2. Description of Proposed Action and Alternatives

This Programmatic EA for the SSP disposition of real and personal property evaluates two alternatives: the Proposed Action and the No Action Alternative. These two alternatives are described below:

- **Proposed Action**: NASA proposes to implement a centralized process for the disposition of the SSP real and personal property consisting of a coordinated series of actions. SSP real and personal property would be evaluated in accordance with NASA Procedural Requirements (NPR) 8800.15, "Real Estate Management Program Implementation Manual," and NPR 4300.1, "NASA Personal Property Disposal Procedural Requirements," to select the best option for disposition.
- **No Action Alternative:** NASA would not implement the proposed comprehensive and coordinated effort to disposition SSP property under a structured and centralized SSP process. The disposition of SSP property would instead occur on a center-by-center and item-by-item basis in the normal course of NASA's ongoing facility and program management.

The SSP is scheduled for retirement in 2010; NASA is developing this Programmatic EA to fulfill the NEPA requirements. SSP property disposition activities may extend several years beyond 2010. This document provides information about the SSP operations, assets, and environmental activities that are conducted at the major NASA Centers that support SSP. This section of the Programmatic EA describes the Proposed Action and alternatives and summarizes the potential impacts associated with the disposition of assets used in the SSP. Property is defined as follows:

- Real property is defined as land, buildings, and other structures and their associated built-in systems that cannot readily be moved without changing the essential character of the real property.
- Personal property is defined as all assets not classified as real property owned by, leased to, or acquired by the government. Personal property whose disposition may have the potential to significantly affect the environment is analyzed in this Programmatic EA.

This Programmatic EA for the SSP describes the assets related to the SSP activities and evaluates the possible environmental impacts associated with their disposition. Note that the discussions and analyses of impacts are organized by NASA Center (except for Palmdale, which is a USAF-owned, contractor-operated facility). That is, the disposition of assets is linked to their locations and the impacts vary based on the locations.

2.1 Description of the Proposed Action and Preferred Alternative

2.1.1 Disposition of Shuttle Assets

Under presidential direction, NASA will cease operations of its SSP in 2010. A number of assets will be dispositioned during the T&R activities. SSP property disposition activities may extend several years beyond 2010.

NASA proposes to implement a centralized process for the disposition of the SSP real and personal property consisting of a coordinated series of actions. SSP real and personal property would be evaluated in accordance with NPR 8800.15, "Real Estate Management Program Implementation Manual," and NPR 4300.1, "NASA Personal Property Disposal Procedural Requirements," to select the best option for disposition.

2.1.1.1 Real Property

When the SSP disposes of real property, the responsible NASA Center will evaluate whether the property can be used by another NASA program (reutilization), or it may mothball or destroy the property. If NASA decides to convey the property to another federal, state, local, or private individual, NASA relinquishes the property to the GSA. The GSA will convey the property according to federal laws and regulations. The property disposition options that will be evaluated for real property are as follows:

- **Reutilization:** The first option for disposal of government property is reutilization by another NASA program. Property is screened for reutilization by NASA's ongoing programs and for use by future programs.
- **Utilization:** If the property is not required by other NASA programs, it is made available to other federal agencies. The receiving federal agency would be responsible for the applicable NEPA analysis and documentation resulting from the use of the property.
- **Mothball**: Under this option, NASA would mothball particular SSP real property in place. Under this scenario, NASA would maintain these properties at some low level of support in the event that a Center or new program could use them in the future.

- **Destruction**: Under this option, the property would be demolished or otherwise removed from NASA property to an appropriate location, such as a landfill or hazardous waste treatment, storage, or disposal facility (TSDF).
- **Release to GSA**: If the property is no longer needed by NASA, it may be relinquished to the GSA for conveyance to other federal, state, local, or private individuals.

Property Survey. NASA has undertaken a historical survey and evaluation of all NASA-owned facilities and properties (real property assets) to assess their eligibility for listing in the NRHP in the context of the SSP (1969 through 2010). In February 2006, a Shuttle Transition Historic Preservation Working Group (HPWG) was formed that included the Historic Preservation Officers (HPOs) for all NASA Centers.

The HPWG drafted a set of standard criteria for the evaluation of Shuttle program-related properties at all NASA Centers (Appendix C). The SSP estimates that approximately 580 NASA facilities and properties were associated with the SSP. Most of these were existing assets, while others were built specifically for the development and implementation of the SSP. Of these, the HPWG identified more than 300 facilities and properties that were believed to have played significant roles in the SSP. In 2006, NASA surveyed these assets to determine NRHP eligibility. Of these, a total of 223 assets were found to be eligible for listing on the NRHP because of their contributions to the SSP. Of these 223 assets, 205 are real property assets and 18 are considered personal property, aircraft, or unique equipment used by the SSP.

Of the 223 assets, 62 were already NRHP-listed or NRHP-eligible due to a past NASA program or activity. Thus, the HPWG's agency-wide SSP study has identified 161 assets that are considered newly eligible for listing because of their significance to the SSP. Nomination decisions and consultation with the appropriate State Historical Preservation Officer (SHPO) will be made by NASA Centers. NASA HQ is developing a final report of the findings, which will be presented to the Advisory Council on Historic Preservation (ACHP) and National Park Service (NPS) for their information. The results of the surveys are presented by Center in Section 3.

These surveys were completed in accordance with Section 110 of the National Historic Preservation Act (NHPA). They also provide eligibility determinations that will support the Section 106 process for undertakings, because they are planned in support of the development and implementation of future NASA programs or missions such as the Constellation Program. Such future undertakings will not be the SSP's responsibility, but will be led by the NASA projects or programs that plan to use SSP-related assets in the future. The program or project office that proposes to modify listed or eligible assets will be responsible for completing consultation in accordance with the Section 106 process.

2.1.1.2 Personal Property

Shuttle-related personal property includes hundreds of thousands of items ranging from common parts to complex tooling and flight hardware. The disposition of common parts has no potential for significant impacts to the environment. Consequently, only personal properties such as complex tooling and flight hardware that may have the potential to adversely affect the environment are analyzed in this Programmatic EA.

When personal property is no longer required by the SSP, it is disposed according to NASA's established procedures for disposal. The disposal procedure progresses through a series of options, as described below:

- **Reutilization:** The first option for the disposal of government property is reutilization by another NASA program. Property is screened for reutilization by NASA's ongoing programs and for use by future programs.
- **Storage:** Under this option, NASA would relocate particular SSP personal property to appropriate storage locations (such as laydown yards or warehouses). At these locations, the property would be maintained at some minimum level of support in the event that a Center or new program could use it in the future. These locations would have an appropriate level of security provided by the location's owner, which either would be NASA or some other federal agency. The storage locations could be located onsite, offsite, or be newly constructed areas or buildings. Because it currently is not known whether any new storage areas would be constructed to store SSP property, the information necessary to analyze the potential environmental impacts for constructing such areas does not exist at this time. Therefore, environmental analyses for the construction of new structures for storage of SSP property are deferred until the construction becomes less speculative, and the information necessary for analyses becomes available. Any additional NEPA analyses will be conducted by the responsible Center.
- **Utilization:** If the property is not required by other NASA programs, it is made available to other federal agencies. The receiving federal agency would be responsible for the applicable NEPA analysis and documentation resulting from the use of the property.
- **Donation:** If the property is not required by another federal agency, it is eligible for donation. Under this option, federal excess property can be provided to the state for screening and then to other eligible applicants, including nonprofit educational and public health activities, nonprofit and public programs (such as museums) for the elderly, educational activities of special interest, public airports, or the homeless.

