parachutes are 70 percent reefed for 6 seconds to reduce the shock of the parachutes opening on the vehicle. Explosive bolts would separate the parachutes from the target missile 2 seconds prior to rocket ignition.

Flight Termination System. The rocket motor is fitted with an FTS to terminate the flight if unsafe conditions develop. The FTS would detonate an explosive charge to rupture the rocket motor casing and terminate the thrust of the rocket. The FTS consists of a charge, detonators, and safing and arming devices.

Ordnance. The Air Drop Target System contains ordnance in the form of rocket motor solid propellant (DOD Class 1.3 explosives) explosive bolts, initiators, detonators, ignitors, and squibs. To stabilize the Air Drop target missile, thrust vector actuator (TVA) and roll control (RC) squibs would be utilized. The FTS contains a linear-shaped charge (LSC), flexible confined detonating cords (FCDC), and safe and arm detonators. The main parachutes contain reefing cutters (DOD Class 1.3 explosives) that cut the reefed lines.

2.2.2 Launch Operations

The Air Drop Target System could be used at any range with existing capabilities to support a C-130 and missile launches. Such ranges are present in the continental United States (CONUS), Alaska, the Hawaiian Islands, and U.S. Army Kwajalein Atoll (USAKA) in the Republic of the Marshall Islands (Figure 2-4). In addition, a number of ranges in broad ocean areas that could be used are not shown in Figure 2-4. System range-specific environmental documentation would be prepared to support the range selection process. The range-specific environmental documentation would consider the transportation, assembly, and integration, as well as the operations of the Air Drop Target System.

The Proposed Action considers the following launch scenarios:

- Using an Air Drop target launch for a test confined to an existing military range using ground sensors to track the target missile.

- Using an Air Drop target launch in extended test range scenarios. For example, launching the Air Drop target from the open ocean adjacent to the test range for intercepts within an existing test

EXPLANATION

Military Installations

Potential Areas for the Implementation of the Air Drop Program

NOT TO SCALE

Figure 2-4

range, using mobile sensors to track the target missile outside the range.

- Using an Air Drop target launch in reversed extended test range scenarios. In this scenario, the Air Drop target would be launched from within an existing test range for intercept in a temporarily designated and cleared open ocean area lying outside the limits of the existing test range; mobile sensors would track the target missile outside the range.

- Using an Air Drop target launch for a test occurring in broad ocean areas using mobile sensors to track the target missile.

Launch Preparation. The rocket motor would be shipped to the launch site from Hill AFB, Utah, by truck or air. Other components, such as the ground control system, aft skirt and fins, and the pallet and sled assembly, would be shipped to the launch site from other contractor locations. Components would be shipped by truck to sites within the contiguous 48 states and by air to locations outside this area (e.g., Hawaii, Alaska, USAKA). When the solid rocket motor and other components arrive at the launch location, the motor would be transferred to a missile or booster assembly building for installation of the FTS and integration of the other components. The target vehicle would be attached to the pallet and sled equipment. Before launch, the Air Drop launch vehicle, pallet/sled, and support equipment would be loaded onto the C-130.

As an alternative, a build-up site in the contiguous 48 states may be used for overseas launch sites. The target would be completely assembled and then shipped by aircraft on its sled pallet to the participating launch site or designated staging area.

Hazardous materials would include the solid rocket propellant and materials associated with the target assembly process including small quantities of Class C ordnance, solder flux, and solvents such as isopropyl alcohol and lubricating oil. No chemical simulants have been identified for use by the Air Drop program. Specific simulant requirements would be analyzed in subsequent environmental documents if required for specific intercept testing programs.

Launch and Intercept. The loaded C-130 would fly in existing restricted airspace to a predetermined drop point. At about 15,000 feet above MSL and speed of 140 knots, the Air Drop assembly would be extracted from the C-130 by the extraction parachute through the open rear door of the aircraft. Soon after, explosive bolts would release the Air Drop target from the pallet. As the Air Drop target falls, it would extract two main parachutes from packs on the sled assembly. The pallet would descend with its extraction parachute to the ocean or land.

Approximately 86 seconds after extraction from the aircraft, when the vehicle would be approximately 5,000 feet above MSL, the parachute release timers would set off the explosive bolts to release the parachute harness. The two main parachutes and sled assembly would descend to the ocean or land.

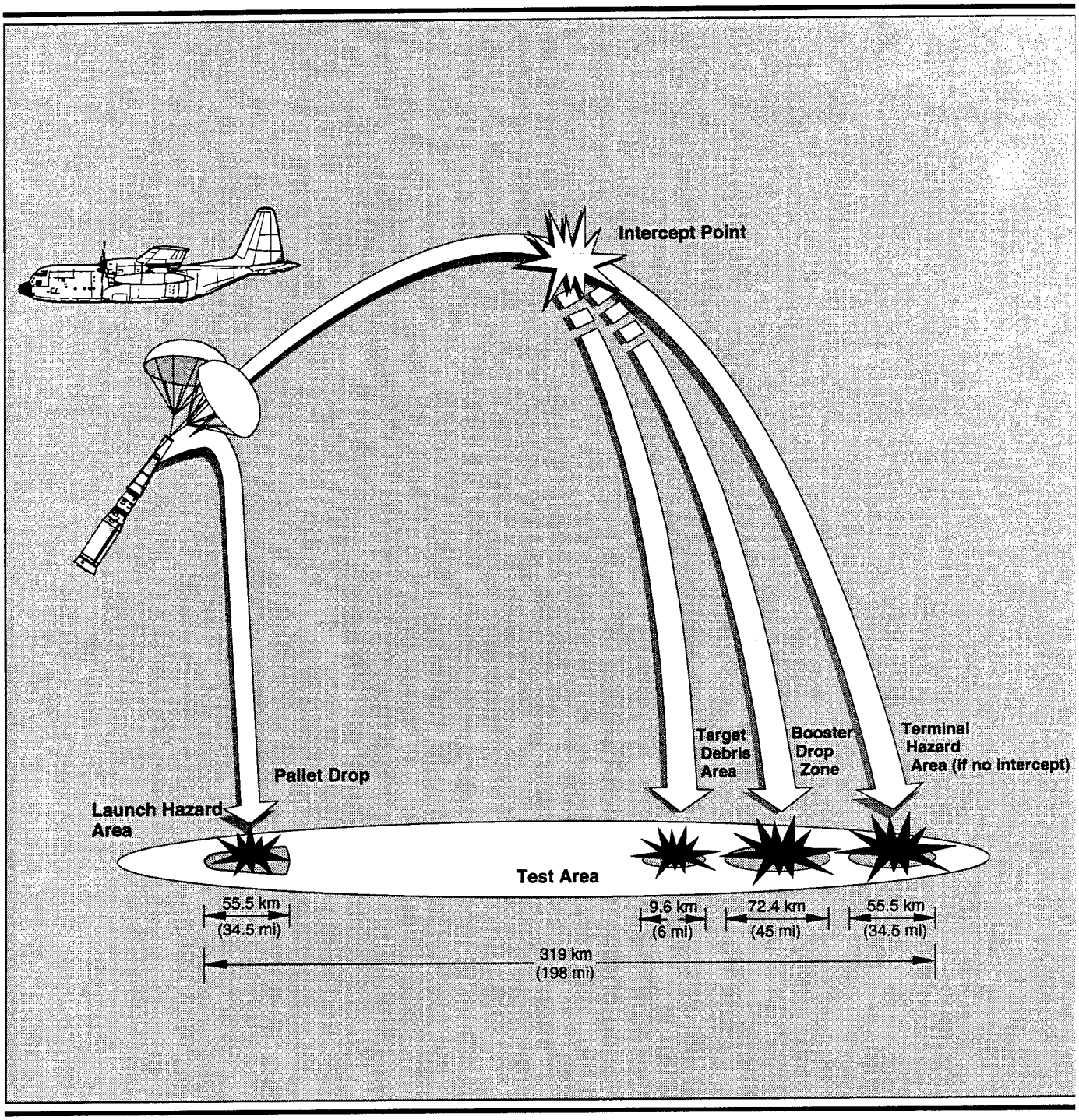
At approximately 5,000 feet above MSL, the launch vehicle would ignite and follow the predetermined trajectory to the aim point within a terminal hazard area. Just as in tests using ground-launched target missiles, test plans using Air Drop targets will also calculate hazard areas for the defensive missiles used in the tests and for the debris from the planned intercepts. Air Drop target launch trajectories extend to a maximum range of 580 km (360 miles). As an example of a representative mission, an Air Drop target might be flown on a launch point-to-aim point flight path of 320 km (200 miles), with a maximum altitude of 220 km (140 miles) and with a total flight time of approximately 8 minutes, 20 seconds. Re-entry velocity would be approximately 3,800 miles per hour (1.7 km per second), with a re-entry flight path angle of -63.5 degrees (angle with the Earth's surface). The air drop and flight path of a representative target are conceptually shown in Figure 2-5.

A launch hazard area (LHA), a terminal hazard area (THA), a target debris circle, an expended booster drop zone, and a test area would be designated for the target flight and intercept. For the purpose of the environmental analysis, the hazard zones and impact areas for a representative launch profile are illustrated in Figure 2-6. These hazard areas would be evacuated and restricted during a test to control access and reduce the potential risk of falling debris. Range clearance and access control would be in accordance with existing range procedures.

The LHA would be designed to contain all Air Drop debris in the event it is destroyed before 40 seconds of flight. The parachute and pallet drop zones would be within the LHA. The LHA covers an 18.9-km (11.5-mile) radius area from the launch point, and extends 56.7 km (34.5 miles) downrange from the launch point along the target flight path.

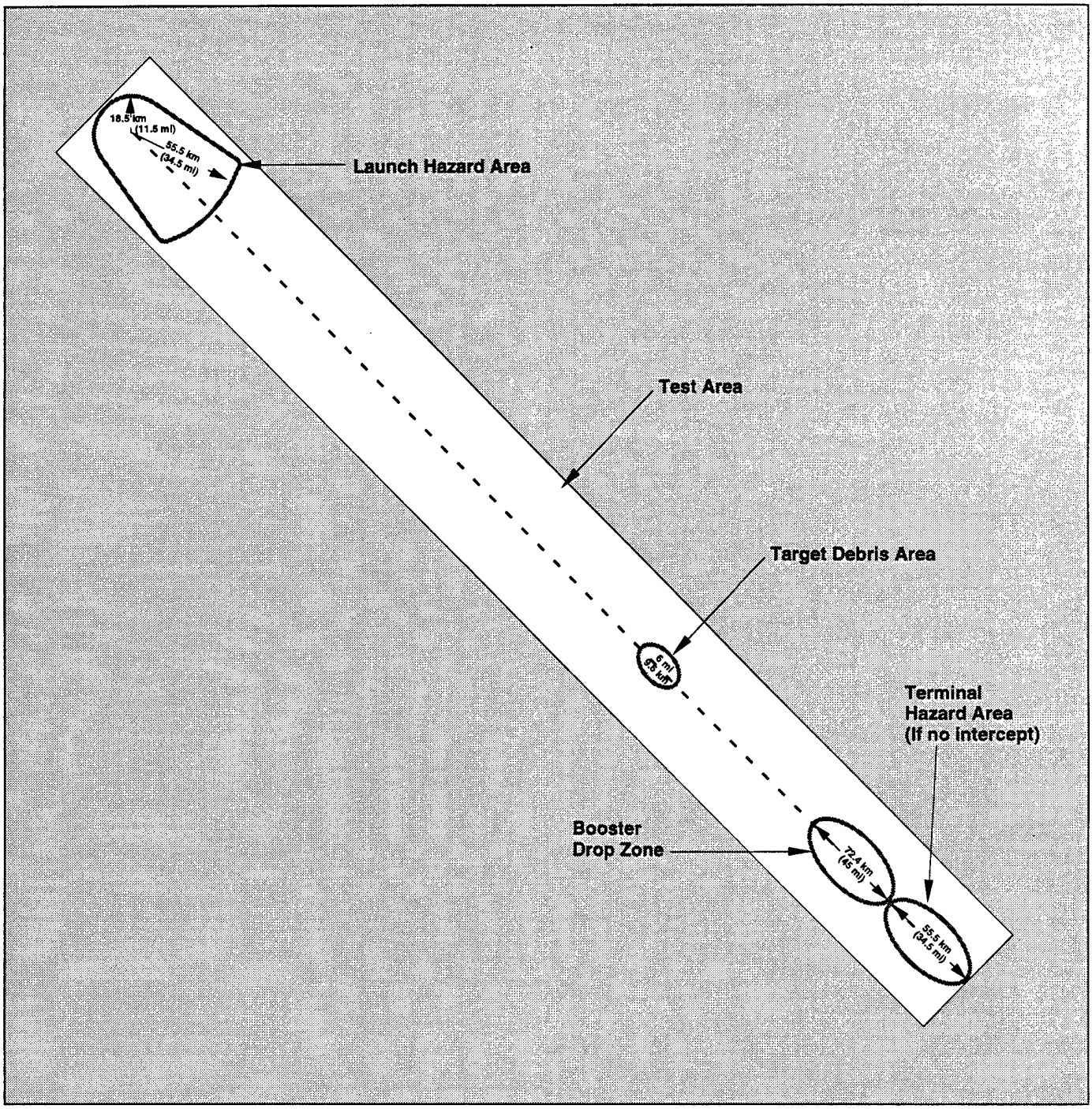
The location and configuration of the target debris circle would be dependent on the interceptor test program. As depicted in the representative launch scenario in Figures 2-5 and 2-6, the circle would have a diameter of approximately 9.7 km (6 mi). The expended booster drop zone is an ellipse approximately 72.4 km (45 mi) long. The THA is based upon the fixed point of target impact. For analysis purposes of the representative Air Drop target trajectory, the THA is a 28.4-km (17.3-mile) by 56.7-km (34.5-mile) ellipse centered at the target impact point.

For currently planned launches, the Air Drop test area would consist of an approximately 320-km- (200-mile) corridor up to 74-km- (46 miles) wide area



Representative Launch/Intercept Scenario

Figure 2-5



EXPLANATION

- - - - Flight Path

Representative Target Impact Zones

Figure 2-6

along the entire target flight path. All Air Drop hazard and test areas would be evacuated and restricted from access during the test period.

After 40 seconds of flight and before rocket burnout at 67 seconds, the probability of missile failure is significantly reduced. An Instantaneous Impact Prediction (IIP) computer model would be used to calculate a target debris area from the launch area to a THA. If and when the IIP indicates that debris would endanger protected areas, the Missile Flight Safety Officer would issue a command destruct message to the Air Drop vehicle.

Debris Recovery. Potential debris from an Air Drop target launch could include the target debris after a failed launch or after a successful launch. Other items would include the pallet with its attached extraction parachutes, and the two main parachutes used to stabilize the target in its descent, and that separate from the target prior to rocket ignition. Target debris could include fragments of unburned propellant, and pallet debris could include metal fragments.

When deployed over an open ocean area, the pallet and attached parachute impacting the open ocean would sink and, therefore, would not be recovered. However, the two main parachutes may need to be recovered from ocean drops. Debris impacting land areas may be recovered, consistent with range operational procedures. If required, on-land debris recovery may involve the use of helicopters and off-road vehicles. Recovery of Air Drop target debris from successful intercepts, and recovery of missile and missile components after unsuccessful launches, would be conducted in accordance with the applicable range procedures. If the potential exists to disturb biological or cultural resources during debris recovery activities, recovery efforts would be coordinated with applicable range representatives and agencies to develop appropriate mitigation measures to avoid impact to sensitive resources.

2.2.3 Range Support Requirements

The DOD ranges that would support the Air Drop system must have the capability of meeting the aircraft, assembly, handling, monitoring, and support needs of the Air Drop program. Specifically, the ranges that would be able to accommodate the Air Drop Target System must have the required safety policies, equipment, and experience to support the SR-19 booster rocket and C-130 aircraft. The Air Drop program would be integrated into the overall range schedule and safety plans, as required, for the test period.

Support Facilities/Infrastructure. The future ranges would be able to accommodate the Air Drop program with existing support facilities and infrastructure, or have access to staging areas within a reasonable distance from the range. Therefore, no construction or additional major equipment would be required at the test range designated to support the Air Drop Target System.

The support range would have existing ordnance storage facilities and the Ordnance Assembly Building (OAB) capable of handling DOD Class 1.1 explosives to accommodate the Air Drop target components. DOD Class 1.1 explosives are principally a blast hazard and may be expected to mass-detonate when a small portion is initiated. In addition, a roller dock assembly with a 25,000-pound-capacity loader would be available to load the target on its pallet. Other handling and transfer equipment (e.g., crane, forklifts) would be available from the existing range inventory, and a 20-foot flatbed trailer that can be equipped with transfer rails for the motor would be available to support the target assembly.

The booster must be maintained at a certain temperature. Therefore, adequate cooling and heating systems would be available within the OAB and the C-130 aircraft.

The runway would be able to accommodate the C-130 loaded with approximately 22,000 pounds for take off and landing. Existing roadways and infrastructure would be available to transport and transfer the launch vehicle and components to and from the OAB, magazine storage, and the C-130 aircraft.

Aircraft Support. The drop aircraft would be a C-130 equipped for airdrop. Two chase aircraft (NP-3Ds or equivalent) would accompany the C-130 to support tracking and recording requirements during the flight and launch.

Communications and Tracking. Real-time communications would be available among the components of the system during the test period including the C-130 drop aircraft, range control center, the launch vehicle communication console, and range and aircraft support. C-Band beacon tracking would be available for the C-130 and the launch vehicle payload until its impact. Redundant telemetry receiving and recording would be provided. Position data plots of the C-130 and launch vehicle payload would be produced to review the test. No additional sensors would be required for the Air Drop Target System.

Air Space Configuration. Air Drop target flights would be conducted in designated airspace. DOD ranges used for the Air Drop program would have designated air space exclusions for their activities. Some tests for which Air Drop targets could be proposed might use extended test ranges or temporarily designated open ocean areas, which would require DOD to obtain approval of additional airspace controls.

Personnel Requirements. Approximately 20 to 35 personnel would be required to handle/maintain the equipment in the short term to support a given test. The aircrew, engineering, ordnance, electromagnetic office, range and mission control, and safety office personnel would be available from the existing range operations for day-to-day operations. Therefore, no increases

in full-time personnel would be required to support the Air Drop program within the specific test ranges.

2.2.4 Safety Systems

The safety elements that would be implemented for the Air Drop program include the delivery of the solid rocket motor to the launch site and prelaunch and launch operations. The objective of the safety program is to ensure that the general public, launch area personnel, foreign land masses, and launch resources are provided an acceptable level of safety, and that all aspects of prelaunch and launch operations adhere to relevant regulations.

The SR-19-AJ-1 would be shipped to the launch site from Hill AFB, Utah, by truck or air. All transportation, handling, and storage of the solid-rocket motor would be accomplished in accordance with long-standing technical orders and procedures and Department of Transportation (DOT) regulations for interstate shipment of hazardous substances (49 CFR Parts 100-199) to ensure that the propellant is not subject to conditions that could result in a fire or other mishap. All motors are transported in specially designed shipping carriages to reduce the potential of fire if an accident should occur (U.S. Air Force, 1992). Unnecessary personnel would be cleared from the transport/loading areas during critical operations.

When the solid-rocket motor arrives at the launch location, the motor would be transferred to an OAB for installation of the FTS and other components. The solid-rocket motor contains approximately 13,600 pounds of propellant and is classified as DOD Class 1.3 explosives. The Air Drop Target System also contains DOD Class 1.1 explosives (e.g., explosive bolts). The OAB used at the launch sites would be designed to contain DOD Class 1.1 explosives. At these facilities, explosive safety quantity-distance (ESQD) criteria have been used to establish safe distances from the facility and associated support and unrelated facilities and roadways. For the SR-19-AJ-1, the ESQD with the flight termination system in place would be 1,250 feet from inhabited buildings and 750 feet from public transportation corridors. Work on the solid-rocket motor and parachute/vertical restraint rigging inside the missile or booster assembly building would be conducted in accordance with operating procedures established for the Air Drop program. All procedures and FTS would be approved by the launch site safety office before initiation of any task.

