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National Aeronautics and Space Administration

U.S. Army White Sands Missile Range

Environmental Assessment for NASA Launch Abort System (LAS) Test Activities at the U.S. Army White Sands Missile Range, NM

FINAL

NASA Johnson Space Center White Sands Test Facility

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Environmental Assessment for NASA Launch Abort System (LAS) Test Activities at the U.S. Army White Sands Missile Range

Location:	White Sands Missile Range is located within Doña Ana and Otero Counties in New Mexico.
Lead Agency:	National Aeronautics and Space Administration (NASA) Johnson Space Center White Sands Test Facility
Cooperating Agency:	United States Army White Sands Missile Range
Proposed Action:	NASA proposes to perform Orion Launch Abort System (LAS) ground operations and flight testing to ensure the system is effective during both simulated, unmanned, launch pad, and ascent operations. These non-crewed pad abort and ascent abort tests would evaluate the effectiveness of the proposed LAS to safely return astronauts in the event of an unforeseen emergency.
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Date:	August 1, 2007

Executive Summary

The National Aeronautics and Space Administration (NASA) has embarked on a program for exploration of the Moon, Mars, and beyond. This program, Constellation, includes the design, construction, testing, and implementation of the Orion project. An integral part of the Orion project is a Launch Abort System (LAS). The LAS would provide a mechanism for the Crew Module (CM) to rapidly separate from the launch vehicle and safely return astronauts to Earth in the event of an emergency during launch pad or ascent operations.

To accomplish this portion of the Constellation program, NASA is proposing flight testing at the U.S. Army White Sands Missile Range (WSMR) at Launch Complex (LC)-32. This series of non-crewed pad abort and ascent abort tests would evaluate the effectiveness of the proposed LAS to safely return astronauts.

This Environmental Assessment (EA) addresses the potential impacts associated with proposed actions at LC-32, which includes the construction of new facilities to support LAS testing. NASA and WSMR representatives would collaboratively design and construct a launch facility for LAS testing at the preferred location of LC-32.

The two reasonable alternatives are: 1) an alternative location at WSMR; and 2) the no action alternative. Alternative launch site locations at WSMR include, but are not limited to, the Dog Site, LC-33, LC-50, LER-4, and the Small Missile Range. Other WSMR locations may also be considered. All alternative locations meet the same testing and safety requirements as needed at LC-32. The proposed and alternative sites allow for flight distance requirements, skilled personnel, existing infrastructure, and operational support, and are remote locations on WSMR that would not pose a threat to public safety; although, the use of the alternative WSMR launch complexes other than LC-32 could impact the overall schedule of the LAS test activities. Due to their current use and locations, airspace and scheduling would require more effort at the alternative sites. In addition, the LAS tests would not be considered a top priority and the LAS test launches would have to accommodate the schedules of other test programs at those launch sites. The no action alternative would include no new facilities, structures, or launch testing operations at WSMR and would prevent any environmental impacts associated with the construction of a new launch pad and impacts associated with LAS test activities.

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Acronyms

ATB	Abort Test Booster
BISON-M	Biota Information System of New Mexico
CLV	Crew Launch Vehicle
CEV	Crew Exploration Vehicle
cm	Centimeter(s)
CM	Crew Module
CP	Center-Perforate
CRCC	Cox Range Control Center
CSM	Crew And Service Module
EA	Environmental Assessment
DoDESB	Department of Defense Explosive Safety Board
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EO	Executive Order
FAA	Federal Aviation Administration
ft	Foot/Feet
FTA	Flight Test Article
FTV	Flight Test Vehicle
HTPB	Hydroxyl Terminated Polybutadine
in.	Inch(es)
ISS	International Space Station
JSC	NASA Johnson Space Center
kph	Kilometer(s) per Hour
LADDERS	Landing and Descent Deceleration Earth Recovery System
LaRC	Langley Research Center
LAS	Launch Abort System
LAV	Launch Abort Vehicle
lb	Pound(s)
lbm	Pound(s) per minute
LC	Launch Complex
m	Meter(s)
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	Mile(s) per Hour
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act of 1969
NMDGF	New Mexico Department of Game and Fish
PDS	Parachute Deceleration System
RCS	Reaction Control System

Acronyms

s	Second(s)
SM	Service Module
SMSS	Service Module Sub-section
SOP	Standard Operating Procedure
TES	Threatened, Endangered, or Sensitive
USAF	U.S. Air Force
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
WS-ES	White Sands-Environment and Safety
WSMR	White Sands Missile Range
WSTF	NASA Johnson Space Center White Sands Test Facility

1.0 Purpose and Need for the Proposed Action

This Environmental Assessment (EA) has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. §§ 4321-4370d), and according to the Procedures of Implementation of NEPA for National Aeronautics and Space Administration (NASA) (Title 14, Code of Federal Regulations, part 1216 subparts 1216.1 and 1216.3). The EA describes the purpose and need for the proposed facility construction and NASA's Launch Abort System (LAS) test project to be conducted at the U.S. Army White Sands Missile Range (WSMR) Launch Complex (LC)-32 in support of NASA's Constellation Program. Two reasonable alternatives are considered: 1) an alternative location at WSMR, and 2) the no action alternative. Existing environmental conditions at the proposed and alternative locations on WSMR are described and the potential environmental consequences for each action are then analyzed.

1.1 Background

The Vision for Space Exploration (NASA 2004) calls for humans to return to the Moon by the end of the next decade, paving the way for eventual journeys to Mars and beyond. The completion of the International Space Station (ISS) and retirement of the Space Shuttle fleet by 2010 necessitate an innovative plan and program to fulfill the goals of the Vision. NASA's Constellation Program, a family of new spacecraft, launchers, and associated hardware, would facilitate a variety of manned and unmanned missions, from ISS re-supply to lunar and planetary landings.

The Orion spacecraft, formerly known as the Crew Exploration Vehicle (CEV), is being developed to provide access to the ISS after Space Shuttle retirement and enable exploration of the Moon and beyond. The Orion spacecraft consists of three modules: Crew Module (CM), Service Module (SM), and LAS. Although the Constellation hardware is based on systems originally developed for the Space Shuttle, the Orion spacecraft is heavily influenced by the earlier Apollo spacecraft design.

Figure 1 shows a diagram of the Constellation Program flight vehicle, which includes Orion (CEV) and Ares I (CLV). This diagram also shows the three Orion modules: CM, SM, and LAS.

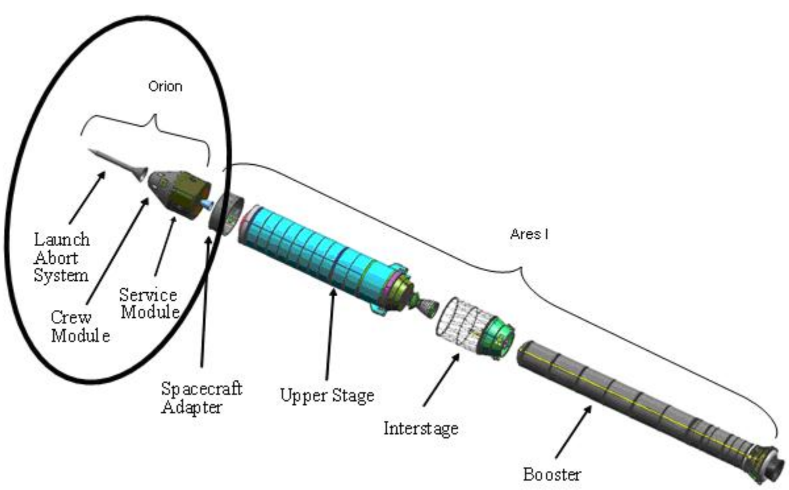
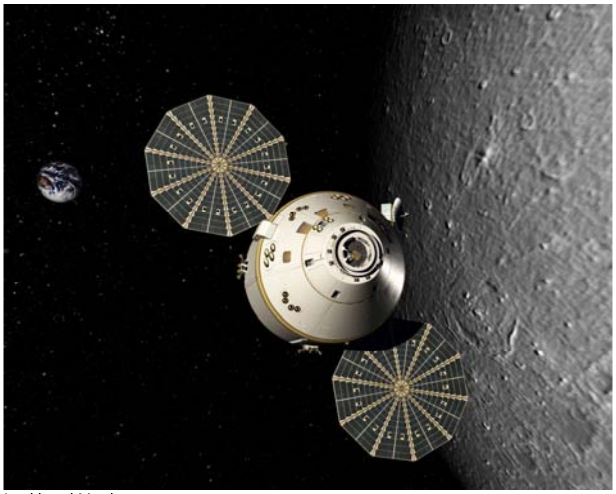


Figure 1
Constellation Program Flight Vehicle



Lockheed Martin

In this artist rendition Orion orbits the moon with disc-shaped solar arrays tracking the sun to generate electricity.

Orion by the Numbers

Diameter	**5 m**	**16.5 ft**
Pressurized Volume	**20 m^3**	**692 ft^3**
Habitable Volume	**11 m^3**	**380 ft^3**
Total Propulsive Capability (SM Engine)	**1,738 m/s**	**5,700 ft/s**
SM Engine Thrust	**33,362 N**	**7,500 lb**
Lunar Return Payload	**100 kg**	**220 lb**
Dry Mass	**14,045 kg**	**30,965 lb**
Propellant Mass	**9,350 kg**	**20,613 lb**
Landing Weight	**7,337 kg**	**16,174 lb**

Source: NASA Fact Sheet, FS-2006-08-0022-JSC

1.2 Purpose and Need

NASA proposes to perform Orion LAS ground operations and flight testing at WSMR (Figure 2). The purpose of the LAS Test Project is to ensure the system is effective during simulated, non-crewed, launch pad, and ascent operations. Should an emergency arise during launch pad or ascent operations, a rapid escape of the CM would be accomplished by means of the LAS. The LAS, which is structurally attached to the CM by a pyrotechnic mechanism, would use a short maneuver to pull the CM away from the remainder of the launch vehicle stack. This would require separating the CM from the SM. The LAS would be jettisoned from the CM, which would return to Earth using a parachute deceleration system (PDS) and Landing and Descent Deceleration Earth Recovery System (LADDERS) airbags.

Under nominal conditions, the LAS tower would be jettisoned approximately 30 seconds (s) after first stage separation and would be discarded in the Atlantic Ocean.

The need for this testing is to evaluate the performance of the crew escape functions of the LAS, which include landing and recovery systems. These non-crewed tests would demonstrate the ability of the LAS to effectively separate a CM from the launch vehicle and safely return astronauts to Earth in the event of an emergency during either launch procedures or initial ascent operations. Accomplishing the test objectives would provide flight test data needed to determine if the LAS is safe for human space flight, help reduce system development and implementation risks, and provide experience in executing ground and flight operations.

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Artist rendering of the Orion crew exploration vehicle's LAS test vehicle and PDS landing system at WSMR. This concept shows the CM as it lands in the desert under its recovery parachutes (out of scene) using LADDERS airbags to help soften landings on dry land.

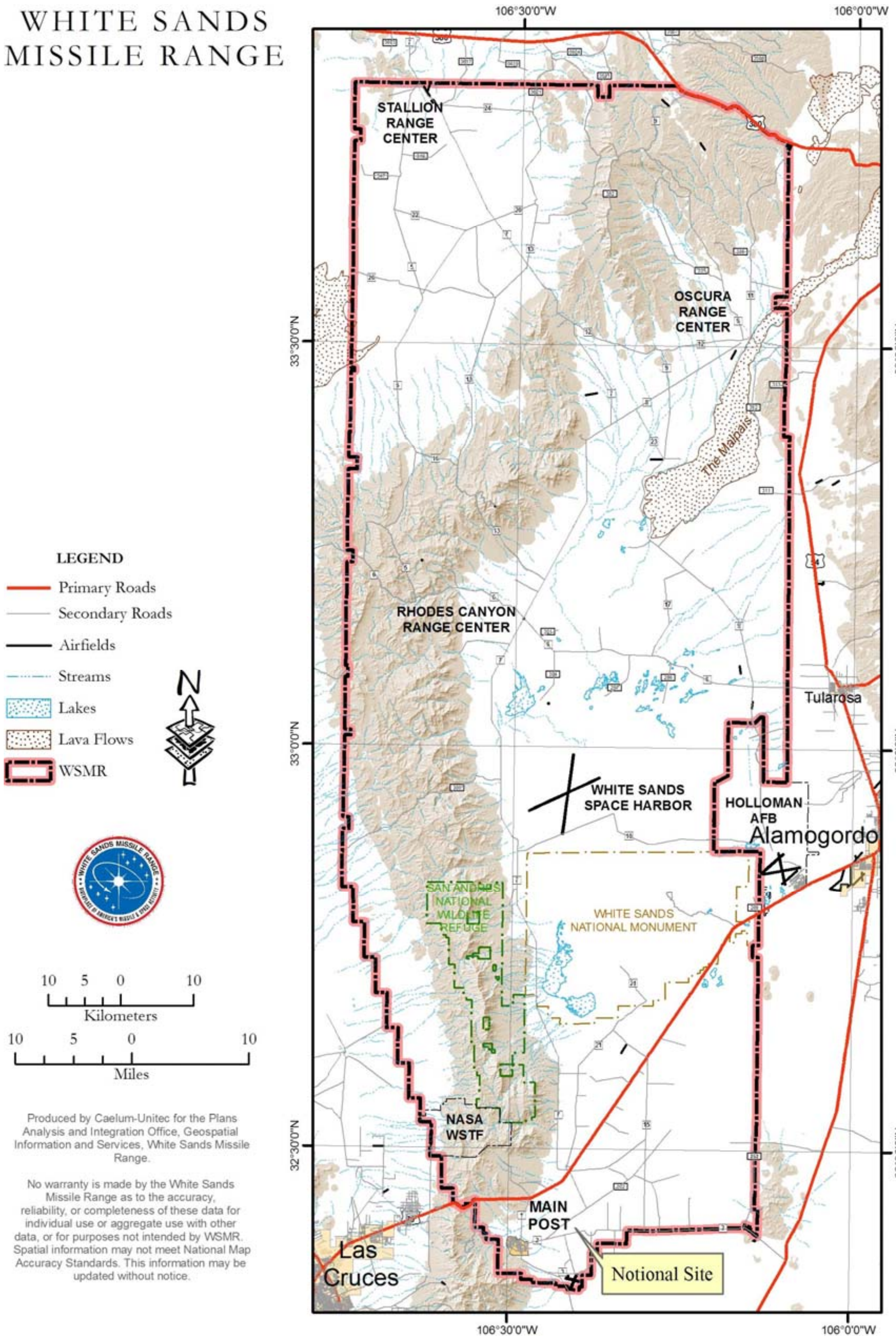


Figure 2
White Sands Missile Range
NOTE: Launch Complex (LC)-32 is the proposed, or notional, site.

The Constellation Program is scheduled to be completed in phases over several decades. A Constellation Programmatic Environmental Impact Statement (EIS) Notice of Intent was published in September 2006. The anticipated completion date of the EIS is no later than the summer of 2008. However to meet the aggressive schedule necessary to develop the Constellation Program, the proposed construction and LAS testing would start before EIS completion.