- **Sales:** Under this option, providing that efforts to reutilize and/or donate have been exhausted, NASA would dispose of the property by means of a competitive bid process such as an auction, sealed bid, or retail sales, in accordance with the guidelines.
- **Destruction:** Under this option, the property would be demolished or otherwise removed from NASA property to an appropriate location, such as a landfill or hazardous waste TSDF.

The evaluation criteria to assess the potential historical significance of personal property and the preservation requirements are being developed by NASA. Once completed, these requirements will be applied to SSP personal property to determine what is historically significant. NASA defines artifacts as unique objects that document the history of the science and technology of aeronautics and astronautics. Their significance and interest stem mainly from their relation to the following: historic flights, programs, activities, or incidents; achievements or improvements in technology; our understanding of the universe; and important or well-known personalities (NASA, 2006e).

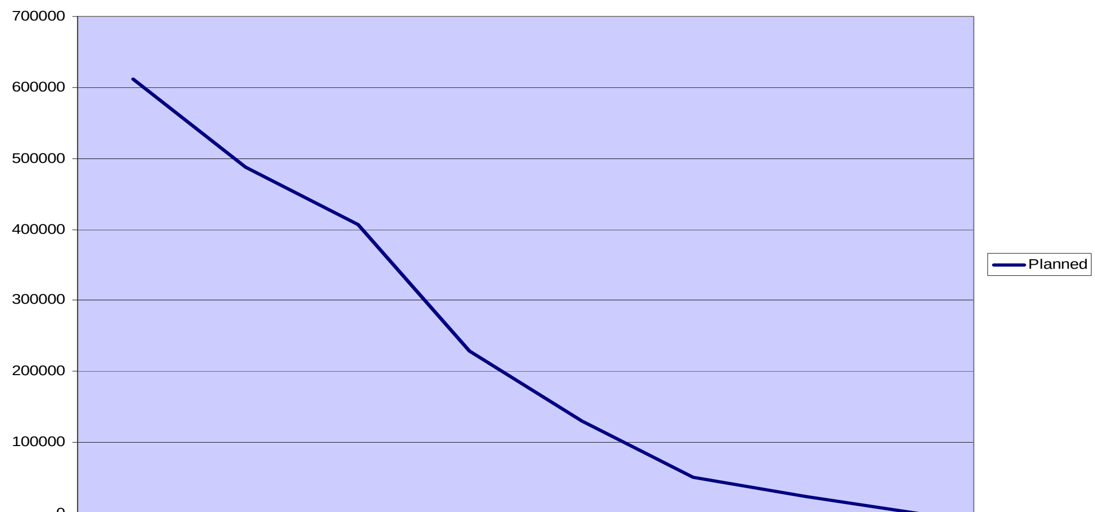
Property may be disposed at a landfill or hazardous waste storage facility if no longer needed, or may be engineered for re-use by NASA, or put on display by NASA or a museum. Some of the property will contain hazardous substances such as lead paint, asbestos, chromium coatings, hypergols, oxidizers, heavy metals, and other materials. NASA currently is planning to address “end-state” requirements for those assets that contain hazardous substances. The end-state requirements for each asset will include the tasks of decontamination and safing each item to meet the requirements for its end-use (final disposition) and to be in compliance with applicable state, federal, and local laws. For example, an asset that will be on public display at a museum will require a higher level of decontamination and safing than will an asset that will be reutilized by future space programs.

2.1.1.3 Property Disposition Schedule

NASA has approximately 600,000 property line items that will be excessed between 2008 and 2015 (Exhibit 2-1) and approximately 350,000 property line items that will be transferred during the same timeframe (Exhibit 2-2). Bar graphs depicting the planned property that will be excessed and transferred by location are shown in Exhibits 2-3 and 2-4, respectively.

EXHIBIT 2-1
Property Excess Planned Burndown

Total Excess Planned Burndown FY 08 - FY15



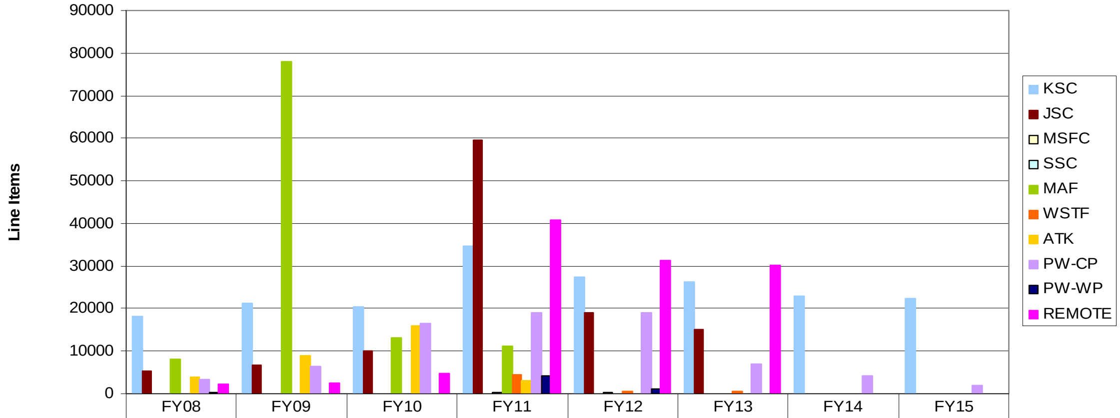
	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15
Planned	611645	487536	406416	229358	130419	51416	24313	0

EXHIBIT 2-2
Property Transfer Planned Burndown

Planned Property Transfer Burndown

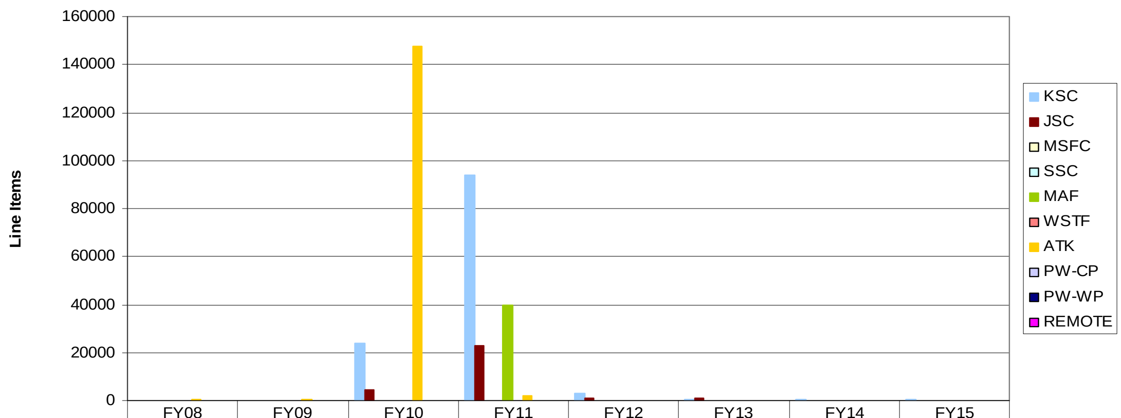
	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15
Planned	341535	340955	165002	6578	2458	675	345	0