The FTS that would be used for the solid-rocket motor is a dual redundant system with a predicted reliability of 99.9 percent. The FTS is an independent system and has a linear-shaped charge, detonators, and a safing and arming device. Final arming of the FTS would occur after the vehicle separates from the sled. In the event the mission needs to be terminated, Range Safety would transmit tones that would be received and decoded in the FTS receivers. The signal would initiate an electrical current that would

cause a small charge to explode, splitting the motor case, resulting in a loss of pressure in the rocket motor. The Air Drop FTS conforms to Range Commanders Council (RCC) 319-92 (FTS Commonality Standard), and can be remotely controlled by an experienced Missile Flight Safety Officer (MFSO) from ground transmitters at the designated site location or from an airborne transmitter.

Before launch, the Air Drop launch vehicle would be loaded onto the aircraft in a designated safe area for explosive loading. A safety plan would be prepared and approved by the launch site safety office that would provide safety criteria and range clearance requirements to conduct the launch operation. The safety plan would be prepared in accordance with the policies of the range. This plan would take into account clearance of the hazard and warning areas, flight termination, target impact, and (if required by the range or desired by the test program) debris recovery.

2.2.5 Launch Anomaly/Flight Mishap

Air drops would be conducted over previously designated and cleared land or ocean areas. In a worst case, if parachutes failed to deploy, an unfired missile, free falling after leaving the drop aircraft, may explode if it hits water or land. A study prepared for the Air Drop tests at China Lake Naval Weapons Center concluded that there was a 50-percent chance an explosion with an equivalence of 6,500 pounds of TNT would occur if the missile does not fire and falls to the earth.

A fired missile that goes off course or otherwise awry would be destroyed by activation of the FTS. The FTS has redundant signal receivers and initiators, further lessening the probability of its failure. The FTS uses a linear-shaped charge of cyclonite ($C_3H_6N_6O_6$) explosive. The explosive is designed to split the rocket case and render it nonpropulsive, ignited or not. If destruction by the FTS is necessary, fragments of fuel and the rocket would then fall to previously designated and cleared land or ocean areas.

If the planned intercept of the Air Drop target was unsuccessful, the target would continue its flight and impact at its aim point in the designated target impact zone. In most events, all solid fuel within the SR-19 would already be expended prior to impact.

After such incidents as those described above, and depending upon the needs of the test programs and applicable regulations and operating procedures at a particular range, test range personnel may seek to recover missile casings and propellants, missile nose fairings and payloads, and/or missile guidance and control hardware. Debris and component recovery normally would not be attempted in ocean areas.

2.3 NO-ACTION ALTERNATIVE

The No-Action Alternative would be the continued use of ground-launched targets. This alternative would severely inhibit the progress of TBM defense interceptor programs that heavily rely upon the use of realistic targets and scenarios for testing and development, and for distances that are representative of certain threats. This alternative would preclude multiple and complex engagements with high azimuth variability. The ranges would be limited to currently authorized test programs, thereby precluding more realistic types of engagement scenarios.

2.4 ALTERNATIVES CONSIDERED UNDER OTHER STUDIES AND ELIMINATED FROM FURTHER STUDY UNDER THIS PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

The Air Drop Target System program may provide DOD a new, highly mobile, highly flexible, target launch system with minimal permanent additional infrastructure. However, Air Drop represents only one of several alternative means to provide realistic targets for current and evolving interceptor programs. Other BMDO/DOD target launch alternative technologies were eliminated from further analysis in this PEA, since they are considered separately under other environmental analyses. A brief description of other target launch alternatives is provided below.

Ocean-Land Sites Alternative. This range-specific alternative provides additional land-launch sites that would launch targets over the ocean from fixed launch points using existing technology. For example, Wake Island was considered, selected, and developed as an ocean land launch site for Kwajalein Missile Range in the 1995 Extended Test Range EIS.

Continental Land Sites Alternative. This range-specific alternative provides additional land-launch sites that would launch targets over land from fixed launch points using existing technology. For example, Fort Wingate Depot Activity was considered, selected, and developed as an additional land launch site for White Sands Missile Range in the 1995 Extended Test Range EIS.

Sea-Going Vessels Alternative. This alternative provides sea-launch sites that would launch targets over the ocean from sea-going vessels. The Extended Test Range EIS considered a sea launch alternative for both the Western Test Range and Eglin Gulf Test Range, but the option was not selected due to technical challenges and perceived high maintenance costs. Currently, a sea launch alternative is undergoing evaluation in the Eglin Supplemental EIS. As technology matures and cost issues are resolved, sea launch may undergo re-evaluation on a programmatic- as well as range-specific basis.

2.5 COMPARISON OF ENVIRONMENTAL IMPACTS

Table 2-1 provides a summary of the potential environmental impacts for the proposed Air Drop Target System program and the No-Action Alternative. A comprehensive description of the environmental impacts, coordination activities, and applicable mitigations for those resources analyzed are provided in Chapter 4.0. In addition, numerous environmental activities have been incorporated into the project as part of the Proposed Action described in Chapter 2.0; as such, they are not included in this summary. The potential environmental effects of conducting the Air Drop program, as described under the Proposed Action, would not result in significant impacts with implementation of the required mitigations presented in Table 2-1. Additional environmental documentation will be required to address potential environmental impacts for specific test programs at candidate test ranges.

Table 2-1. Comparison of Environmental Impacts
Page 1 of 5

Resource Category	Proposed Action	No-Action Alternative	Mitigations	Additional Analysis
Air Quality	Emissions from launch preparation, aircraft, and rocket motor exhaust; and on-road and off-road motor vehicles. HCl and criteria pollutant concentrations from normal launches expected to remain well below the NAAQS and HCl guidelines. Launch anomalies could potentially exceed HCl guidelines.	No change	Monitoring data should be reviewed, and if appropriate, additional monitoring, data collection, and/or test event emissions modeling should be performed before specific target launch events to insure adequate protection to human health and environment.	Site-specific analysis should be conducted to assess impact to annual NAAQS for specific test programs. Site-specific analysis must assess air conformity impacts of the specific Air Drop test activities at the selected installation.
Upper Atmosphere	Very minor contribution to ozone depletion per launch event.	No change	None	Subsequent analysis of potential impacts to the upper atmosphere from multiple launches should be conducted for specific test programs.
Airspace	Launch activities to occur within restricted airspace.	No change	Flight scheduling and coordination with FAA could mitigate potential airspace conflicts for specific test programs at specific ranges.	None

FAA = Federal Aviation Administration
HCl = hydrogen chloride
NAAQS = National Ambient Air Quality Standards

Table 2-1. Comparison of Environmental Impacts
Page 2 of 5

Resource Category	Proposed Action	No-Action Alternative	Mitigations	Additional Analysis
Hazardous Materials and Waste Management	Limited amounts of hazardous materials and waste generated from fueling, maintenance, processing, transport, ordnance, and debris. Hazardous materials and waste would be handled using existing or modified management procedures already in place at existing test ranges. Missile components and intercept debris falling on land would be recovered as necessary in accordance with applicable regulations or range standard operating procedures or as needed by the test programs. Debris and components falling into ocean areas normally would not be recovered. Minimal impacts from water contamination expected due to decomposition and dilution in the open ocean.	No change	Compliance with applicable regulations and management provisions would preclude impacts from accidental releases of hazardous materials.	None

Table 2-1. Comparison of Environmental Impacts
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Resource Category	Proposed Action	No-Action Alternative	Mitigations	Additional Analysis
Noise	Episodic sonic booms and subsonic noise levels during Air Drop target launch could affect the public near existing test ranges. Subsonic noise increases would be within acceptable noise thresholds and would occur within established test ranges. Potential damage to nearby structures within existing ranges from sonic booms.	No change	Compliance with applicable safety regulations and practices would minimize noise exposure to workers.	Subsequent site-specific analysis will consider impacts from noise for specific test programs.
Health and Safety	Health and Safety concerns include launch and flight safety/mishaps, establishment of designated safety zones, missile debris impacts, transportation of Air Drop target components, explosive safety, and hazards of Air Drop booster emission products.	No change	Compliance with applicable laws and regulations would minimize potential public and worker safety impacts.	Site-specific safety operating procedures for specific Air Drop test programs will be developed to reduce safety risks.
Water Resources	Minimal impact to water quality from falling debris and debris recovery operations due to decomposition and dilution.	No change	None	Subsequent site-specific analysis will consider impacts to surface water resources for specific test programs.

Table 2-1. Comparison of Environmental Impacts
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Resource Category	Proposed Action	No-Action Alternative	Mitigations	Additional Analysis
Cultural Resources	Potential impact to cultural resources from falling debris, debris recovery operations, and sonic booms. Potential interference with Native American activities.	No change	Compliance with applicable rules and regulations would minimize adverse impacts.	Additional Section 106 review under NHPA will be conducted for specific Air Drop test programs to determine whether specific activities could affect cultural resources.
Biological Resources	Potential impact to biological resources from falling debris, debris recovery, increased noise levels, and rocket motor exhaust.	No change	Compliance with applicable rules and regulations would minimize adverse impacts to threatened and endangered species, wetlands, and other critical habitats.	Further site-specific analysis will be conducted for specific Air Drop test programs to determine whether specific activities could affect biological resources at the test ranges.
Land Use and Aesthetics	Little to no change to existing range land uses. Uses compatible with existing military, industrial, or isolated settings. Short-term disturbance to recreational land uses due to noise levels or restricted access. Potential for public visibility during target launch.	No change	None	None

NHPA = National Historic Preservation Act

Table 2-1. Comparison of Environmental Impacts
Page 5 of 5

Resource Category	Proposed Action	No-Action Alternative	Mitigations	Additional Analysis
Socioeconomics	Little to no increase in direct jobs. Clearance and evacuation during launch activities could temporarily restrict or delay access to commercial waterways, transportation corridors, and public recreational areas.	No change	None	None
Environmental Justice	No significant impacts identified with implementation of the Air Drop program.	No change	None	Subsequent analysis of potential environmental justice impacts will be conducted for specific test program if adverse environmental impacts are determined.

3.0 AFFECTED ENVIRONMENT

This chapter describes the affected environment baseline conditions that form the basis for identifying and evaluating potential environmental consequences of the Proposed Action and alternatives. The environmental conditions discussed in this chapter are not directed to specific regions of influence (ROIs) defined for specific sites. Instead, discussions focus upon defining what the ROI would consist of. Information is presented for the entire United States including the CONUS, Alaska, Hawaii, and the USAKA facility in the Republic of the Marshall Islands. This chapter includes the following information for each resource area considered in this PEA:

- A brief introduction of the topics considered, including a description of relevant regulatory framework
- An approach to defining the ROI once a geographic region for the Air Drop Target System is identified in future environmental documentation
- A discussion of the range of existing conditions that could be encountered once specific locations for the Air Drop Target System are defined in future environmental documentation.

3.1 AIR QUALITY

The Clean Air Act (CAA), 42 U.S.C. Sections 7401-7671, most recently amended in November 1990, provides that emission sources must comply with the air quality standards and regulations established by federal, state, and local regulatory agencies. These standards and regulations focus upon (1) the maximum allowable ambient pollutant concentrations, and (2) the maximum allowable emissions from individual sources. Under Section 176(c) of the 1990 CAA Amendments (CAAA), no federal agency may support, in any way, any project that does not conform to an applicable state implementation plan (SIP).

The CAA established National Ambient Air Quality Standards (NAAQS) for those pollutants (termed criteria pollutants) that pose the greatest threat to air quality in the United States. The NAAQS, summarized in Table 3-1, includes maximum concentrations for ozone, carbon monoxide (CO), sulfur dioxide (SO_2), lead, nitrogen dioxide (NO_2), and particulate matter equal to or less than 10 microns in diameter (PM_{10}). Some states have either adopted established NAAQS or established more stringent standards than the NAAQS.

The 1990 CAAA established interim milestones to ensure reasonable progress toward achievement of the NAAQS. An SIP is the vehicle by which states adhere to the NAAQS. The SIP details procedures by which areas that

Table 3-1. National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards[a]	
		Primary[b]	Secondary[c]
Ozone	1 hour	0.12 ppm (235 $\mu g/m^3$)	Same as primary standard
Carbon monoxide	8 hours	9 ppm (10,000 $\mu g/m^3$)	--
	1 hour	35 ppm (40,000 $\mu g/m^3$)	--
Nitrogen dioxide	Annual	0.053 ppm (100 $\mu g/m^3$)	Same as primary standard
	1 hour	--	--
Sulfur dioxide	Annual	0.03 ppm (80 $\mu g/m^3$)	--
	24 hours	0.14 ppm (365 $\mu g/m^3$)	--
	3 hours	--	0.5 ppm (1,300 $\mu g/m^3$)
	1 hour	--	--
PM_{10}	Annual	50 $\mu g/m^3$ [d]	Same as primary standard
	24 hours	150 $\mu g/m^3$	Same as primary standard
Sulfates	24 hours	--	--
Lead	30 days	--	--
	Quarterly	1.5 $\mu g/m^3$	Same as primary standard

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

(b) National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

(c) National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of pollutant.

(d) Calculated as arithmetic mean.

$\mu g/m^3$ = micrograms per cubic meter

PM_{10} = particulate matter equal to or less than 10 microns in diameter

ppm = parts per million

do not meet air quality standards can reduce emissions and improve air quality with the goal toward attainment status. An SIP contains specific measures by which these goals are attained.

Section 175(c) of the CAAA requires states to submit an SIP revision to the U.S. Environment Protection Agency (EPA) for nonattainment areas requesting redesignation to attainment. The SIP revision, referred to as a maintenance plan, establishes control measures and emission planning budgets necessary for the area to maintain the NAAQS for at least 10 years after redesignation. The state must submit, 8 years after redesignation, another maintenance plan demonstrating that the maintenance area will not exceed the standard for an additional 10 years after expiration of the initial 10-year maintenance plan.

The 1990 CAAA also revised the conformity provisions under Section 176(c) of the CAA. Section 176(c) provides that no federal agency may support a project that fails to conform to the approved SIP. The statute defines

conformity to an SIP as conformity to an SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS, and achieving expeditious attainment of such standards. Conformity also means that the project will not cause or contribute to any new violation of a standard, increase the frequency or severity of any existing violation of a standard, or delay timely attainment of any standard. U.S. EPA promulgated conformity rules for general federal action to determine the projects conformity to an applicable SIP.

Toxic air pollutants are chemicals known to cause or are suspected of causing cancer or other serious health effects. Air toxics include metals, other particulates, and certain vapors from fuel and other sources. The 1990 CAAA authorized the U.S. EPA to set standards requiring facilities to sharply reduce routine emissions of air toxics. The CAAA specifically addresses reduction of 189 listed hazardous air pollutants (HAPs). In conjunction with this list of air toxics, the U.S. EPA must publish major source categories emitting these substances. The list must include major sources emitting 10 tons or more per year of any one pollutant or 25 tons per year or more of any combination of listed pollutants. Technology-based standards, termed Maximum Achievable Control Technology (MACT), will be developed for all HAPs.

3.1.1 Region of Influence

The ROI for air quality would encompass, at a minimum, the airsheds and local air district jurisdictional boundaries potentially affected by the sources of air emissions from the affected installations and test ranges. Definition of an exact ROI requires knowledge of specific pollutant types, emission rates and release parameters, proximity to other emission sources, and local and regional meteorological conditions.

3.1.2 Range of Conditions

Analysis in this PEA examines the criteria pollutants of CO, NO_2, SO_2, and PM_{10}. The analysis also evaluates emissions of volatile organic compounds (VOCs) and nitrogen oxides (NO_x), which are primary ozone precursor pollutants. Ozone forms when precursor pollutants react in the presence of heat and sunlight. Potential sources of HAPs are also evaluated.

The existing air quality of the affected environment is defined by air quality data and emissions data within the ROI. Air quality data can be obtained by examining records from air quality monitoring stations. Emission inventory data can be obtained from the applicable test ranges and the local or state air quality district.

Federal and state air pollution control regulations distinguish between "attainment areas," which are in compliance with the NAAQS, and

"nonattainment areas," which are not in compliance with the NAAQS. Areas in which sufficient air quality data have not been collected are designated as "unclassified." These areas are regulated under the same requirements as attainment areas.

Designation as a nonattainment area triggers control requirements designed to achieve attainment by specified dates. Air quality control measures, including emission trading and credit offsets, are defined with national umbrella threshholds in the CAA. In addition, no major new or modified stationary sources can be constructed in nonattainment areas without permits that impose stringent pollution control requirements and sufficient offsets to ensure progress toward compliance. The CAAA defines major stationary sources of pollutants in terms of the sources, potential annual output of pollutants.

For areas that are in compliance with NAAQS (attainment areas), Prevention of Significant Deterioration (PSD) regulations limit pollutant emissions from new sources and establish allowable increments of pollutant levels. New or modified stationary sources (including increased production levels) are subject to PSD review to ensure that these sources are constructed without significant adverse deterioration of the clean air in the area. Emissions from any new or modified sources must be controlled using best available control technology. The air quality impacts in combination with other PSD sources in the area must not exceed the maximum allowable incremental increases identified in Table 3-2. Certain national parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas include all areas not designated as Class I. All areas in the United States not classified as Class I areas are now classified as Class II areas. Class III areas, which would allow greater deterioration than Class II areas, have not been designated.

Table 3-2. Maximum Allowable Pollutant Concentration Increases under Prevention of Significant Deterioration Regulations

		Maximum Allowable Increment ($\mu g/m^3$)		
Pollutant	Averaging Time	Class I	Class II	Class III
Nitrogen dioxide	Annual	2.5	25	50
Sulfur dioxide	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
PM_{10}	Annual	4	17	34
	24-hour	8	30	60

Note: Class I areas are regions in which the air quality is intended to be kept pristine, such as national parks and wilderness areas. All other lands are initially designated Class II. Individual states have the authority to redesignate Class II lands as Class III to allow maximum industrial use.
$\mu g/m^3$ = micrograms per cubic meter
PM_{10} = particulate matter equal to or less than 10 microns in diameter
PSD = Prevention of Significant Deterioration

Source: Title 40 CFR Parts 51 and 52, as revised June 3, 1993.

It is important to note that the Air Drop missile and the C-130 aircraft are not considered stationary sources. Therefore, the stationary source control requirements and thresholds are not applicable to the rocket motor exhaust or the aircraft emissions. However, all federal actions occurring within nonattainment or maintenance areas are subject to the U.S. EPA's general conformity rule. The applicability and requirements of the conformity rule are dependent upon the project impacts, as well as ambient air quality and the applicable SIP measures within the ROI.

The regulatory requirements, including permitting and emission control requirements, for criteria pollutant and HAP sources will vary depending upon the source and the applicable state and local regulations, which may be more limiting or stringent than the federal regulations. The primary toxic air contaminant emitted from the rocket motor exhaust products is hydrogen chloride (HCl). The most appropriate of the various exposure guidelines for emergencies are those of the National Research Council (National Research Council, 1987), as rocket motor emissions, among other sources, were specifically considered in their development. The 1992 U.S. EPA guidelines are the most appropriate for short-term planned exposures.

3.2 UPPER ATMOSPHERE

The stratosphere is approximately 8 to 31 miles above the Earth's surface. It is the main region of ozone production in the atmosphere. Unlike ground-level ozone, stratospheric ozone is beneficial to the human environment. Amounts of stratospheric ozone depend upon complex interplay between molecular transformations of chemical compounds and meteorological transport between different altitudes and latitudes. Chlorine is a particularly effective ozone destroyer.

The CAAA has established phase-outs for the production of compounds that reduce ozone levels in the uppermost layer of the atmosphere, the stratosphere. Class I ozone-depleting compounds including chlorofluorocarbons (CFCs), carbon tetrachloride, methylbromide, and methyl chloroform were phased out in 1996. Class II ozone-depleting compounds, hydrochlorofluorocarbons (HCFCs), have a gradual phase-out that starts in 2000.

3.2.1 Region of Influence

Due to its interactions, the ROI for impacts to the upper atmosphere would include all the Earth's upper atmosphere.