1.3 Test System

1.3.1 Test Vehicle

The vehicle and its components that would be used during the Orion LAS test project include:

LAS: This system would consist of a full-scale test configuration on all but the final LAS test flight. The final LAS test flight would be a flight configuration. Flight configuration of the LAS would be one that is mature enough in design to be re-used for flights that could include humans or fly autonomously/ unmanned to the ISS. The LAS would weigh approximately 6,140 kg (13,536 lb).

CM Heatshield Simulator Dishes for the LAS Test Vehicle during Assembly at Langley Research Center (LaRC)

CM: This module would consist of a prototype configuration on all but the last LAS test flight with an active reaction control system (RCS). The last LAS test flight would be a flight-configuration vehicle with an active RCS. The CM would weigh approximately 8,671 kg (19,116 lb).

SMSS: A full-size SM as shown in Figure 1 would not be necessary. A scaled down SM, called the Service Module Sub-section (SMSS), would have sufficient size and external protuberances necessary to permit accurate simulation of the CM/SM separation aerodynamics. The SMSS is attached to the Abort Test Booster (ATB) and weighs 2,525 kg (5,567 lb).

Sep Ring: The Sep Ring would contain the actual CM/SM separation mechanism. It would be attached to the SMSS. The Sep Ring/SMSS combination would weigh approximately 2,268 kg (5,000 lb).

ATB: The configuration of the ATB is preliminary. The ATB would be used for the ascent abort tests to simulate the five segment solid rocket booster that will be used for Orion flights and lift the abort flight test boilerplate capsules to the appropriate test conditions. It is expected to use a solid propellant with a gross weight ranging from 45,000 to 113,400 kg (100,000 to 250,000 lb) depending on its final design test configuration.

1.3.2 Propellants

Though specifics of the LAS are to be determined, a high-energy solid propellant would be used. The current baseline for the CM calls for propellants of gaseous oxygen and methane. The ATB would use the Peacekeeper 1st Stage motor loaded with TP-H1207C propellant, which is a class 1.3 hydroxyl-terminated polybutadiene (HTPB) with 88 percent solids.

1.4 Description of Proposed Action

1.4.1 Flight Testing

In addition to construction activities, the proposed action includes initial test vehicle ground processing, integration, and checkouts followed by actual flight testing. The ground processing and flight test portion of the project is expected to start in late 2008 and conclude by 2012. Flight testing would include up to six tests: two pad abort flight tests, and four ascent abort flight tests. The final (fourth) ascent abort flight test in the series would be performed at high-altitude using a 2nd stage booster. The two pad and four ascent abort tests are similar and would continue up to 2012 with the final high-altitude test scheduled for late 2011. Additional tests may be conducted if the results are not satisfactory or conclusive.

Human-rating and qualification of the Orion LAS and recovery systems would be implemented by a series of full-scale non-crewed flight tests with different test scenarios for either pad abort testing or ascent abort testing. The increasingly complex tests would involve flight LAS designs coupled with various crew test articles. To carry the LAS/CM stack (the Flight Test Article) to the desired test conditions (ascent abort), the ATB, a specialized launch vehicle, would be used. A graphical representation of the proposed test sequence is provided in Figure 3; in addition, Figure 4 provides a graphical representation of the proposed flight test vehicles for the pad abort and ascent flight tests.

All flight test components would land on WSMR property and would be recovered.

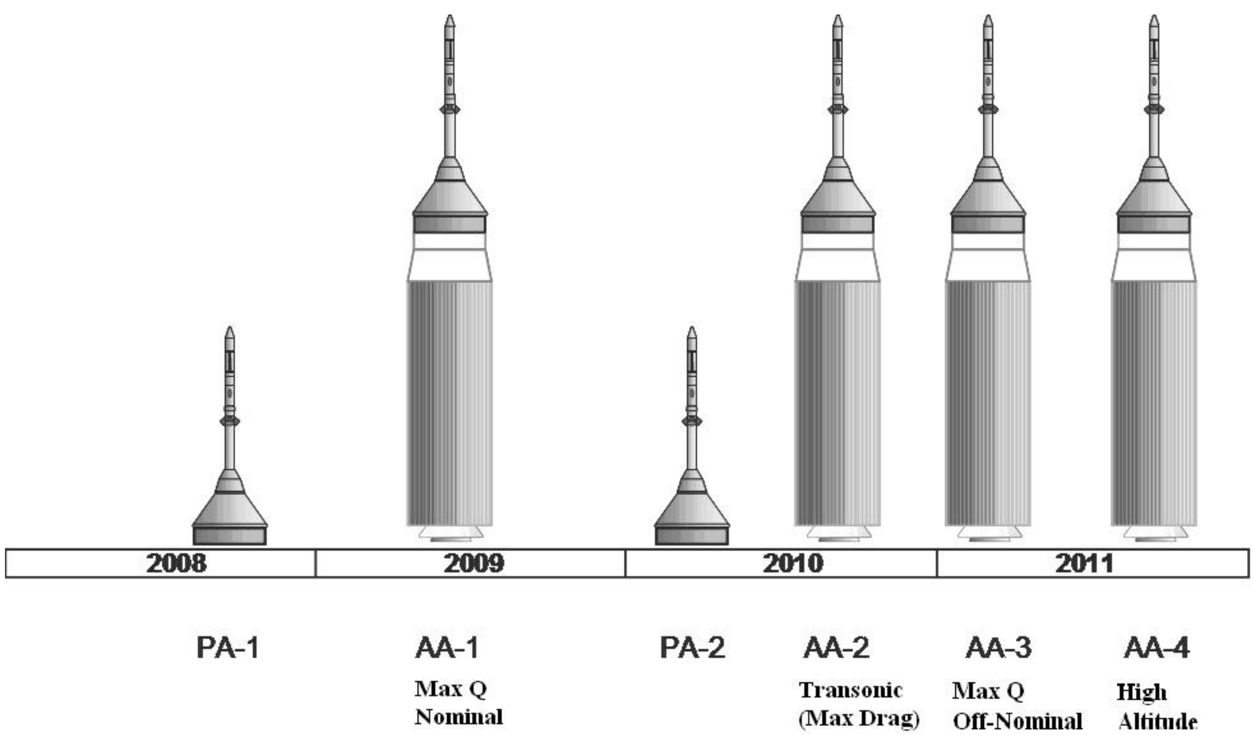


Figure 3
Proposed Test Scenarios

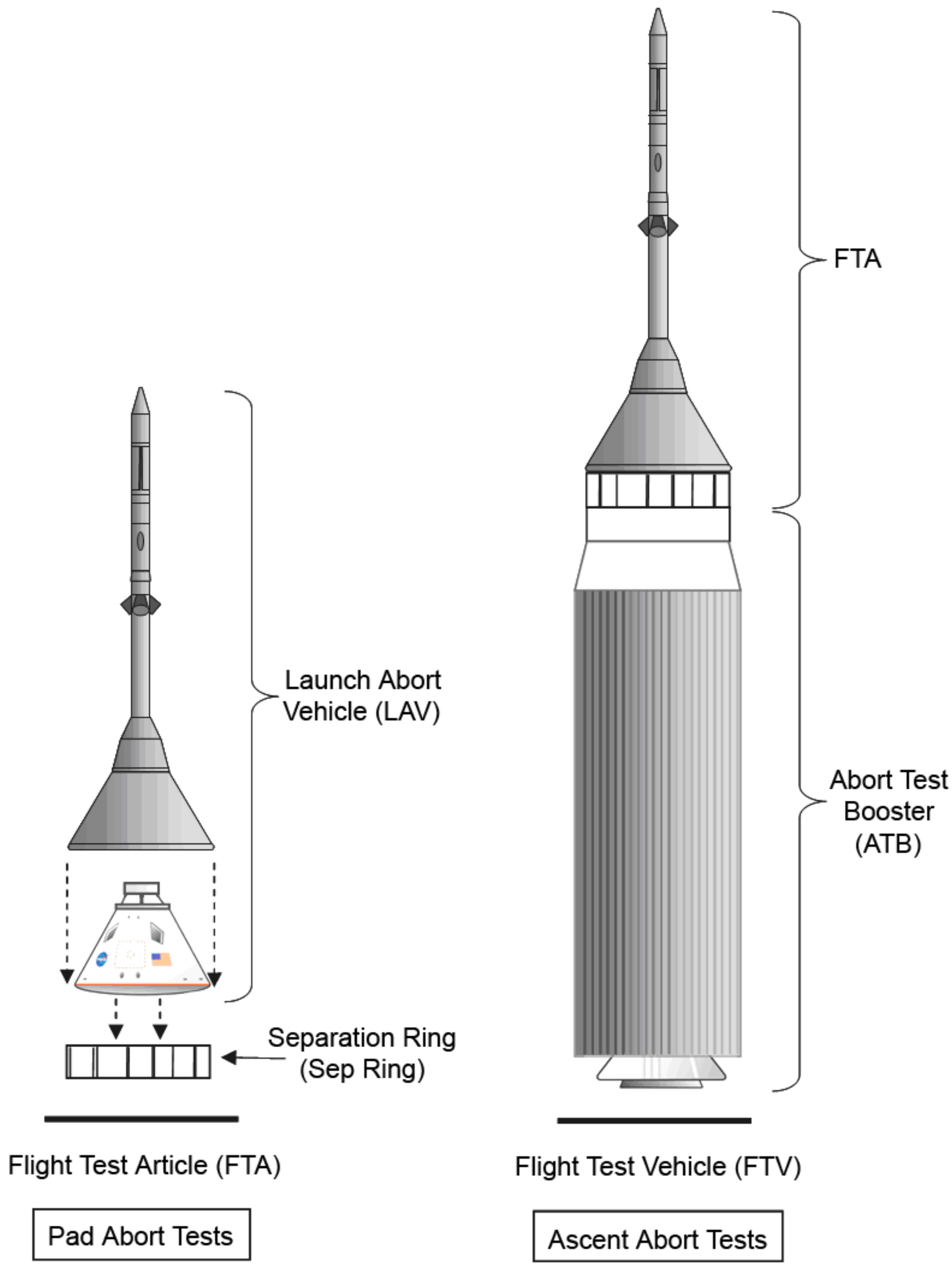


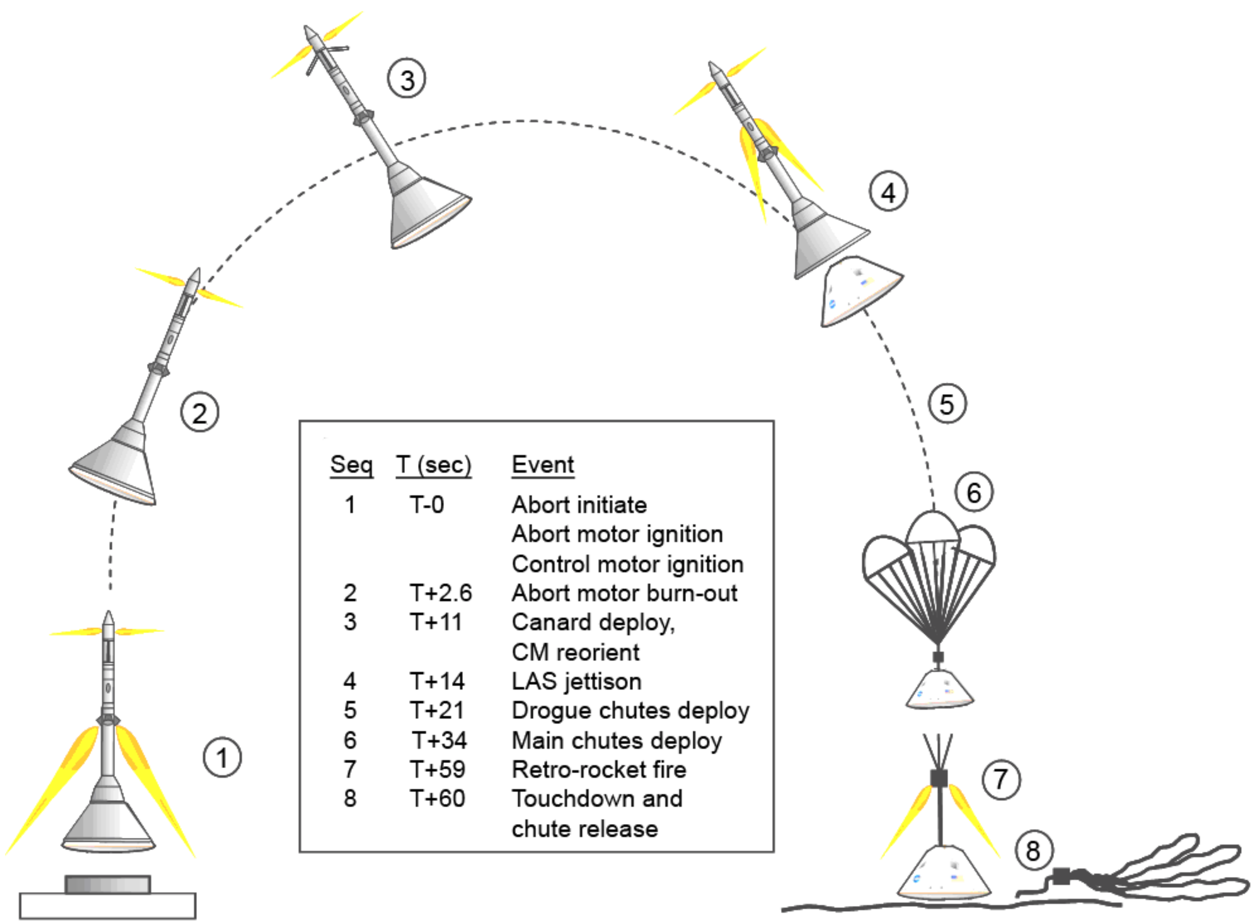
Figure 4

Graphical Representation of Pad Flight Test Article and Ascent Flight Test Vehicle

Note: The final 2011 high-altitude test would include a 2nd stage booster (not shown on diagram)

1.4.1.1 Pad Abort Test

The pad abort test objective is to demonstrate the LAS has adequate performance to lift the CM from the launch pad to an altitude high enough, with enough distance uprange, to permit the CM to execute a nominal landing that is a safe distance from the launch pad. After pre-launch checks, the NASA control team would initiate the abort test event. The abort motor and attitude control motor on the LAS would fire and the Launch Abort Vehicle (the combined LAS and CM) would rocket away from the launch pad. After abort motor burnout, the canards on the LAS would deploy to reorient the entire vehicle to a heat-shield-forward orientation for free-fall. The LAS would then jettison and the CM would initiate the landing and recovery sequences to jettison the forward bay cover and deploy the parachutes for landing. Two pad abort tests are planned. Uprange distance is estimated at approximately 1.3 km (0.8 mi). The CM and LAS would be recovered for post-flight inspections. Figure 5 provides a general representation of a pad abort test sequence.



Seq	T (sec)	Event
1	T-0	Abort initiate Abort motor ignition Control motor ignition
2	T+2.6	Abort motor burn-out
3	T+11	Canard deploy, CM reorient
4	T+14	LAS jettison
5	T+21	Drogue chutes deploy
6	T+34	Main chutes deploy
7	T+59	Retro-rocket fire
8	T+60	Touchdown and chute release

Figure 5
Pad Abort Test

1.4.1.2 Ascent Abort Flight Test

The ascent abort flight test objective is to demonstrate the LAS has adequate performance to separate and maneuver the CM out of the path of the launch vehicle in response to abort events occurring during the initial ascent phase of flight. Four flight tests are planned to demonstrate separation and recovery under conditions of: (1) maximum drag during the transonic phase, (2) nominal trajectory, (3) off-nominal trajectory, and (4) high altitude near completion of first stage thrust. Uprange distance for ascent abort tests is estimated between 1.1 and 5.1 km (0.7 and 3.2 mi) depending on final booster specifications and test scenarios, and 113.6 km (70.6 mi) for the high altitude test AA-4, Figure 6 provides a general representation of an ascent abort test.