EXHIBIT 2-3
Property Excess Planned Burndown by Location



	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15
KSC	18258	21183	20296	34578	27354	26283	23023	22338
JSC	5369	6790	10188	59532	19039	15065	0	0
MSFC	0	0	136	14	7	0	0	0
SSC	0	0	0	264	352	0	0	0
MAF	8002	77984	13087	11315	0	0	0	0
WSTF	0	0	0	4334	617	617	0	0
ATK	4000	9000	16000	3141	0	0	0	0
PW-CP	3287	6534	16559	18929	19140	6953	4080	1975
PW-WP	216	72	0	4136	1034	0	0	0
REMOTE	2295	2546	4854	40815	31396	30085	0	0

EXHIBIT 2-4
Property Transfer Planned Burndown by Location



	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15
KSC	90	135	24029	94079	3012	675	330	345
JSC	0	0	4240	22825	1108	1108	0	0
MSFC	0	0	107	0	0	0	0	0
SSC	0	0	0	0	0	0	0	0
MAF	12	45	50	39520	0	0	0	0
WSTF	0	0	0	0	0	0	0	0
ATK	400	400	147527	2000	0	0	0	0
PW-CP	0	0	0	0	0	0	0	0
PW-WP	0	0	0	0	0	0	0	0
REMOTE	0	0	0	0	0	0	0	0

2.1.2 Space Shuttle Operations and Elements

2.1.2.1 Space Shuttle Operations

SSP-related operations are conducted at numerous sites nationwide. The locations of the major SSP-related sites are shown in Exhibit 2-5. Exhibits 2-6 and 2-7 illustrate the SSP hardware flow and associated facilities. Additional SSP-related operations such as testing and training are conducted at these and other sites. The major Centers and their roles in supporting the SSP are described below:

- KSC – Space Shuttle assembly, launch, and landing
- JSC – SSP management, astronaut training, and mission control
- EF – Astronaut flight training
- EPFOL – Astronaut flight training
- SSC – SSME testing
- MAF – SSP ET manufacturing
- MSFC – Space Shuttle propulsion management
- WSTF – Hypergol testing and astronaut Shuttle landing training facility (White Sands Space Harbor [WSSH])
- DFRC – Space Shuttle back-up landing facility
- Palmdale – Thermal Control System (TCS) development, cold plates, ET disconnects, and logistics manufacturing

The prime contractor facilities associated with SSP operations include ATK (Promontory, Utah), Boeing (Huntington Beach, California), Lockheed Martin (at MAF), Pratt Whitney Rocketdyne (West Palm Beach, Florida; and Canoga Park, California), and USA (primarily KSC and JSC locations). These facilities were not included (except for MAF's NASA Operations) because they are responsible for the disposition of their own properties. However, government-owned property at contractor sites is included in this EA. Exhibit 2-6 outlines the flow of SSP hardware between the prime contractor facilities and the NASA Centers.

Facilities at which SSP operations are conducted, including government owned/government-operated (GO/GO) and government owned/contractor-operated (GO/CO), are assessed for potential environmental impacts. The design, manufacture, testing, and operation of numerous SSP components are accomplished at several contractor facilities around the U.S. These facilities are covered by existing environmental permits and state regulations and are not assessed for potential environmental impacts in this Programmatic EA.

EXHIBIT 2-5
SSP Facilities

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EXHIBIT 2-6
SSP Hardware Flow

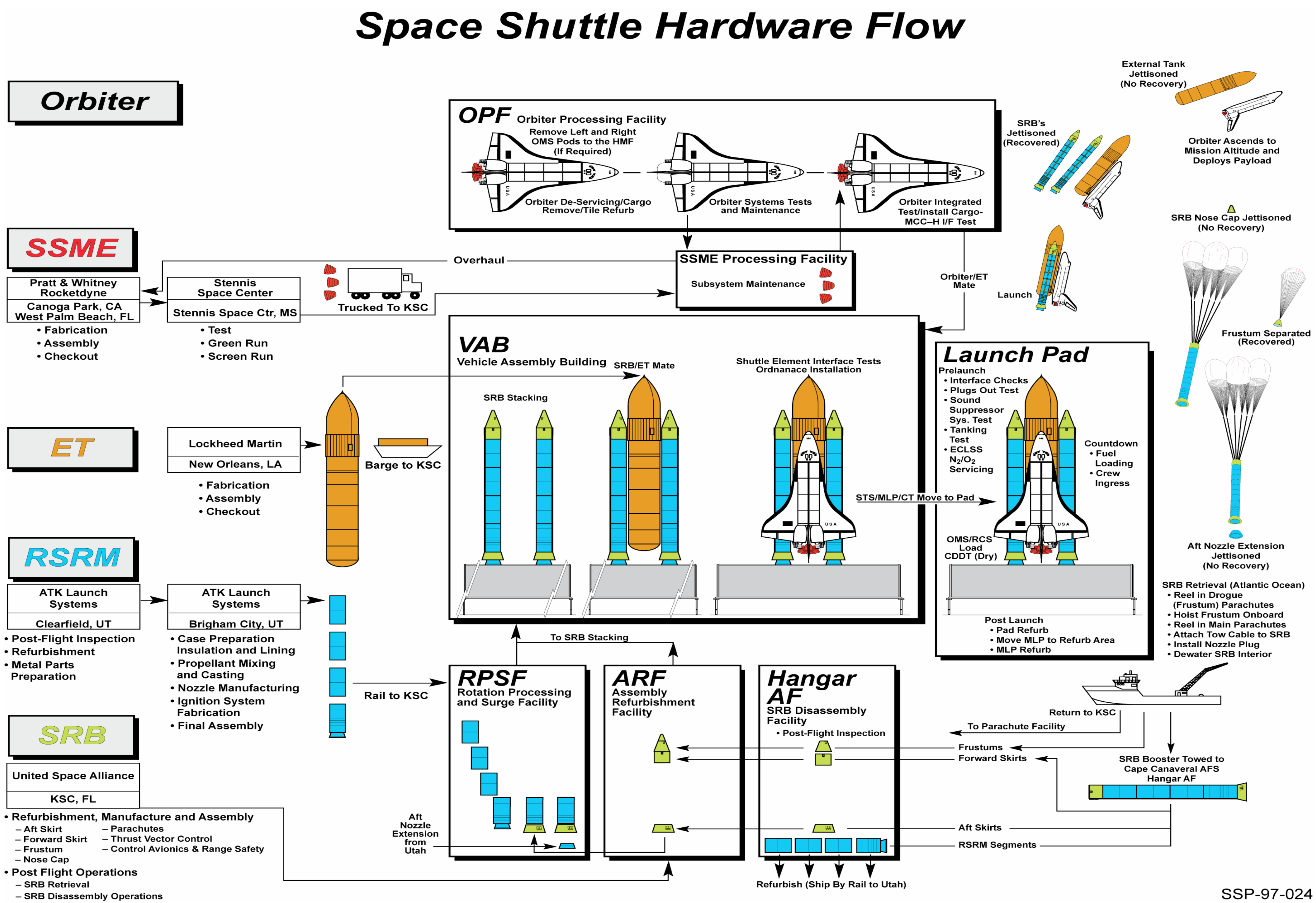

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EXHIBIT 2-7
Space Shuttle Elements Flow at SSP Related NASA Centers