3.2.2 Range of Conditions

The condition and variation in the stratospheric ozone layer have been studied over the last 20 years. While considerable uncertainties remain in fully

understanding the complex reactions that occur in the atmosphere that influence the depletion of the stratospheric ozone layer, a growing body of evidence links CFC and other chlorinated compounds with ozone depletion. The United Nations Environmental Program assessment estimates that for every 1 percent decrease in ozone, biologically damaging ultraviolet radiation will increase 1.3 percent. Evaluations of impacts from increased ultraviolet radiation at a given location are dependent upon the time of year and the latitude. Health risks from ozone depletion include increases in cataracts and suppression of the human immune response system. Other risks include damage to crops and aquatic organisms, and increased formation of ground-level smog.

3.3 AIRSPACE

Airspace is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use. As such, it must be managed in a manner that best serves the competing needs of commercial, general, and military aviation. The Federal Aviation Administration (FAA) is charged, by Public Law 85-725, with the safe and efficient use of the nation's airspace, and has established certain criteria and limits to its use. To do this, the FAA established the National Airspace System (NAS) as "... the common network of United States airspace, air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information and manpower and material." The NAS is divided into six classes dependent upon location, use, and degree of control.

The facilities that manage air traffic flow throughout the NAS are the Air Route Traffic Control Centers (ARTCCs). Complementing these are several types of special use airspace (SUA) designated by the military to meet its particular needs. Twenty ARTCCs within the CONUS provide separation service to aircraft operating under instrument flight rules within controlled airspace, principally during enroute phases of flight. They also provide traffic and weather advisories to airborne aircraft.

Rules of flight and air traffic control (ATC) procedures have been established that govern how aircraft must operate within each type of designated airspace. The type and dimension of individual airspace areas established within a given region and their spatial and procedural relationships to one another are contingent upon the different activities conducted in that region's airspace.

When any significant change is planned for this region (e.g., airport expansion, a new military mission), the FAA will reassess the airspace configuration to determine if such changes will adversely affect (1) ATC systems and/or facilities, (2) movement of other air traffic in the area, or (3) airspace already designated and used for other purposes (i.e., restricted areas).

Testing of the Air Drop target missile requires examination of several geographical areas, or ROIs, of airspace and ATC. Characteristics of the operational profile of the vehicle will be a major factor in determining the impact of the test program on the NAS. This evaluation will not only include portions of the NAS, but also some of the effects of operation in international airspace.

3.3.1 Region of Influence

The ROI for airspace would include any areas in which the airspace and aircraft operations could be directly or indirectly affected by Air Drop Target System operations. This could include areas above federal, public, and private land, and over United States territorial and international open water areas.

3.3.2 Range of Conditions

Most Air Drop Target System flights would occur within military test range SUAs. An SUA is an area of the airspace wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not part of those activities. Specific test proposals requiring use of extended test ranges or testing in broad ocean areas might require designation of additional SUAs. The types of SUA that are operated by test ranges typically consist of restricted areas, military operations areas (MOAs), alert areas, warning areas, prohibited areas, and controlled firing areas. These areas are defined as follows:

- **Restricted Areas** - Airspace in which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Most restricted areas are designated joint-use, and operations may be authorized by the controlling ATC facility when it is not being utilized by the using agency.

- **MOAs** - An airspace assignment of defined vertical and lateral dimensions established outside positive control areas to separate/segregate certain military activities.

- **Alert Areas** - Airspace that may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- **Warning Areas** - Airspace that may contain hazardous operations to nonparticipating aircraft in international airspace.

- **Prohibited Areas** - Designated airspace within which the flight of aircraft is prohibited.

- **Controlled Firing Areas** - Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards

to nonparticipating aircraft and to ensure the safety of persons and property on the ground.

The above SUA at test ranges are used for a variety of activities such as aircraft operations, missile intercept testing, and weapon systems testing. These activities occur both over land and over water (open ocean), depending upon the test range location. The SUA is controlled by the operating agency (typically the test range) and, when not active, can be returned to the FAA for use by civilian aircraft.

3.4 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

Hazardous materials and waste management requirements for any DOD facility are governed by federal, state/local, DOD, and military service regulations. These laws and regulations govern hazardous substance release reporting, hazardous material transportation on and off DOD facilities, storage and handling of hazardous materials, hazardous waste management, emergency planning, and community right-to-know requirements. Hazardous materials/ waste and worker protection from health and safety risks at DOD facilities are governed by regulations listed in Appendix B.

Several federal agencies oversee various aspects of hazardous material use. The DOT regulates safe packaging and transportation of hazardous materials, as specified in 49 CFR Parts 171 through 180 and 897. The Occupational Safety and Health Administration (OSHA) regulates the safe use of hazardous materials in the workplace in 29 CFR, primarily Part 1910. Environmental safety and public health issues associated with hazardous materials are regulated by the U.S. EPA through specific criteria applied to areas such as air emissions and water discharge. In addition, individual states may be responsible for the regulation of hazardous materials within their state.

For purposes of this analysis, hazardous materials and wastes are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); 42 U.S.C. Sections 9601 et seq., as amended; and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Sections 6901-6992, as amended. In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare or the environment when released. In addition, individual state and local regulations may also define hazardous wastes. EO 12088, under the authority of the U.S. EPA, ensures that necessary actions are taken for prevention, management, and abatement of environmental pollution from hazardous materials or wastes due to federal activities.

Transportation of hazardous materials is regulated by the DOT under the Hazardous Materials Transportation Act, 49 CFR Parts 100-199. The

regulations restrict the type and quantity of hazardous substances that may be transported, and require that each hazardous material container be properly packaged and labeled.

Training for personnel involved in hazardous material/waste operations and emergency response is conducted through the appropriate offices at each installation. The training complies with OSHA and U.S. EPA requirements and includes, but is not limited to, the 40-, 24-, and 8-hour (annual) Hazardous Waste Operations Training courses. Additional information on the regulatory framework for worker and public safety is discussed in Section 3.6, Heath and Safety.

The use and generation of project-related hazardous materials and waste may impact installation and range management programs. Therefore, relevant aspects of hazardous materials and waste management include the applicable regulations and procedures for hazardous materials usage and hazardous waste generation. Because the Air Drop program does not entail any building construction, modification, or ground-disturbing activities, hazardous waste-contaminated sites, asbestos-containing material, lead-based paint, and other aspects of hazardous material and waste management are not relevant to the analysis.

3.4.1 Region of Influence

The ROI for hazardous materials and waste management would include those installations and ranges where the Air Drop Target System would be prepared and launched. This would include both developed areas where facilities supporting target system preparation are located and open range areas, over land and water, where target system debris may impact. The extent of the ROI would vary according to the physical and chemical characteristics of the materials in questions. The pathway through which the materials typically travel determines the geographical area potentially affected.

A number of site-specific factors could also determine the size of the affected area, and include:

- **Atmospheric conditions.** Materials are more volatile at higher temperatures. Hazardous materials are more likely to enter the environment via evaporation in hot weather. Steep temperature gradients enhance the vertical mixing of air and, thus, the dispersion of contaminants. Wind intensifies this dispersion and transports airborne contaminants. Sunlight exposure increases volatilization rates and can result in the formation of chemical compounds. Humidity contributes to the corrosivity of containers in which materials are stored. Rainfall can increase the transport of hazardous materials to groundwater and surface water supplies.

- **Surface water and groundwater.** The size, depth, currents, and other hydrological characteristics of rivers, lakes, estuaries, and other surface water bodies affect how readily water pollutants can spread from their sources. Hydrologic characteristics of individual aquifers, such as the porosity of the rocks and soils comprising the aquifer, influence the hydraulic conductivity and, hence, the ability of contaminants to spread throughout the aquifer.

- **Soil type.** Soil type affects the speed at which released contaminants can reach groundwater supplies. Sandy soils are more permeable and allow more seepage, while clayey soils are less permeable and retard seepage.

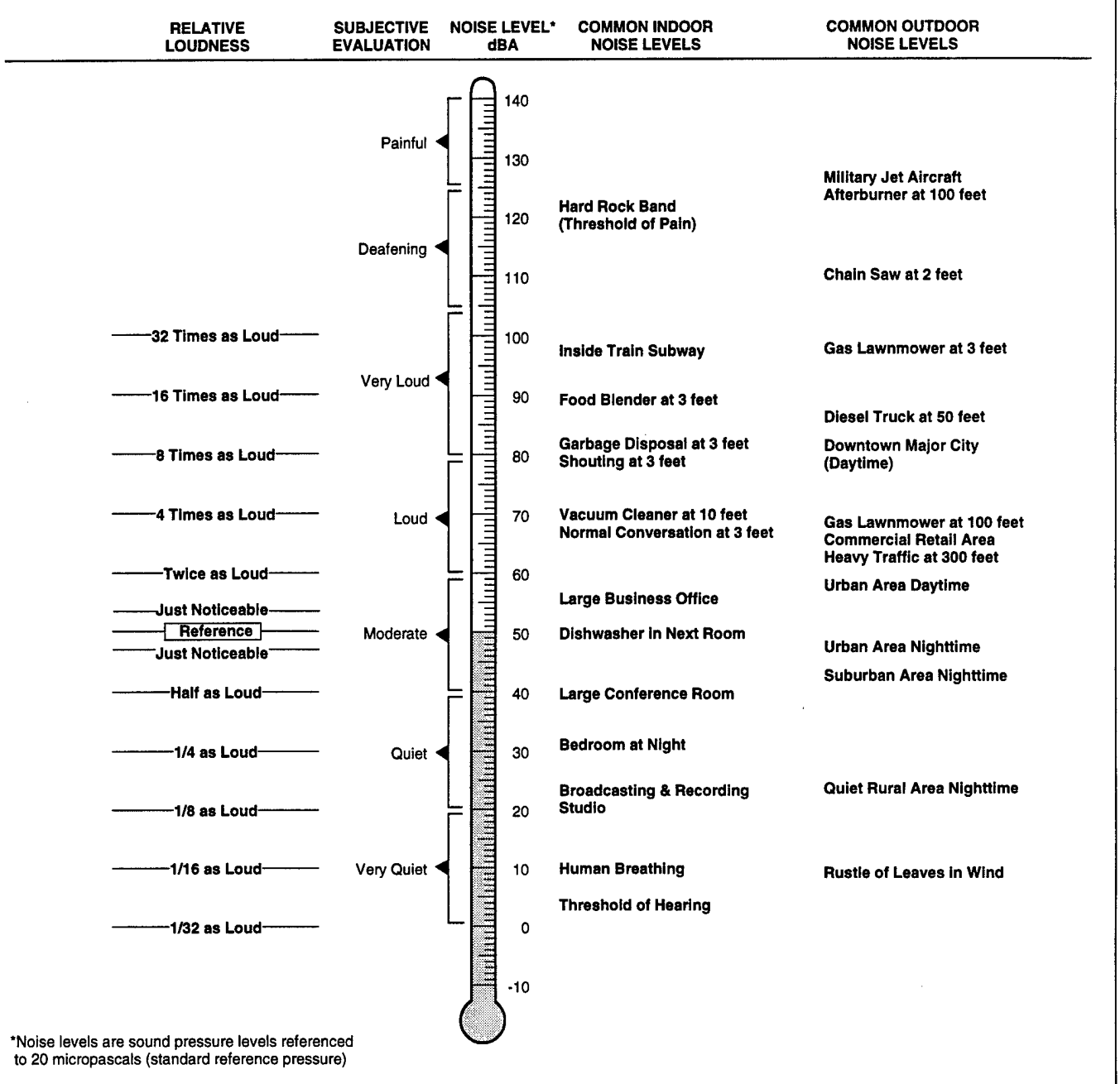
3.4.2 Range of Conditions

The installations and ranges must comply with applicable federal, state, and local laws and regulations regarding hazardous materials and wastes. DOD directives provide direction for compliance with applicable hazardous materials and waste laws and regulations. Individual installations have plans that serve to implement these laws, regulations, and DOD directives. These may include hazardous material and waste management plans; petroleum, oil, and lubricants plans; spill prevention and contingency plans; and pollution prevention plans. Installations are also required to provide annual updates to their business plans to comply with community right-to-know requirements. Land ranges may have debris recovery plans that take into account the hazardous nature of some debris components. Debris recovery is usually not conducted in open ocean range areas.

3.5 NOISE

Noise is defined as unwelcome or unwanted sound that is usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities or that diminishes the quality of the environment. Typical noise levels found in the environment are shown on Figure 3-1.

When measuring typical transportation noise to determine its effects on a human population, A-weighted sound levels are often used to account for the frequency response of the human ear. A-weighted denotes the adjustment of the total sound energy of a noise event to represent the way in which the average human ear responds to that sound energy. When high-intensity impulse noise is evaluated to determine the effects on a human population, C-weighted sound levels are used so that the low-frequency effects of the noise are considered. The low-frequency content of impulse noise contributes to effects, such as window rattle, that influence people's perception of and reaction to the noise.



Typical Sound Levels

Figure 3-1

Noise levels often change with time. Therefore, to compare levels over different time periods, several descriptors were developed that take into account this time-varying nature. Two common descriptors include the day-night average sound level (DNL) and the maximum sound level (L_{max}). The DNL does not always give a good representation of high noise levels that might occur during the day, because the 24-hour averaging tends to under-emphasize noise level peaks. For a single noise of high magnitude (e.g., space vehicle launch, plane overflight), the L_{max} is often more representative than the DNL. These descriptors are used to assess and correlate the various effects of noise on man and animals including land use compatibility, sleep interference, annoyance, hearing loss, speech interference, and startle effects.

As a missile moves through the air, the air in front is displaced to make room for the missile and then returns once the missile passes. In subsonic flight, a pressure wave (which travels at the speed of sound) precedes the missile and initiates the displacement of air around the missile. When the missile exceeds the speed of sound (referred to as Mach 1), the pressure wave, which cannot travel faster than the speed of sound, cannot precede the missile; therefore, the parting of air at the front of the missile is abrupt. A shock wave is formed at the front of the missile when the air is displaced around it, and at the rear when a trailing shock wave occurs as the air recompresses to fill the void after passage of the missile.

The shock wave that results from supersonic flight is commonly called a sonic boom. A sonic boom differs from most other sound because it is an impulse noise, there is no warning of its impending occurrence, and the magnitude of the peak is usually higher. A recent survey of existing models to predict sonic boom impacts on conventional structures has developed a method of estimating loss of glass, plaster, and bric-a-brac (Haber and Nakaki, 1989). A summary of possible damage to structures based upon this method is presented in Table 3-3.

Sensitive receptors that can be affected by noise can include occupants of any facility requiring mostly quiet conditions (e.g., residence, school, hospital, church); workers in a workplace where noise can affect performance or cause hearing damage; and noise-sensitive wildlife species.

The smallest change in noise levels detectable by the human ear is approximately 3 decibels (dB). An increase of 10 dB is roughly equivalent to a doubling in the perceived sound level.

There are no nonoccupational standards for impulse noise generated from missile launches. Air Force Occupational Safety and Health Standard 48-19, Hazardous Noise Program, establishes 140 dB as the limit for impulse noise without protective equipment. For nonimpulse noise, the Air Force standard is 30 seconds for a 115-A-weighted dB nonimpulse noise exposure.

Table 3-3. Possible Damage to Structures from Sonic Booms

Sonic Boom Peak Overpressure Nominal (pounds per square inch)	Item Affected	Type of Damage
0.5-2	Cracks in plaster	Fine; extension of existing; more in ceilings; over door frames; between some plaster boards.
	Cracks in glass	Rarely shattered; either partial or extension of existing.
	Damage to roof	Slippage of existing loose tiles/slates; sometimes new cracking of old slates at nail hole.
	Damage to outside walls	Existing cracks in stucco extended.
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass (e.g., large goblets).
	Other	Dust falls in chimneys.
2-4	Glass, plaster, roof, ceilings	Failures show that would have been difficult to forecast in terms of their existing localized condition; nominally in good condition.
4-10	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic; green houses; ships; oil rigs.
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster.
	Roofs	High-probability rate of failure in nominally good slate, slurry-wash; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can bodily move.
	Walls (outside)	Old, free-standing walls in fairly good condition can collapse.
	Walls (inside)	"Party" walls known to move at 10 pounds per square inch.
Greater than 10	Glass	Some good glass will fail regularly to sonic booms from the same direction; glass with existing faults could shatter and fly; large window frames move.
	Plaster	Most plaster affected.
	Ceilings	Plaster boards displaced by nail popping.
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gable-end and wall-plate cracks; domestic chimneys dislodgment if not in good condition.
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage.
	Bric-a-brac	Some nominally secure items can fall (e.g., large pictures; especially if fixed to party walls).

Source: Haber and Nakaki, 1989

3.5.1 Region of Influence

The ROI for noise would include any areas in which noise levels from Air Drop Target System operations (aircraft and missile) could directly or indirectly affect sensitive receptors. The ROI would include sites of each proposed activity, as well as areas near these sites where activities may increase noise levels, including all areas of human habitation.

3.5.2 Range of Conditions

Acoustic conditions in the ROI will vary with the type of land use, population, noise sources, and other factors. Air Drop Target System activities would be situated in a variety of acoustical settings. These settings would typically be associated with existing military ranges, and could vary from remote sites with low ambient sound levels typical of uninhabited or wilderness settings to noisy industrial settings. Some noise could affect residential communities near military ranges.

DNLs typical of residential land uses range from about 35 A-weighted dB for a rural residential area, to 72 A-weighted dB or higher for an urbanized area, as shown in Table 3-4.

Table 3-4. Typical Ranges or Residential Noise Levels

Description	DNL A-weighted (dB)
Rural Residential	35-50
Quiet Suburban Residential	48-52
Normal Suburban Residential	53-57
Urban Residential	58-62
Noisy Urban Residential	63-67
Very Noisy Urban Residential	68-72

dB = decibel
DNL = day-night average sound level
Source: U.S. Environmental Protection Agency, 1974

Higher noise levels can be expected to occur in more industrialized areas. Rural, agricultural, or desert locations would be expected to have ambient sound levels in the range of DNL 35 to 50 A-weighted dB.

Existing military test ranges and launch facilities have major sources of noise including military and civilian aircraft departures and arrivals, military aircraft conducting subsonic and supersonic training, rocket and missile launches, munitions testing and firing, and traffic on local roads and highways. These activities can occur over land and water (over water range). The subsonic military aircraft flying low-level routes at 300 feet above ground level (AGL)

can generate noise levels of up to 118 dB (F-15) within the range. Sonic booms frequently occur in the existing supersonic corridor at military ranges, and can generate overpressures that would fall in the range of 1 to 4 pounds per square feet (psf). Missile launches that occur on some ranges generate noise levels of 140 A-weighted dB near the launch site.

3.6 HEALTH AND SAFETY

Health and safety includes consideration of any activities, occurrences, or operations that have the potential to affect one or more of the following:

- The well-being, safety, or health of workers involved with the Air Drop program or present at the operational site
- The well-being, safety, or health of members of the public
- Protection from damage or destruction of property.

OSHA is responsible for protecting worker health and safety in the workplace and to preserve human resources. OSHA regulations can be found in 29 CFR. Under OSHA, each agency must:

- Provide safe and healthful conditions and places of employment
- Acquire, maintain, and require use of safety equipment
- Keep records of occupational accidents and illnesses
- Report annually to the Secretary of Labor.

Workplace hazards that are commonly encountered include exposure to a wide variety of toxic materials employed in normal operations, handling and use of explosive and flammable materials, and hazards associated with routine industrial activities. Each installation has implemented a comprehensive safety program to identify, evaluate, and mitigate these potential occupational hazards.

Prelaunch operations are conducted in accordance with established Standard Operating Procedures (SOPs) that have been approved by the appropriate office. At launch time, the launch vehicle can be armed only after all required safety evacuations sufficient to ensure that no unauthorized personnel are present in hazardous areas have been accomplished.

To maximize the safety of flight testing, a standardized procedure has been developed at each individual range for the planning, safety evaluation, and conduct of these operations. The objective is to ensure that the public is not exposed to any additional risks, and the environment is not exposed to significant risks beyond those expected from normal military, workforce, and public activities.

