Spaceport Master Plan
Phase 2a

Space Florida
30-APR-09

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File Number: 302-7292-007

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SECTION A: EXECUTIVE SUMMARY

Introduction

Since the early days of the United States of America's space program, Florida has been the world leader in commitment and involvement to the enterprise of space launch related activities. As the aerospace business continues to evolve, it is important for the State of Florida to have an updated 5-year Spaceport Master Plan that allows Florida to continue to be the premier location for space launch activity.

This Spaceport Master Plan, Phase 2a, is a major component of the second phase of a comprehensive State of Florida, Space Transportation Master Plan. This Spaceport Master Plan will specifically analyze a commercial Spaceport hub located at Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS). The primary focus of the Spaceport Master Plan, Phase 2a, consists of space launch capabilities at Space Launch Complex 36 (SLC-36), Space Launch Complex 46 (SLC-46), and Space Launch Complex 47 (SLC-47), identified as the Space Florida Spaceport. Phase 2b of the Spaceport Master Plan will analyze the current condition and future requirements of Florida's transportation infrastructure to support aerospace related businesses in Florida.

FL Spaceport Infrastructure

Florida is a leader in space launch related activities at KSC and CCAFS supporting a large number of launches for commercial, civil, and defense payloads. Launches in Florida are currently conducted from Launch Complex 39A & 39B (Space Shuttle) at KSC or from SLC-41 (Atlas V), SLC-37 (Delta IV), or SLC-17 (Delta II) at CCAFS.

SpaceX is preparing to launch their Falcon 9 launch vehicle from their licensed SLC-40. Space Florida is currently pursing licensing agreements with the Air Force to provide commercial launch access to SLC-36 and SLC-46 at CCAFS. Launches from the CCAFS Skid Strip via carrier aircraft have been conducted for Pegasus launch vehicles.

- SLC-36: Space Florida currently has a "Right of Entry" at SLC-36 and is coordinating with the Air Force to obtain a real property license to operate and maintain SLC-36. Concurrently Space Florida is coordinating with the FAA to obtain a launch site operator's license.
- SLC-46: Space Florida is pursuing a renewal of the previous license for SLC-46 with the Air Force and a renewed Memorandum of Agreement with the Naval Ordnance Test Unit.

- SLC-47: Space Florida has a Real Property License from the 45th Space Wing to operate and maintain SLC-47 to support Space Florida's small rocket program, which includes the Super Loki sounding rocket.

Outside of KSC/CCAFS, Jacksonville Aviation Authority is currently in the process of obtaining a Launch Site operators License from the FAA, to support Suborbital Reusable Launch Vehicles operating from Cecil Field Spaceport in Jacksonville.

Commercial Launch Zone

One method proposed to encourage businesses to bring space-related enterprises to Florida is the concept of the Commercial Launch Zone (CLZ) and its associated legislation. Space Florida is advocating for passage of new legislation during the 2009 Florida Legislative session. The legislation would create a commercial launch zone that includes unique incentives designed to entice new space-related business to locate, relocate, or expand in Florida making it more competitive in the global aerospace marketplace. If enacted, the legislation is structured to provide relief for some of the costs of establishing new aerospace-related business in Florida, including Free Trade Zone-type benefits, which lower the tax burden for a defined period of time.

The hub of the CLZ encompasses KSC and CCAFS and includes launch complexes SLC-36, SLC-46, SLC-40, and SLC-47, as well as a variety of support facilities, including but not limited to the Space Life Sciences Laboratory and the Reusable Launch Vehicle (RLV) hanger at the Shuttle Landing Facility (SLF), KSC, and Astrotech's Titusville, facilities. See Space Florida's Strategic Business Plan for additional details on the CLZ.

Launch Complex Evaluation

In this phase of the Spaceport Master Plan, three launch complexes (SLC-36, SLC-46, and SLC-47) at the CCAFS were evaluated employing the following two methods: First, the Spaceport Evaluation Mechanism (SEM) approach was used to assess commercial viability of a Spaceport at CCAFS. Second, an overall Launch Site Viability Evaluation Method was used to identify additional site factors for assessing individual launch complexes within the Spaceport.