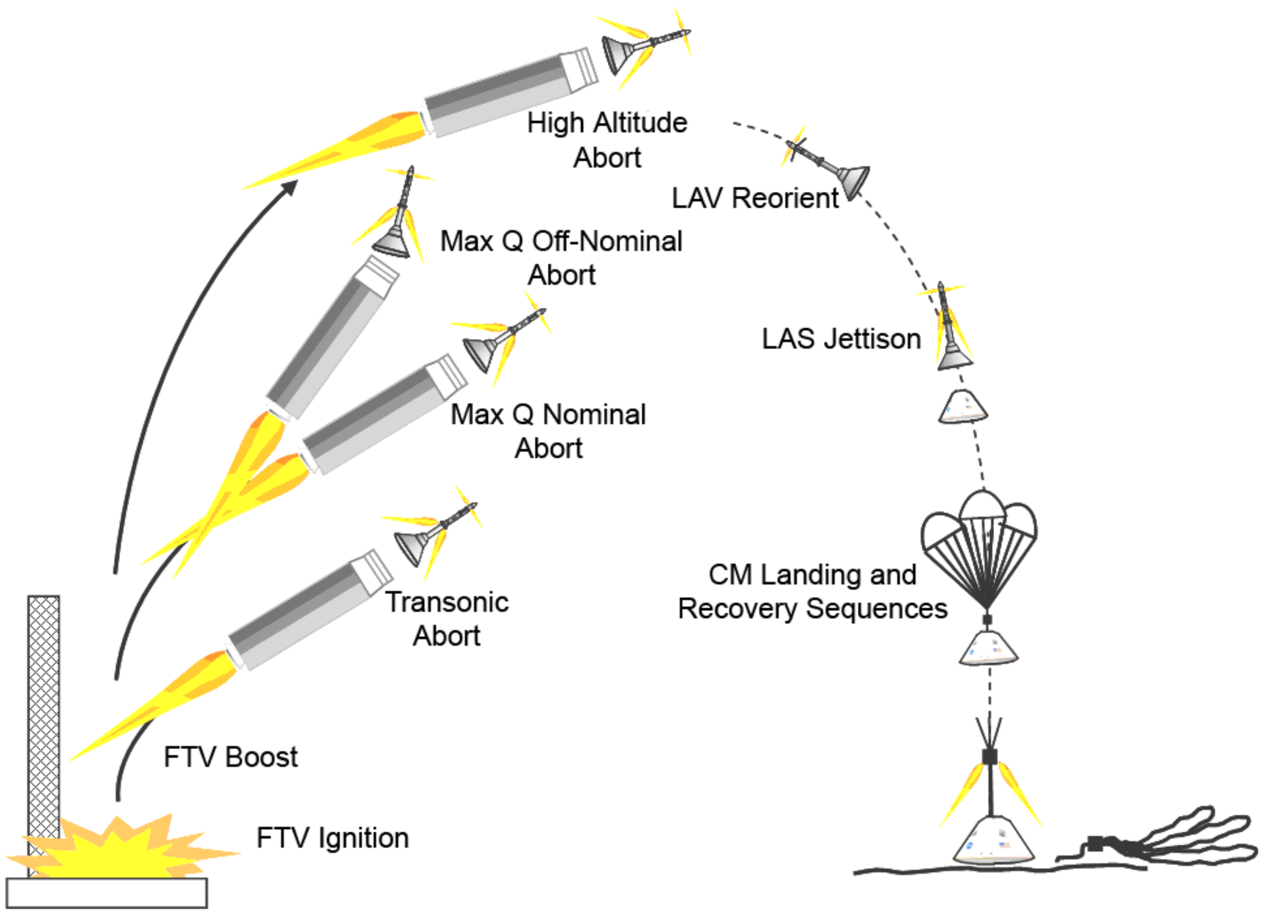


Figure 6
Ascent Abort Test

1.4.2 Construction of Facilities

Whenever possible, existing structures would be evaluated and used as appropriate and new construction is expected to be limited to areas already affected by previous WSMR test programs. Overall, some existing structures, or new construction, would be required for the following: integration facilities, launch pad, launch pad work platform, umbilical tower, blast wall, mission control van pad, pyrotechnics building, and general support structures (offices, restrooms, gantry rails, etc.). The proposed action also plans to use other WSMR assets including mission control, communication infrastructure, command/data/video links, and radar/optical tracking equipment, as necessary, to support this project.

Under the proposed action, NASA and WSMR representatives would collaboratively design and construct a launch facility for LAS testing at the preferred location of Launch Complex (LC)-32 as noted in Figures 7 through 9. Construction for a Final Integration and Test Facility and launch facilities would begin in late 2007 with completion dates estimated at mid-2008.

Figure 7
Photograph of Launch Complex (LC)-32

Figure 8
Alternative View of Launch Complex (LC)-32

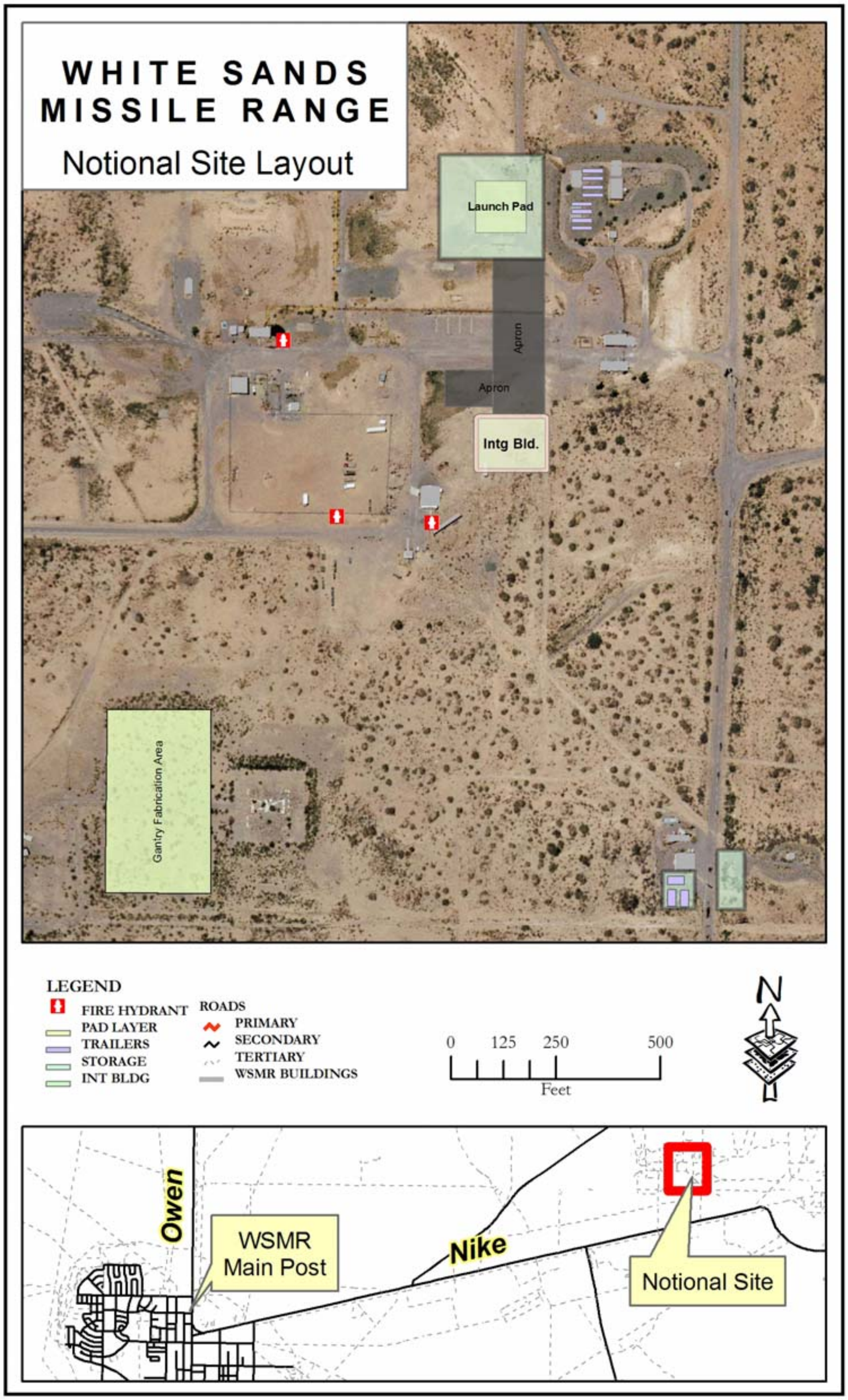


Figure 9
Proposed or Notional Site: Launch Complex (LC)-32

Integration and storage facilities would be constructed or identified to support the following test components along with corresponding ground support equipment: one LAS, one CM, one Sep Ring, two ATB motors, one ATB guidance control assembly module, two ATB aeroshells, two ATB inter-stages, one ATB Thrust Reaction Structure, one ATB ballast module, two SMSSs, and Pathfinder elements. The LAS, CM, Sep Ring, two ATB motors, two ATB inter-stages, and ATB GCA module would be located and processed in the same integration test facility. Existing facilities would be identified at WSMR and NASA Johnson Space Center White Sands Test Facility (WSTF) for storage of the LAS non-propulsive hardware, two ATB aeroshells, two ATB service module sub-sections, one ATB ballast module, one Thrust Reaction Structure, and Pathfinder elements. Storage may be provided at WSMR for the attitude control motor, jettison motor, and abort motor. The WSTF North Highbay could be used as additional storage for the project. Any new construction or existing WSMR facility that must be modified to meet the following requirements must go through a site plan review process and/or Department of Defense Explosive Safety Board (DoDESB) approval.

1.4.2.1 Final Integration and Test Facility

A Final Integration and Test Facility would be constructed to support test component integration and would accommodate: one LAS, one CM, one Sep Ring, two ATB motors, two ATB inter-stages, one ATB GCA module, and personnel workspace for at least 20 people with adjacent parking space. The building would be a 19,200 square feet pre-fabricated, steel structure (Figure 10). A portable restroom would be added adjacent to the proposed building site.

An environmentally protected heating, ventilation, and air conditioning (HVAC) system would be constructed that is capable of maintaining the building temperature at 70 °F +/- 5 °F for personnel comfort and maintaining the building humidity above 50 percent relative humidity. A 48 cubic foot minimum hazardous storage locker for hazardous chemicals, such as alcohols and adhesives, would be allotted in the test facility. In addition, OSHA qualified portable eyewash station(s) and safety shower(s) would be located near each personnel access door. Potable water would be supplied by bottled water dispensers.

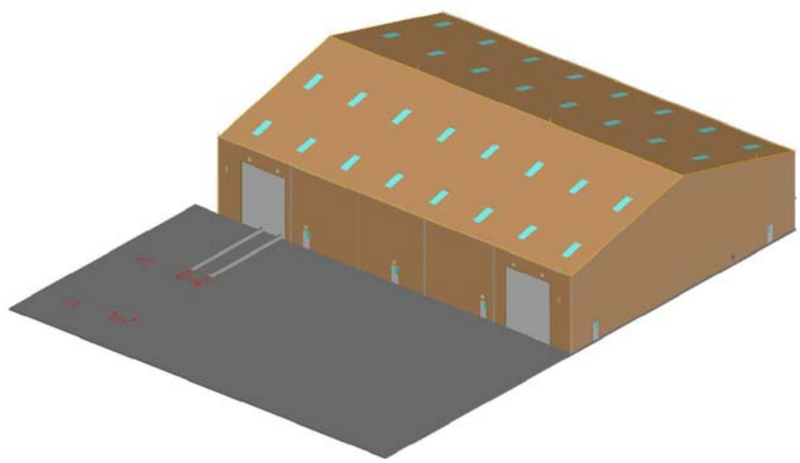


Figure 10
Final Integration and Test Facility

The Final Integration and Test Facility would meet requirements of Army Regulation 385-64, *U.S. Army Explosives Safety Program* (2000), for a total propellant weight of 203,992 lbm of Department of Transportation (DOT) Class 1.3 solid propellant, which includes 5,726 lbm of DOT Class 1.3 solid propellant for the LAS and 99,133 lbm of DOT Class 1.3 solid propellant for each ATB motor. An interior and exterior warning light and siren would be installed to alert personnel of hazardous operations. In addition, a fire suppression system would be provided per NSS 1740.12 (NASA 2005), NASA-STD-8719.11 (2000), and NFPA 13 (2007).

1.4.2.2 Storage

Storage would be accommodated by available space in the facility, an existing fenced area, or other WSMR storage facilities. The LAS test vehicle motors would be stored at the motor vendor location or at a location on WSMR separate from the other LAS components.

1.4.2.3 Launch Facilities

The following launch facilities would be constructed or identified to support testing: launch pad, launch gantry, umbilical tower, and launch services pad. Figures 11 and 12 show the engineering design of the test vehicles for the Pad Abort and Ascent Abort Flight Tests and proposed launch facilities. Any new construction or existing WSMR facility that must be modified to meet the facility requirements must go through a site plan review process and/or DoDESB approval.

1.4.2.4 Launch Pad

A launch pad would be constructed or identified to support the mass of the launch stool (steel structure that attaches the ascent abort articles to the launch pad), ATB, Sep Ring, CM, LAS, launch gantry, umbilical tower, cranes, and ground support equipment used to facilitate vehicle stacking. The concrete would be designed to support a minimum of 1,518 psi based on the ATB break over fixture point load and sustained wind loads up to 161 kph (100 mph). The launch pad would be oriented north since all launches would be fired uprange; in addition, the pad orientation would be arranged such that all structures would be south of the flight path. Portable general purpose fire extinguishers would be installed throughout the launch pad. Lightning protection at the launch pad for pad abort tests will consist of three towers approximately 34 m (110 ft) tall spaced equally around the launch pad area. These towers will be provided by WSMR and are mobile, telescoping, towers with attached grounding reels. These temporary towers can be retracted when not in-use.

1.4.2.5 Launch Gantry

A launch gantry would provide 360 degree access from 0 to approximately 40 m (130 ft) above ground level at the various locations and would include retractable work platforms with OSHA fall protection. The gantry would be designed to support an additional 12 m (40 ft) height extension with additional platforms to support the parameters of the ascent abort flight test. An exterior rear access platform that is 18 m (60 ft) above ground would be accessible by an external crane for the purpose of delivering cargo and equipment of up to 907 kg (2,000 lb) loads. Lighting protection for the ascent test operations is provided by the gantry tower itself. There are no additional lightning protection systems required for ascent abort test operations.

1.4.2.6 Umbilical Tower

The umbilical tower would be a frame platform vertical structure used to support the test vehicle’s electrical service and fluid lines. The tower would be a retractable, removable, and reusable structure. At launch, the base would be separated from the electrical and commodity lines and would fall to the ground without damaging equipment or launch pad infrastructure. The tower would be constructed to the highest point on the test vehicle to connect the umbilical lines.