For each major program tested at an installation, a risk assessment is conducted with consideration to the public and range personnel. Risk levels deemed acceptable for persons are considered appropriate for other sensitive factors, such as cultural and historical sites. The general form of most risk assessments is to first determine the likelihood that failure will occur and the results of the failure, including the amount of debris, distance the debris travels, the pattern of debris in the air or on the ground, and the hazard associated with each piece of debris. In addition, the number and location of residents in unevacuated areas must be determined to calculate the risk.

DOD and military service regulations establish ESQDs, setting minimum distances between facilities used for storage and handling of explosives and other nonrelated facilities and activities, based upon maximum quantities of explosives that may be stored at the location. These standards were established to prevent explosive propagation between one explosive storage/handling location and another, as well as to prevent or minimize injury or death to personnel.

3.6.1 Region of Influence

For worker safety, the ROI would include only the immediate work location within the installation and test range affected by the Air Drop activities. For public safety, the ROI would encompass a much larger area. The ROI would vary depending upon the selected range of the operation, but could extend for many miles from the source of the hazard. During missile flight operations, the ROI would include not only the launch and intended impact zones, but also all locations along the Air Drop flight path.

3.6.2 Range of Conditions

A particular risk to worker and/or public safety from a given component or system would not appreciably vary from site to site or from facility to facility. However, the range of conditions for health and safety require further site-specific information. Specific hazards to personnel at the kinds of government installations suitable for Air Drop Target System activities could include the following activities:

- Toxic and hazardous material handling
- Fuel transfer operations
- Rocket/booster/missile final assembly
- Rocket/booster transport
- Launch operations
- Launch debris/explosion debris
- Intercept debris.

To ensure safety, a standardized procedure has been developed at military test ranges for the planning, safety evaluation, and conduct of these

operations. At the individual installations, an appropriate safety officer is actively engaged in evaluating the flight hazards from all types of weapons systems for the purpose of protecting the public, on-range personnel, sensitive cultural assets, and high-dollar-value facilities from flight hazards. Each individual test is supported by a variety of test instruments to ensure that the missile flight path and the health status of the test system can be continually evaluated, and corrective actions to be taken in the event the missile does not perform as planned.

3.7 WATER RESOURCES

Water resources include surface water (rivers, streams, lakes, ponds, reservoirs, wetlands, estuaries, and oceans) and groundwater. This analysis considers general surface waters and the Atlantic and Pacific oceans. If applicable, analysis of specific surface water resources would be considered in future evaluations. Groundwater is not presented as a water resource pertinent to the Air Drop PEA, since groundwater impacts from the Air Drop are not expected (see Section 3.4, Hazardous Materials and Waste Management).

Water Quality. The quality of water in a surface water resource is a function of natural factors (e.g., precipitation, runoff, groundwater discharge) and of human factors (e.g., pollution). Two major types of water pollution are generally recognized: point source pollution, involving distinct identifiable sources; and nonpoint source pollution, involving diffuse releases from several sources over a large area. Because nonpoint sources are more difficult to control, they are generally considered to be a more serious problem (Stein, 1992).

Under the Clean Water Act (CWA) of 1977, the U.S. EPA has developed surface water quality criteria to protect human health and aquatic biota. Discharge of pollutants from any point source into waters of the United States is regulated by the U.S. EPA National Pollutant Discharge Elimination System (NPDES), under the authority of Section 402 of the CWA. The discharge of pollutants to surface water from any site or facility requires a permit under the NPDES. NPDES permits include effluent limitations specifying the maximum concentrations of specific pollutants that may be present in discharge water. The Wetlands Protection Act protects wetlands as defined in EO 11990, 40 CFR Part 6, and Section 404 of the CWA (see Section 3.9, Biological Resources). The Safe Drinking Water Act (SDWA) promulgates the criteria for protection of drinking water sources through the National Drinking Water Standards in 40 CFR Part 143. In addition to SDWA standards, the U.S. EPA has developed water quality standards to protect aquatic biota in freshwater and marine surface bodies, to protect the health of humans who come in contact with the water, and to protect the health of humans who consume fish and other edible organisms taken from the water (U.S. Environmental Protection Agency, 1991b).

Floodplains. The base floodplain (100-year floodplain) is defined in EO 11988, Flood Management, as the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, and encompassing (at a minimum) areas subject to a 1-percent or more chance of flooding in any given year. The critical action floodplain (500-year floodplain) includes those areas subject to a 0.2 percent or more chance of flooding in any given year. The Water Resources Council Guidelines for Implementing EO 11988 (43 CFR Part 6032) recognize two general types of floodplains: riverine and coastal. Riverine floodplains are valley areas adjacent to streams and rivers that are subject to flooding whenever the carrying capacity of the channel is exceeded. Coastal floodplains are areas adjacent to large lakes, estuaries, oceans, and other bodies of standing water that are subject to flooding from landward flows of water caused by unusually high tides, waves from high winds, storm surges, or tsunamis (large oceanic waves associated with strong earthquakes or other geological disturbances).

The 100-year floodplain is divided into two parts: the floodway and the floodway fringe. The floodway consists of the channel of the river or other watercourse plus any adjacent lands that must be kept free of encroachment to discharge the 100-year flood, without increasing the height of the floodwater by 30.5 centimeters (1.0 foot). Some states have adopted more restrictive standards for defining the floodway. The floodway fringe includes the remainder of the 100-year floodplain (U.S. Geological Survey, 1991).

3.7.1 Region of Influence

The ROI for surface water quality and floodplains would generally involve the affected downstream portion of the watershed. For activities at inland sites, the ROI would generally encompass specific reaches (segments) of rivers and streams and/or specific lakes or ponds. For activities at coastal sites, the ROI would generally encompass specific portions of estuaries and/or nearshore oceans. For activities involving launches over the open ocean, the ROI would encompass affected ocean waters as well. Determining the downstream extent of ROIs involving rivers or streams, or the outward extent of ROIs in large lakes, estuaries, or the ocean would require knowing specific hydrologic characteristics of the affected water bodies and of the anticipated impacts.

3.7.2 Range of Conditions

Water Quality. The quality of surface water is diverse, affected by both natural processes and human activities. Regional generalizations are not especially useful in assessing water quality impacts, since the quality of water in bodies that are geographically close can vary widely in response to localized differences in natural conditions and pollution sources.

Water quality data can be obtained for many surface water bodies from databases such as the Water Storage and Retrieval System maintained by the U.S. EPA. For some surface water bodies, more complete water quality data are available from other federal or state agencies. If available data are inadequate, water samples can be collected from the surface water bodies in the ROI and analyzed using methods approved by the U.S. EPA.

Water quality in 10 percent of those river and stream miles assessed in the CONUS, Hawaii, and Puerto Rico in 1990 did not meet the designated standard. Another 21 percent of those rivers and streams only partially supported their designated use, and an additional 7 percent were adequately polluted to threaten the designated use. Water quality in 21 percent of the assessed lake acres in 1990 did not support the designated use (U.S. Environmental Protection Agency, 1992).

Approximately 76 percent of the river length in Hawaii supported its designated uses in 1990, and all of the estuarine area assessed in Hawaii was considered fishable. Alaska did not submit comparable data on surface water quality in 1990 (U.S. Environmental Protection Agency, 1992). There are no inland surface waters on the USAKA. Marine water quality in the vicinity of the USAKA is generally excellent, except in specific locations in shallow waters adjacent to several USAKA islands where elevated levels of copper and mercury have been noted in marine organisms (U.S. Army Space and Strategic Defense Command, 1993).

Floodplains. The Federal Emergency Management Agency has published maps delineating floodplains for many parts of the CONUS. Flood Hazard Boundary Maps, which provide an approximate delineation of the 100-year floodplain and other special flood hazard areas, are the best available information for some areas. Flood Insurance Rate Maps (FIRMs) provide more precise delineations based upon hydrologic and hydraulic calculations. FIRMs typically delineate all land areas as either Zone A (the 100-year floodplain), Zone B (the 500-year floodplain), or Zone C (not subject to inundation by the 500-year flood). Some FIRMs differentiate Zone A into the floodway and the floodway fringe.

Inland floodplains would generally be associated with rivers and streams. Flood hazard areas in coastal locations would generally comprise areas subject to spring tides, storm surges, and tsunamis. Beaches and barrier islands are especially vulnerable, although many other low-lying coastal areas are also subject to these hazards.

3.8 CULTURAL RESOURCES

Cultural resources consist of prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific,

traditional, religious, or other reason. They can be divided into categories of prehistoric resources, historic structures and resources, traditional resources, and paleontological resources.

Numerous laws and regulations require federal agencies to consider the effects of a proposed project on cultural resources. These laws and regulations stipulate a process for compliance, define the responsibilities of the federal agency proposing the action, and prescribe the relationship among other involved agencies (e.g., the State Historic Preservation Officer [SHPO], the Advisory Council on Historic Preservation [Council]). The primary law governing cultural resources in terms of their treatment in an environmental analysis is the National Historic Preservation Act (NHPA) of 1966, as amended, which addresses the identification and preservation of historic properties.

Historic properties under 36 CFR Part 800 are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (National Register). For the purposes of these regulations, the term also includes artifacts, records, and remains that are related to, and located within, such properties. The term "eligible for inclusion in the National Register" includes properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria. Therefore, sites that meet the criteria, but are not yet evaluated, may be considered potentially eligible for the National Register and, as such, are afforded the same regulatory consideration as nominated historic properties. Only those cultural resources determined to be significant (i.e., potentially eligible for the National Register) under cultural resources legislation are subject to protection or consideration by a federal agency.

Native American traditional religious and cultural properties can be determined eligible for inclusion in the National Register and are given the same protection as other cultural properties. The Native American Graves Protection and Repatriation Act (NAGPRA) and the American Indian Religious Freedom Act (AIRFA) further define appropriate treatment of Native American resources and mandate consultation with appropriate Native American tribes.

Of concern regarding impacts to cultural resources is the damage or destruction of properties eligible for listing in or listed in the National Register or properties of Native American religious and cultural importance. Damage can be direct, such as damage from falling debris or ground disturbances resulting from off-road vehicles; or indirect, such as visual, auditory, and atmospheric disturbances, that destroy the integrity of the site.

3.8.1 Region of Influence

The ROI for cultural resources would encompass any area within which implementation of the Proposed Action or alternatives could cause changes in

the character or use of historic properties including test ranges, overflight areas, and areas exposed to the effects of noise and sonic booms. It is the same as the area of potential effect (APE) as defined under Section 106 of the NHPA.

3.8.2 Range of Conditions

Prehistoric Resources. Prehistoric resources are defined as physical remnants of human activity that predate the advent of written records in a particular culture and geographic region. Prehistoric resources are evidence of past human activity that is important to a culture, subculture, or community. They include archaeological sites, structures, artifacts, and other evidence of prehistoric human behavior. Resources can include artifacts such as pottery, basketry, weapons, projectiles, or tools; structures or portions of structures; rock paintings or carvings; graves; campsites, hunting camps, homes, villages, or rock shelters; or any portion of any of those items. Areas where prehistoric sites occur can be predicted based upon analysis of settlement patterns and methods of subsistence. Prehistoric resources can occur both in surface and subsurface contexts.

Historic Resources. Historic resources consist of physical properties or locations that postdate the arrival of the beginning of written record in a particular culture and geographic region. Historic resources can include districts, buildings, sites, structures, objects, documents, artifacts, archaeological sites, and other evidence of human behavior. Historic resources also include locations associated with events that have made a significant contribution to history or that are associated with the lives of historically significant persons. Military bases, structures, and buildings may possess historic importance if they are associated with important events or persons in military history.

Traditional Resources. Traditional resources can include prehistoric sites and artifacts, historic areas of occupation and events, historic and contemporary sacred areas, materials used to produce implements and sacred objects, hunting and gathering areas, and other botanical, biological, and geological resources of importance to Native American groups. Significant traditional sites are subject to the same regulation and afforded the same protection as other types of historic properties. Traditional resources sites often overlap with (or are components of) archaeological sites. Under the legislation of the NAGPRA, Native American tribes with an affiliation to the area must be identified, and consultation with the tribes undertaken, to identify any Native American concerns.

Paleontological Resources. Paleontological resources include the fossil evidence of past plant and animal life, and are considered as part of this cultural resources analysis. They can occur in surface exposures, subsurface

deposits exposed by ground-disturbing activities, and sites affording special environments for preservation.

3.9 BIOLOGICAL RESOURCES

Biological resources include the native and introduced terrestrial and marine flora and fauna within the project area. Terrestrial biology includes those land and water areas within U.S. Fish and Wildlife Service (USFWS) jurisdiction; the marine biology includes the saltwater areas under National Marine Fisheries Service jurisdiction. For discussion purposes, biological resources are divided into vegetation and wildlife, threatened and endangered species, and sensitive habitats.

Biological resources are protected by numerous laws and regulations that require federal agencies to consider, and possibly mitigate, the potential effects on these resources. The vegetation and wildlife range of conditions descriptions for the ROI set the stage for the biological resources possibly affected by the Air Drop Target System. Marine mammals such as whales, dolphins, seals, and sea lions are protected under the Marine Mammal Protection Act. Threatened and endangered species and their designated critical habitat are addressed separately because of the protection afforded these species and their critical habitat under the Endangered Species Act of 1973, as amended. Sensitive habitats include areas protected by legislation, habitats of concern to regulating agencies or informed scientists, or areas that provide significant resources for wildlife. Sensitive habitats include wetlands protected by Section 404 of the CWA, plant communities of state concern that are unusual or are limited in distribution, and important seasonal use areas for wildlife such as migration routes, breeding areas, or environments that are vital to the existence of a species or population.

3.9.1 Region of Influence

The ROI for biological resources would be the land and/or marine areas potentially affected by the project activities including system operations, launch operations, range support, system safety, and potential launch anomalies.

3.9.2 Range of Conditions

The ROI encompasses a wide variety of biological conditions. Biological resources are unique to any site. The natural biotic resources are grouped into broad geographical categories to identify the range of types that could be affected by specific activities. Terrestrial aquatic habitats including streams, rivers, lakes, and coastal estuaries are not specifically called out, but occur within the biomes described.

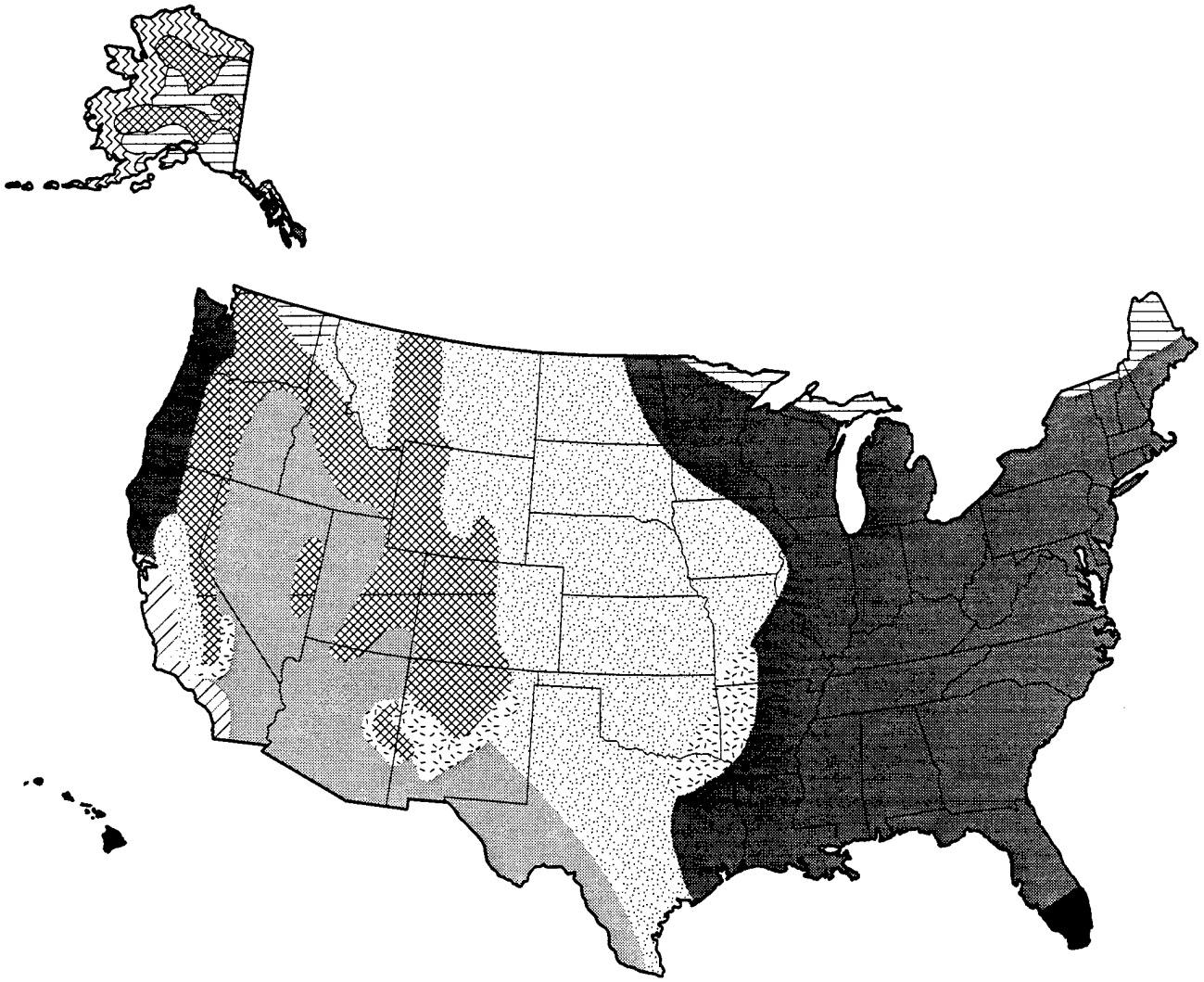
Terrestrial Vegetation and Wildlife. This section describes the major biological regions on land occurring within the ROI. These regions can be broadly classified into terrestrial biomes and aquatic communities. Biomes are characterized by dominant vegetation types and climatic conditions (Arms and Camp, 1987; Campbell, 1990). These regions support vegetation and wildlife adapted to those conditions. Dominant aquatic environments are separated into freshwater and saltwater communities for discussion purposes.

Similarities in climatic conditions, especially temperature and precipitation, create similar biomes worldwide. While similar types of organisms may be found within a particular biome, the species composition may vary among different geographical areas (e.g., New World cacti, Old World euphorbs). In addition, alteration of these environments by human activities has changed the composition of species in many biomes.

Numerous biomes occur within the ROI (Figure 3-2). While the biomes are defined as having distinct boundaries, there are often gradients of species composition (ecoclines) creating complex communities with high species diversity. The following discussion characterizes the general biomes depicted, as well as aquatic environments within the ROI (Arms and Camp, 1987; Campbell, 1990).

Temperate Grassland. This biome is characterized by relatively cold temperatures with drought and fire cycles that prevent the establishment of woody shrubs and trees. Temperate grasslands are dominated by various grass and forb (small broad-leaved plant) species. Temperate grasslands (also known as prairies and veldts) support upland game birds, white-tailed deer, and burrowing animals such as mice and gophers, and coyote. Vegetation grows rapidly in grasslands, but, unlike forests, there is little vertical structure (or stratification). Because of this, animals living here tend to shelter on or under the ground (Campbell, 1990). Grasslands have a moderate diversity of species relative to other biomes. Playa lakes and prairie pothole wetlands provide important waterfowl habitat. Streams and small lakes are found throughout this area. This biome occurs in the midwestern United States.

Temperate Forest. Found in midaltitude regions, temperate forests receive sufficient water to allow deciduous trees to dominate the landscape. Climatic variables, such as precipitation and temperature, and abiotic variables, including soil and fire cycles, determine the structure of temperate forests. For this reason, the temperate forest biome can be divided into temperate deciduous, temperate evergreen, and temperate rainforests. These subdivisions are discussed below. Further habitat structure is provided by herbaceous plants and shrubs. Animal species in temperate forests are both abundant and varied. Invertebrates abound within the leaf litter and soil of



EXPLANATION

- Tropical Seasonal Forest
- Temperate Forest
- Temperate Woodland
- Temperate Grassland
- Chaparral
- Desert and Semi-Desert
- Taiga
- Tundra
- Mountains
- Other

NOT TO SCALE

Source: U.S. Air Force, 1994.