The SEM approach addresses spaceport factors such as business plans, regulatory issues, operational safety plans, infrastructure, location, and operational facilities. The Launch Site Viability Evaluation looks at specific factors related to individual launch sites within the spaceport, including proximity to populated areas, access to transportation infrastructure, environmental considerations, and susceptibility to hurricane tidal surges.

Results and Recommendation

The results of the SEM approach verify that the Space Florida Spaceport will satisfactorily meet all 9 critical path criteria and nearly all of the 49 remaining evaluation criteria with the recommended development. In addition all three of the launch complexes evaluated (SLC-36, SLC-46, and SLC-47) utilizing the Launch Site Viability Evaluation method showed that the sites are excellent for development for the classes of launch vehicles identified for use at each launch complex. The favorable results of the two approaches to evaluating the Space Florida Spaceport confirm the selection of these launch complexes for commercial spaceport development as these sites already satisfactory meet a wide range of requirements for developing a successful spaceport.

This Spaceport Master Plan, Phase 2a, recommends development of the Space Florida Spaceport initially consisting of three launch complexes at CCAFS, SLC-36, SLC-46, and SLC-47. By developing these launch sites Space Florida will be able to provide commercial access to space for both vertically launched Orbital and Suborbital launch vehicles as well as launch capability for both solid fueled Castor-120 based and liquid fueled LOX/RP-1 launch vehicles. It is recommended that the development of each site be conducted in a phased manner over the next several years similar to the summary 5 year plan shown in Figure 1. Illustrations of this development are provided in Figure 2 and Figure 3.