Space Shuttle Elements	Orbiter	Space Shuttle Main Engines	External Tank	Solid Rocket Booster	Reusable Solid Rocket Motor (RSRM)
Dryden Flight Research Center (DFRC)	Alternate landing site for the Orbiter if conditions are not favorable at KSC. Maintains GSE and a Shuttle hangar in case of a Shuttle landing at DFRC.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Ellington Field (EF)	Maintains aircraft including the STA for training the astronauts by simulating the flight controls of the Orbiter. In the past, the Shuttle, transported on a Boeing 747 carrier, has stopped at EF for transport to KSC.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
El Paso Forward Operating Location (EPFOL)	Astronauts fly T-38 aircraft from EF to EPFOL to prepare for flights in the STA. The astronauts are briefed at EPFOL for their training mission in the STA.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Johnson Space Center (JSC)	Manages the Orbiter Project. The office also manages program engineering support activities for operation elements and flight crew equipment hardware and flight preparation activities. The USA Flight Crew Equipment Facility is located offsite, but supports numerous requirements associated with Orbiter-owned hardware.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Kennedy Space Center (KSC)	After completing a space mission, the Orbiter is returned to KSC to undergo preparations for its next flight in the OPF. In the OPF, the vehicle is safed, residual propellants and other fluids are drained, and returning horizontal and middeck payloads are removed. Any problems that may have occurred with Orbiter systems and equipment on the previous mission are checked out and corrected. Equipment is repaired or replaced and extensively tested. Any modifications to the Orbiter that are required for the next mission also are made in the OPF. Following extensive testing and verification of all electrical and mechanical interfaces, the Orbiter is transferred to the nearby VAB, where it is mated to the ET with attached SRBs. The MLPs provide GSE for Shuttle checkout, servicing, and launch. They are a two-story transportable launch base for the Shuttle stack. The exterior of the MLPs provide for SRB hold-down posts, Orbiter tail service masts, and sound suppression water nozzles for deluge water. The MLPs are transported from the VAB to the launch pad by a large tracked vehicle called the Crawler-Transporter. At the launch pad, final preflight and interface checks of the Orbiter, its payloads, and the associated GSE are conducted. After a positive Flight Readiness Review, the decision to launch is made and the final countdown begins.	The SSMEs arrive at KSC via truck from SSC. Three SSMEs are readied for installation on the Orbiter at the SSME Processing Facility. The SSME Processing Facility also performs maintenance on the SSMEs. The SSMEs are moved to the OPF for installation on the Orbiter.	The ET is sent to KSC from MAF for installation for final assembly at the VAB via barge.	SRBs are built at KSC. SRBs are manufactured, assembled, and refurbished at the ARF. The SRBs are sent through Post Flight Operations at Hangar AF. These operations entail recovering and towing the SRBs, disassembly, safing, and surface coating removal. SRBs are then sent to the RPSF and then to the VAB for final assembly.	RSRMs are constructed at a contractor's facility in Utah and shipped by rail to KSC. The RSRM is run through the RPSF and is then sent to the VAB for final assembly.
Marshall Space Flight Center (MSFC)	Not applicable.	Manages the SSME Project.	Manages the ET Project.	Manages the RSRB (combined motor and booster project)	Manages the RSRB Project.

EXHIBIT 2-7
Space Shuttle Elements Flow at SSP Related NASA Centers

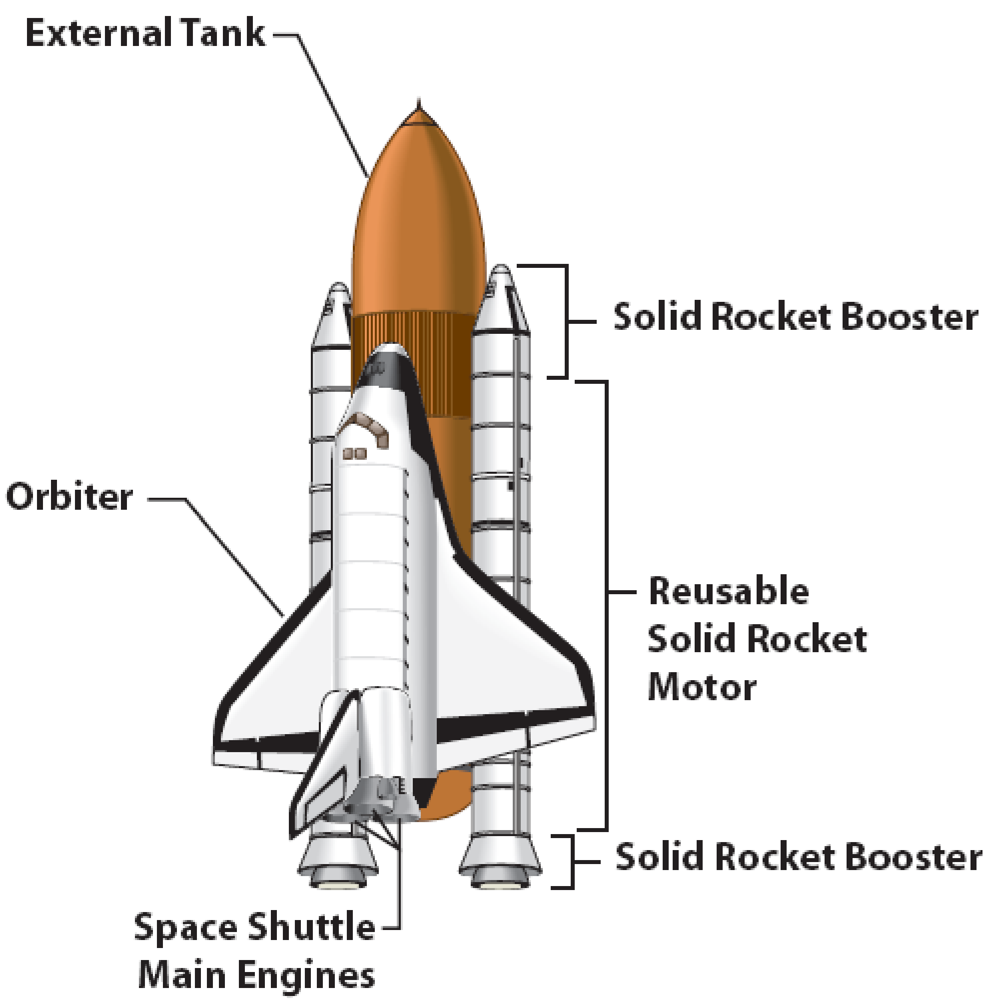
Space Shuttle Elements	**Orbiter**	**Space Shuttle Main Engines**	**External Tank**	**Solid Rocket Booster**	**Reusable Solid Rocket Motor (RSRM)**
Michoud Assembly Facility (MAF)	Not applicable.	Not applicable.	ET is manufactured, assembled, and tested at MAF.	Not applicable.	Not applicable
Palmdale	TPS manufacturing and testing, cold plate manufacturing, and logistic manufacturing are conducted at Palmdale.	Not applicable.	ET umbilical manufacturing and assembly are conducted at Palmdale.	Not applicable.	Not applicable.
Stennis Space Center (SSC)	Not applicable.	SSME testing is conducted at SSC. NASA operates nine barges at SSC to transport liquid hydrogen (three barges) and liquid oxygen (six barges). The SSME is tested to meet an SSP requirement, whether it is to test an engine component or to prepare an entire engine for flight. After testing, the engine remains on the test stand for further testing or is removed and sent to Building 9101 for storage or to be rebuilt. If the engine is being tested for flight, the flight testing profile is completed through a series of tests. The engine is removed and then shipped via truck to KSC for installation on an Orbiter.	Not applicable.	Not applicable.	Not applicable.
White Sands Test Facility (WSTF)	NASA evaluates materials and components at WSTF for use in propulsion, power generation, and life-support systems, crew cabin equipment, payloads, and experiments carried aboard the Shuttle Orbiter and the ISS. The WSSH is the Orbiter approach and landing training facility. It also is a contingent landing site for the Orbiter if the conditions at KSC or EAFB are not favorable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Notes:
ARF = Assembly and Refurbishment Facility
DFRC = Dryden Flight Research Center
EF = Ellington Field
EPFOL = El Paso Forward Operating Location
ET = External Tank
GSE = Ground support equipment
ISS = International Space Station
JSC = Johnson Space Center
KSC = Kennedy Space Center
MAF = Michoud Assembly Facility
MLP = Mobile Launch Platform
MSFC = Marshall Space Flight Center
NASA = National Aeronautics and Space Administration
NBL = Neutral Buoyancy Laboratory
OPF = Orbiter Processing Facility
RPSF = Rotation, Processing and Surge Facility
RSRM = Reusable Solid Rocket Motor
SRB = Solid Rocket Booster
SSC = Stennis Space Center
SSME = Space Shuttle Main Engine
SSP = Space Shuttle Program
STA = Shuttle Training Aircraft
TPS = Thermal Protection System
USA = United Space Alliance
VAB = Vehicle Assembly Building
WSSH = White Sands Space Harbor
WSTF = White Sands Test Facility
WSTF = White Sands Test Facility