1.4.2.7 Launch Services Pad and Blast Barrier

An 753 m^2 (8,100 ft^2) launch services pad and blast barrier that is capable of surviving a nominal test launch would be identified or constructed. The launch services pad would support the test components and ground support equipment located behind the blast barrier and would provide a safe location during launch. The area surrounding the pad would be improved for vehicle and personnel access.

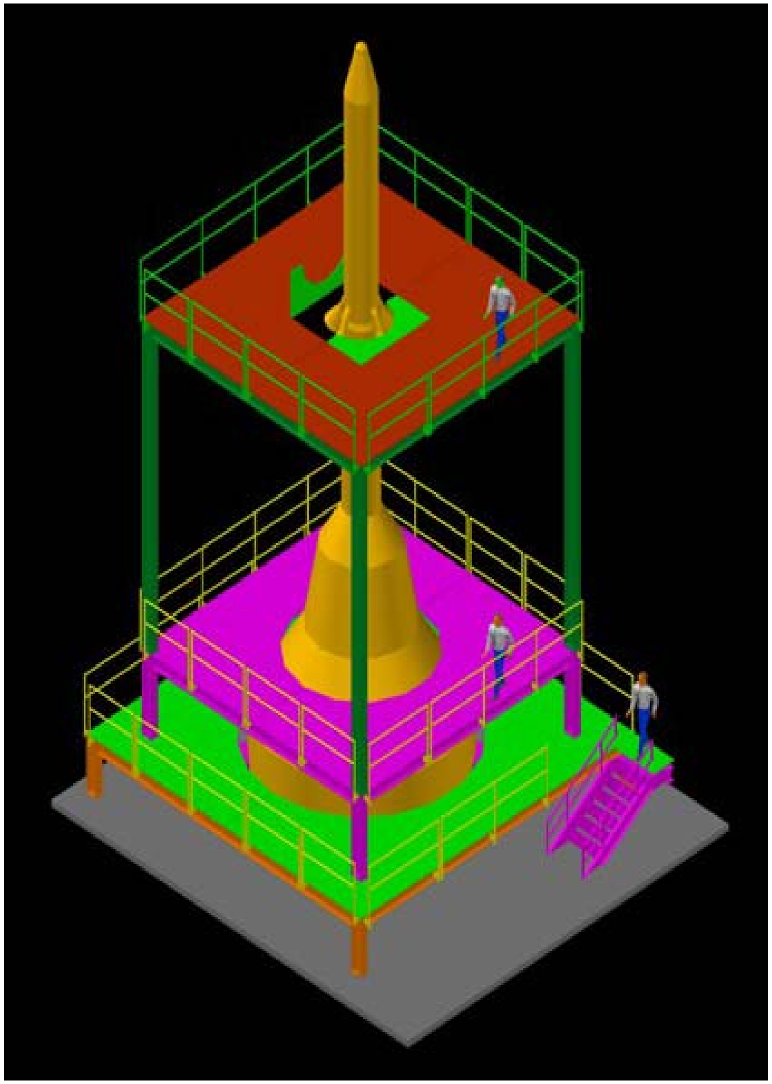


Figure 11
Pad Abort Flight Test Vehicle and Launch Facility

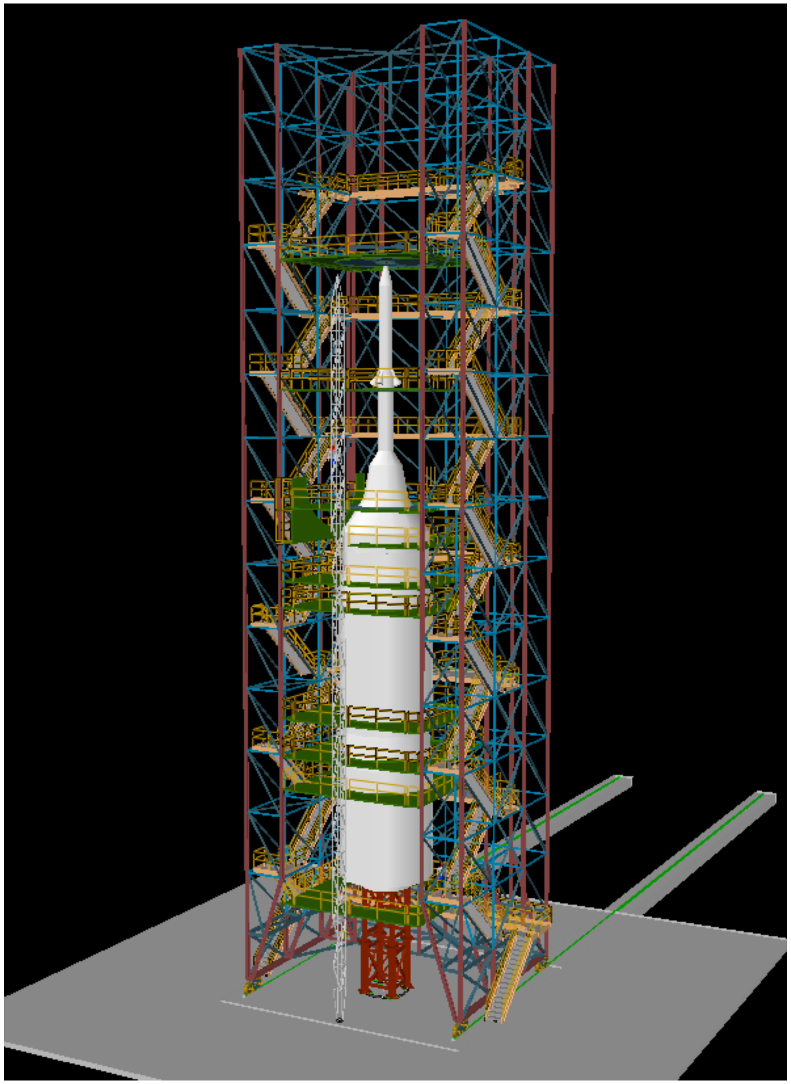


Figure 12
Ascent Abort Flight Test Vehicle and Launch Facility

1.4.2.8 Transportation and Roads

Existing roads would be used whenever possible. Newly constructed roads would be 8-inch based course roads improved for vehicle access to the integration and storage buildings to include building aprons with sufficient turn radius, entrance (from Main Road), turn-around, and other requirements for hazardous material handling, and truck/trailer and crane operations. All point loads, turn radii, and grade requirements would be based on a Type II transporter and meet HS20-44 DOT loading requirements.

1.4.2.9 Hazardous Materials, Hazardous Waste, and Solid Waste

For the proposed testing, satellite areas would be used to collect hazardous waste for eventual off-site disposal through a permitted facility. In addition to WSMR regulation, WSTF hazardous waste management procedures would also be used. All solid waste generated at WSMR is collected by an off-site contractor and is disposed of in the Otero landfill.

The pad abort launch vehicle is estimated to be approximately 14 m (47 ft) long with a lift-off gross weight of approximately 32,000 lbm for the entire LAS including the CM. The ascent abort flight vehicle would use an ATB that is conceptually planned as a Peacekeeper 1st stage motor. The LAS would use the following propellants: TP-H1264 (Abort Motor), ANB-3776 (Jettison Motor), and AAB-3771 (Attitude Control Motor). The LAS propellants are high-energy solid propellants with constituents similar in formulation to the ATB propellant. The ATB propellant constituents are a formulation based upon ammonium perchlorate (oxidizer) with aluminum (fuel) additions that are bound together with HTPB. The HTPB is a polymer that is used in chemical reactions to bind fuel and oxidizer into a solid mass for precise loading into solid rocket motors. Table 1 provides the propellant quantity and classification.

Similar propellants may be substituted during testing with prior approval from NASA/WSMR personnel. Following flight, hazardous materials in the form of: spent solid rocket boosters, fluid remains in liquid propellant tanks, and unexploded pyrotechnics due to potential malfunctions would remain. These would be recovered for final disposal. There is no ionizing or non-ionizing radiation equipment or devices involved in this test project.

Table 1
LAS Test Vehicle Propellant, Quality, and Classification

Motor	Propellant	Propellant Mass	Igniter Propellant Mass	Classification/ Division
Abort Motor/ATK	TP-H1264	4709 lbm	21 lbm	Prop Class 1.3
Jettison Motor/Aerojet	ANB-3776	365 lbm	1.6 lbm	Prop Class 1.3
Attitude Control Motor/Aerojet	AAB-3771	695 lbm	TBD	Prop Class 1.3

2.0 Alternative Actions

2.1 Alternative Launch Sites

Alternative launch site locations at WSMR include, but are not limited to, the Dog Site, LC-33, LC-50, LER-4, and the Small Missile Range. Other WSMR locations may also be considered (Figure 13). All locations meet the same testing and safety requirements as needed at LC-32. All sites allow for flight distance requirements, skilled personnel, existing infrastructure, and operational support, and are remote locations on WSMR that would not pose a threat to public safety.

2.2 No Action Alternative

The no action alternative would include no new facilities, structures, or launch testing operations at WSMR.

3.0 Affected Environment

This section describes the natural and human created environments in the vicinity of LC-32 and the potential landing locations at WSMR (Figure 14). For more detailed information, refer to the White Sands Missile Range Range-wide Environmental Impact Statement (WSMR 1998), the Integrated Natural Resources Management Plan (WSMR 2001), and the Integrated Cultural Resources Management Plan (WSMR 2004).

3.1 Land Use and Airspace

WSMR was established on July 9, 1945, as White Sands Proving Grounds to conduct research in rocket warfare. The Department of Defense (DoD) facility is closed to the public and is surrounded by land that is primarily managed by other federal agencies and the state government. WSMR is now used as a remote site for missile development and testing conducted by the U.S. Army, Navy, Air Force, and NASA, as well as foreign governments. The proposed LAS Test Project at LC-32 is comparable with other types of activities carried out at WSMR and is compatible with the overall mission.

The term airspace is described as the above-ground region used for transit of aerial vehicles. Airspace is a finite resource that can be defined spatially and temporally when describing its use for aviation purposes (USAF 2003). At WSMR, the Cox Range Control Center (CRCC) is delegated management and control (e.g. air traffic control and scheduling) of the airspace in the area described for the proposed action. WSMR’s airspace complex includes several restricted airspace areas that individually have unique specifications (e.g. area, altitude, and operation times).