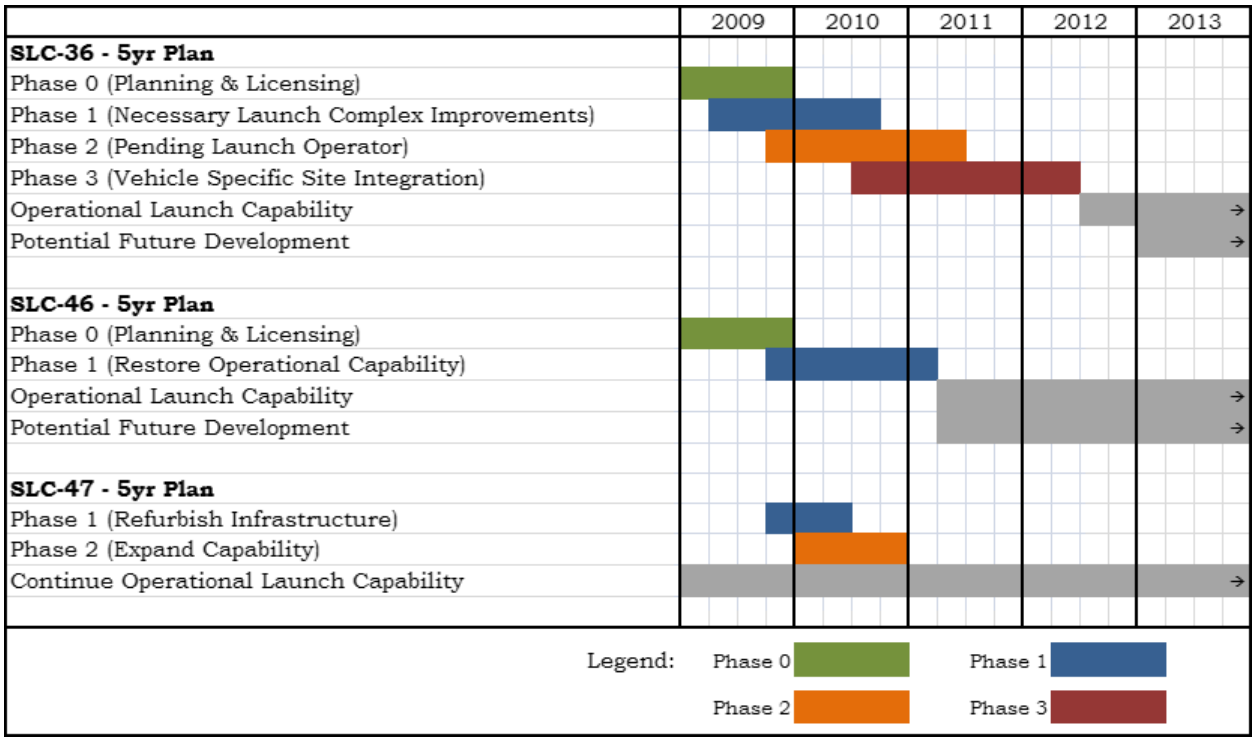

Figure 1: Summary 5yr Plan for Florida Spaceport

Figure 2: SLC-36 Recommended Development Phases

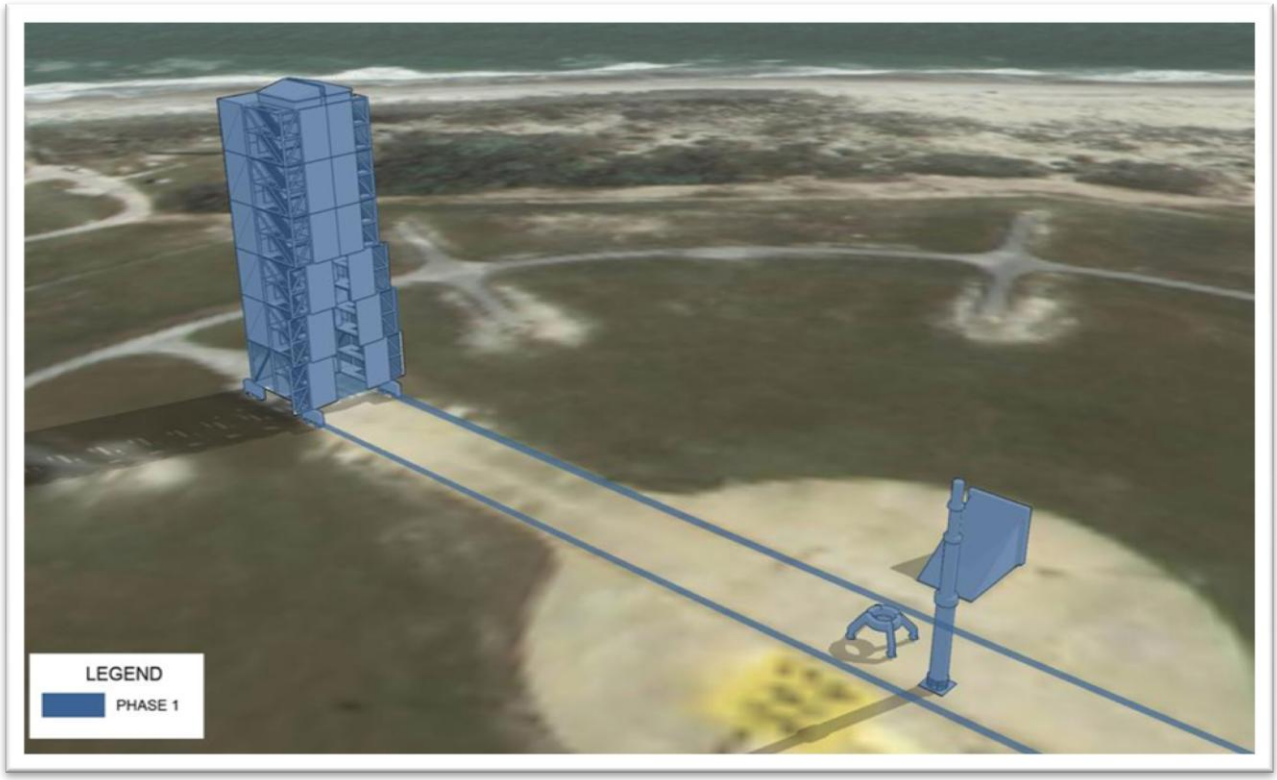

Figure 3: SLC-46 Recommended Development Phase 1

SECTION B: INTRODUCTION

As the aerospace industry continues to evolve, it is important for the State of Florida to have an updated plan that allows Florida to continue to be the premier location for space launch and tourism activity. This Spaceport Master Plan Update, Phase 2a, is the second phase of a comprehensive Space Transportation Master Plan. The Space Transportation Master Plan will analyze the current and required condition of Florida's transportation infrastructure to support space related businesses in Florida. The Spaceport Master Plan, Phase 2a, specifically analyzes a commercial Spaceport hub located at Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS). The primary focus of the Phase 2a consists of space launch capabilities at SLC-36, SLC-46, and SLC-47. Phases 2b and 3 of the Spaceport Master Plan are in development to be finalized in late 2009/early 2010.