2.1.2.2 Space Shuttle Space Flight Hardware Elements

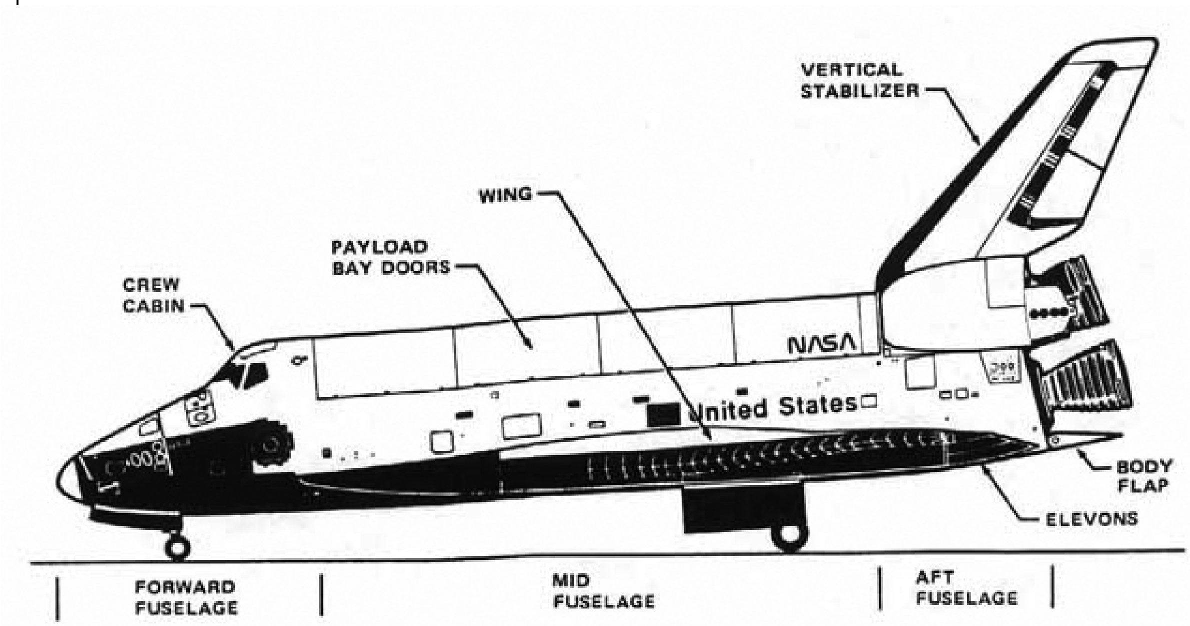
The primary Space Shuttle elements are a piloted, reusable orbiting vehicle called the Orbiter, three SSMEs, an ET, two Reusable Solid Rocket Motors (RSRMs), and two Solid Rocket Boosters (SRBs). The configuration of the vehicle's elements is shown in Exhibit 2-8. Ground support equipment (GSE), logistics support, and flight crew equipment also are critical components of the SSP. These groups work together with the Systems Engineering and Integration Office to support the assembly, launch, flight, landing, and refurbishment of the Space Shuttle.

EXHIBIT 2-8
Space Shuttle Configuration



Orbiter. The Orbiter, shown in Exhibit 2-9, is about the same size and weight as a DC-9 aircraft. The Orbiter contains a pressurized crew compartment that normally can carry up to 7 crew members, and has a payload bay to carry cargo that is 18 meters (m) (60 feet [ft]) long and 4.5 m (15 ft) wide, and 3 main engines mounted on its aft end. To protect its aluminum structure during ascent and descent into Earth's atmosphere, the Orbiter is covered with heat-resistant tiles and reinforced carbon panels (NASA, 2004e).

EXHIBIT 2-9
Space Shuttle Orbiter



After completing a space mission, the Orbiter is returned to KSC to undergo preparations for its next flight in a sophisticated aircraft-like hangar called the Orbiter Processing Facility (OPF). In the OPF, the vehicle is safed, residual propellants and other fluids are drained, and returning horizontal and middeck payloads are removed. The Orbiter is refurbished and processed by USA at KSC.

Any problems that may have occurred with Orbiter systems and equipment on the previous mission are checked out and corrected. Equipment is repaired or replaced and extensively tested. Modifications to the Orbiter that are required for the next mission also are made in the OPF.

Orbiter refurbishment operations and processing for the next mission also begin in the OPF. Large horizontal payloads are installed in the Orbiter cargo bay. Vertical payloads are installed at the launch pad.

Following extensive testing and verification of the electrical and mechanical interfaces, the Orbiter is transferred to the nearby Vehicle Assembly Building (VAB), where it is mated to the ET with attached SRBs. Then, the assembled Space Shuttle vehicle is carried to the launch pad by a large tracked vehicle called the Crawler-Transporter.

At the launch pad, final preflight and interface checks of the Orbiter, its payloads, and associated GSE are conducted. After a positive Flight Readiness Review, the decision to launch is made and the final countdown begins (NASA, 1992).

Space Shuttle Main Engine. The three main engines on the Orbiter are the SSMEs, as shown in Exhibit 2-10. With a maximum thrust at sea level of more than 418,000 pounds each, they work in tandem with the SRBs from liftoff until the SRBs separate, about 2 minutes after launch, after which they are the sole means of propelling the Orbiter into space. They use liquid hydrogen (LH2) for fuel and cooling and liquid oxygen (LOX) as an oxidizer. The propellant is carried in separate tanks in the ET and supplied to the main engines under pressure. Each SSME is 4 m (14 ft) long and 2.3 m (7.5 ft) in diameter at the nozzle exit, and weighs approximately 3,175 kilograms (kg) (7,000 pounds). The SSME's major components are the fuel and oxidizer turbopumps, preburners, hot gas manifold, main combustion chamber, nozzle, oxidizer heat exchanger, and propellant valves.

SSME components are manufactured by Pratt-Whitney/Rocketdyne in Canoga Park, California, and shipped to SSC for assembly and testing. SSMEs are hot-fired tested and prepared for flight at SSC. SSC tests new engine components as well as entire engines for flight. After an SSME successfully completes a test series that determines its flight readiness, it is transported via truck to KSC. The SSME arrives at the SSME Processing Facility, where it is readied for installation on the Orbiter. The SSME Processing Facility also performs maintenance on the SSME. The SSME is moved to the OPF for installation on an Orbiter.