Terrestrial Biomes Present within the ROI

Figure 3-2

the forest. Undeveloped temperate forests are also home to larger herbivores (e.g., deer species) and carnivores (e.g., mountain lion, wolf, bobcat).

Temperate Deciduous Forest. Temperate deciduous forests undergo pronounced seasonal change from cold precipitous winters to warm, wet summers (Krebs, 1985). Trees like beeches (*Fagus* sp.), oaks (*Quercus* sp.), and maples (*Acer* sp.) are primary components of this biome. Animals that may be found in this biome include deer (*Odocoileus* sp.), squirrels (family *Sciuridae*), bobcat (*Felis rufus*), and deer mouse (*Peromyscus maniculatus*). During the winter, up to 75 percent of bird species migrate to milder regions, while many other animals that remain enter a period of dormancy (e.g., hibernation). Aquatic ecosystems are abundant in this biome. This biome occurs in most of the eastern one-third of the United States.

Temperate Evergreen Forest. Temperate evergreen forests are dominated by conifers adapted to poor soil conditions and seasonal fires. Ponderosa and Jeffery pine, sugar-cone pine, big-cone spruce, and other trees are found in this biome. Some of these plants require forest fire to germinate their seeds. Chaparral is often found in the foothills of this vegetation community. Black bear, woodpecker, raccoon, and deer occur in this biome. This biome occurs in the western United States, as well as in the southeast.

Temperate Rain Forest. Temperate coastal climates that provide abundant rainfall during the winter and fog/cloud moisture during the summer support this formation. Temperate rain forests contain some of the tallest trees in the world, such as redwood (*Sequoia semperviens*). This biome occurs along the north Pacific coast and along the coastal Sitka spruce forests extending north to Alaska.

Desert. These environments are marked by low amounts of available water. Temperatures vary among deserts; both hot and cold deserts exist (Krebs, 1985; Arms and Camp, 1987). Plant growth in deserts is determined by cycles of precipitation. Some deserts with almost no annual precipitation do not support perennial vegetation. Hot deserts that are less dry contain small woody perennial shrubs and succulent plants (e.g., cacti) with understories of perennial and annual growth. Desert bighorn, jackrabbit, mountain lion, coyote, javelina, golden eagle, and desert tortoise are characteristic of the hot deserts. Seed-eating animals such as ants, mice, and birds take advantage of the relatively high amount of seed production from this perennial and annual growth. A variety of reptiles are found in hot desert biomes. Most desert-dwelling animals have morphological, physiological, or behavioral adaptations that aid in water conservation. Riparian areas are important and scarce. Hot deserts are found in the southwestern United States. Cold deserts are found along large, permanent areas of ice such as ice caps or snowfields. These regions support mainly herbaceous annual growth and few animals. Deserts support a somewhat lower diversity of

species in contrast with other biomes. Because of this, the integrity of desert ecosystems is delicate.

Taiga. Found in higher elevations in temperate climates, this forest is dominated by conifers such as pine, spruce, and fir, but also contains deciduous tree species. Precipitation tends to be high in this biome, particularly in the form of snow. The accumulation of snow insulates the soil and prevents permafrost, which would inhibit tree growth as in tundra environments (see below). Small mammals use this snowpack by burrowing through it and foraging on the detritus at ground level. Large herbivores such as moose, elk, and deer can be found in coniferous forests, as well as predators like bear, wolf, and lynx. Animals associated with the few coniferous tree species found in this biome include squirrels, jays, and woodpeckers.

Chaparral. Also known as scrubland, chaparral occurs in Mediterranean-type climates with mild, wet winters and hot, dry summers. Major components of this vegetation complex include dense, spiny shrubs that are adapted to frequent fire regimens. Mule deer, mountain lion, California quail, and ground squirrel are characteristic of this biome. Streams and washes are found cutting through the chaparral hillsides. This biome occurs along the Pacific coast in California and Oregon.

Tropical Seasonal Forest. These environments provide high amounts of precipitation and sunlight. Similar to tropical rain forests, tropical seasonal forests are marked by distinct wet and dry seasons with increasing distance from the equator. Plant species diversity is high. This biome occurs in Hawaii and on many other Pacific Islands. In addition, deciduous trees become more prevalent in areas where the dry season is longer and rainfall is less. In the CONUS, south Florida's tropical seasonal forest supports organisms such as cypress trees (several species of Taxodiaceae and Cupressaceae), pitcher plants (*Sarracenia* sp.), American alligators (*Alligator mississippiensis*), and whitetail deer (*Odocoileus virginianus*).

Tundra. Arctic and alpine tundras are characterized by low-lying vegetation and low temperatures. Arctic tundra occurs where it is very cold and permafrost is prevalent throughout the year. Species diversity is low compared to other biomes. The slow decay rate in this frozen environment makes tundra particularly vulnerable to disturbance. Tundra vegetation is dominated by sedges, grasses, mosses, lichens, and dwarf woody shrubs. Bog wetlands are common. Caribou, reindeer, lemmings, ptarmigans, snowy owl, arctic fox, and wolverines are typical. Insects are thick during the thaw and provide an important food source for migrating birds. This biome occurs in Alaska.

Mountain Complexes. Mountain complexes contain a variety of forest and other habitat types and is distinguished by the topography and rain shadow effects. They are found in the Rocky Mountains and in steep mountainous

areas on the Pacific Islands. The high diversity of the plant community reflects the rapid change in elevation. In the extreme northwestern regions of the United States and much of Alaska, a coniferous forest containing spruce, fir, and pine occur. The dense canopy prevents shrubs and herbs from growing well. A variety of animals can be found, including tree squirrels, raccoon, Steller's jay, black and brown bear, and white-tailed deer. Meadow wetlands, lakes, and streams occur in this biome.

Coastal. Not technically a biome, coastal habitat consists of estuaries, beaches, mudflats, rocky shorelines, and sand dunes. Shore birds, sea lions, seals, and sea turtles nest along some of the sandy beaches. Mussels and barnacles are found attached to the rocks in the intertidal zone. Seals and sea lions may be found in these shoreline areas. Many sensitive plants can be found in the dunes. Areas with the highest number of species individuals are highest along the Pacific coast, southern Alaska, and northeastern Atlantic coast. The numbers decrease to the south along the Atlantic coast and north along the Alaskan coast. Estuaries provide habitat for many marine animals at some stage of their lives. These are highly productive areas and provide nesting, feeding, and resting habitat for many migratory bird species. Small islands such as Kwajalein Atoll contain mostly coastal habitat. Kwajalein supports habitat for birds such as the sooty tern, gray-backed tern, short-eared owl, black noddy, brown noddy, and red-tailed tropicbird.

Marine Vegetation and Wildlife. This section describes the general biological resources in the Arctic Ocean, Bering Sea, Pacific Ocean, Atlantic Ocean, and the Gulf of Mexico.

The waters just off the coastlines contain the continental shelves. Numerous islands are within the continental shelf region. These subtidal and shelf regions support diverse marine flora that consists of algae and seagrasses. Phytoplankton are considered part of the open ocean community. They are microscopic floating plants that typically decrease in abundance with increasing distance from the surface. Zooplankton are tiny, free-floating animals that provide an important component of the food chain. They can be the larvae from larger marine vertebrate and invertebrate species. Invertebrates also include worms, crustaceans, snails, starfish, and squid. Islands often support sensitive wildlife species and provide important habitat for sea birds, seals, and sea lions. Kelp beds found in their waters provide food and shelter for fish and other animals, including the sea otter off the coast of California. The Gulf of Mexico is also included in this habitat and is rich with sea life. Sea grasses in the Gulf provide habitat for many species including penaeid shrimp, blue crabs, and bay scallops. Many fish species, sea turtle species, and marine mammal species, such as whales and dolphins, are found in the Gulf. Many pelagic species are also found along the Atlantic coast of the United States. Nutrients are readily available as deposited by rivers, and support the most densely populated area within the marine

habitat. The Alaska coastline supports numerous whale and seal species, and salmon are common along Alaska's shores and rivers.

Coral reefs surround the Pacific Islands, including Hawaii and Kwajalein, and are found along the southern end of Florida. Hard coral, along with sea whips and boring sponges, form the bottom community of invertebrates. Coral reefs are found only in clear water and support a great variety of fish and invertebrates. They provide an important habitat that, if disturbed or destroyed, takes many years to regrow.

The open ocean has two main habitats. In the surface 100 meters, plankton and other drifting animals and plants live where photosynthesis can be facilitated by sunlight. Fish, marine mammals, and sea turtles swim within this area to find food and other habitat needs. They often travel where the plankton travel. Farther down the water column, a vast population of decomposer bacteria live on dead organisms that fall from the surface layers or on the other fish and invertebrate species that live in the deep sea (Arms and Camp, 1987).

Threatened and Endangered Species. Threatened and endangered plant and animal species may occur in any of the biomes. The federally listed species can be found in 50 CFR Part 10. Critical habitats for threatened and endangered species are those environments that are essential to the continued existence of the species. These areas may require specific management considerations above those required for the species themselves under the Endangered Species Act.

Sensitive Habitats. Sensitive habitats may also occur in any of the biomes. Many of these areas support wildlife that have important life functions provided by these habitats.

Wetlands protected under Section 404 of the CWA are defined by the U.S. Army Corps of Engineers (USACE) as areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. They are found in all biomes, but are concentrated in Alaska, the northeast, mid-Atlantic, southeast, and south-central regions of the United States. Wetlands provide important functions including critical wildlife habitat, water cleansing, flood control, and recreation. Although wetlands can be found in saltwater habitats such as estuaries, they are not typically found in marine environments.

Numerous sensitive wildlife areas occur within the biomes and in the marine environment. Some of these areas are protected through laws and regulations. The Wild and Scenic Rivers Act protects pristine rivers that often provide habitat for marine species for part of their life spans, such as salmon. Wildlife wintering areas, wildlife watering areas, wildlife breeding

areas, National Wildlife Refuges, National Marine Fisheries, and wilderness areas are all important to the health of the biologic environment. Other open space, such as national and state forests and parks, also provide a wildlife habitat function and aid in maintaining open space for the continued existence of wildlife species.

3.10 LAND USE AND AESTHETICS

Land use is defined as the human use of land for residential, recreational, religious, and aesthetic purposes; for economic production; or for natural resources protection. The land base within the United States encompasses wide variations in land cover. These variations have led to diversity in the types of land uses. Changes in land use may have both beneficial and adverse impacts on other resources.

Aesthetics is the appearance of a landscape described in terms of landform, vegetation, water, and man-made features. They are those man-made or natural features that can be seen. The elements that make up a landscape unit are described in terms of their visual quality within a physiographic region.

Land under federal jurisdiction includes national parks, national forests, national grasslands, national wildlife refuges, national scenic waterways, wilderness areas, wilderness study areas, Native American lands, military installations, and other land protected, owned, or managed by federal agencies. On the state level, restrictions on land use can include state parks, state conservation districts, growth management regulations, and statewide air and water quality regulations. Each of these restrictions can limit the type and density of development. On a regional or local level, zoning ordinances that restrict the type and amount of development within a specified area are common.

Generalized land uses within the CONUS include agricultural and federally owned land. Although found throughout the CONUS in large or small parcels, agricultural uses are generally found in large tracts in the central and western portions of the United States. Agricultural uses include cropland, grazing, farms, and other related industries.

Urban and rural population centers are situated throughout the CONUS. The most densely populated areas in the CONUS are in the eastern one-half of the United States and along the Pacific coast. Major concentrations of population are along the Atlantic coast from Boston to Washington, DC; along the Great Lakes; and along the Pacific coast, primarily in southern California and around Puget Sound in the state of Washington. The least populated areas are in the western one-half of the United States. Most of the inland portions of the western states consist of a few densely populated areas separated by large areas with few or no people. Land uses associated

with these areas primarily include residential uses, with supporting commercial, industrial, and other uses such as schools and hospitals.

There are approximately 1.9 billion acres in the CONUS. Approximately 400 million acres in the CONUS are owned by the federal government; almost 90 percent of this acreage is in the western states. Included in these federal lands are national parks, forests, and wildlife refuges and Bureau of Land Management (BLM) lands (U.S. Air Force, 1994).

The U.S. Forest Service is the responsible authority for the national forests and national grasslands located within the CONUS. There are 157 national forests situated in the 48 states. These national forest lands comprise a gross acreage of 169 million acres (U.S. Air Force, 1994).

The National Park Service (NPS) is the responsible authority for the national parks situated within the CONUS. The NPS oversees 41 parks that together comprise approximately 27 million acres.

The USFWS is the responsible authority for national wildlife refuges situated within the CONUS. There are 472 wildlife refuges situated in the CONUS, occupying approximately 14 million acres (U.S. Air Force, 1994).

The NPS is the responsible authority for national scenic waterways. There are nine national scenic waterways that comprise approximately 293,000 acres. Wilderness areas are public lands administered by the BLM, National Forest Service, and NPS. These areas are defined as roadless areas of 5,000 acres or more that provide resource value, naturalness, solitude, or unconfined recreation. Wilderness areas in the CONUS comprise a total of approximately 68 million acres (U.S. Air Force, 1994).

Native American lands are administered by the Bureau of Indian Affairs and comprise approximately 57 million acres within the CONUS. The majority of Native American lands are in the western United States. The largest of these areas is the Navajo Reservation, which encompasses approximately 15.6 million acres in Arizona, Utah, Colorado, and New Mexico (U.S. Air Force, 1994).

In addition to federal lands are 1.5 billion acres of nonfederal lands, of which approximately 77 million acres are developed. Nonfederally owned lands include agricultural areas, other recreational areas, and population centers (U.S. Air Force, 1994).

3.10.1 Region of Influence

The ROI for land use would encompass the military range land and surrounding land area subject to impacts, directly or indirectly, from the Air Drop program. The ROI for aesthetics is defined as an area of visual effect

from subject sites, and areas from which project activities can be seen. Determining the ROI would require taking an inventory of the resources surrounding the site of each Air Drop activity, evaluating land use in and around the site, and evaluating the appearance of the site as seen from surrounding areas.

3.10.2 Range of Conditions

The ROI could include a wide range of landcover types, from desert, to forest, to tundra, to coastal areas. Populated areas within the ROI could range from those that are virtually devoid of human inhabitants to those that are densely populated (although most ranges are sparsely or not at all populated). Because each region has its own identity and aesthetic qualities, the potential degradation of aesthetic quality by an activity would depend upon the character of the proposed activity, its visibility, and viewer expectations for the surrounding area.

Depending upon where the Air Drop program would be implemented, adjacent land uses could vary widely from desert, forest, grassland, grazing land, and cropland, to small towns and large urban areas. Land areas could include or be adjacent to protected areas such as national or state forests, cultural or historic sites, wildlife refuges or natural resource conservation districts, or coastal areas.

3.11 SOCIOECONOMICS

Socioeconomics encompasses the social, economic, and demographic variables associated with community growth and development that have the potential to be either directly or indirectly affected by external events such as changes in public policy. Social consequences (e.g., adverse health effects from poor air quality conditions) affect the overall quality of life enjoyed by the residents of a community. Economic consequences (e.g., increased health care costs, decreased tourism) affect business activities, market structures, procurement methods, and dissemination of goods within and between communities. Demographic consequences (e.g., out-migration of firms and labor because of increased business costs) affect size, distribution, and composition of community population. A community can be described as a dynamic socioeconomic system, wherein physical and human resources, technology, social and economic institutions, and natural resources interrelate to create new products, processes, and services to meet consumer demands. The measure of a community's ability to support these demands depends upon its ability to respond to changing environmental, social, economic, and demographic conditions.

3.11.1 Region of Influence

The ROI for socioeconomics would encompass any area within which implementation of the Proposed Action or alternatives could cause changes in the social or economic variables associated with community growth and development. These areas could include test ranges, overflight areas, and safety areas.

3.11.2 Range of Conditions

Socioeconomic conditions in the ROI will vary with the type of land use, population, types of socioeconomic activity, and other factors. With respect to socioeconomics, communities within the ROI may be classified into four categories or community types: uninhabited regions, rural areas/small communities, medium-size communities, and large metropolitan areas. Air Drop Target System activities could be situated in a variety of these socioeconomic settings. Although Air Drop Target System activities would be associated with existing military ranges, exact locations and requirements are unknown at the programmatic level.

The primary focus of this analysis relative to socioeconomics is the relationship between the project's socioeconomic factors (labor, capital, land) and the ROI's ability to accommodate or absorb these demands. Socioeconomic issues and concerns focus primarily on how changes in regional economic activity facilitated by operation of the Air Drop Target System activities might affect the demographic composition and economic capacity of a host community and, in turn, the human and natural environment of a region.

Typical characteristics of the four socioeconomic categories of communities include:

- **Uninhabited Regions.** This category includes unpopulated portions of the United States, United States Territories, foreign lands, or open ocean. Economic activity is limited or nonexistent. The primary issue is restriction of the existing activities allowed on these unpopulated areas by project-related public safety buffers and the availability of infrastructure to support an activity.

- **Rural Areas/Small Communities.** This category includes rural areas or small communities with populations of less than 50,000. These are small business centers, and have a small workforce and little diversification of industries and employment. Some of these areas are isolated areas in hilly or mountainous regions whose local importance is unquestioned, but whose tributary areas are too small to support a larger business center. Public services and infrastructure networks are generally limited; however, capacity of services would vary with each location. Small towns generally have small, specialized economies and relatively large basic

sectors dependent on export activities. The primary issue is restriction of the existing activities by project-related public safety buffers on land and infrastructure networks, and the availability of an employment and industrial base to support an activity.

- **Medium-Sized Communities.** This category includes areas with populations typical of a Metropolitan Statistical Area (MSA). An MSA is defined as an area with a city of at least 50,000 in population or an urbanized area of at least 50,000 with a total metropolitan population of at least 100,000. These communities usually operate as local to regional centers for economic activity. A local center usually has the largest community within a radius of approximately 50 miles. However, a larger regional or nationwide center is nearby for wholesaling, finance, and similar activities that do not involve the consumer directly. A regional center usually would be the largest community within a radius of 100 to 150 miles. This area serves as a wholesaling center and headquarters of many regional businesses. The number of employment sectors is higher than in small communities, and economic relationships would exist among only a limited number of industries. Public services and infrastructure networks would tend to be more extensive than in smaller communities. The primary issue is restriction of the existing activities by project-related public safety buffers, and the availability of an employment and industrial base to support a large activity.

- **Large Communities.** This category includes communities with populations similar to those of a Consolidated Metropolitan Statistical Area (CMSA). A CMSA consists of two or more primary MSAs that can be considered a single unit for statistical purposes because of economic and social integration. To qualify as a CMSA, the metropolitan area as a whole must have a population of at least 1 million. These communities usually are independent centers of large-scale financial, wholesaling, and service activity. These areas typically have high population densities and numerous employment sectors. Economically supportive relationships among industries are well developed, and a large pool of labor exists. These areas are well served by public services and infrastructure. However, major transportation networks may be operating at, near, or over capacity. Large and diversified metropolitan regions, which provide a wide range of goods and services to local residents, generally have a relatively small export or basic sector. The primary issue is restriction of the existing activities by project-related public safety buffers, and the availability of an employment and industrial base to support unique activity.

3.12 ENVIRONMENTAL JUSTICE

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was issued by the President on February 11, 1994. Objectives of the EO include development of federal

agency implementation strategies, identification of minority and low-income populations where proposed federal actions have disproportionately high and adverse human health and environmental effects, and participation of minority and low-income populations. Accompanying EO 12898 was a Presidential Transmittal Memorandum that referenced existing federal statutes and regulations to be used in conjunction with EO 12898. The memorandum addressed the use of the policies and procedures of NEPA. Specifically, the memorandum indicates that, "Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 U.S.C. Section 4321, et. seq." Although an environmental justice analysis is not mandated by NEPA, DOD has directed that NEPA will be used as the primary approach to implement the provisions of the EO.