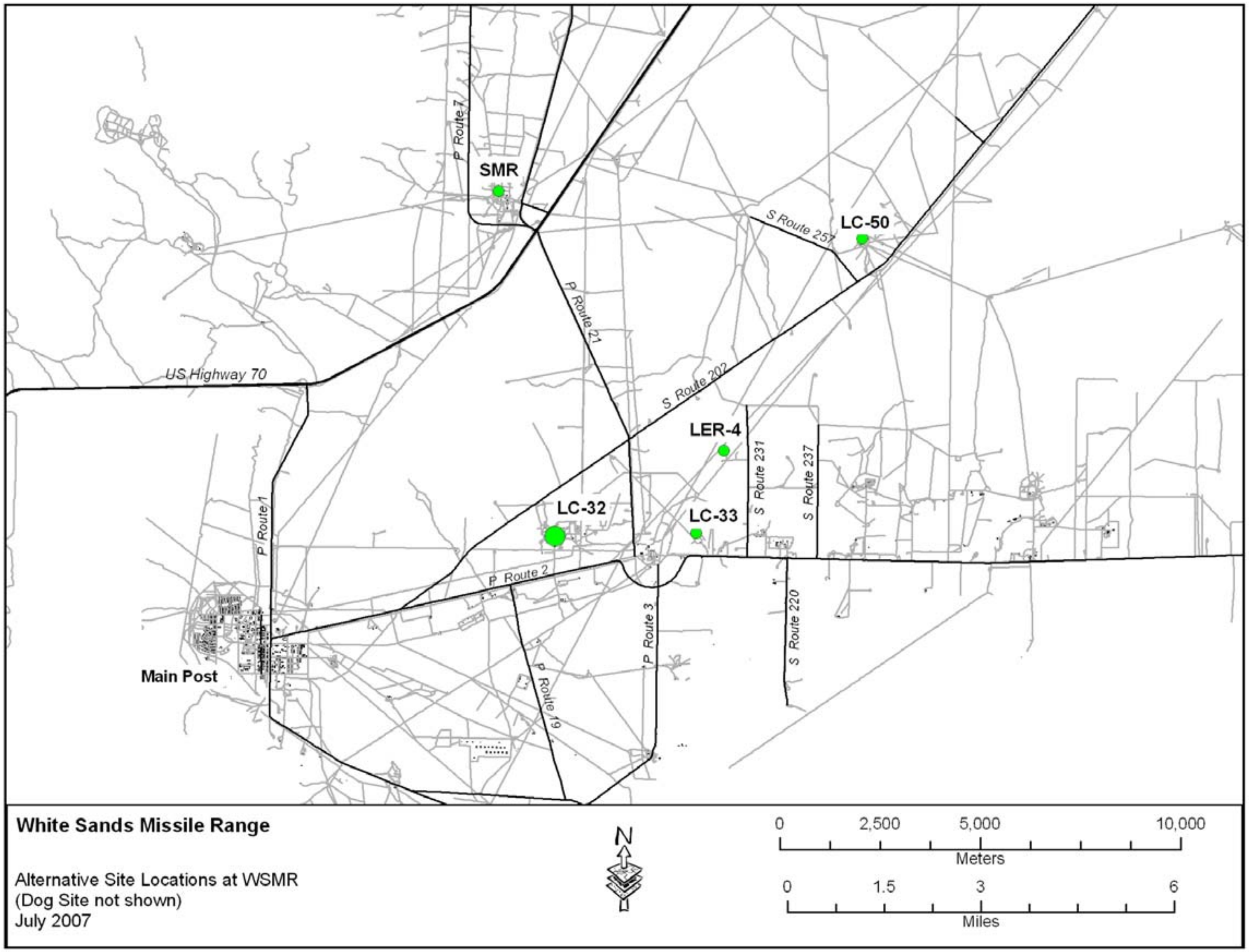


Figure 13
Alternate Launch Complex (LC) Locations

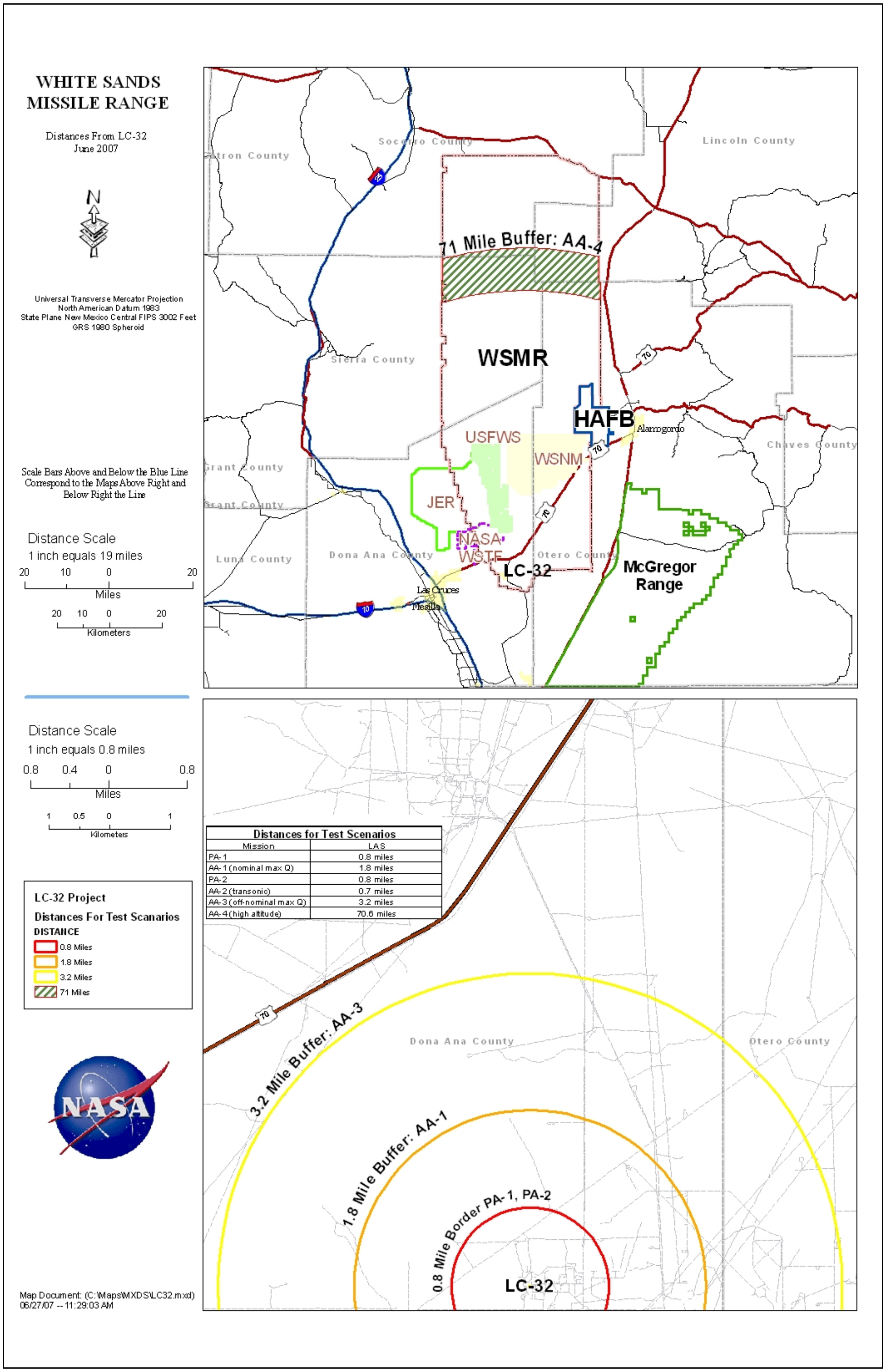


Figure 14
Potential Landing Locations

3.1.1 Scheduling

CRCC would schedule airspace use in WSMR-controlled airspace during times of testing. A priority scheduling system prescribes the use of WSMR airspace. Due to differing priority for projects at WSMR, the scheduling would have to be carefully coordinated to manage potential impacts to the LAS Test Schedule. The proposed activities would involve over-flights of the range from LC-32 in the southern portion to the potential landing sites near the launch pad or further to the northeast as testing distance progresses.

3.2 Physical Resources

3.2.1 Location Description and Topography

LC-32 is located on the southern part of the range in Doña Ana County (see Figures 2 and 14), east of the main post. The area is currently used as a major launch complex for WSMR and the approximately 271 hectares (670 acres) has been previously disturbed due to other testing. The area around LC-32 can be reached by paved roads, and the land in the immediate area is dominated by mesquite-covered coppice sand dunes.

WSMR has considerable aesthetic and visual resources within its boundaries and merging into surrounding areas. Scenic desert landscapes with rugged topography are typical. High mountains with sheer rock faces contrast with broad, flat basins, which make this area unique and visually appealing. However, most of the WSMR landscape is not readily viewable by the general public due to access restrictions.

3.2.2 Climate

Located in the northern portion of the Chihuahuan Desert, WSMR has an arid to semi-arid climate with abundant sunshine, relatively low humidity, modest rainfall, and relatively mild winters typical of low latitude arid areas. Rainfall through the year is light and insufficient for any growth except desert vegetation. The average rainfall at WSMR is around 30 cm (12 in.); however, it varies across the range with highest amounts on or near the mountains. Temperatures at WSMR are generally warm in the summer and mild during the winter. Temperatures are often near 32 to 38 °C (90 to 100 °F) for long periods in the summer. Mild daytime temperatures characterize winter, rising to 12.8 to 15.6 °C (55 to 60 °F) on average. The lowest temperatures occur in December and January, and night-time temperatures often drop below freezing (WSMR 1998).

At WSMR, the prevailing wind direction is from the southwest with spring being the windy season. Average wind speed is approximately 10 kph (6 mph), but wind gusts of more than 48 kph (30 mph) are common. Winds are strongest from late February through early May. Westerly winds during this time occasionally cause severe dust storms. These storms are a result of sparse vegetation and dry loose soil. Dust storms occur most frequently in March and April and more rarely in other months (Eschrich 1992).

3.2.3 Geology

WSMR is located within the southeastern-most portion of the Basin and Range Province, a regional area typified by uplifted fault blocks forming mountains, and downthrown blocks forming basins. Erosion of the uplifted fault blocks, and deposition of the eroded sediments, have resulted in thick sequences of alluvial material accumulating within the basins. LC-32 is located on the western margins of the Tularosa Basin with no bedrock outcrops in the vicinity. The launch site is situated atop Quaternary alluvium and active eolian deposits (sand dunes).

3.2.4 Soils

LC-32 soils are designated as Yesum-Holloman and Marcial-Ubar association. Because of New Mexico's arid climate and propensity for wind storms, soil blowing is considered a hazard. Marcial-Ubar consists of silty clay loam and silty loam; in this area soil blowing is considered a moderate hazard. However in Yesum-Holloman, soil blowing is a severe hazard where in some areas the soil is actively blowing. Yesum-Holloman consists of well drained soil of very fine sand loam and gypsum land hummocky (uneven). Runoff in both soils is slow and water erosion is also a slight hazard. Due to past testing activities the soils can be described as previously disturbed.

This is typical of LC-32.

3.2.5 Air Quality

The U.S. Environmental Protection Agency (EPA) regulates air quality through National Ambient Air Quality Standards (NAAQS). Air quality is assessed according to six criteria pollutants: carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, respirable particulate matter, and lead (EPA 2006). WSMR is located in counties considered to be in attainment of NAAQS (WSMR 1998, NMED 2007). However, high levels of particulate matter from natural sources, such as dust storms, may occur temporarily during periods of high winds (see Section 3.3.4).

The State of New Mexico, in accordance with federal clean air standards, has adopted a set of air quality control regulations that apply to stationary sources of air pollution. These regulations apply to stationary sources, such as diesel generators. They do not apply to mobile sources, such as trucks, aircraft, or missiles. WSMR has a Title V air permit and must comply with all federal, state, and local regulations. WSMR must also comply with State or Federal Implementation plans, if any, with adequate supporting analysis.

Air quality at LC-32 is affected by daily weather conditions, such as individual and common collective sources of air pollutants. Most emissions are primarily from vehicle exhaust and dust generated on dirt and gravel roads. Increased airborne particulate matter during times of high wind speeds, particularly in the spring, affects air quality on the main post and LCs.

3.2.6 Water Resources

Herrick's (1955) assessment of the groundwater resources incorporates approximately 518-km² (200-mi²) for WSMR's Main Post, which includes LC–32. The Main Post is within a reentrant (a landform that extends out beyond its surroundings, as a spur projecting from the side of a mountain) in the mountains bordering the Tularosa Basin on the west. The reentrant is bounded on the south and southwest by the Organ Mountains, on the northwest by the San Augustin Mountains, and on the north by the San Andres Mountains.

The total relief of the area is nearly 1,524 m (5,000 ft). Several small springs occur in the mountains, but there are no perennial streams in the area. The annual precipitation in the area averages 30 cm (12 in.). Playas in the basin east of this area occasionally contain water following heavy summer thunderstorms.

At LC-32, groundwater is pumped principally from groundwater storage in the Main Post area (WSMR 1998). The principal source of groundwater in the bolson (a flat arid valley) deposits in the Main Post is the precipitation that falls within the reentrant and the nearby mountains, which is an area of approximately 104 km^2 (40 mi^2). The average annual recharge to the area groundwater is estimated at 1.23 million m^3 (320 million gal) per year. Water table contours indicate that groundwater moves eastward out of the reentrant to the lower part of the basin east of the area. From there, it moves southeast towards the Hueco Bolson in Texas (WSMR 1998).

3.3 Biological Resources

3.3.1 Flora

The vegetation surrounding LC-32 is mainly composed of a honey mesquite shrubland. This vegetation community is composed of small coppice sand dunes occupied by honey mesquite (*Prosopis glandulosa*). Plant diversity is minimal with broom snakeweed (*Gutierrezia sarothrae*) commonly growing between the dunes. The potential landing sites that are further out from LC-32 offer similar vegetation, as well as desert shrubland dominated by creosote bush (*Larrea tridentate*).

Chihuahuan Desert Shrubland

3.3.2 Fauna

Common species of birds that could occur at or near LC-32 or the potential landing sites include quail (Family *Odontophoridae*), mourning doves (*Zenaida macroura*), roadrunners (*Geococcyx californianus*), hawks, owls, ravens, turkey vultures (*Cathartes aura*), sparrows, wrens, flycatchers, and a variety of other songbirds. Migratory bird species frequent WSMR during the spring and fall. This is when the bird population is at its greatest.

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Oryx Grazing Along the Roadside at WSMR

Common large and small mammals that are expected to occur in the LC-32 and potential land sites include oryx (*Oryx gazelle*), coyote (*Canis latrans*), raccoons (*Procyon lotor*), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), woodrats, mice, and bats. The area at and around LC-32 is widely disturbed by humans due to the nature of the work at the missile range. Because of this, most of the species found in the area are those that tolerate the disturbance.

The list of lizards and snakes would include horned lizards (*Phrynosoma* sp.), whiptails (*Aspidoscelis* sp.), collared lizards (*Crotaphytus collaris*), coachwhips (*Masticophis flagellum*), gopher snakes (*Pituophis catenifer*), prairie rattlesnakes (*Crotalus viridis*), and western diamondback rattlesnakes (*Crotalus atrox*). Amphibian species found in this area include true toads (*Bufo* sp.) and spadefoot toads (*Spea* and *Scaphiopus* sp.). The tiger salamander (*Ambystoma tigrinum*) could possibly inhabit watering units, tanks, or springs near LC-32 or the landing sites. There are no habitats that contain fish in the LC-32 area. But the white sands pupfish (*Cyprinodon tularosa*) could potentially occur in habitats near the proposed landing sites for the longer launches.

Obtaining a thorough inventory of invertebrates is problematic due to the overwhelming number of insects, arachnids, and aquatic species that remain undocumented. At least 17 genera of land snails have been identified in several studies along the San Andres and Oscura Mountains (WSMR 1998).

3.3.3 Threatened, Endangered, and Sensitive Species

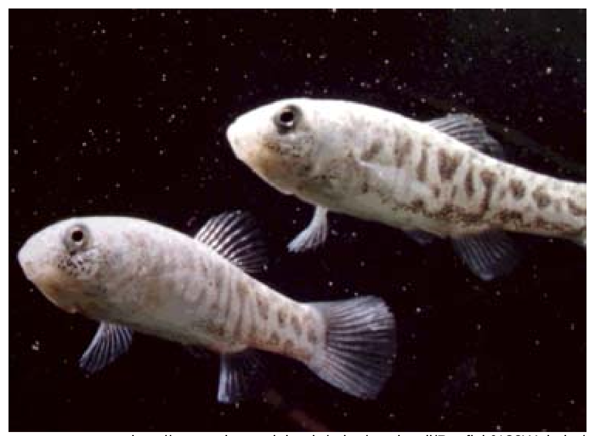
Threatened, endangered, or sensitive (TES) species lists developed by the U.S. Fish and Wildlife Service (USFWS) and New Mexico Department of Game and Fish (NMDGF) were reviewed to determine the potential for TES occurrences near LC-32 and the proposed landing sites further uprange.

3.3.4 Flora

Todsen's pennyroyal (*Hedeoma todsenii*) is the only Federal endangered floral species documented on WSMR. Six populations have been found on high pinion-juniper slopes on Granddaddy Peak and the Chalk Hills on the western edge of the San Andres Mountains. These populations are far from the proposed launch or landing sites.

3.3.5 Fauna

White Sands pupfish (*Cyprinodon tularosa*) (pictured right) is a state-threatened fish that looks like a small, dark-eyed, silver-scaled goldfish without a forked-tail fin. They are light brownish-gray above and silvery-white below with a chunky body that is 4.45 to 6.35 cm (1-3/4 to 2-1/2 in.) long. The adult males have a noticeable, iridescent blue coloration and a dusky band along the outer edge of the tail fin. The adult females are distinguished by a dark spot, called an ocellus, at the base of the dorsal fin and a vertical barring pattern on their sides. The pupfish feeds on a variety of plants, detritus, and small organisms.



http://www.ndsu.nodak.edu/ndsu/stockwell/Pupfish%20Website/

White Sands Pupfish

White Sands pupfish occupy a variety of micro-habitats, ranging from deep spring ponds to shallow pools and calm spring runs. Daily water temperatures can vary dramatically, often by more than 21 °C (70 °F). Winter air temperature lows are around -1 °C (30 °F), while summer air temperature highs often exceed 38 °C (100 °F). Similarly, the salt content of the water ranges from fresh water to saltier than seawater.

Natural threats to the pupfish include nonnative fishes (introduced years ago into nearby ponds) and the expansion of saltcedar (an exotic plant introduced in the 1950s). Other threats include groundwater pumping, pollution, habitat alteration through construction, and missile debris impacts.

A complete list of TES faunal species known or expected to occur on WSMR can be found in Table 2. TES species lists developed by the USFWS and NMDGF were reviewed by the county. LC-32 falls within Doña Ana County but is very close in proximity to Southern Otero County. The list was created using the NMDGF Biota Information System of New Mexico (BISON-M) database (2007). No suitable habitat for federal or state listed threatened and endangered faunal species is present at LC-32 or uprange.