External Tank. The ET contains the propellants used by the SSMEs, as shown in Exhibit 2-11. The ET also provides structural support for the Shuttle stack during the launch at the attachment points for the SRBs and Orbiter.

The ET, which is the only major component of the Space Shuttle that is not reusable, is 47 m (154 ft) long and 8.7 m (28.6 ft) in diameter, and weighs slightly more than 71,000 pounds without fuel. The largest and heaviest (when loaded) element of the space shuttle, the ET has three major components: the forward LOX tank, an un-pressurized intertank that contains most of the electrical components, and the aft LH2 tank. To meet the need for flights to the ISS, a new super lightweight tank was developed that incorporates aluminum-lithium in its internal structures, thus reducing the overall tank weight by 7,500 pounds.

EXHIBIT 2-10
Space Shuttle Main Engine

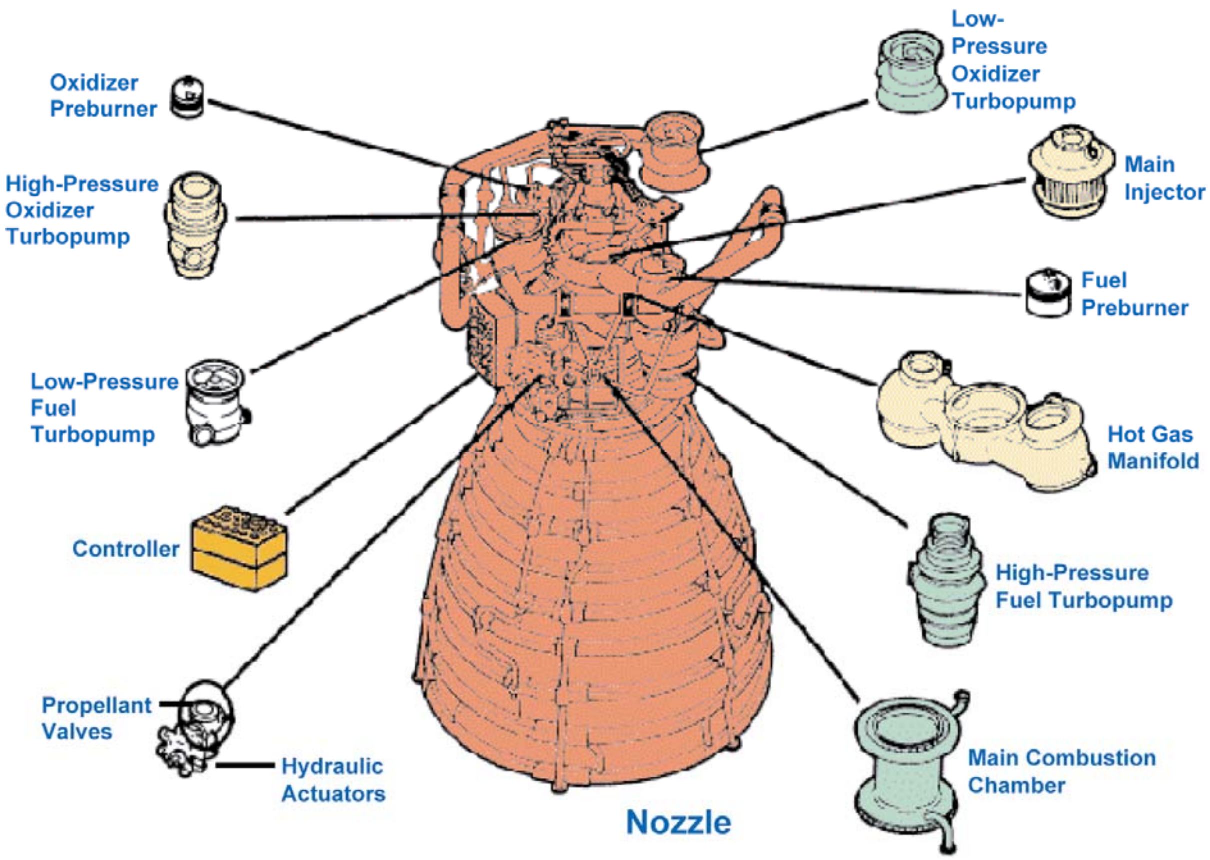
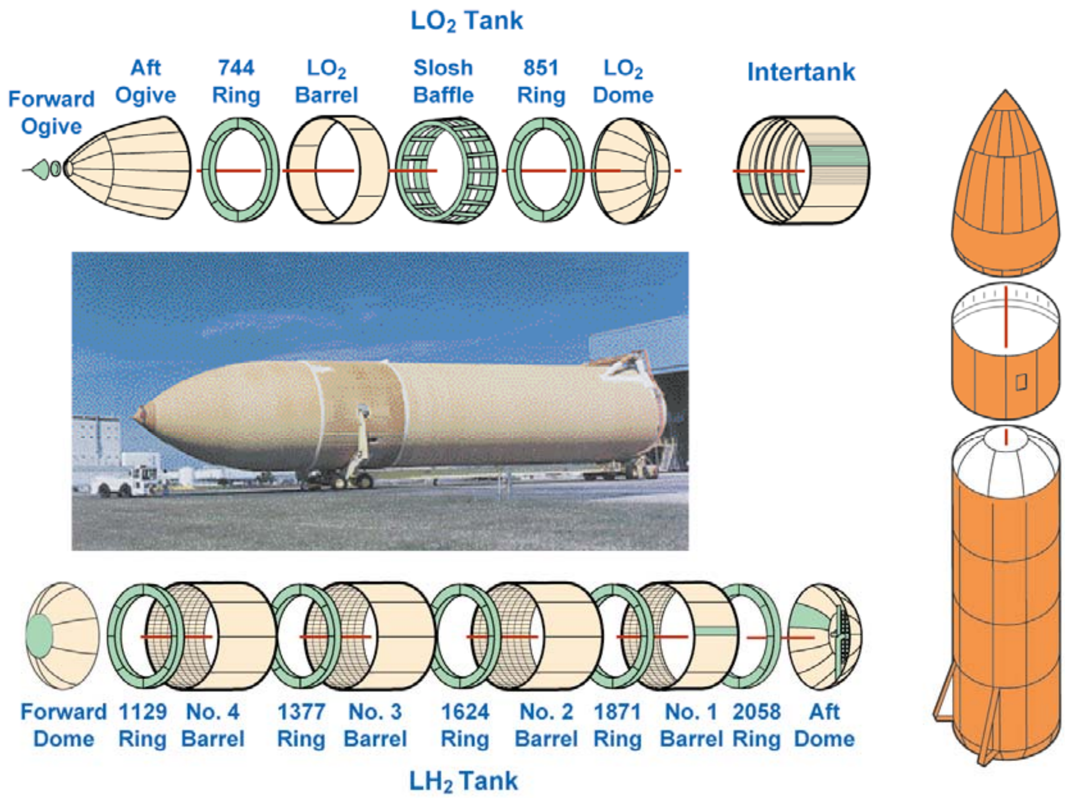