3.12.1 Region of Influence

The ROI for environmental justice would encompass the areas of impact (impact footprint) for each resource for which adverse impacts occur. Adverse impacts, as defined by the Federal Interagency Working Group on Environmental Justice, are those impacts that would have a negative effect on human health or the environment that is significant, unacceptable, or above generally accepted norms. Impacts could include direct effects on resources, indirect effects (e.g., increased population or employment), and cumulative effects of the Proposed Action and reasonable foreseeable future actions. Impact footprints typically vary for each resource. Identifying areas where adverse environmental impacts may occur will define the areas where environmental justice analysis will be focused, to determine whether minority or low-income communities living in those areas will be disproportionately affected by a Proposed Action.

3.12.2 Range of Conditions

Although EO 12898 provides no guidelines as to how to determine concentrations of minority or low-income populations, demographic analysis can provide information on the approximate locations of minority and/or low-income populations in areas potentially affected by a proposed action.

The 1990 Census of Population and Housing reports numbers of both minority and low-income residents. Minority populations included in the census are identified as Black; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; Hispanic; or Other. Poverty level (used to define low-income populations) is reported as the number of families with income below $12,764 for a family of four in 1989 (as reported in the 1990 Census of Population and Housing).

In developing statistics for the census, the U.S. Department of Commerce, Bureau of the Census, has identified small subdivisions, called census tracts, that are used to group statistical census data. Census tracts, or equivalent census areas (i.e., Block Numbering Areas [BNAs] for nonmetropolitan or rural areas) can be used to locate minority and low-income populations living in areas impacted by a proposed project. In order to determine whether disproportionate impacts to minority or low-income populations would result from the Proposed Action, census data for each tract (or BNA) that underlies an impact footprint is analyzed to determine if it contains a disproportionately high percentage of minority and/or low-income residents. This determination is made by comparing the percentages of minority and low-income residents in each census tract with the corresponding percentages in the community of comparison (COC).

Governmental or geopolitical units are used as the basis for the COC, which is defined as the smallest governmental or geopolitical unit that encompasses the impact footprint for each resource. Most often, the COC is at the county level, but the COC could include cities, towns, tribal governments, or resource-specific agencies (e.g., air quality control boards for the air quality resource footprint). The demographic profile of the COC provides the context within which the environmental justice analysis will be conducted.

The results of the comparison of the affected census areas to the COC determine if adverse impacts affect areas of disproportionate minority or low-income populations. If a census tract has higher percentage of minority and/or low-income populations included within them than the COC, or has a minority and/or low-income population percentage greater than 50 percent, that census tract could be disproportionately affected by adverse environmental impacts.

Examples of potential environmental impacts that could result in environmental justice impacts are as follows:

- Impacts to potable surface water or groundwater quality or levels
- Local air quality impacts such as plumes from a point source or traffic-related levels adjacent to a highway or at intersections
- Impacts to fish and wildlife where these resources are consumed for subsistence
- Impacts to cultural or religious sites
- Noise impacts caused by increased traffic or aircraft noise
- Changes in land use

- Transportation and utility effects that could result in environmental impacts

- Other possible environmental impacts.

If a census tract has a lower percentage of minority and/or low-income populations than the COC, and a percentage less than 50 percent, it is presumed that there are no disproportionate impacts on minority or low-income populations. In this case, no further environmental justice analysis or mitigation is necessary. Additional outreach could be performed to verify that there are no concentrations of isolated minority or low-income populations with the footprint that would be impacted.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents the potential environmental consequences from the Proposed Action and No-Action Alternative described in Chapter 2.0. The analysis of potential environmental consequences involves an evaluation of changes in the natural and human environment that may result from implementation of the proposed Air Drop Target System and the No-Action Alternative. These effects are evaluated relative to the existing environment as defined in Chapter 3.0. Anticipated direct and indirect impacts are quantitatively and/or qualitatively assessed, with consideration of both short- and long-term effects. Evaluation of the potential to cause significant environmental consequences was based upon the tests of significance outlined in CEQ regulations for NEPA. The environmental consequences of each alternative are summarized and compared in Section 2.5 of Chapter 2.0.

The environmental consequences are assessed at a programmatic level necessary to support a decision of whether to proceed or not with the Air Drop Target System program as a viable target system. The environmental impacts of the Air Drop Target System at specific ranges are not considered. Future environmental documentation will be prepared as necessary to support decisions for specific test programs at candidate locations.

In accordance with NEPA, cumulative impacts that result from the incremental impact of the Proposed Action when added to other past, present, or reasonably foreseeable future actions are discussed, as applicable, by resource in this chapter. The means of mitigating environmental impacts resulting from the Proposed Action are also discussed, as applicable.

4.1 AIR QUALITY

4.1.1 Proposed Action

Significant impacts to air quality are not expected under the Proposed Action. The Air Drop Target System would result in emissions of criteria and HAPs. Sources of pollutants associated with the Air Drop Target System would include emissions from the C-130 and NP-3D aircraft operations, the target launch exhaust, non-road mobile sources associated with support equipment, on-road mobile sources associated with component transport and employee commutes, and potential VOCs associated with preprocessing activities. No construction activities or associated emissions would occur under the Proposed Action. Operational emissions would generally be episodic and brief in duration. The majority of the operational air emissions would occur from the exhaust of the launch vehicle.

The solid-rocket propellant combustion products are shown in Table 4-1. The rocket motor would be ignited at approximately 5,000 feet above MSL and

Table 4-1. Total Combustion Products for the Air Drop SR-19-AJ-1 (modified) Rocket Motor

Combustion Products	Pounds
Aluminum Oxide	3,886
Carbon Monoxide	2,919
Hydrogen Chloride	3,084
Nitrogen	1,200
Water	1,708
Hydrogen	257
Carbon Dioxide	633
Other	164
Total	13,851

Note: Amount of combustion product does not include any conversion of products due to afterburning or atmospheric reaction.

Source: U.S. Navy, 1996

then rapidly ascend out of the lower atmosphere on a ballistic trajectory. Emissions associated with the landing and take-off (LTO) cycle of the C-130 and ancillary aircraft are shown in Table 4-2. Based upon previously published analyses for similar DOD and National Aeronautics and Space Administration (NASA) programs, preprocessing emissions should be minimal. Stationary sources associated with the Air Drop Target System would be subject to applicable PSD and New Source Review permits on a facility-by-facility basis. On-road vehicles and support equipment would generate mobile source emissions. However, activity levels are expected to be minimal and result in negligible increases in emissions of criteria pollutants.

Table 4-2. Emissions from a Typical C-130 or NP-3D LTO Cycle[a]

Pollutant	Emissions, in pounds
Carbon Monoxide	37.4
Nitrogen Oxides	7.0
Sulfur Dioxide	1.4
Volatile Organic Compounds	21.6
PM_{10}	1.1

Note: (a) Emissions per LTO cycle include, taxi in/out, takeoff, climbout and approach, and associated aerospace ground equipment support.
LTO = landing and take-off
PM_{10} = particulate matter equal to or less than 10 microns in diameter

The target launch exhaust would result in emissions of aluminum oxide (Al_2O_3), CO, HCl, and other pollutants, as shown in Table 4-1. CO is a criteria pollutant and is compared to the NAAQS. Al_2O_3 in the rocket exhaust is a solid dust, and is conservatively assumed to be PM_{10} for comparison with the NAAQS. HCl is not a criteria pollutant, but is included in the 189 HAPs listed in Title III of the CAA. Its concentrations are compared to the National Research Council guidelines. Dispersion of these pollutants from ground-launch systems during lift-off have been extensively studied. The short-term

air quality impacts caused by the launch of an individual Hera target missile (a two-stage target missile using an SR-19-AJ-1 rocket motor as the first stage and an M57A-1 rocket motor as the second stage) was modeled for the TMD Hera Target Systems EA (U.S. Army Space and Strategic Defense Command, 1994a). The TSCREEN PUFF computer model results indicated that, for a normal launch, neither the relevant NAAQS nor the HCl guidelines are expected to be exceeded for distances greater than 0.6 mile from the launch.

Results from the screening model also indicated that the emission concentrations for a missile failure accident scenario (at ground level) would not exceed the NAAQS or HCl guidelines for distances greater than 0.6 mile, with one exception. The Short-Term Public Emergency Guidelines for HCl could potentially be exceeded at 3.1 miles from the launch. Because the target LHA would be cleared during launch, it is not expected that the public would be exposed to levels above the guidelines in an accidental scenario. In addition, the Air Drop Target System only consists of the second stage of the Minuteman II rocket motor; therefore, emissions are expected to be less than those analyzed for the entire Hera target missile. Therefore, impacts to the air quality in the lower atmosphere are not expected to be significant from the launch of the Air Drop target missile.

Impacts to the applicable annual NAAQS and state Ambient Air Quality Standards (AAQS) would be dependent upon the number of launches at a given location per year. Previous dispersion modeling studies for launching the STARs vehicle at the USAKA demonstrated that the launch of 84 rockets in a single year resulted in predicted annual emission concentrations that do not exceed the NAAQS. The concentrations of key emissions are documented under the High Level of Activity Alternative in the USAKA EIS (U.S. Army Space and Strategic Defense Command, 1993). Subsequent site-specific analyses for candidate location and specific test programs should be conducted to assess potential cumulative impacts of the annual launches to the NAAQS and the state AAQS.

The potential for minor impacts exists from hydrochloric acid formed by the hydration of the HCl gas. Except during rainy or very high humidity conditions, the HCl gas remains dry and is quickly dispersed into the atmosphere. However, precipitation during or immediately after a launch may lead to rain mixing with the HCl in the air, and result in localized near-field deposition of acidic rain (U.S. Army Space and Strategic Defense Command, 1994a).

Profiles of peak ground-level concentrations are a function of distance from launch and are based upon typical weather parameters, expected performance and trajectories of the vehicle, and other modeling assumptions. Meteorological monitoring and air modeling could be performed before a test

launch to minimize pollutant dispersal and its impact to human health and the environment.

The Conformity Rule (40 CFR Part 93, Subpart B) applies to federal actions occurring in federal nonattainment or maintenance areas. The rule defines the applicability criteria, including several source exemptions and emission thresholds that determine whether the federal action requires a formal written conformity determination. If the federal action's total direct and indirect emissions remain below the emission thresholds, the action is presumed to conform, and no written conformity determination is required. The definition of total direct and indirect emissions for conformity purposes distinguish emissions according to timing and location, rather than the type of emission source. Direct emissions occur at the same time and place as the federal action. Indirect emissions include those that may occur later in time or at a distance from the federal action. In addition, the Conformity Rule limits the scope of indirect emissions to those that can be quantified and are reasonably foreseeable by the federal agency at the time of analysis, and those that the federal agency can practicably control and maintain control through its continuing program responsibility.

Emission sources associated with the Air Drop program would not be exempt from the Conformity Rule. Total direct and indirect emissions associated with the Proposed Action would include all emissions occurring below the mixing height of the affected air quality region including launch preprocessing operations, on-road and off-road motor vehicles associated with on-site activities, transport and employee commutes, and aircraft operations at the range. Air Drop target launch exhaust could potentially be considered a direct emission source depending upon the location and meteorology of the candidate launch site.

Future site-specific analysis must assess the conformity of the specific Air Drop test activities at a candidate installation with the applicable SIP. The analysis would consider the peak annual total direct and indirect emissions expected at the candidate installation. These emissions would be compared to the applicable de minimis emission thresholds for each nonattainment pollutant. The specific de minimis thresholds vary by pollutant and nonattainment status, ranging from 10 to 100 tons per year (Table 4-3).

If the Air Drop Target System activities within a given air quality region generate total direct and indirect emissions that remain below the de minimis emission thresholds, the action would be presumed to conform, and no written conformity determination would be required. If the specific Air Drop Target System activities at a given test range are subject to a formal conformity determination, one of five criteria may be used to demonstrate positive conformity. These criteria are based upon the type of

Table 4-3. Conformity de minimis Emission Thresholds

Pollutant	Status	Classification	de minimis Level (tons per year)
Ozone (measured as NO_x or VOCs)	Nonattainment	Extreme	10
		Severe	25
		Serious	50
		Moderate/marginal (inside ozone transport region)	50(VOCs)/100 (NO_x)
	Maintenance	All others	100
		Inside ozone transport region	50 (VOCs)/100 (NO_x)
		Outside ozone transport region	100
Carbon monoxide	Nonattainment/maintenance	All	100
Particulate matter	Nonattainment	Serious	70
		Moderate	100
	Maintenance	NA	100
Sulfur dioxide	Nonattainment/maintenance	NA	100
Nitrogen oxides	Nonattainment/maintenance	NA	100

NA = not applicable
NO_x = nitrogen oxides
VOC = volatile organic compound

pollutant and status of the applicable SIP. Examples include revising the applicable SIP to incorporate enforceable control measures to fully offset the net emission increase, or fully offsetting the net emission increases from other surplus emission reductions that become available in the region. Specific conformity determination requirements will be evaluated by the test program proposing to use the Air Drop target and by their servicing range to avoid significant air conformity impacts.

4.1.2 No-Action Alternative

Under the No-Action Alternative, there would be no emissions associated with Air Drop launches, and testing would continue using existing ground-launched targets. Because there would be no change in the existing conditions, significant impacts to air quality would not be expected.

4.2 UPPER ATMOSPHERE

4.2.1 Proposed Action

Impacts to the upper atmosphere would occur during launches of the solid-rocket motor into and through the stratosphere. The Air Drop target would emit chlorine and other ozone-depleting combustion products when burning propellants. Emissions of these ozone-depleting compounds from Air Drop

Target System activities would be minor per launch relative to other anthropogenic sources.

The rate of the Air Drop target launches would influence the potential impacts to the upper atmosphere. While the large Space Shuttle and Titan IV rockets are not part of the Air Drop Target System, past research suggests that combustion products from these launches do not generally pose a threat to stratospheric ozone levels. For example, based upon impact modeling of 9 space shuttle and 6 Titan IV launches per year, approximately 726 tons of chlorine were released into the stratosphere. This is relatively small compared to the 300 kilotons of chlorine released annually from industrial sources worldwide. These studies address larger rocket vehicles than those used for the Air Drop Target System. Therefore, the Air Drop rocket motor exhaust would emit substantially less chlorine per launch than the Space Shuttle or Titan IV launches. Subsequent site-specific analyses for candidate location and specific test programs should be conducted to assess potential cumulative impacts to the upper atmosphere from multiple launches.

4.2.2 No-Action Alternative

Under the No-Action Alternative, there would be no emissions associated with Air Drop launches, and testing would continue using existing ground-launched targets. Because there would be no change in existing conditions, significant impacts to the upper atmosphere would not be expected.

4.3 AIRSPACE

4.3.1 Proposed Action

Hazardous air operations require specially designated airspace to protect nonparticipating aircraft. Air Drop flight activities would require either restricted airspace or, if over water, warning areas. Most of the airspace requirements for Air Drop Target System activities would occur over existing government test ranges with a history of such flight operations.

At maximum range, flight of the Air Drop target would require an area somewhat more than 580 km (360 miles) long, 74 km (46 miles) wide, and from the surface to an altitude of 220 km (140 miles). (For most Air Drop test events, airspace would also be required for interceptors and for the expected debris from successful intercepts.) Most of the areas along the flight path would either require restricted airspace or warning areas. During launch activities, the airspace within the restricted and warning areas would be closed to all nonparticipating aircraft at certain altitudes. At the initial launch point, debris drop zone, and target intercept, the airspace would be restricted from the surface to an unlimited altitude in accordance with FAA requirements. As the target vehicle gains altitude along the flight path, Air

Drop target flight altitudes above 60,000 feet above MSL should not affect airspace or nonparticipating aircraft flight activities.

The use of established restricted airspace or warning areas within an existing test range should have minimal impacts on the government air operations that use those areas, since these types of activities are routine. If the Air Drop Target System program would require additional hours of use other than currently allowed by the FAA, then the scheduling agency would have to coordinate with the FAA. If Air Drop flight operations would require establishment of new restricted airspace or warning areas, then the restricted area proposals and final action must both be published in the Federal Register. The FAA would not normally allow restricted airspace to be designated lower than 1,200 feet above the surface. If a valid reason exists and there is a minimal adverse effect on the overall system, restricted areas may be designated lower than 1,200 feet above the surface. The surface may be designated as the floor only when the using agency either owns, leases, or by agreement controls the underlying surface. For any change in airspace, coordination with the FAA would be required (U.S. Army Space and Strategic Defense Command, 1994a). The FAA would reassess the airspace configuration to determine if such changes would adversely affect ATC systems and/or facilities, movement of other air traffic in the area, or airspace already designated and used for other purposes (i.e., restricted areas). This coordination with the FAA should eliminate the potential for adverse effects on the NAS caused by the Air Drop program. Any rerouting of commercial traffic because of the Air Drop program would be short-term and intermittent. If the Air Drop program uses an existing government test range or other airspace that requires modification or addition of restricted or warning area airspace that impacts the NAS, the FAA may not allow the airspace revisions.

4.3.2 No-Action Alternative

Under the No-Action Alternative there would be no Air Drop activities; therefore, there would be no change in current authorized programs. No significant impacts to the NAS would result from the No-Action Alternative.

4.4 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

4.4.1 Proposed Action

Hazardous materials and waste issues associated with the Proposed Action involve fueling and maintenance of support aircraft (C-130 and NP-3D); transport, storage, and maintenance of solid propellant rocket motors; materials used for target and sled preparation and integration; materials required for maintenance and operation of support equipment (e.g., cooling required for the target while in the transport aircraft); ordnance and explosives associated with the target and sled assemblies; and debris

produced by an unignited or flight-terminated target system. The Proposed Action does not involve any construction or ground-disturbing activities. Therefore, no impacts to or constraints imposed by the presence of any hazardous waste-contaminated sites or efforts to remediate them would be expected.

Installations that use hazardous materials and generate hazardous wastes must comply with applicable federal and state laws and regulations and DOD directives. The Air Drop program requirements would be incorporated into existing or modified installation/range procedures and management plans, as required.

Because the Air Drop program would be deployed only at those installations capable of accommodating C-130 aircraft, facilities, equipment, and materials required to support aircraft operation are anticipated to be in place. Aircraft maintenance and fueling would be routine activities conducted at the installation(s) selected. The installation would have procedures in place for the proper storage and use of hazardous materials, and the handling and disposal of hazardous wastes associated with aircraft operations and maintenance. Maintenance and fueling requirements for the Air Drop support aircraft would not be expected to present a significant impact to existing hazardous material and hazardous waste management procedures on the installation.

Transportation of the solid propellant rocket motors would be conducted in accordance with 49 CFR Parts 100-199, as described in Chapter 3.0. Because the Air Drop program would require existing ordnance storage facilities and OAB, explosive storage and handling procedures would be in place at the selected installation(s). Storage and handling of ordnance and explosives are discussed in more detail under Section 4.6, Health and Safety.

In the event of flight termination of the target system, or if the target system should fail to ignite, missile components and/or debris could be produced. The primary hazardous component of this debris would be fragments of solid propellant. Debris landing on the ground outside normally designated ordnance impact areas would be recovered in accordance with range operation procedures. Debris would also be recovered as required by the needs of the test programs and/or as range operating procedures. Existing range recovery procedures are in place at these installations, thus precluding potential significant impacts. Debris occurring on the open ocean would not be recovered, except for the main parachutes. The impact of rocket motor debris on ocean water quality was addressed in the Air Drop Overseas EA (U.S. Navy, 1996), which concluded that the environmental impact to ocean water would be expected to be minimal. The possibility of water pollution associated with the Air Drop Target System would be primarily associated with the rocket motor propellant, which is soluble. Other hazardous materials on the Air Drop Target System including explosive, pyrotechnic, and other

hazardous components and devices would be expended or nearly expended before entry into the ocean. Air Drop Target System materials, such as heavy metals and plastics, would decompose at a slow rate in the marine environment.

In the event of unburned rocket motor propellant falling into the ocean, small fragments of fuel may float on the surface, but would eventually become waterlogged and sink. Solid propellant is primarily composed of rubber mixed with ammonium perchlorite. Although definitive information on the solubility and toxicity of propellant in seawater does not exist, it is expected that the material would slowly dissolve, and in the most conservative case, toxic concentration of ammonium perchlorite would be expected only within a few yards of the source material. Any area affected by the slow dissolution of the propellant would be relatively small due to the small size of the rocket motor or propellant pieces relative to the quantity of the water (U.S. Navy, 1996).