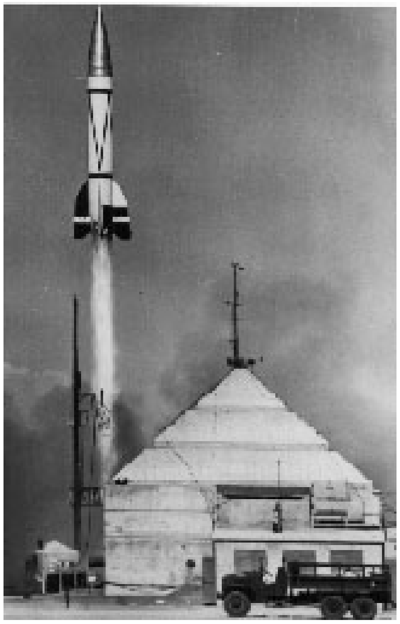
Table 2
Federal and State Listed TES Fauna Known or Potential to Occur on WSMR*

Common Name	Scientific Name	Federal Status	State Status
	MAMMALS		
Desert bighorn sheep	*Ovis canadensis mexicana*		E
Desert pocket gopher	*Geomys arenarius brevirostris*	SOC	
New Mexican meadow jumping mouse	*Zapus hudsonius luteus*		T
Organ Mountains Colorado chipmunk	*Tamias quadrivittatus australis*		T
Oscura Mountains Colorado chipmunk	*Tamias quadrivittatus oscuraensis*		T
Spotted bat	*Euderma maculatum*		T
Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	SOC	
	BIRDS		
American peregrine falcon	*Falco peregrinus anatum*		T
Aplomado falcon	*Falco femoralis septentrionalis*	E	E
Baird's sparrow	*Ammodramus bairdii*		T
Bell's vireo	*Vireo bellii*		T
Black tern	*Chlidonias niger surinamensis*	SOC	
Burrowing Owl	*Athene cunicularia*	SOC	
Common black hawk	*Buteogallus anthracinus anthracinus*		T
Common ground-dove	*Columbina passerina pallescens*		E
Costa's hummingbird	*Calypte costae*		T
Gray vireo	*Vireo vicinior*		T
Interior least tern	*Sterna antillarum athalassos*	E	E
Loggerhead Shrike	*Lanius ludovicianus*	SOC	
Mexican spotted owl	*Strix occidentalis lucida*	T	
Mountain plover	*Charadrius montanus*	T	
Northern goshawk	*Accipiter gentilis atricapillus*	SOC	
Piping plover	*Charadrius melodus circumcinctus*	T	E
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E
Varied bunting	*Passerina versicolor*		T
Whooping crane	*Grus americana*	E	E
	REPTILES		
Texas horned lizard	*Phrynosoma cornutum*	SOC	
	FISH		
White Sands Pupfish	*Cyprinodon tularosa*		T

E=Endangered; T=Threatened; SOC=Species of Concern; SA=Species Threatened by Similarity
* (NMDGF BISON-M 2007)

3.4 Cultural Resources

Human habitation of the WSMR region represents an almost continuous occupational sequence encompassing a period from approximately 9,000 B.C. to the present and includes numerous Paleoindian, Archaic, Formative, Protohistoric, and Historic period cultural resources. Cultural resources include prehistoric or historic sites, structures, districts, artifacts, or other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Several cultural resource surveys have been conducted in and around LC-32 and uprange.



WSRM

Listed as a national landmark, LC-33 is located east of LC-32. The complex consists of a concrete blockhouse and a gantry crane. The complex, started in 1945, was developed specifically to accommodate testing of V-2 rockets.

WSMR Fact

LC-33 was the country's first major rocket launch facility. The launch site was the birthplace of events that led to the orbiting of satellites, manned space flight, trips to the moon, and the Space Shuttle. A blockhouse, several concrete launching pads, a 100-ft tall launching tower for small rockets, gantry, and blast pit occupied the complex beginning in 1945. Construction began in July and was completed by September at a cost of $36,000.

Although the site is still used today by WSMR's Material Test Directorate in support of weapons testing, the site was designated a National Historical Landmark by the National Park Service in October 1985 and in February 1983 by the State of New Mexico.

Source: White Sands Missile Range Website, http://www.wsmr.army.mil/pao/FactSheets/lc33.htm

3.5 Noise and Vibration

There are many testing operations at WSMR that generate noise, however tests are intermittent and occur for very short duration. In addition, WSMR is a remote desert location. Noise resulting from testing is derived from three sources: background, intermittent, and impulse noise. Present sources of intermittent noise at WSMR include missile launches, sonic booms, low-altitude military jet traffic, aircraft over-flights, and military helicopters. Sources of background noise include vehicle traffic, while impulse noise sources include gun fire and explosions. Intermittent and background noise sources at LC-32 are missile launches, sonic booms, and general vehicle traffic from roads.

Due to the large size of the proposed booster system, vibration is also a concern during ascent abort tests. The vibration could impact the buildings and structures nearby. It could also disturb any nearby humans and wildlife.

3.6 Socioeconomics

Socioeconomics consists of the basic attributes and resources associated with the human environment especially in regard to population, economic activity, and environmental justice. The socioeconomic region of impact for the proposed action includes the surrounding areas of New Mexico's Doña Ana and Otero Counties.

3.6.1 Population and Economic Activity

Economic activity typically includes employment, personal income, industrial growth, housing, and public services. Due to local contract dollars and employment (federal government and contractor) salaries, WSMR contributes approximately $1.8 million per day to the regional economy (IPED 2003). The counties in the region of influence have shown increases in population and employment through recent years. The cities of Las Cruces (approximately 32 km (20 mi) away) and Alamogordo (approximately 64 km (40 mi) away) are the nearest in proximity to LC-32.

3.6.2 Environmental Justice

On February 11, 1994, the President of the U.S. signed Executive Order (EO) 12898, entitled, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” (Clinton 1994). The general purposes of the EO are to: 1) focus the attention of Federal Agencies on the human health and environmental conditions in minority and low-income communities with the goal of achieving environmental justice; 2) foster nondiscrimination in Federal programs that substantially affect human health or the environment; and 3) give minority and low-income communities greater opportunities for public participation in, and access to, public information on matters relating to human health and the environment (EPA 2006).

The EO directs federal agencies, including NASA, to develop environmental justice strategies. Further, EO 12898 requires NASA, to the greatest extent practicable and permitted by law, to make the achievement of environmental justice part of NASA’s mission. Disproportionately high adverse human health or environmental effects on minority or low-income populations must be identified and addressed. In response, NASA established an agency-wide strategy, which, in addition to the requirements set forth in the EO, seeks to: 1) minimize administrative burdens; 2) focus on public outreach and involvement; 3) encourage implementation plans tailored to the specific situation at each Space Center; 4) make each Center responsible for developing its own Environmental Justice Plan; and 5) consider both normal operations and accidents. WSTF has developed a plan to comply with the EO and NASA’s agency-wide strategy.

Based on the information from the U.S. Census Bureau, minority and low income populations are believed to exist within the proposed action’s region of influence. Statistics for minority populations in the region of influence indicate an average of 47.3-percent Hispanic of any race with a combined average of 23.7 percent minority population for “other” minority groups. The population in poverty within the region of influence averages 24.9 percent. The general population of minority and low income population in the state of New Mexico average 42.1-percent Hispanic of any race, 33.2-percent population of “other” minority groups, and 18.4 percent in poverty (USCB 2005). The proposed locations of LC-32 and the uprange landing sites are remote and not considered to be near towns or schools analyzed within the region of influence of this document.

3.7 Infrastructure and Utilities

The infrastructure that could potentially be affected from the proposed action includes permanent and portable physical structures (e.g. buildings), site use, electricity, utilities, waste disposal and treatment, transportation and roads, and communications. The capacity and current demands of the following infrastructure elements at LC-32 would be examined to determine infrastructure constraints.

3.7.1 Structures and Utilities

Several permanent buildings and a launch platform exist on site at LC-32. Existing utilities include electrical power, telephone service, and water for drinking and sanitation purposes. The area also includes a new bathroom facility. Public services, including civil and military police, fire protection, and emergency medical treatment services, are operated and /or supervised by the U.S. Army at WSMR. Most of the personnel providing these services are based at the Main Post.

3.7.2 Transportation and Roads

An extensive road network connects most areas within WSMR. WSMR is bounded by U.S. Highway 380 to the north and U.S. Highway 54 to the east. U.S. Highway 70 crosses the southern portion of WSMR. Range Road 7, the main north-south access from Main Post, is a paved two-lane road that provides access to a comprehensive internal network of roads north of Main Post. Nike Avenue, the main east-west access from Main Post south of U.S. Highway 70, is also a paved two-lane road. The size, surface, and condition of other gravel and dirt access roads on WSMR vary.

LC-32 is accessible through paved and unpaved roads, which interconnect various launch complexes. Vehicular traffic and parking is expected to increase during the proposed testing. WSMR guidelines would dictate the transportation and handling of waste and hazardous materials to and from the launch site, and from the landing sites.

During times of testing, an agreement with the State of New Mexico allows WSMR to establish off-range roadblocks on U.S. Highways 70 and 380 as a safety precaution during missile tests. Under the agreement, roadblocks may last no longer than 1 hour and 15 min. U.S. Highway 70 is subject to an average of one roadblock per day (WSMR 1998).

3.8 Hazardous Materials, Hazardous Waste, and Solid Waste

WSMR Regulation 200-1, *Environmental Hazardous Waste Management* (WSMR 2006), provides guidelines for the handling and management of hazardous waste and facilitates compliance with all Federal, State, and local laws regulating generation, handling, treatment, storage, and disposal of hazardous wastes. All solid waste generated at WSMR is collected by an off-site contractor and is disposed of in the Otero landfill.

3.9 Human Health and Safety

General health and safety protocols for WSMR personnel are addressed in various Federal, State, and WSMR guidelines, rules, and regulations. Two comprehensive programs addressing these issues are Army Regulation 385-100 and WSMR Regulation 385-18. Detailed standard operating procedures (SOPs) have been established to fulfill health and safety requirements. WSMR is a participant in the Emergency Operations Plan, which establishes a response network involving Federal, State, and local agencies. The WSMR EIS presents a detailed description of the resources and procedures that would be used by WSMR and surrounding communities to handle a hazardous materials accident or other multi-hazard event.

Fire suppression systems, alarm sirens, warning lights, and a public address system would be provided for personnel safety and used per OSHA, WSMR, and NASA regulations (see Section 3.8 for pertinent facility information). An emergency evacuation point with voice communication capability would be provided near the launch pad at a distance equal or greater than the inhabited building distance.

WSMR Flight Safety has the authority to terminate flight tests to protect personnel and equipment. Flight Safety is required to approve all flight tests, based on a comprehensive review of safety factors, risk analysis, and relevant SOPs. In addition, the Department of Defense Explosion Safety Board has to approve the test site, LAS motors, and propellant usage prior to testing.

Other safety issues include encounters with unexploded ordnance (UXO); biological hazards, such as venomous snakes and spiders; and Hantavirus Pulmonary Syndrome, a disease contracted by humans coming in contact with urine or droppings of deer mice (*Peromyscus maniculatus*) containing Hantavirus.

Public safety is also an issue with the proposed testing. Since the Constellation Program is developing the next generation of U.S. space exploration vehicles, NASA and WSMR see the potential for national and international news media and public and international interest in the LAS testing. Areas both on and off the WSMR main headquarters area such as San Augustin Pass, Condron Field, and even public sites in Alamogordo could provide the viewing space for interested parties. Educational activities could also be planned for viewers. Better figures on public interest would be needed, but at minimum public viewers would need to be outside the safety buffer zone set by Flight Safety. Also, portable restrooms, trash cans, and other public facilities requested would need to be provided as well. Suggested possibilities based on these criteria would be made closer to the first launch date. WSMR Public Affairs and other missile range officials would provide the necessary guidance for the viewing sites and assist NASA Public Affairs in providing the testing and launch information to the public.

4.0 Environmental Consequences

4.1 Land Use and Airspace

The proposed construction of new launch facilities at LC-32, flights, and landings are typical of activities carried out at WSMR. LC-32 is an existing launch site designed for this purpose. The sites uprange are also used for landing other test missiles and vehicles at WSMR. No significant land use impacts are expected from any proposed activities at the proposed site or the alternative launch complexes.

Impacts on airspace and scheduling from the proposed action would be minimal. Proposed LAS testing would involve overflights of the range from LC-32 to the uprange landing sites. The use of WSMR-controlled airspace under the proposed action would not result in a significant impact to airspace resources. Activities would fall inside the scope of normal activities within WSMR-controlled airspace. Close scheduling and coordination from CRCC would minimize any airspace conflicts with other concurrent testing or training operations being conducted on WSMR.

The use of the alternative WSMR launch complexes could impact the overall schedule of the LAS project. Due to their current use and locations, airspace and scheduling would require more effort at the alternative sites. The NASA project would not be considered a top priority and the LAS test launches would have to accommodate the schedules of other testing at those launch sites.

At this time, NASA Dryden Flight Research Center has a memorandum of agreement (MOA) with WSMR for testing flight articles (Appendix). JSC, the parent site to WSTF, does not have a similar agreement with WSMR, although other MOAs between WSMR and WSTF exist. A MOA or memorandum of understanding (MOU) may be required to complete the LAS testing at WSMR if the preexisting MOAs are deemed not sufficient.

Another issue of concern is the use of the Peacekeeper booster system. The Peacekeeper booster is regulated by the START II Treaty (1993) between the United States and Russia. WSMR would need to obtain higher level approval to allow the ascent abort testing.

The no action alternative would include no testing at WSMR. Selection of this alternative would have no effects to airspace, and scheduling would not be significantly impacted.

4.2 Physical Resources

4.2.1 Topography

The topography at LC-32 and the alternative launch complexes would not be affected by launch activities described in the proposed action. All launch activities would take place within an established launch complex resulting in no significant impact to topography.

The landing of the LAS may produce a small impact crater. Smaller craters may also be created by debris associated from the impact. Only a small area would be disturbed by the LAS impact. If debris exists, it would be quickly recovered as to lessen the impact of recovery on the area. There is the possibility that smaller debris may go unnoticed and left behind. But since the testing includes only six tests, the accumulation of this debris would be minimal.

The no action alternative would result in no change to the existing topography at WSMR and the surrounding area.

4.2.2 Climate

The proposed test launches and landings, associated activities, and the no action alternative would not alter the climate at WSMR.

4.2.3 Geology

Geology at the launch facilities and landing sites would not be significantly affected. Launch activities would take place within an established launch complex. Efforts would be made to minimize potential impacts at the landing sites.

The no action alternative would include no testing at WSMR and result in no change to existing geology.

4.2.4 Soils

The greatest potential for soil disturbance from the proposed action or alternatives would be associated with the landing of the LAS vehicle uprange. The ground impact associated with the LAS is variable depending on soil density at the landing site, travel distance, and altitude of the vehicle. Since the test vehicle is designed to support human life in the event of an emergency, the parachutes and other features required for a safe landing should decrease and minimize the impact at landing.

In the event of a launch accident, environmental effects may include propellant contamination of surface soils in addition to potential contamination of soil at depth due to high-velocity impact. There is also the potential for intact pieces of solid propellant to still be present on the soil at, or near, the launch accident location. A Contingency Plan will be developed that documents both WSMR and NASA standard procedures for emergency preparations and initial spill response relating to a launch accident. The Contingency Plan will delineate specific actions for immediate response procedures to minimize soil contamination (e.g., immediate retrieval of intact solid propellant), regulatory agency notifications (where appropriate), and final corrective action procedures. Corrective action procedure may include preparation of agency-approved clean-up Work Plans, soil sampling and analyses to determine nature and extent of contamination, and final soil removal, containerization, and treatment or disposal requirements. Finally, longer-term area rehabilitation and monitoring procedures may be included in Work Plans, if necessary.

There would also be minimal soil disturbance at the launch site due to construction of new facilities. Overall the soil and soil quality would not be significantly affected by the proposed LAS testing.

The no action alternative would include no testing at WSMR. The no action alternative would result in no change to the existing physical resources at WSMR and the surrounding area.