This section discusses the purpose of the Spaceport Master Plan, Phase 2a, defines the potential markets supported by the Spaceport, identifies the role of Space Florida in Spaceport development, and characterizes stakeholder involvement in the Spaceport.

B.1 PURPOSE

B.1.a SPACE FLORIDA SPACEPORT MASTER PLAN VISION STATEMENT

As rail transportation transformed the 19th Century and air transportation transformed the 20th Century, space transportation will transform the 21st Century. Key to this transformation is the concept of assured access to space and the resulting services provided on Earth and enabled from space. To successfully implement this transformation, access to space and space services must become cost effective and assured.

It is the intent of the State of Florida, working with aerospace businesses, academia, local and state government(s), and the federal government, to be a leader in this 21st Century space transformation as described within the Space Florida Spaceport Master Plan, Phase 2a. This master plan includes the development of SLC-36, SLC-46, and SLC-47, at CCAFS, and their related support infrastructure, on or off site within the State of Florida, as a gateway to this transformation. These launch complexes are a key part of the launch head point of embarkation for access to space and as a test platform for this transformation.

The Space Florida Spaceport Master Plan is being developed in four phases:

- **Phase 1** – Completed June 2008, included the re-scoping, development, and outline of the Spaceport Master Plan, and interview with key stakeholder entities, and are available in two documents: "SF TMP Outline 951398" and TMP 1page Scope Summary" (Ref [11] & [12])
- **Phase 2a** – Focus on SLC-36, SLC-46, and SLC-47 and their related infrastructure.
- **Phase 2b** – Broaden the focus to the Cape Canaveral Spaceport (Ref [6]) and other state-wide spaceport initiatives.
- **Phase 3** – Complete the plan as a sub-section to the State's Space Transportation Master Plan to increase spaceport throughput.

Success in this transformation depends upon the development of state-of-the-art technologies, supporting infrastructure, and processes matching launch sites to commercial launch vehicle and payload requirements, while seamlessly interfacing with the policies, statutes, rules and regulations of the DOT, FAA/AST, TSA, NASB, DoD, and other agencies and associations.

B.1.b EXTENT OF SPACE FLORIDA SPACEPORT'S SCOPE, STRENGTHS, LIMITATIONS AND CONSTRAINTS

Phase 2a of the Spaceport Master Plan is focused primarily on development of SLC-36, SLC-46, and SLC-47 at CCAFS. Phase 2a provides a broad look at the effects of the Spaceport on the overall Florida Space Transportation Master Plan (TMP), including how the Spaceport interfaces with the Commercial Launch Zone.

To help ensure the success of this master plan, Space Florida and RS&H have met with both NASA and the 45th Space Wing to discuss their respective General Development Plans. The information shared in these meetings has been used to verify asset availability, enhance overall coordination, ensure that common goals are being met, and ensure that this plan is consistent with the KSC and 45th Space Wing Plans.

Some of the fundamental strengths of the Space Florida Spaceport include:

- Launch Complexes have a previous history of space launch activity and have previously been licensed by the FAA.
- Most potential launch complexes consist of previously disturbed land that would minimize overall environmental impact.
- Significant support infrastructure is in place, including roads, rail access, barge facilities, runway access, power, data/comm., range safety, weather services, and launch control.
- Launch Complexes are located within secure perimeter of CCAFS.

- An experienced workforce may be immediately accessed.

Some of the fundamental limitations and constraints of the Space Florida Spaceport include:

- Launch azimuths prelude the option of launching into a polar orbit.
- A large concentration of endangered species and surrounded by wetlands, limits the ability to expand outside previously disturbed areas.
- NASA, DoD, FAA, and commercial space transportation policies and processes require support of commercial space launch on federal range sites.

B.2 SPACEPORT MARKETS IN THE UNITED STATES

Florida currently faces competition from private and public spaceports on the national and global level. The unique characteristics of the evolving national spaceport launchscape are identified and discussed in this Definition of the Markets section. As shown in Figure 4, the FAA/AST currently identifies 6 U.S. Federal spaceports, 5 non-Federal spaceports, and 3 proposed non-Federal spaceports. The proposed Space Florida Spaceport is an evolution of the Cape Canaveral Spaceport identified in the figure below.