EXHIBIT 2-11
Space Shuttle External Tank



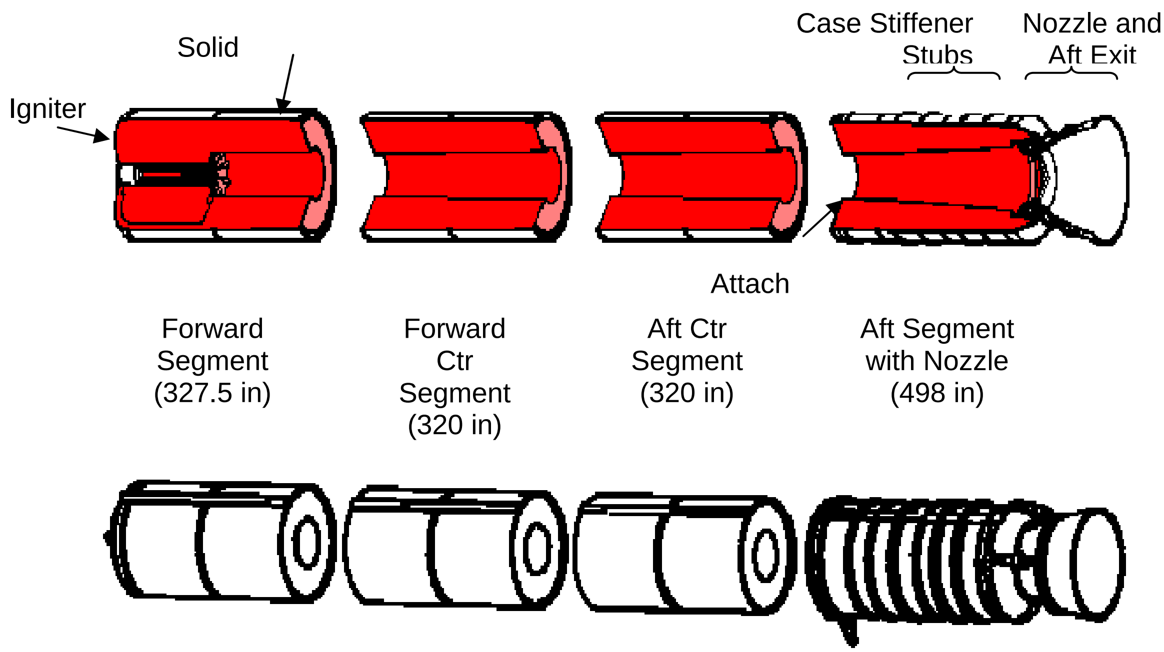
The skin of the ET is covered with a thermal protection system (TPS) coating of spray-on polyisocyanurate foam. The purpose of the TPS is to maintain the propellants at an acceptable temperature, to protect the skin surface from aerodynamic heat, and to minimize ice formation.

The ET includes a propellant feed system to duct the propellants to the Orbiter engines, a pressurization and vent system to regulate the tank pressure, an environmental conditioning system to regulate the temperature and render the atmosphere in the intertank area inert, and an electrical system to distribute power and instrumentation signals and provide lightning protection. The tank's propellants are fed to the Orbiter through a 43-centimeter (cm) (17-inch)-diameter connection that branches inside the Orbiter to feed each main engine (NASA, 2007q).

The ET is manufactured by Lockheed Martin at MAF in New Orleans, Louisiana. Upon completion, the tanks are shipped via barge to KSC, where they are mated to the Shuttle in the VAB.

Reusable Solid Rocket Motor. The Space Shuttle RSRM is the largest Solid Rocket Motor (SRM) ever to fly and the only SRM rated for human flight (Exhibit 2-12).

EXHIBIT 2-12
Space Shuttle Reusable Solid Rocket Motor



Each RSRM consists of four rocket motor segments, a nozzle, and an aft exit cone assembly. Each motor is just slightly more than 38 m (126 ft) long and 3.7 m (12 ft) in diameter. The propellant mixture in each motor consists of aluminum powder (fuel), polymer (binder), iron oxide (a catalyst), and a curing agent.

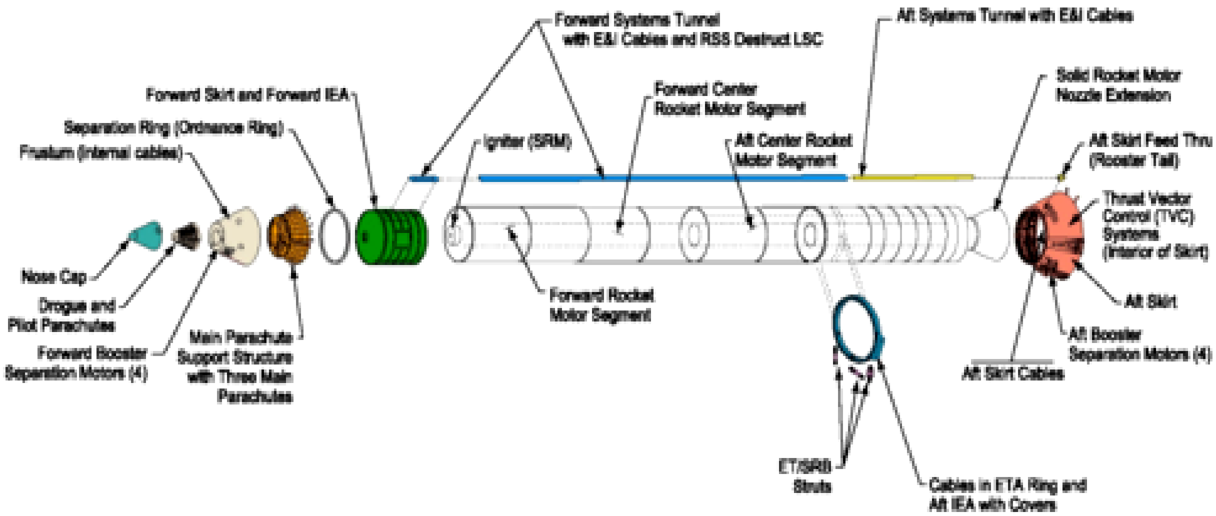
Each Space Shuttle launch requires the boost of two RSRMs to lift the 4.5-million-pound shuttle vehicle. From ignition to end of burn, each RSRM generates an average thrust of 2.6 million pounds and burns for approximately 123 seconds. By the time the twin RSRMs have expended their fuel, the Space Shuttle Orbiter has reached an altitude of 39 kilometers (km) (24 nautical miles) and is traveling at a speed in excess of 4,828 km per hour (km/h) (3,000 miles per hour [mph]). Hardware for each RSRM can be used as many as 20 times.

ATK manufactures and assembles the RSRM segments and nozzles at Promontory, Utah, and then ships them by rail to KSC. At KSC, they are stacked with additional assemblies to become SRBs, as described below.

After flight, the RSRMs are retrieved and towed by boat to the CCAFS Hangar AF, where they are disassembled, rinsed, and placed on railcars for shipment back to ATK. ATK refurbishes the RSRM hardware, prepares the case segments, mixes and casts the propellant, and assembles the segments in preparation for shipment back to KSC.

Solid Rocket Booster. The SRBs include forward skirt and aft skirt assemblies stacked fore and aft with the RSRM segments (Exhibit 2-13). The SRB is manufactured and assembled by USA at KSC. The SRB forward and aft skirts are assembled and refurbished in the SRB Assembly and Refurbishment Facility (ARF). The RSRM aft segment is attached to the SRB aft skirt in the Rotation, Processing, and Surge Facility. In the VAB, the additional RSRM segments and the SRB forward skirt are stacked on top of the aft assembly. The aft skirt is assembled in the RSRM stack in the Rotation, Processing, and Surge Facility.