4.2.5 Air Quality

Construction at LC-32 would generate man-made dust from the proposed activities. Dust, or soil particulate matter, would also occur at the vehicle landing site from the vehicle itself and the recovery vehicles. However, only small quantities of dust would be generated during these short and infrequent events. To minimize dust during these activities, dust control measures, such as water trucks or dust suppressants, would be used. Portable generators may also be used during the project. Depending on their proposed use, any new stationary source, such as a generator, would have to be added to WSMR's air permit.

In addition to dust, LAS vehicle exhaust and combustion products from fuels burned in internal combustion engines would be the principle impacts to air quality as a result of the proposed activities. Based on the proposed propellants for this test program, approximately 60% of the air emissions are expected to be a combination of carbon monoxide, hydrogen chloride, hydrogen cyanide, nitrogen oxide(s), and aluminum chloride. The remaining 40% of the exhaust emission products includes a mixture of nitrogen, carbon dioxide, and water vapor. Minute quantities of an aluminum, aluminum oxide, and aluminum nitride combination may also be present. The alternative locations would also experience the same issues as the proposed launch and landing locations. Based on daily activities at WSMR, and the short duration of the actual vehicle testing, there would be no long-term cumulative effects or significant impacts to air quality.

The no action alternative would include no testing at WSMR and would not affect the air quality at WSMR or the surrounding area.

4.2.6 Water Resources

No permanent water bodies (e.g. stream, creeks) occur in the vicinity of LC–32 or within the landing areas, with the exception of the AA-4 high altitude test. The proposed landing site for AA-4 is approximately 71 miles from LC-32 and the vehicle would pass over permanent bodies of water. But there are no immediate water concerns at the proposed landing site. Therefore, surface water would not be affected by any of the proposed testing. Groundwater resources would not be significantly impacted by the proposed action. Minor amounts of water could temporarily accumulate in places where thin layers of sediment form atop the bedrock surfaces, especially during the summer rainy season. It is unlikely there would be quantities of groundwater of any significance.

In the unlikely event that any fuel residues remain after vehicle landing, these would be present in very small quantities and contained within the LAS booster debris. In the event of unburned solid rocket fuel, soil sampling may be required at the discretion of White Sands-Environment and Safety (WS-ES) Directorate. Debris would be cleared from the site and disposed of as solid waste after each test event.

As stated, there are no permanent water bodies in the expected landing areas. However, in the event of a launch accident that includes a serious deviation from an intended flight path, environmental effects may include propellant contamination of surface water and possibly shallow groundwater in certain low-lying areas of the range. There is also the potential for intact pieces of solid propellant to still be present in, or nearby, a surface water location which could then be impacted by precipitation, further adding contamination to surface water, or shallow groundwater. A Contingency Plan will be developed that documents both WSMR and NASA standard procedures for emergency preparations and initial spill response relating to a launch accident. Additionally, the Contingency Plan will delineate specific actions for immediate response procedures to minimize potential water contamination (e.g., immediate retrieval of intact solid propellant), regulatory agency notifications (where appropriate), and final corrective action procedures. Corrective action procedure may include preparation of agency-approved clean-up Work Plans, water sampling and analyses to determine nature and extent of contamination, and treatment or remediation procedures. Finally, longer-term monitoring may be included in Work Plans, if necessary.

Equipment used for construction activities would be inspected frequently for petroleum, oil, and lubricant (POL) leaks and appropriate containment would be placed underneath equipment when not in use. In the unlikely event of an accidental POL spill, contaminated soil would be cleaned using the most appropriate remediation method. POL spills would be reported immediately to the Emergency Operations Center by project personnel. In the event of spills, PW-E-EC would determine whether to activate the Spill Prevention, Control, and Countermeasure Plan and the Installation Spill Contingency Plan.

The no action alternative would include no testing of the Orion at WSMR and would result in no change to the existing surface and groundwater at WSMR and the surrounding area.

4.3 Biological Resources

4.3.1 Flora

Construction and repair activities would only occur at LC-32 in a previously disturbed area. No new vegetation disturbances would occur. This would be true for the alternative launch sites as well. Some vegetation could be disturbed at the LAS landing sites, but only a small area would be affected. In all proposed testing activities ground vehicles would use existing roads when available, and travel a single in-and-out path when traveling off-road. Off-road traffic would be restricted in accordance with WSMR Regulation 70-8 to minimize disturbance and vegetation. Overall, there would be no long-term significant impacts to site vegetation.

Wild land fire and debris from the landing of the LAS would be minimal under the planned testing. In the event of a vehicle failure during ascent abort testing, NASA would include a flight termination device that could explode the booster. As a result of this potential scenario, fire and debris are two concerns. WSMR is equipped to handle such situations, but additional NASA resources may need to be included to properly handle the situation. Revegetation and best management practices to minimize erosion would be included in the recovery plan if a fire did occur. The debris would also be collected as efficiently as possible to decrease the impact to surrounding vegetation and wildlife.

A fire detection system with automatic detectors, pull stations, and warning devices, such as a fire alarm horn, would be installed on the launch pad, in addition to the installation of portable ABC fire extinguishers throughout the launch pad. The Final Integration and Test Facility would also have a fire suppression system.

The no action alternative would include no testing at WSMR and would result in no change to the existing floral community at WSMR.

4.3.2 Fauna

Fauna could be affected by construction activities at LC-32, vehicle landing, and recovery activities. Noise from sources, such as vehicles, heavy machinery, and general human activities, related to construction and other test activities would lead to species-specific faunal reactions. Factors influencing faunal responses may be time and length of the noise, seasonality, time of day, stress and physiological effects, life history, naturally occurring and background noise, and habituation (Larkin 1996). Most small mammals would avoid excessive noise by retreating into burrows while larger species of mammals and birds would temporarily vacate the area. Reproductive activities of some small mammals and birds may be temporarily disrupted by noise and the presence of humans while other animals may become increasingly habituated and display little modification in behavior with ongoing exposure.

During the construction of the launch pads, a gantry and umbilical tower would be erected. Due to its size Federal Aviation Administration (FAA)-approved lighting would be required. Towers pose a collision risk to migratory birds that typically travel in large flocks at night. There is also the possibility of daytime bird strikes from low-visibility structures and wires. Tower lights are known to confuse birds, which increases the likelihood of bird strikes. Also, depending on the final design, it could be an attractive nesting spot for some bird species.

Most migratory birds are not listed as threatened or endangered but are protected under the Migratory Bird Treaty Act. It is estimated that between four million and 50 million birds are killed each year in the U.S. by towers (Manville 2005). More precise estimates are not available because the preponderance of towers across the landscape is a fairly new phenomenon, and data are just now being collected and compiled. It is clear that many factors contribute to these numbers, including tower location, design, wires, lighting, weather, and bird behavior. Mitigation factors discussed in Section 5 would reduce the potential for these bird mortalities.

Other potential consequences of testing activities include injury to fauna from the test article or other flying debris. The probability that fauna would be directly hit by the test vehicle or debris is inherently low. The test activities would involve only limited aerial activity, which would pose little threat of bird collisions. While individual mortality may occur, faunal populations would not be significantly impacted because each activity would affect only a limited portion of the total available habitat within WSMR. The affects on faunal species would be the same at the alternative launch locations.

The no action alternative would include no testing at WSMR and would result in no change to the existing fauna resources at WSMR.

4.3.3 Threatened, Endangered, and Sensitive Species

Todsen’s pennyroyal (*Hedeoma todsenii*), which is federally listed as an endangered species, does not occur on or near any of the proposed launch or landing sites. Also, no suitable habitat was detected in any of these areas. The proposed action would have no effect on Todsen’s pennyroyal.

No TES faunal species occur at LC-32 or the other proposed launch sites. They are also unlikely to be found at the proposed landing sites as well. The state endangered White Sands pupfish (*Cyprinodon tularosa*) occupy a variety of micro-habitats, ranging from deep spring ponds to shallow pools and calm spring runs. Daily water temperatures can vary dramatically, often by more than 21 °C (70 °F). Similarly, the salt content of the water ranges from fresh water to saltier than seawater.

http://www.ndsu.nodak.edu/ndsu/stockwell/Pupfish%20Website/

Malpais Spring, Salt Creek, Mound Spring, and Lost River

Natural threats to the pupfish include nonnative fishes (introduced years ago into nearby ponds) and the expansion of saltcedar (an exotic plant introduced in the 1950s). Other threats include groundwater pumping, pollution, habitat alteration through construction, and missile debris impacts. The White Sands pupfish occurs in four locations in southeast New Mexico; three of which are located on WSMR: Mound Springs, Malpais Springs, and Salt Creek. The nearest population to test activities would be Salt Creek, which is approximately 16 km (10 mi) south of the landing site for AA-4, and it is unlikely the planned test vehicle flight path would affect this species.

Wild land fire and debris from the landing of the LAS would be minimal under the planned testing. In the event of a vehicle failure during ascent abort testing, NASA would include a flight termination device that could stop the booster. As a result of this potential scenario, fire and debris are two concerns. In the event the test article affects land not currently examined in this EA, the WSMR land manager would be notified of the disturbance to the vegetative and faunal communities to react responsibly and lessen the potential impact to TES and other species.

The no action alternative would include no testing at WSMR and would result in no change to the existing fauna and floral populations at WSMR and the surrounding area.

4.4 Cultural Resources

Based on previous surveys of LC-32, the proposed alternative complexes, and the proposed landing sites, there are no known cultural resources that would be affected by the proposed activities. The V-2 landmark at LC-33 is the closest known resource that could be impacted. For the safety of the structural integrity of the landmark buildings and structures, a vibration monitor would be installed prior to testing of the LAS.

There is also the potential to strike a subsurface site during construction. A dig permit describing the proposed location of construction would be required prior to any activities. In the event that a previously unknown resource is located, all activity would cease and site archeologists would be notified.

The no action alternative would include no testing at WSMR and would result in no change to the existing cultural resources at WSMR.

4.5 Noise and Vibration

Vehicle launches and landings, vehicle traffic, construction, and recovery operations would generate noise. The vehicle landing would not create any high-level noise, but construction and launching activities at the launch complex could create loud but short impulse noise. For the safety of workers, proper protective equipment including hearing protection would be required (OSHA 2006). As a precaution noise monitors could be set up prior to the first test. Any loud noise or vibration generated during testing activities would be infrequent, very short in duration, and not be expected to affect the local wildlife. Thus, the proposed testing would have no significant impact on conditions that currently exist.

The no action alternative would include no testing at WSMR and would result in no change to the existing environment at WSMR.

4.6 Socioeconomics

Impacts resulting from the proposed action or alternatives would be considered significant if they were to cause a major increase or decrease in populations and/or employment levels in the region, substantially change the quality of life for persons living in the region or generate an unfairly high and disproportionate burden on minority and low-income persons living in the region.

No significant impact to employment, population, and economic activity is expected from the proposed action or alternatives. The current level of socioeconomic activity would not significantly change or be adversely affected. Personnel working in support of the proposed activities would include military, civil servants, and contractors. Proposed activities would provide small socioeconomic benefits primarily for the cities of Las Cruces and Alamogordo.

Minority and low income populations are believed to exist within the proposed action's region of influence. Cities, towns, and block groups within the region of influence were not considered to have high minority and poverty populations compared to the general population of New Mexico. Under the proposed action, there would be no significant impact on, nor a potential for, disproportionately high and adverse effects on minority and low-income populations. The proposed action locations are not located near permanent communities, surrounding towns and schools, nor Main post homes and schools.

The no action alternative would result in no change to the present socioeconomic relationships between WSMR and the surrounding communities. The number of workers employed at WSMR would remain at approximately current levels, there would be little or no change to the regional income and population, and there would be no significant impact or adverse consequences to minority or low-income populations in the area.

4.7 Infrastructure and Utilities

Impacts resulting from the proposed action or alternatives would be considered significant if they were to increase demand on public infrastructure or services that would negatively affect the quality of service for persons living in the region. The proposed action, which occurs entirely within WSMR boundaries, would not significantly impact public infrastructure or increase the burden on infrastructure. Infrastructure and power requirements for the activities at LC-32 or the alternative sites would not exceed WSMR's existing infrastructure resources. Generators would be inspected to ensure proper working order and compliance with applicable permitting requirements, safety, air quality, and spill containment.

Water and septic system use would increase under the proposed action. Currently, there is no water deluge system for the exhaust. All existing facilities are considered sufficient to handle an increase in demands for services under the proposed action. In the event that it is necessary, NASA would pay to have the septic tanks at LC-32 serviced. No major changes to the demands for public services (e.g. fire protection, solid waste disposal) are anticipated under the proposed action.

Proposed activities would have little to no impact on the permanent communication and electrical sources at LC-32. Cellular phones or radios, required for personnel traveling north of U.S. Highway 70 on WSMR, would see increased use during testing, but the increased use of this communication would not significantly impact communication resources.

Increased vehicle traffic at LC-32 and the landing sites may result from the proposed action but would not be considered significant. The existing roads and parking structures would be used and is considered adequate to handle the demands under the proposed action. Existing roads would be repaired and new gravel roads would be added as necessary. The transportation of waste or hazardous materials would be in compliance with WSMR regulations. Only approved or existing routes would be used.

Proposed activities may require occasional blocking of traffic on WSMR roads and U.S. Highway 70. The proposed testing would not significantly affect transportation from periodic as roadblocks impede vehicular traffic infrequently and temporarily.

The no action alternative would include no testing and the burden on infrastructure, transportation, and communications would be slightly less than under the proposed action.

4.8 Hazardous Materials, Hazardous Waste, and Solid Waste

Following flight, hazardous materials in the form of spent solid rocket boosters, remaining fluid in liquid propellant RCS tanks, and unexploded pyrotechnics due to potential malfunctions would remain. Small debris may also be present. These materials would be recovered for final disposal and do not pose a significant source of solid or hazardous waste. The solid propellant is expected to be completely expended prior to landing and would not affect soil chemical quality. All hazardous material and hazardous wastes are recovered immediately, transported, stored, and disposed of in accordance with WSMR Regulation 200-1 and WSMR’s Resource Conservation and Recovery Act (RCRA) permit. Small amounts of hazardous or toxic materials would be stored at LC-32. Nonhazardous waste would be handled as solid waste or non-regulated waste. All solid waste generated at WSMR is collected by an off-site contractor and is disposed of in the Otero landfill.

In the event of a failure of the test vehicle, NASA would have a contingency plan in place to handle the corrective action, clean-up, and disposal of the vehicle debris and any contaminated materials. WSMR would also be consulted on the preferred methods to rehabilitate the area if it is deemed necessary.

In the unlikely event of accidental petroleum, oil, and lubricant spills, contaminated soil would be cleaned using the most appropriate remediation method.

The no action alternative would include no testing of the LAS at WSMR and would result in no excess hazardous or solid waste being generated at WSMR.

4.9 Human Health and Safety

As a safety precaution, personnel would be evacuated from LC-32 to safe areas during the launch and landing of the vehicle. During testing, the LAS test vehicle would have a flight termination system to destroy the vehicle if abnormal functioning is detected during the flight, eliminating the risk of impacts in areas other than the proposed landing areas.

Accidents, including fires and hazardous material spills would be reported immediately to WS-ES. A report would be submitted to WS-ES describing the measures taken or proposed to minimize impacts and/or prevent recurrences of the incident. Proper personal protective equipment would be used by personnel working on the project.