4.4.2 No-Action Alternative

Under the No-Action Alternative, no hazardous materials associated with Air Drop program activities would be used and no related hazardous wastes would be generated. No changes in existing hazardous material usage and hazardous waste generation due to Air Drop program activities on DOD installations or ranges would occur.

4.5 NOISE

4.5.1 Proposed Action

Brief, intermittent periods of noise could be generated by Air Drop launches and aircraft used in the missile launch. Measures to protect workers near Air Drop operations would comply with OSHA and DOD standards. Nearby residents could be disturbed by these noise events, but should not be exposed to levels exceeding OSHA standards. Most noise events would originate from existing government test ranges with a history of similar noise generation. No significant impacts to the noise environment are expected under the Proposed Action.

The greatest potential for noise under Air Drop activities would be from the launch of the SR19-AJ-1. No noise data exist for the SR19-AJ-1, but data are available for the M56A-1 that is similar to the SR19-AJ-1. Initial analysis showed that the M56A-1 has a higher acoustic power and would generate slightly higher noise levels. The noise levels in this section are associated with the M56A-1; any noise effects from the SR19-AJ-1 would be less (U.S. Army Space and Strategic Defense Command, 1994b). Expected noise levels from the M56A-1 are shown in Table 4-4. OSHA noise exposure standards for workers limit the maximum noise level for a period of

Table 4-4. M56A-1 Noise Levels (A-Weighted dB)

Related Impact	Sound Level	Distance to Related Impact (in feet)
Maximum levels specified Instantaneous hearing damage; possible structural damage	140	225
Recommended minimum distance for all noncritical personnel; no hearing protection required for noises of less than 10 minutes; possible short-term hearing loss; window rattling	115	3,000
Highly annoying sound level	92	14,500
Most residents annoyed	82	30,000

Source: U.S. Army Space and Strategic Defense Command, 1992.

15 minutes or less to 115 A-weighted dB. The maximum impulse noise without protective equipment is limited by the Air Force to a 140-dB peak.

The Air Drop vehicle would be launched from an altitude of approximately 5,000 feet above MSL and would quickly gain in elevation. Noise levels would be approximately 115 A-weighted dB at ground level directly below the launch point. This noise level would be of short duration and below the OSHA threshold requiring hearing protection. The initial launch point of the Air Drop vehicle would occur over existing government ranges in remote locations with a history of similar rocket noises or in areas that would be clear of people. Because the launch would occur in remote areas and noise levels on the ground would be below OSHA safety requirements, no impacts from subsonic rocket noise would be expected. Launches over open water not near any sensitive receptors (e.g., an island with a population) would have no noise impacts on the human environment. Noise from the C-130 aircraft would be infrequent and would not affect the DNL noise contours at the test range airfields.

Sonic booms would be generated by movement of the Air Drop target at speeds greater than the speed of sound. The sonic boom would occur along the vehicle path, and the sound level on the ground would depend upon the flight profile and the atmospheric conditions. The sonic boom would be directed toward the front of the vehicle downrange of the launch point. The Air Drop vehicle would exceed the speed of sound when it reaches an altitude of approximately 3 miles, and would remain in excess of the speed of sound for the balance of the flight. While above the Earth for most of the flight, there would be insufficient atmosphere to transmit sound pressure

waves. As the Air Drop vehicle begins to descend, sonic boom levels could reach 8 to 16 psf (U.S. Army Space and Strategic Defense Command, 1994b). These psf levels could cause glass to fail, plaster in buildings to crack, roofs to be affected, internal walls to move, and secure items in the home to fall from the walls. These noise levels should occur over existing government ranges in remote locations, away from sensitive receptors that could be affected by such noise levels. Subsequent site-specific analysis will consider impacts from noise for specific test programs.

The energy from sonic booms is primarily in the 2-Hertz (Hz) through 10-Hz range (considerably below that of gunfire and most industrial noise). Tests conducted in 1968 at Tonapah, Nevada, showed that sonic booms with overpressures from 50 to 144 psf did not create hearing loss to the exposed people. Test on subjects exposed to simulated air-bag noise at peak levels as high as 80 psf showed that temporary changes in hearing were mainly caused by high-frequency noise, not the low frequencies found in sonic booms (Sommer and Nixon, 1973). Because the sonic booms associated with the Air Drop System would only be up to 16 psf, no impacts to human hearing would occur.

4.5.2 No-Action Alternative

Under the No-Action Alternative, there would be no change in current authorized programs. Therefore, there would be no significant impacts to the noise environment.

4.6 HEALTH AND SAFETY

4.6.1 Proposed Action

Potential issues related to health and safety include launch and flight safety/mishaps, establishment of designated safety zones, missile debris impacts, transportation of Air Drop target components, explosive safety, and hazards of Air Drop booster emission products.

Issues related to transportation of Air Drop target components, explosive safety, and hazardous emission products are indirectly related to the location or test range where operations occur, and are not considered site-specific; potential impacts are applicable at all test locations. Flight safety issues are also similar at all ranges, but intensity of impacts can vary considerably from range to range.

Flight Safety Issues

The following issues would be identical for each range. However, the intensity of impacts would be specific to the candidate range location.

- Launch-site malfunction: A missile could malfunction or deviate from its anticipated flight path immediately after takeoff (requiring that the flight be terminated using the FTS). Debris resulting from a launch-site malfunction could result in the scattering of missile debris anywhere within the LHA.

- In-flight malfunction: An in-flight missile could malfunction and travel outside its established flight path. This event would require that the flight be terminated using the FTS to prevent the flight from encroaching on possible populated areas or busy airspace. The resulting debris would impact within the flight corridor ground footprint.

- Successful Intercept: Debris from both the target and defensive missiles from a successful intercept test would impact within predefined target debris area. The target debris area would be determined based upon mission kinematics (motions and forces of the two missiles), but would be confined within controlled range areas or open sea areas.

- Unsuccessful Intercept: Both the target and defensive missile from an unsuccessful intercept test would either be allowed to continue along a ballistic trajectory and impact, intact, into predefined THAs or would be terminated using the FTS.

An LHA would be established around the Air Drop launch point for the purposes of:

- Containing debris that may result from a near-launch failure and resultant missile breakup or flight termination action.

- Providing protection to the public in the event instrumentation and computer systems used to monitor the flight path of the missile/target do not operate properly and the missile/target must be destroyed.

- For physical and operational security reasons.

The requirements of establishing the boundaries of an LHA would depend upon the characteristics of the missile system and the flight trajectory and the capabilities of the launching range.

At launch, the missile would proceed in the direction it is initially pointed, but could change direction within the limits of the missile system's ability to turn without tumbling. In order to prevent a missile system from proceeding out of control, each range would specify minimum tracking and response capabilities, which determine the maximum amount of time required for a flight safety officer to recognize a flight anomaly and respond by actuating the FTS.

The THA for the Air Drop target would ensure the following:

- The risk to the public for these events would be minimized
- Recovery time of the booster would be minimized
- Physical security and safety measures could be enforced
- Adverse environmental effects would be minimized.

The size of a THA would be determined by analyzing variances in normal missile system guidance, day-of-test wind variations, and other missile system variations affecting the ballistics of the vehicle. Prior to firing, missile system flight trajectories would be preplanned. As a result of preplanning the flight path, the missile would impact in or about a designated known point.

During launch activities, only mission-essential personnel would be allowed within hazard areas. Nonessential personnel are evacuated before launch and access is controlled to ensure that only authorized personnel remain.

Explosive Safety

Hazards associated with explosive devices include explosion and fire, and could be initiated by events such as transportation accidents, accidental impact or dropping of explosives, improper handling procedures, or missile system termination. These hazards would affect the safety of workers, but have only limited potential to affect public safety. Additional worker and public safety hazards would be present for persons handling explosive materials that may occur in missile debris areas (associated with flight operations, intercepts, or accidents).

Explosive handling operations are governed by facility-specific requirements. Such operations are routinely conducted at many DOD installations and are governed by established DOD, individual military branch, and local regulations that specify all required procedures. Generally, handling of explosive materials such as those proposed for use in Air Drop operations would not be considered a significant hazard in military operations. However, the potential magnitude of safety impacts will be addressed at a site-specific level for each candidate test location.

Transportation Safety

The shipment of Air Drop systems has the potential to affect the public. Transportation may occur by air or truck in specialized shipping containers designed to protect them from damage in the event of an accident. However, because the fuel and explosives are sensitive to heat, there is the potential of ignition of propellant in an accident.

NASA and DOD have considerable experience with the shipment of missiles and other sensitive components. Analyses of experience using the air and

road modes of transportation for shipment of missile systems have shown the following:

- **Air Transport.** In 1987, the U.S. Air Force reported an accident rate for C-141 aircraft (used for general transport) of 1x10-3 for every 1 million aircraft miles flown. Using this criteria, there is a probability of 1 accident in 1 million trips per 1,000 miles each.

- **Road Transport.** Specific DOD data concerning road transport of missile systems are lacking. However, representative data from the National Highway Transportation Safety Administration show a major accident rate of 6x10-8 per truck mile or a probability of 1 accident in 16,700 trips of 1,000 miles each.

In each of the above cases, the accident probability presented reflects only the potential for an accident involving the transport vehicle. Only a small fraction of such accidents would affect a missile system being transported, because of the use of specialized shipping containers that protect the shipment.

Based upon DOD experience discussed above, it can be concluded that the potential for an accident involving an in-transit Air Drop missile system would be remote and the potential for such an accident to result in the ignition of a missile or cause the detonation of explosive materials is even more remote. For this reason, it has been concluded that transportation of Air Drop components is not a significant safety hazard.

The increased use of hazardous materials, explosives, and other prelaunch activities associated with the Air Drop Target System represents a small increase in potential safety risk at existing military ranges. Flight operations associated with Air Drop would also increase the safety risk at these ranges. However, these increases are not considered to represent significant impact. Safety standards are high and would serve to keep the total safety impacts within acceptable standards to both workers and the public. Air Drop Target System activities would be conducted according to DOD and range policies, instruction, and standard operating procedures; and local, regional, and federal environmental laws and regulations. The Range Safety Operational Plan and Flight Safety Report would also be followed. Safety procedures implemented through a program safety plan would minimize the potential for safety mishaps.

4.6.2 No-Action Alternative

Under the No-Action Alternative, there would be no Air Drop launches, and testing would continue using ground-launched targets only. The ranges would be limited to currently authorized test programs, and no impacts to health and safety would be identified with the No-Action Alternative.

4.7 WATER RESOURCES

4.7.1 Proposed Action

Activities under the Proposed Action would utilize ranges with existing facilities. Possible impacts would be limited to falling rocket debris including rocket motor and solid fuel debris, and dispersed fuel or propellant. As necessary to meet the needs of the test program, conform with applicable regulations or range standard operating procedures, and to avoid significant impacts to water resources, missile components and debris impacting on land would be recovered according to existing range recovery procedures. Therefore, no significant impacts from hazardous debris on water resources would be expected. Debris impacting on the open ocean would not be recovered, except for the main parachutes. The impact of rocket debris on ocean water quality is addressed in the Air Drop Overseas EA (U.S. Navy, 1996), which concludes that the environmental impact to ocean water would be expected to be minimal. The findings of the Overseas EA are summarized in Section 4.4.1. Thus, no significant impacts to surface water resources are expected from the Proposed Action for the Air Drop program. However, subsequent site-specific analysis will consider impacts to surface water resources for specific test programs.

4.7.2 No-Action Alternative

Under the No-Action Alternative, there would be no Air Drop launches, and testing would continue using ground-launched targets only. The ranges would be limited to currently authorized test programs, and no impacts to water resources would be identified with the No-Action Alternative.

4.8 CULTURAL RESOURCES

4.8.1 Proposed Action

Ranges supporting the Proposed Action would already have existing capabilities to support the program. Activities under the Proposed Action would use ranges with existing facilities that have a history of similar activities, and would require no additional construction, ground-disturbing activities, structure demolition, or other actions that could cause irreversible physical destruction of cultural resources. Thus, no significant impacts are expected from ground disturbance from facilities and/or range support requirements for the Air Drop program.

Exposure of historic properties to noise and vibrations could initiate or accelerate the deterioration process. Long-term effects such as (1) fatigue effects in walls and other structural elements after extensive exposure, (2) moisture damage initiated by cosmetic cracks in exterior surfaces, and (3) gradual erosion of surface materials (e.g., adobe mud-plastered wall) can

occur in historic structures from repeated events. Prehistoric rock alignments or petroglyphs can be weakened and damaged as well. However, a study examining the effects of noise impacts to structures concluded that in order to cause damage to buildings, the buildings must be within 150 feet of an aircraft generating noise at DNL 120 dB. At the initial launch point, it is expected that noise levels of the SR19-AJ-A rocket would be approximately 115 A-weighted dB at ground level directly below the launch point. Additionally, the likelihood of damage decreases with distance from the centerline of the flight path, thereby reducing the likelihood of vibration-induced effects such as rockfall (U.S. Air Force, 1992). For these reasons, no significant impacts from subsonic rocket noise are anticipated.

Sonic booms created by the descent of the Air Drop target have potential to impact prehistoric resources and historic structures and buildings. The possible types of impacts to historic structures include cracking and/or crumbling of the stucco and plaster, failure of roofs and walls, and cracking or shattering of windows. Older buildings and those made of fragile materials have a higher potential to be damaged. Table 3-3 describes types of structural damage that occurs at various overpressure levels. Because up to 16 psf overpressures could occur due to sonic booms, an adverse impact could occur to historic properties.

Appropriate mitigation measures must be undertaken to reduce adverse impacts to a non-adverse level, as defined in the NHPA. Section 106 review of the undertaking should occur, first determining whether any historic properties exist that would be adversely impacted, then mitigating those impacts to a non-adverse level. Mitigation could include avoidance such as planning launches and flight patterns in locations that minimize historic properties exposure to the sonic booms, or appropriate recordation of the property. If appropriate planning or mitigation measures occur in coordination with appropriate authorities, and impacts are reduced to a non-adverse level, no significant impacts would be anticipated from sonic booms under the Proposed Action.

Debris from the launch would have an extremely low potential to fall upon and damage historic structures and buildings. With appropriate planning of launches, the probability of a direct hit by falling debris is low. Therefore, no significant impacts from falling debris are anticipated under the Proposed Action.

Debris recovery has a high potential to create adverse impacts to cultural resources. Ground disturbance caused by off-road vehicles could disturb or destroy archaeological sites. Additionally, the potential for inappropriate handling and/or unauthorized excavation of inadvertently discovered archaeological resources also creates an adverse impact. Installations that routinely conduct launches have established procedures for the recovery of launch debris to protect cultural resources. If procedures have not been

established for specific ranges, a plan for debris recovery should be established to prevent significant impact from these efforts. Measures to ensure protection of cultural resources could include minimal use of off-road vehicles, the presence of a qualified archaeologist during recovery, and implementing procedures to be followed in the event of an unexpected discovery of cultural resources. If appropriate planning occurs and applicable cultural resources legislation is complied with, no significant impacts are expected from debris recovery under the Proposed Action.

Air Drop activities could adversely impact Native American traditional properties and/or ceremonies. Ground-disturbing activities could create the same impacts as those discussed earlier. Noise and sonic booms could disrupt Native American traditional ceremonies and destroy the traditional setting of sites. Vibrations created by Air Drop launches could damage traditional Native American rock resources (e.g., rock art, rock cairns, rock alignments) by loosening materials. Native American concerns must be resolved through consultation with appropriate tribes affiliated with the area. Disruption of ceremonies could be mitigated by planning Air Drop launches at times when Native American ceremonies are not occurring. Damage to traditional properties (e.g., rock art panels) by sonic booms could be mitigated by selecting flight patterns that minimize the exposure of historic properties to the sonic booms.

Consultation with Native American tribes is mandated by the NHPA for traditional properties eligible for listing in the National Register. Native American tribes with an affiliation to the area must be identified in the project planning phase, and concerns and conflict must be resolved through consultation. NAGPRA and AIRFA have further requirements regarding projects affecting Native American properties. NAGPRA requires consultation with appropriate Native American tribes if Native American burials, items with cultural affiliation, or other cultural items as defined in the legislation would be affected by the project. If appropriate consultation procedures are implemented and appropriate planning incorporated, no significant impacts to cultural resources will be expected to traditional resources under the Proposed Action.

Overall, no significant impacts to cultural resources under the Proposed Action are expected. The determination of no significant impact is contingent upon appropriate planning, consultation, and compliance with Section 106 of the NHPA and other appropriate cultural resource legislation, as discussed below.

Section 106 review under the NHPA is required for any undertaking that has potential to impact cultural resources for specific ranges. Surveys, studies, and consultation efforts would be conducted as required under the NHPA to determine whether cultural resources that are listed in or eligible for listing in the National Register exist within the APE. If adverse impacts are identified

under the Section 106 review process for specific ranges, it would be necessary to develop mitigation measures to minimize or eliminate the adverse effect to cultural resources. Site-specific consultation, research, and field surveys may be necessary to determine whether specific activities could affect cultural resources. The results of these efforts would be included in future environmental documentation.

The provisions of other applicable cultural resources legislation including NAGPRA, AIRFA, and the Archaeological Resource Protection Act (ARPA) must be implemented at specific ranges. Efforts to fulfill these requirements may be coordinated with Section 106 review efforts. However, each law has separate requirements that may need to be fulfilled independently.

Avoidance of cultural resources is usually the preferred method of mitigation in protecting cultural resources. Where avoidance is not feasible, mitigation measures should be developed. Mitigation measures should be developed in consultation with the SHPO, the Council, and any other interested parties. If Native American resources are involved, consultation with appropriate tribes is required.

4.8.2 No-Action Alternative

Under the No-Action Alternative, there would be no Air Drop launch, and testing would continue using existing ground-launched targets. The ranges would be limited to currently authorized test programs. There are no significant impacts identified with the No-Action Alternative.

4.9 BIOLOGICAL RESOURCES

4.9.1 Proposed Action

The impacts to biological resources from the Air Drop Target System activities would be expected from the falling 2-ton pallet and sled (in the LHA), the rocket stage and falling debris from target destruction (in the impact area and THA), aircraft overflight, aircraft noise, launch noise and associated sonic boom, and the exhaust produced by the target upon firing. Debris on land would be recovered as necessary to meet the needs of the test program, conform with applicable regulations or range standard operating procedures, or to avoid significant impacts to biological resources. Therefore, significant impacts to biological resources would not be expected. Debris falling in the ocean would be expected to sink and would not be recovered. Flight termination by rupturing the rocket motor casing could cause unburned fuel and other debris to fall to the ground within the impact zones.

Collisions with migrating birds could potentially occur because various species migrate at 5,000 feet AGL. Waterfowl migration takes place predominantly at night, although they may move at any time of day, at

5,000 feet AGL, coastal and wetland areas support congregations of these species at dusk and dawn. Raptors migrate at 5,000 feet AGL during the day, but also can have a year-round presence. Other large birds, such as the American white pelican, are also found at these altitudes during the fall/spring.

Because sensitive species tend to be widely scattered and occupy small surface areas, the chance of an individual animal or plant being struck by the sled, expended rocket stage, or debris would be remote and not likely to jeopardize the continued existence of any individual species. There are site-specific cases where an individual species, such as a pupfish, is restricted to one small, but significant, spring or stream. These locations would be identified in future site-specific analyses and avoided where possible.

Fallout from the HCl cloud could slightly alter the acidity of the environment. However, because of the relatively small number of operations expected over the life of the program and the great area over which it could occur, these effects are expected to be minimal and temporary.

The Kennedy Space Center is performing a long-term study on the effects of solid-rocket booster exhaust, consisting of HCl and Al_2O_3. Although the Air Drop target would not generate ground-level exhaust or deluge water, the study does show that plants and animals are being affected by these chemical compounds. Acute near-field (within 1.5 km) deposition effects include vegetation damage, fish kills, and temporary increases in metals in water and soils. Occasional mortality of terrestrial fauna was also observed (Schmalzer, et al., 1992). Surface waters and local soils have not shown cumulative declines in pH levels. Acid spotting of plants has been observed as far away as 11.5 miles. Repeated and severe deposition could result in the loss of sensitive species, loss of plant community structure, reduction in total cover, and replacement of some species by weedy invaders (National Aeronautics and Space Administration, 1985).