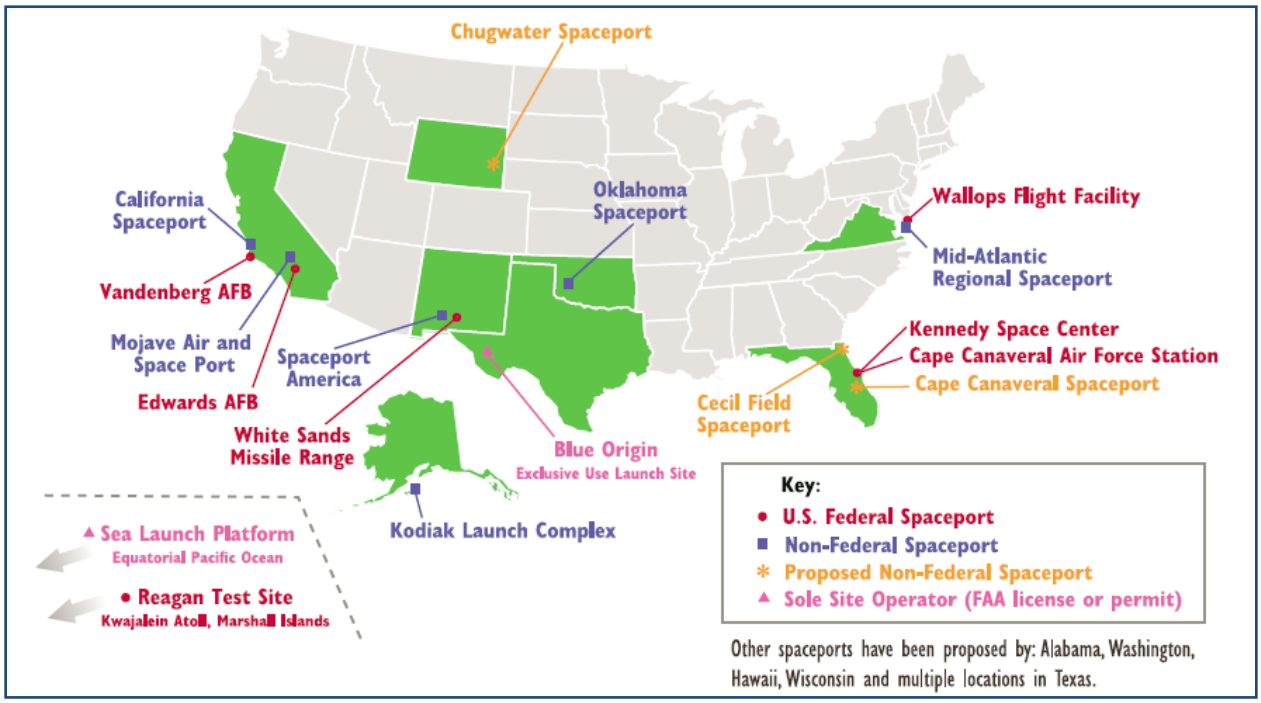

Figure 4: 2009 FAA/AST Identification of US Spaceports & Launch Sites (Ref [4])

B.2.a EXISTING FEDERAL RANGES & SPACEPORTS

Federal Ranges have historically provided our Nation's access for Military and Civilian (NASA) space launch. These Spaceports are primarily located within or adjacent to active military bases. Their primary function is to enable space launch for National Security/ DOD programs and National prestige programs.

Kennedy Space Center, FL

Kennedy Space Center (KSC) is located on Merritt Island between the Banana and Indian Rivers. On July 29, 1958, President Dwight D. Eisenhower signed Public Law 85-568, creating the National Aeronautics and Space Administration (NASA). In July 1962, the agency established its Launch Operations Center on Florida's east coast [currently CCAFS], The NASA Florida launch operations site was renamed, the John F. Kennedy Space Center (KSC) in late 1963 to honor the president who put America on the path to the moon. CCAFS and KSC have served as the departure gate for every American manned mission and hundreds of advanced scientific spacecraft. From the early days of Project Mercury (CCAFS), Gemini (CCAFS), Apollo(CCAFS & KSC), Skylab to the space shuttle and International Space Station, from the Hubble Space Telescope to the Mars Exploration Rovers, the launch center enjoys a rich heritage in its vital role as NASA's processing and launch center (Ref [14]).