Personnel would be required to receive UXO training before being allowed entry onto WSMR, including instruction not to disturb potential UXO items. All potential UXO and unfamiliar objects would be reported to WSMR Range Operations. Also, all the major UXO areas uprange are to be avoided as landing zones during testing.

There is some risk to personnel from venomous snake bites, but these typically occur only when the species is harassed or provoked. Test personnel would be instructed not to harass venomous spiders and snakes. In addition, Hantavirus training would be provided to personnel.

Public safety is also an issue with the proposed testing. Public interest in the testing could provide a local increase in population at launch time. At minimum, viewers would be placed outside the safety buffer zone set by Flight Safety, and be provided trash cans and portable bathroom facilities at the selected viewing sites. WSMR Public Affairs would provide selected sites based on the information gathered before the first test. WSMR Public Affairs would also provide ways to inform the public of the launches and related activities for each test. Overall the proposed action would have no significant impact on human health and safety.

The no action alternative would include no testing at WSMR and have no impact on human health and safety.

4.10 Irretrievable and Irreversible Commitment of Resources

The proposed testing of the NASA Orion LAS at LC-32 and the uprange landing sites would cause no losses to natural, cultural, or human resources. Some irreversible and irretrievable commitment to resources would be expected from the use of test components, fuel, energy, and labor. The LAS activities at WSMR would not commit natural resources in unacceptable quantities nor cause resources to become inaccessible for other uses.

4.11 Cumulative Impacts

Cumulative impacts are those environmental impacts that result from the incremental effects of the proposed action when compounded by other past, present, or reasonably foreseeable future actions (40 CFR §1508.7). The Orion LAS project would make minor insignificant contributions to impacts at WSMR. Booster exhaust and support vehicle emissions would contribute minor amounts to air emissions. Additional dust would also be generated during construction activities and vehicle landings. Test emissions would be infrequent and dissipation of emissions and dust would be rapid and have no long-term cumulative effects.

The Orion LAS testing would make minor contributions to noise during construction and testing activities. Noise associated with construction activities and test activities would be localized at LC-32 and the proposed landing sites uprange. In addition noise from launch and landing would be infrequent. Vehicle traffic associated with testing and construction activities would slightly increase but would not significantly increase traffic loads on the existing road network at WSMR. Although the larger debris are routinely collected and removed from the site after each test, a few small pieces often remain. Thus, fragments of metal or related components could potentially accumulate over time.

5.0 Mitigation and Monitoring

To minimize potential environmental impacts associated with the proposed action as identified in the preceding analysis, the following mitigations would be adopted. These mitigations are central to the determination of no significant impact. Mitigation efforts would be implemented at the discretion of

WS-ES. Any unexpected adverse impacts to the environment would require additional mitigation measures.

5.1 Land Use and Airspace

Close scheduling and coordination from WSMR CRCC would minimize any airspace or scheduling conflicts with other testing or training operations being conducted on WSMR.

5.2 Physical Resources

To minimize dust during construction activities, dust control measures, such as water trucks or dust suppressants, would be used.

Equipment used for construction activities would be inspected frequently for petroleum, oil, and lubricant leaks and appropriate containment would be placed underneath equipment when not in use if needed.

5.3 Biological Resources

Ground vehicles would use existing roads when available, and follow a single in-and-out path when traveling off-road. Off-road traffic would be restricted to minimize disturbance to the vegetation.

If any species listed in Section 3 are found following the completion of this EA, WS-ES would be consulted to determine if additional mitigation is necessary to prevent impact to the listed species' populations.

As part of the construction activities, a gantry and umbilical tower would be constructed. Current designs have the tower under 61 m (200 ft) tall. The height of towers directly influences the number of birds killed; towers greater than 305 m (1,000 ft) are responsible for the most mortalities. For that reason, the USFWS recommends that towers be less than 61 m (200 ft) tall, which is the shortest tower than can be unlit according to FAA regulations (USFWS 2000). But lights would still be needed for the tower, and would be provided by the launch pad and not higher up on the tower. The illumination level would provide at least 5 ft candles of lighting per OSHA 29 CFR 1926.56 and comply with the New Mexico Night Sky Protection Act. To reduce the risks to birds and bats, the minimum number and intensities of lights required with the longest duration of dark between flashes would be used. These parameters are in accordance with the USFWS tower guidelines (USFWS 2000) and are bird friendly. No mitigation or monitoring is necessary for the lightning protection systems.

Efforts would be made to make the platforms and structure of the tower undesirable to nesting birds, such as hawks and great horned owls. Scheduled surveys would be conducted during the nesting season (February through April) to search for and remove nesting material to prevent egg deposition. Birds, such as great horned owls, would be discouraged by using open grating on the platform floors for the gantry and tower. Personnel would be instructed to report dead birds or bats near the launch pad facility as soon as they are discovered.

5.4 Cultural Resources

A dig permit describing the proposed location of construction would be required prior to any activities. In the event that a previously unknown resource is located, all activity would cease and WSMR archeologists would be notified.

In the event that any project activities are required outside the proposed areas in this EA, these activities would be coordinated with site archeologists and additional archeological surveys would be conducted if necessary.

5.5 Hazardous Materials, Hazardous Waste, and Solid Waste

Vehicle debris would be collected and removed from the landing site.

Hazardous materials and hazardous wastes would be recovered immediately, transported, stored, and disposed of in accordance with WSMR regulations and RCRA permit. Nonhazardous waste would be handled as solid waste or non-regulated waste.

5.6 Human Health and Safety

The LAS test vehicles would have a flight termination system to eliminate the risk of impacts in areas other than the proposed landing sites.

Preparations would be accomplished for debris recovery and potential fire hazards for each test as would requirements established by WSMR’s Flight Safety Office.

All personnel working on the test project would have the required UXO, wildlife, cultural, and necessary training.

Safe viewing sites would be provided to the public during the launches. Public safety is also an issue with the proposed testing. At minimum, viewers would be placed outside the safety buffer zone set by Flight Safety and provided trash cans and portable bathroom facilities at the selected viewing sites. WSMR Public Affairs would provide selected sites based on the information gathered before the first test. WSMR Public Affairs would also provide ways to inform the public of the launches and related activities for each test.

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Appendix

Memorandum of Agreement

Interagency Agreement
Between
Department of the Army
White Sands Missile Range
and
National Aeronautics and Space Administration
Dryden Flight Research Center
for
Crew Exploration Vehicle Abort Flight tests

This agreement is entered into by the National Aeronautics and Space Administration (NASA), Dryden Flight Research Center (DFRC), and the Department of the Army, White Sands Missile Range (WSMR). The legal authority for NASA to enter into this agreement is found in sections 203(c) (5) and (6) of the Space Act of 1958 (42 U.S.C 2451 et.seq.), as amended.

I. BACKGROUND

NASA Dryden Flight Research Center, under the direction of NASA Johnson Space Center, is responsible to perform a series of Crew Exploration Vehicle (CEV) abort flight tests. These flight tests are part of the CEV Abort Flight Test (AFT) Project. The CEV is NASA's next generation human spacecraft. The objective of these tests is to help in the development and certification of the CEV launch abort system (LAS). The LAS is the "ejection seat" of the crew module (CM). If the need arises, the LAS will pull the CM free of the booster and to a safe condition. The combination of the crew module and launch abort system for these tests will be referred to as the flight test article (FTA).

There will be series of tests on the ground pad, called the pad abort (PA) tests, which will test the LAS under zero — zero conditions. There will also be a series of airborne tests, known as the ascent abort (AA) tests, which will test the LAS under flight conditions. For these tests a booster rocket, known as the abort test booster (ATB) will propel the FTA to the appropriate test conditions at which time the LAS will initiate the abort sequence, separating the FTA from the ATB. The FTA will parachute to a landing for recovery, but the ATB will be destroyed. There is also the possibility of ATB qualification flights. This test would be an ascent test, but the FTA would not separate from the ATB.

It has been determined, after a detailed look at several ranges, that WSMR is the optimum location to perform these tests and WSMR has agreed to host them. Support required from WSMR will start with the initial flight safety and environmental assessment studies and continue through launch and recovery of the flight test articles and clean up of the ATB.

II. PURPOSE

The purpose of the effort agreed to by the parties to this agreement will be to obtain all support necessary to perform pad abort tests, booster qualification flight tests, and flight abort tests. The agreement also allows for follow on or related activities as agreed by the parties after initial results are achieved.

Information and data developed shall be available to the parties to this agreement subject to the limitations herein.

Although the general purpose and the particular party responsibilities are set out in the agreement, both parties agree that a more detailed work description shall be completed for each activity. This work description shall use existing documents, such as the Universal Documentation System (UDS) for range support.

III. RESPONSIBLITIES

A. WSMR will be responsible for, but not limited to:

1. Support necessary to plan, develop, document and build a test site.
    a. Site must accommodate ground test, pad abort tests, as well as, ascent abort tests.
    b. Site must accommodate a variety of test support equipment and ground personnel, which may include several vans and support vehicles.
2. Support necessary to set up, prepare and pre-flight the FTA's and ATB's near the launch site.
3. Support necessary to integrate the FTA to the pad for the PA tests or to the ATB then to the pad for the booster qualification flight test and AA tests.
4. Support necessary for the launch and recovery of the FTA's.
5. Support necessary to clear the Range following the booster qualification flight test and the AA tests.
6. Providing a single focal point for communicating with the DFRC AFT Project Manager (PM).
7. Working with DFRC AFT PM or his/her designee to define specific tasks and identify specific resources necessary for the execution of these tests.
8. Documenting these tasks with the CEV AFT Task Document, UDS or other document as applicable.
9. Acquiring access for identified NASA and NASA contractor personnel to normal base services (e.g., food, bus, utilities) provided to WSMR civilian and contractor personnel.

10. Acquiring range support, including range safety services, communication, TM, Radar, Data links and Video services as required.
11. Acquiring test site office space and normal office support serves as agreed.
12. Acquiring an ATB assembly building if required.
13. Acquiring mobile or fixed control room(s) if required.
14. Acquiring security for the launch site, ATB, and FTA if required.
15. Supporting an inter-agency airworthiness and flight safety review process that will be defined and agreed to by NASA, WSMR, and the ATB provider, if other than NASA.
16. Ensuring that Ground Safety and Range Safety Requirements are met.

B. NASA Dryden will be responsible for:

1. Reimbursing WSMR in amounts agreed for their efforts under this agreement.
2. Providing project management and engineering assistance, and other contributions to the test efforts detailed in the activity work descriptions.
3. Providing a current schedule of events, updated at least yearly.
4. Providing the ATB's and FTA's and NASA ground test equipment in accordance with schedule provided.
5. Ground and flight operations in coordination with WSMR.
6. Providing nominal and dispersed trajectories.
7. Supporting an inter-agency airworthiness and flight safety review process that will be defined and agreed to by NASA, WSMR, and the ATB provider, if other than NASA.
8. Providing a list of the necessary project requirements and services to WSMR to enable them to carry out their support function.
9. Reimbursing WSMR, either directly or indirectly, for remediation of any environmental contamination caused by its CEV AFT operations. NASA DFRC shall coordinate any responses to environmental regulatory agencies with WSMR.
10. Providing Public Affairs support through Johnson Space Center.
11. Mission Success of the FTA and related test objectives.
12. Providing WSMR with all required information and support to assure safety objectives and requirements are met.

IV. SCHEDULE AND MILESTONES

The current major milestones and schedules are found at Attachment 1. Refinements to this schedule will be made at least yearly, but most likely on a more frequent basis. More detailed milestones and schedules will be provided as part of the work descriptions for particular activities. DFRC and WSMR will each have priority use of their own project development work force and facilities. The parties will agree on the use of work force resources on a case-by-case basis. Any pre-empting of an established schedule will be as mutually agreed.

V. LIABILITY AND RISK OF LOSS

A. A Pre-Mishap Plan will be established as necessary prior to applicable test events.

B. Both DFRC and WSMR retain the rights to investigate, adjudicate, settle, and pay or deny any claim of liability made against the United States through the alleged action or inaction of that organization's employees or agents. Both organizations agree to cooperate in investigations conducted by the other organization.

C. Accident investigation and accountability will be in accordance with the procedures set forth in the Memorandum of Understanding (MOU) between NASA and DoD for Joint Investigation of Aircraft and Space Mishaps, dated 9 December 1982.

VI. KEY PERSONNEL

The following personnel are designated as key officials for their respective Party. These key officials are principal points of contact between the Parties in the performance of the Agreement.

	NASA Dryden	WSMR
Name:	Griffin Corpening	Filemon Aragon
Title:	DFRC AFT Project Manager	Project Engineer
Address:	NASA DFRC, M/S 48xx P.O. Box 273 Edwards, CA 93523-0273	CSTE-DTC-MT-MS, Bldg 1504 WSMR, NM 88002-5157
Phone:	661-276-2497	505-678-0723

VII. FINANCIAL OBLIGATIONS

For transfer of funds from NASA DFRC to WSMR:

A. DFRC concurrence in the Agreement signifies agreement to reimburse WSMR for all agreed upon legitimate costs in accordance with Chapter 11 of Volume 11B of the DOD Financial Management Regulation, DOD 7000.14-R and any applicable local instruction.

B. NASA understands that WSMR is a cost reimbursable agency and as such, NASA is responsible for costs incurred by WSMR. Under the Economy Act, NASA will provide the agreed amount, based on each activity's fiscal year requirements, upon being funded for mission execution. Funds will be provided, and billing and payment will be completed, through the established Intra-government Payment and Collection (IPAC) process. WSMR mission managers will manage their respective funding and will provide financial status, status charts, program management reviews, or other meetings as required.

VIII. ADDITIONAL TERMS

A. Data rights. Information and data exchanged in furtherance of the activities under this Agreement will be exchanged without use and disclosure restrictions unless required by national security regulations or otherwise agreed to by the Parties for specifically identified information or data.

B. Property. NASA will retain ownership of the ATB's, FTA's, NASA ground support equipment, and flight test data during and after this experiment, unless otherwise agreed by the parties. This includes test sensors and software provided to accomplish the various tasks under this agreement. NASA DFRC will retain ownership of the data conditioning, recording, and telemetry hardware and any associated software provided with them.

IX. TERMS AND TERMINATION

A. This Agreement becomes effective upon the date of the last signature below and shall remain in effect until the completion of all obligations of both Parties hereto, or ten (10) years from the date of the last signature below, whichever comes first. The Agreement may be extended by written agreement of the parties.

B. Either Party has the right to terminate this Agreement, giving 30 days written notice any time for any reason it deems substantial. In the event of such termination, each Party shall bear its own costs of termination.

C. Any WSMR personnel hereunder who visit NASA Dryden or another NASA facility shall comply with all prescribed security and safety regulations.

D. Any NASA personnel or their contractors hereunder who visit WSMR shall comply with all prescribed security and safety regulations.

In WITNESS WHEREOF, each Party has caused this Agreement to be executed by its duly authorized representative on the date indicated below.

National Aeronautics and
Space Administration, Dryden
Flight Research Center

Original Signed by:

Robert R. Meyer
Associate Director for Programs
NASA Dryden Flight Research Center

Date: 5/15/06

Department of the Army,
White Sands Missile Range

Original Signed by:

Thomas R. Berard, SES
Director
White Sands Missile Range

Date: 15 Jun 2006