Noise associated with missile launches and post-flight recovery operations is not expected to cause significant impacts to any listed species because of the infrequent sonic boom events that are expected and the high-level overflight (5,000 feet above MSL) that will accompany the launch. As a general rule, animals begin to show startle and avoidance behaviors when an intruding noise exceeds the ambient level by 10-30 dB, or over 85 dB total. A sound level of 50 dB over ambient can cause animals to panic and leave a preferred habitat (Bowels, et al., 1991). The Proposed Action would increase the short-term overflight noise level. Depending upon where the impact occurs, this level could cause a startle effect of the wildlife in the area. These overflights would occur in areas that are accustomed to similar types of noise levels. Wildlife living in these areas would not react as strongly to the flight missions as if the flights were to occur in areas not used for similar types of aircraft and missions because of acclimation of these individuals to

these disturbances. The availability of vegetation or landform cover as hiding places also temper an animal's startle response (Bowels, et al., 1991: Manci, et al., 1988). Animal responses also vary with the nature of their normal activities, location, and physical condition. They are less likely to respond if they were involved in important activities, such as feeding or guarding a calf (Bowels, et al., 1991). However, effects on sick, young, or breeding animals may be exacerbated and harmful.

Sonic booms may have some effect on wildlife, depending upon the sensitivities of the areas and species impacted. Biologists at Dry Tortugas colony in the southern tip of Florida have recorded a major reproductive failure among sooty terns (*Sterna fuscata*) when other terns had normal nesting successes that year. Sonic booms were suspected as causing this failure. After sonic booms were restricted in the area, the birds appeared to have a normal nesting success (Austin, et al., 1970). Animal responses to sonic booms are typically a simple startle response, but reactions differ according to the species involved, whether the animal is alone, and the animal's previous exposure to sonic booms (Bell,1972). This type of harassment of listed species or marine mammals will require a permit under the Endangered Species Act and the Marine Mammal Protection Act, respectively.

No visual impact is expected from the overflight of the Air Drop operations because these vehicles would be above the 550-foot AGL zone that has been shown to account for most wildlife reaction to visual stimuli (Bowels, et al., 1991).

The ranges chosen must have the capability of meeting the required safety policies and safety protocol, and would require a sweep of the impact areas before falling debris can be launched. Whales and other significant wildlife could be identified during this time to further reduce potential impacts through avoidance.

Recovery of debris from sensitive biological areas would be coordinated with applicable range representatives and agencies to develop appropriate mitigation measures to avoid impacts to sensitive resources. Test range personnel would retrieve the missile casing and propellant. Debris craters may be filled as necessary after recovery efforts have been completed.

There is some concern of marine or terrestrial wildlife ingesting toxins from the unburned propellant or becoming entangled with parachutes. Entanglement could be severe if it occurs in an aquatic environment. Chances of a marine mammal or a sea turtle becoming entangled in the parachute debris are remote because of the small amount of time the parachute would be within these species' water column before it is rescued or it sinks below their range. Ingestion of toxins would be extremely remote because of the diluting effect of the ocean water and the relatively small area

to be affected. Impact caused by the falling missile, along with the sled and pallet, could hit and kill plants or animals. Indirect effects of the falling components could cause a shock wave or frighten nearby wildlife.

Specific Air Drop test programs would have to be evaluated on a case-by-case basis to determine the exact nature of impacts to protected biological resources. Compliance with federal regulations will require documentation to address impacts to threatened and endangered species listed under the federal Endangered Species Act, species protected under wildlife protection laws (e.g., the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act), and sensitive habitats such as jurisdictional wetlands and Waters of the United States. Launches impacting biological resources on state or Native American lands may require separate consultation with the appropriate state and Native American wetlands and wildlife protection agencies under applicable regulations.

Documentation addressing individual launches will be required to partially comply with the regulatory requirements for federal actions that may harm threatened and endangered species. Specific Air Drop activities must comply with the federal Endangered Species Act of 1973 (16 U.S.C. Sections 1531-1547, et al.). Section 7 of the Endangered Species Act requires all federal actions with endangered species concerns to conduct endangered species consultation prior to irretrievable or irreversible commitment of resources. Formal consultation under Section 7 of the Endangered Species Act is required when a federal agency determines that there may be a potential impact to individuals, populations, or habitat of a species listed under the Endangered Species Act. Formal consultation is a process between the USFWS (or the National Marine Fisheries Service for oceanic resources) and the proponent federal agency that concludes with the USFWS's issuance of an opinion stating whether or not the action is likely to jeopardize the continued existence of a listed species.

In addition to addressing threatened and endangered species issues, future program-specific documentation should analyze and recommend impact-minimizing measures for actions that may affect species protected under the Migratory Bird Treaty Act (16 U.S.C. Sections 703-712), and the Bald and Golden Eagle Protection Act (16 U.S.C. Sections 668-668d). Normally, depredation permits are not issued for projects that may impact birds protected under these acts. Accordingly, the data collected would be used to develop measures to insure future actions comply with the conditions of these acts through planning and other mitigative and avoidance measures. Section 404 of the federal CWA is the principal regulatory mechanism necessary to minimize or avoid impacts to wetlands and Waters of the United States resulting from Air Drop activities. Under Section 404, any action that would directly involve the placement of fill in, dredging from, or flooding of wetlands or other Waters of the United States, requires permitting from the USACE prior to implementation. It is presumed that Air Drop activities will

be designed to avoid impacts to wetlands and Waters of the United States, and will generally not require permitting under this Act. Unforeseen scenarios that result in accidental impacts to wetlands are likely to require after-the-fact consultation with the USACE to determine necessary mitigation requirements under Section 404.

Site-specific Air Drop activities that may impact wetlands during launches, landing, and/or recoveries would require consideration of U.S. EPA regulations issued under Section 404(b)(1). These regulations state that permitting of fill activities will not be approved unless the following conditions are met: no practicable, less environmentally damaging alternative to the action exists; the activity does not cause or contribute to violations of state water quality standards, jeopardize threatened and endangered species, or impact sensitive cultural resources; the activity does not contribute to significant degradation of the Waters of the United States; and all practicable and appropriate steps have been taken to minimize potential adverse impacts to the aquatic ecosystem (40 CFR Part 230.10). Further, the guidelines establish a rebuttable presumption, that for non-water-dependent projects, a practicable alternative to filling wetlands exists.

4.9.2 No-Action Alternative

Under the No-Action Alternative, there would be no Air Drop launch, and testing would continue using ground-launched targets only. The ranges would be limited to currently authorized test programs. No change to biological resources effects would occur.

4.10 LAND USE AND AESTHETICS

4.10.1 Proposed Action

It is expected that all Air Drop activities under the Proposed Action would use land and facilities within existing government installations that are already dedicated to similar activities. Some activities could require the dedication of facilities presently used for other purposes. These activities would generally be consistent with present land use objectives and plans developed for those installations, as well as with applicable adjacent zoning ordinances. The potential for land use impacts would be highly dependent on site-specific environmental characteristics. The Air Drop program would be compatible with current or future programs of the individual military installations. If new targets or new areas would be required to support the operations of the Air Drop program, appropriate coordination would be made in the development process.

Activities such as launches would require surrounding buffers for safety and security. The noise, emissions, and other physical characteristics of these activities could restrict the use of land outside the buffers as well. The

candidate installations should likely be large enough to accommodate this buffer requirement restriction without affecting adjoining privately owned land.

Activities performed entirely within government installations would not conflict with local zoning ordinances or with local land use plans and development objectives. Launches would generally be performed at installations with a history of similar activities and, therefore, would not likely conflict with local ordinances or land use plans of adjacent areas.

The principal land use of concern is recreational use. The potential recreational impacts include the prohibition of access and evacuation of individuals within the test area before launch. Disturbance to the recreational experience, particularly in adjacent or nearby national parks and wilderness areas, could occur from noise, particularly the sonic booms associated with missile launches and flights. Depending upon ambient noise levels near the observer and local wind conditions, the sonic booms would likely be noticeable, but short-term and infrequent. Adverse impacts to passive recreation for individuals seeking solitude could occur from the noise levels. However, the overall impacts to recreation are considered insignificant.

Land use would not be impacted or changed; however, people living and working in the restricted areas would have to be evacuated for safety reasons. Individuals participating in recreational activities and public roads through the areas that would be closed for the duration of the Air Drop launch would also be affected from the temporary clearance. Individual evacuation agreements would be negotiated with property owners or agencies.

If the launch would occur over water, there could be a temporary closure of recreational and commercial waterways. Access to areas and public notices would be coordinated with agencies such as the Coast Guard. Ocean vessels would be notified in advance of launch activities through Notice to Mariners.

Similar procedures are already in place at most existing test ranges. Based upon the test plan and local conditions at the range, announcements could be made in the local media; public notices could be posted on entrances to highways, access roads, and off-road trails; and notification to all hotels, motels, campgrounds, visitor centers, National Monument Headquarters, U.S. Forest Service offices, and regional tour operators and outfitters and recreational users to reduce recreational use of the affected areas. Most Air Drop pre-launch activities would take place inside existing buildings on existing installations and facilities. The external appearance of these buildings would not generally change. Field testing would take place within existing government installations where larger perimeter buffers would exclude most ground activities from public view. Some ground and airborne activities may be visible to the public near installation perimeters or test path.

However, the activities would be infrequent and would generally appear to resemble other ongoing field activities conducted at these installations. In the event of a mishap, open burning of unused propellants or debris could be briefly visible to surrounding areas.

Because of the use of buffer or safety zones for restricted access and evacuation plans, and the use of existing DOD installations capable of supporting the Air Drop activities, there would be no significant impact to land use and aesthetics.

4.10.2 No-Action Alternative

Under the No-Action Alternative, there would be no Air Drop launch, and testing would continue using existing ground-launched targets. The ranges would be limited to currently authorized test programs, and impacts to land use and aesthetics analyzed under the existing programs. There are no significant impacts identified with the No-Action Alternative.

4.11 SOCIOECONOMICS

4.11.1 Proposed Action

DOD ranges that would support the Air Drop Target System are expected to have the capability of meeting the aircraft, assembly, handling, monitoring and support needs of the Air Drop program. The Air Drop program would be integrated into the overall range schedule and safety plans, as required, for the test period. The ranges would be able to accommodate the Air Drop program with existing support facilities and infrastructure. Therefore, no socioeconomic impacts related to employment, population, or induced increases in local government expenditures are expected.

The Air Drop test area consists of a 24- to 46-mile corridor along the entire target flight path. All Air Drop hazard and test areas are expected to be evacuated and access restricted during the test period. Hazard and test area evacuations should be evaluated for socioeconomic impacts that may occur as a result of limited or restricted public access to the hazard and test areas. In addition, socioeconomic impacts may occur as a result of highway closures for extended periods of time by restricting regional access to economic centers. Socioeconomic impacts created by public access restrictions could be minimized through advance planning and coordination with public agencies within the ROI.

4.11.2 No-Action Alternative

DOD ranges would not be required to support the Air Drop Target System. The ranges would continue to operate with existing programs, support

facilities, and infrastructure. Therefore, no socioeconomic impacts are expected.

4.12 ENVIRONMENTAL JUSTICE

4.12.1 Proposed Action

Environmental justice analysis is conducted when substantial adverse impacts are associated with the Proposed Action. The environmental justice analysis is based upon impacts identified for the various resource areas. At the programmatic level, there are no significant impacts identified with the Air Drop program. If substantial adverse impacts are identified upon selection of a specific test range, environmental justice analysis for the Air Drop activity would be necessary in future environmental analysis and documentation.

No adverse impacts have been identified at this programmatic level of analysis. However, resource areas that have been identified by this PEA as needing further site-specific analysis should be evaluated for environmental justice when a specific test range is selected and impacts are determined. Should substantial adverse impacts be identified, then it would be necessary to define the impact footprint for each resource area. After identifying the impact footprint(s), the affected census tracts and the COC would need to be determined. Next, census data for minority and low-income populations would be compiled. Analysis must take place to assess if the affected census tract has a higher percentage of minority and/or low-income population than the COC, or if the census tract has higher than 50 percent minority or low-income populations. Local social services organizations should be contacted and public outreach conducted in the early stages of the analysis to ensure that minority and low-income populations are informed of and involved in the process. These measures could also assist in verifying analysis results to ensure that disproportionate minority or low-income populations have been accurately represented.

If minority and/or low-income populations are determined to be disproportionately affected, mitigation measures or preventive measures should be implemented to eliminate the impact. Mitigation and preventive measures would be dependent upon the resource area impacted.

4.12.2 No-Action Alternative

Under the No-Action Alternative, there would be no Air Drop activities. Therefore, no impacts from the Air Drop program would occur and environmental justice analysis is not necessary.

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APPENDIX A

LIST OF ABBREVIATIONS AND ACRONYMS

APPENDIX A LIST OF ABBREVIATIONS AND ACRONYMS

AAQS	Ambient Air Quality Standards
AFB	Air Force Base
AFI	Air Force Instruction
AGL	above ground level
AIRFA	American Indian Religious Freedom Act
Al_2O_3	aluminum oxide
APE	Area of Potential Effect
ARPA	Archaeological Resource Protection Act
ARTCC	Air Route Traffic Control Center
ATC	air traffic control
BLM	Bureau of Land Management
BMDO	Ballistic Missile Defense Organization
BSA	Buffer Stop Assembly
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
$C_3H_6N_6O_6$	cyclonite
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Recovery Act
CFC	chlorfluorocarbon
CFR	Code of Federal Regulations
CMSA	Consolidated Metropolitan Statistical Area
CO	carbon monoxide
COC	community of comparison
CONUS	Continental United States
CWA	Clean Water Act
dB	decibel
DNL	day-night average sound level
DOD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESQD	explosive safety quantity-distance
FAA	Federal Aviation Administration
FCDC	flexible confined detonating cords
FIRM	Flood Insurance Rate Map
FTS	Flight Termination System
GPS	global positioning system
HAP	hazardous air pollutant
HCFC	hydrochloroflurocarbon
HCl	hydrogen chloride
Hz	Hertz
IIP	Instantaneous Impact Prediction
km	kilometer

LHA	launch hazard area
L_{max}	maximum sound level
LSC	linear-shaped charge
LTO	landing and take-off
MACT	maximum achievable control technology
MFSO	Missile Flight Safety Officer
MOA	military operations area
MSA	Metropolitan Statistical Area
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NH_4ClO_4	ammonium perchlorate
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
OAB	Ordnance Assembly Building
OSHA	Occupational Safety and Health Administration
PASE	palletized airborne support equipment
PEA	programmatic environmental assessment
PM_{10}	particulate matter equal to or less than 10 microns in diameter
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
RC	roll control
RCC	Range Commanders Council
RCRA	Resource Conservation and Recovery Act
ROI	region of influence
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SO_2	sulfur dioxide
SOP	Standard Operating Procedure
SUA	special use airspace
TBM	Theater Ballistic Missile
THA	terminal hazard area
TMD	Theater Missile Defense
TVA	thrust vector actuator
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USAKA	U.S. Army Kwajalein Atoll
VOC	volatile organic compound

APPENDIX B

REGULATORY INFORMATION

APPENDIX B REGULATORY INFORMATION

This appendix provides information on applicable regulations used in the assessment of environmental impacts in this Programmatic Environmental Assessment.

Resource Area	Principal Regulatory Statutes
Cultural Resources and Native Populations	American Indian Religious Freedom Act (42 U.S.C. 1996, et seq.) Antiquities Act (16 U.S.C. 431, et seq.) Archaeological and Historic Preservation Act (16 U.S.C. 469a, et seq.) Archaeological Resources Protection Act (16 U.S.C. 470a, et seq.) Executive Order 11593, Protection and Enhancement of the Cultural Environment Historic Sites Act (16 U.S.C. 461, et seq.) National Historic Preservation Act (16 U.S.C. 470, et seq.) Native American Graves Protection and Repatriation Act (25 U.S.C. 3001, et seq.) DOD Directive 4710.1 Archeological and Historic Resources Management
Biological Resources	Anadromous Fish Conservation Act (16 U.S.C. 757a, et seq.) Bald and Golden Eagle Protection Act (16 U.S.C. 668, et seq.) Endangered Species Act (16 U.S.C. 1531, et seq.) Fish and Wildlife Coordination Act (16 U.S.C. 661, et seq.) Fishery Conservation and Management Act (16 U.S.C. 1801, et seq.) Marine Mammal Protection Act (16 U.S.C. 1361, et seq.) Marine Protection, Research, and Sanctuaries Act (33 U.S.C. 1401, et seq.) Migratory Bird Treaty Act (16 U.S.C. 703, et seq.) Executive Order 11990, Protection of Wetlands DOD Directive 4700.4, Natural Resource Management Program
Air Quality	Clean Air Act (42 U.S.C. 7401, et seq.)
Water Resources	Clean Water Act (33 U.S.C. 1251, et seq.) Marine Protection, Research, and Sanctuaries Act (33 U.S.C. 1401, et seq.) Executive Order 11988, Floodplain Management Safe Drinking Water Act (42 U.S.C. 300, et seq.) DOD Directive 6230.1, Safe Drinking Water Executive Order 11990, Wetlands Protection
Hazardous Materials and Waste	Comprehensive Environmental Response, Compensation, and Liability Act (43 U.S.C. 9601, et seq.)

Resource Area	Principal Regulatory Statutes
Hazardous Materials and Waste (Continued)	Federal Facility Compliance Act of 1992 (42 U.S.C. 6901, et seq.) Hazardous Materials Transportation Act (49 U.S.C. 1801, et seq.) Pollution Prevention Act (42 U.S.C. 13101, et seq.) Resource Conservation and Recovery Act (42 U.S.C. 6901, et seq.) Superfund Amendments and Reauthorization Act, Emergency Planning and Community Right-To-Know Toxic Substances Control Act (15 U.S.C. 2601 et seq.) DOD Directive 4210.15, Hazardous Material Pollution Prevention DOD Directive 5030.41, Oil and Hazardous Substance Pollution Prevention and Contingency Program DOD Directive 6050.5, DOD Hazard Communication Program Executive Order 12088, Federal Compliance with Pollution Control Standards DOD Instruction 6050.5, Hazardous Material Information System DOD 4145.19-R-1 Chapter 5, Section 4, "Hazardous Commodities"
Noise	Noise Control Act (42 U.S.C. 4901, et seq.) Occupational Safety and Health Act (29 U.S.C. 651, et seq.)
Health and Safety	Occupational Safety and Health Act (29 U.S.C. 651, et seq.) Radiation Control for Health and Safety Act (42 U.S.C. 263b, et seq.) DOD Directive 1000.3, Safety and Occupational Health Policy for the Department of Defense DOD Directive 6055.5, Industrial Hygiene and Occupational Health DOD Directive 5000.1, Part 6, Section 1, Systems Safety, Health Hazards, and Environmental Impact
Land Use	Farmland Protection Policy Act (7 U.S.C. 4201, et seq.) Federal Land Policy and Management Act (43 U.S.C., et seq.) Coastal Zone Management Act (16 U.S.C. 1451, et seq.) Wild and Scenic Rivers Act (16 U.S.C. 1274, et seq.)
Airspace	DOD Directive 4165.57, Air Installations Compatible Use Zone
Other	Executive Order 12114, Environmental Effects Abroad of Major Federal Actions Executive Order 12372, Intergovernmental Review of Federal Programs National Environmental Policy Act (42 U.S.C. 4321, et seq.)

Resource Area	Principal Regulatory Statutes
Other (Continued)	BMDO Directive 6050, Environmental Program Management DOD Directive 6050.1, Environmental Effects in the U.S. of Department of Defense Actions DOD Directive 6050.7, Environmental Effects Abroad of Major Department of Defense Actions

Note: This table lists key environmental and health and safety regulations application to operations; however, it is not all inclusive. Future changes to these regulations may cause revisions to this list.
DOD = Department of Defense
U.S.C. = U.S. Code
BMDO = Ballistic Missile Defense Organization

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