EXHIBIT 2-13
Space Shuttle Solid Rocket Booster



The forward skirt is assembled to the RSRM stack in the VAB. The aft skirt assembly consists of the aft skirt, which houses the steering system called the thrust vector control system, cables, and four separation motors. The forward skirt assembly consists of the nose cap (houses pilot and drogue parachutes), four booster separation motors, frustum (houses three main parachutes and cables), and the forward aft skirt (houses guidance gyros).

Two minutes after SSP launch, at an altitude of about 39 km (24 miles), the two SRB and RSRM assemblies separate from the ET and descend by parachute into the ocean, where they are collected by recovery ships for refurbishment and reuse. Post-flight inspection is conducted in Hangar AF. After inspection, the motor segments are shipped back to ATK in Utah to be reloaded with solid propellant.

Shuttle Processing. The Shuttle Processing operations include all of the integration, maintenance, processing, and repairs to the Space Shuttle vehicle upon landing until launch. Therefore, Shuttle Processing uses most of the facilities located at KSC to perform the operations, including the Launch Pad Complexes, VAB, OPFs, and Shuttle Landing Facility (SLF). During the course of a Shuttle ground operations flow, the Orbiter is processed and integrated with the SSMEs, and eventually mated to the ET and SRBs atop the Mobile Launch Platform. Propellant operations take place at the Launch Pad before a launch.

2.1.3 Proposed Action Schedule

The SSP is scheduled for retirement in 2010. Under the Proposed Action, once an asset is determined to no longer be needed by the SSP, it would become slated for disposition. Disposition could occur for some assets before SSP retirement in 2010. However, many assets will be needed until the final Space Shuttle mission is completed. Furthermore, the evaluation of the potential usefulness of some assets for other NASA programs may not be possible until those programs reach a certain level of maturity. Therefore, so that NASA may best use its SSP-related assets, final disposition of SSP-related assets under the Proposed Action would continue for several years past 2010.

2.2 Description of the No Action Alternative

Under the No Action alternative, NASA would not implement the proposed comprehensive and coordinated effort to disposition SSP property under a structured and centralized SSP process. The disposition of SSP property would instead occur on a center-by-center and item-by-item basis in the normal course of NASA's ongoing facility and program management.

2.3 Alternatives Considered but Not Carried Forward

There were no other alternatives considered. The Vision for Space Exploration issued by the President directed NASA to use the Space Shuttle to fulfill its obligation to complete assembly of the ISS and then to retire the Shuttle in 2010; therefore, no other alternatives were considered.

2.4 Summary Comparison of Alternatives

Exhibit 2-14 summarizes the potential environmental impacts, which are presented in detail in Section 4. Potential impacts to resources resulting from the implementation of the two alternatives were identified and placed into one of the following pre-determined classifications (NASA, 2007h):

- No Impact–no impacts are expected
- Minimal–Impacts are not expected to be measurable, or are measurable but are too small to cause any change in the environment

- Minor–Impacts that are measurable but are within the capacity of the affected system to absorb the change, or the impacts can be compensated for with little effort and few resources so that the impact is not substantial
- Moderate–Impacts that are measurable but are within the capacity of the affected system to absorb the change, or the impacts can be compensated for with effort and resources so that the impact is not substantial
- Major–Environmental impacts that, individually or cumulatively, could be substantial

EXHIBIT 2-14
Summary Comparison of Alternatives

Resource Area	Potential Impact of Proposed Action	Potential Impact of No Action Alternative
Kennedy Space Center		
Air Quality	minimal to no impact	minimal to no impact
Biological Resources	minimal impact	minimal impact
Cultural Resources	moderate impact	moderate impact
Hazardous/Toxic Materials and Waste	minimal impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact
Land Use	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Socioeconomics	minimal to no impact	minimal to no impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
Johnson Space Center		
Air Quality	minimal to no impact	minimal to no impact
Biological Resources	no impact	no impact
Cultural Resources	moderate impact	moderate impact
Hazardous/Toxic Materials and Waste	minimal impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact
Land Use	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact

EXHIBIT 2-14
Summary Comparison of Alternatives

Resource Area	Potential Impact of Proposed Action	Potential Impact of No Action Alternative
Socioeconomics	minimal to no impact	minimal to no impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
Ellington Field		
Air Quality	minimal to no impact	minimal to no impact
Hazardous/Toxic Materials and Waste	minimal to no impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact
Land Use	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
El Paso Forward Operating Location		
Air Quality	minimal to no impact	minimal to no impact
Hazardous/Toxic Materials and Waste	minimal to no impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
Stennis Space Center		
Air Quality	minimal to no impact	minimal to no impact
Biological Resources	minimal impact	minimal impact
Cultural Resources	moderate impact	moderate impact
Hazardous/Toxic Materials and Waste	minimal impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact

EXHIBIT 2-14
Summary Comparison of Alternatives

Resource Area	Potential Impact of Proposed Action	Potential Impact of No Action Alternative
Land Use	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
Michoud Assembly Facility		
Air Quality	minimal to no impact	minimal to no impact
Biological Resources	minimal impact	minimal impact
Cultural Resources	moderate impact	moderate impact
Hazardous/Toxic Materials and Waste	minimal impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact
Land Use	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Socioeconomics	minimal to no impact	minimal to no impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
Marshall Space Flight Center		
Air Quality	minimal to no impact	minimal to no impact
Biological Resources	minimal impact	minimal impact
Cultural Resources	moderate impact	moderate impact
Hazardous/Toxic Materials and Waste	minimal impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact
Land Use	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Socioeconomics	minimal to no impact	minimal to no impact

EXHIBIT 2-14
Summary Comparison of Alternatives

Resource Area	Potential Impact of Proposed Action	Potential Impact of No Action Alternative
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
White Sands Test Facility		
Air Quality	minimal to no impact	minimal to no impact
Biological Resources	minimal impact	minimal impact
Cultural Resources	moderate impact	moderate impact
Hazardous/Toxic Materials and Waste	minimal impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact
Land Use	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Socioeconomics	minimal to no impact	minimal to no impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
Dryden Flight Research Center		
Air Quality	minimal to no impact	minimal to no impact
Cultural Resources	moderate impact	moderate impact
Hazardous/Toxic Materials and Waste	minimal impact	minimal impact
Health and Safety	minimal impact	minimal impact
Hydrology and Water Quality	minimal impact	minimal impact
Land Use	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact
Palmdale		
Air Quality	minimal to no impact	minimal to no impact
Cultural Resources	moderate impact	moderate impact

EXHIBIT 2-14
Summary Comparison of Alternatives

Resource Area	Potential Impact of Proposed Action	Potential Impact of No Action Alternative
Hazardous/Toxic Materials and Waste	minimal impact	minimal impact
Health and Safety	minimal impact	minimal impact
Noise	minimal impact	minimal impact
Site Infrastructure	minimal impact	minimal impact
Solid Waste	minimal impact	minimal impact
Traffic and Transportation	minimal impact	minimal impact

Notes:
No Impact–No impacts expected
Minimal–Impacts are not expected to be measurable, or are measurable but are too small to cause any change in the environment
Minor–Impacts that are measurable but are within the capacity of the affected system to absorb the change, or the impacts can be compensated for with little effort and few resources so that the impact is not substantial
Moderate–Impacts that are measurable but are within the capacity of the affected system to absorb the change, or the impacts can be compensated for with effort and resources so that the impact is not substantial
Major–Environmental impacts that, individually or cumulatively, could be substantial

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