NASA is operating the Shuttle Program and sections of the Constellation Program in parallel at KSC. LC-39A is in the process of being redesigned for the Ares I rocket. LC-39B will continue to support Shuttle launches through 2011 and is being redesigned to support the Ares V rocket. The NASA/KSC supporting infrastructure includes the Vehicle Assembly Building (VAB), three Orbiter Processing Facilities (OPFs), the Orion Processing Facility (located in the O&C Building), the Launch Control Center (LCC) and a host of ancillary support facilities. At this time the VAB and launch pads are reserved for other uses and are unavailable (Ref [8]). Space Florida holds land use agreements with NASA/KSC and owns and manages the Space Life Science Lab (SLSL) and the Reusable Launch Vehicle (RLV) Hanger at KSC. The RLV Hangar at KSC is expected to become available for commercial space operations. Space Florida conducts 12 balloon releases annually from the Space Education Center, at the KSC Visitor Center campus. Space Florida will continue to coordinate with NASA/KSC to determine if any excess facilities may become available for commercial use in support of the Space Florida Spaceport.

Cape Canaveral Air Force Station, FL

Cape Canaveral Air Force Station (CCAFS) is located South and East of Kennedy Space Center, FL. The Eastern Range has been operational since 1954. At that time the host agency was the Eastern Space & Missile Center (ESMC). In 1991, the ESMC was transformed into an operational wing of the Air Force thereby activating the 45th Space Wing. The launch squadrons' roles under the 45th Space Wing continued the traditions developed from the 1960s through the 1980s. Some of the launch vehicles that have operated from CCAFS include: Athena I/II, Atlas I/II/III/V, Delta II/IV, Pegasus, Saturn IB, Titan 34D, Titan IV, and Trident. The current launch vehicles in use include the Delta II (soon to be retired), Delta IV, and Atlas V (Ref [15]).

At CCAFS presently only launch complexes SLC-17, SLC-37, and SLC-41 are active and capable of immediately supporting space launch missions. In 2007, Space Florida assisted SpaceX in obtaining their 45 SW real property license for SLC-40 to launch their Falcon 9 launch vehicle in 2009. Space Florida is providing funding for SpaceX's Horizontal Launch Facility at SLC-40. Space Florida is coordinating with the 45th Space Wing to utilize SLC-36 and SLC-46 as launch sites as part of Space Florida Spaceport. SLC-47 is licensed to Space Florida to support the Super Loki and University Rocket Programs. Space Florida will continue to coordinate with the Air Force and CCAFS to determine if any excess facilities may become available for commercial use in support of the Space Florida Spaceport.

Vandenberg Air Force Base, CA

Cooke Air Force base was transferred to the US Air Force in 1957 and renamed to Vandenberg Air Force Base (VAFB) one year later. Between March 1, 1966 and December 20, 1968, the Air Force also purchased approximately 15,000 acres from the Sudden Ranch property, located south of the installation's original boundaries through the law of eminent domain. This acquisition enlarged the base to its current 98,000 acres of which only 15% is developed. The 30th Space Wing currently is based at Vandenberg Air Force Base. Because of its specific coastal geometry Vandenberg is the only military installation in the continental United States that launches unmanned government and commercial satellites into polar orbit. It is also the only site from which ICBMs are launched toward the Kwajalein Atoll to verify weapon system performance.

The proximity to the coast offers an excellent location to safely conduct test firings of strategic missile weapon systems and space launch systems including: Thor, Atlas I/II/V, Titan I/II/III/IV, Minuteman I/II/III, Peacekeepers, Minotaur, Taurus, and Delta I/II/IV. In 1972, Vandenberg was selected as the West Coast Space Shuttle launch and landing site, but it has never been used as such. Since the demise of the

shuttle program at Vandenberg, SLC-6 has once again been reconfigured, this time to support polar-orbit satellite launches by the Delta IV family of launch vehicles. (Ref [16]). At VAFB presently several launch complexes are currently active and capable of immediately supporting space launch missions. These launch complexes include SLC-2, SLC-3E, SLC-6, SLC-8, and SLC-576.

Wallops Flight Facility, Virginia

Wallops Flight Facility (WFF) is located on the eastern shore of Virginia. Established in 1945 under NASA's predecessor, the National Advisory Committee for Aeronautics (NACA), Wallops is one of the oldest launch sites in the world. In the early years, research at Wallops was concentrated on obtaining aerodynamic data at transonic and low supersonic speeds. Between 1959 and 1961, Project Mercury capsules were tested on suborbital flights from Wallops in support of NASA's manned space flight program before the astronauts were launched from the Cape Canaveral Air Force Station in Florida.

Since 2001, engineers at NASA Wallops Flight Facility have been developing new range technologies, systems and approaches to improve the cost and responsiveness of launch and flight test activities, within the constraints of available funding and program schedules. With its sounding rocket and balloon flights carrying scientific payloads, its aeronautical systems testing, its range support for Space Shuttle launches, and its educational outreach activities, WFF supports all of NASA's Mission Directorates.

The Wallops Island Launch Site includes six launch pads, three blockhouses for launch control, and assembly buildings to support the preparation and launching of suborbital and orbital launch vehicles. The launch vehicles at this spaceport include Minotaur and sounding rockets. Sounding rockets are an instrument carrying rocket designed to take measurements and perform scientific experiments during its sub-orbital flight (Ref [17]).

WFF is also conducting Small Launch Vehicle Research. The Small Launch Vehicle Research Project (SLVR) is a Wallops effort to develop and provide a comprehensive, end-to-end payload preparation, integration and test, launch and on-orbit support capability for small payloads (Ref [18]).

Reagan Test Site, Kwajalein

The Ronald Reagan Ballistic Missile Defense Test Site, commonly referred to as the Reagan Test Site (RTS) is located in the Republic of the Marshall Islands. The Kwajalein Atoll extends from 8”45’ north to 9”25’ north latitude and from 166”45’ east

to 167”50’ east longitude. The nearest United States location is Hawaii, located approximately 2500 miles East Northeast of Kwajalein.

For domestic space operations, RTS is one of several tracking stations located around the globe that provides nearly continuous coverage of all manned space flight missions. Working in close cooperation with NASA, RTS has participated in numerous space experiments, providing ground radar and optical observation of experimental objects. The Reagan Test Site encompasses approximately 750,000 square miles, although the total land area is only about 70 square miles.

It primarily functions as a test facility for U.S. missile defense and space research programs. The Reagan Test Site is under the command of the US Army Kwajalein Atoll. Launch activities at the test site include ballistic missile tests, ABM interception tests, meteorological sounding rockets and a Falcon 1 commercial spaceport for SpaceX at Omelek Island (Ref [19]).

B.2.b EXISTING COMMERCIAL SPACEPORTS

Commercial spaceports are being developed throughout the United States to support a wide range of commercial space related activities including space research, suborbital, and orbital missions. The following is a brief description of some of these commercial spaceports.

Mid-Atlantic Regional Spaceport, VA (1998)

The Mid-Atlantic Regional Spaceport (MARS) is located at NASA’s Wallops Flight Facility (WFF) on Wallops Island, in Virginia. MARS is a partnership between the Virginia Commercial Space Flight Authority, NASA, Virginia Economic Development Partnership, Old Dominion University, Virginia’s Center for Innovative Technology, and Maryland Department of Business and Economic Development Partnership. Using these partnerships, MARS has been able to provide tax incentives and financial assistance to bring new space related businesses to their area.

MARS has been operating since 1998 and provides access to two launch pads (Pad 0-A, and Pad 0-B), a multiple bay vehicle processing facility, multiple clean room areas, an instrumented heavy-lift airport, and services provided from the NASA launch range. At this time MARS is currently in the process of modifying Launch Pad 0-A to support Orbital Science’s Taurus II orbital launch vehicle.

Kodiak Launch Complex, AK (1998)

The Alaska Aerospace Development Corporation (AADC) completed the Kodiak Launch Complex (KLC) in 2000. It is located in Narrow Cape, Alaska on Kodiak Island and at the time was the first new U.S. "Greenfield" launch site built since the 1960s. Funding originally came from the U.S. Army, U.S. Air Force, NASA, state of Alaska, and various private firms. Alaska provided the property and the port was given a tax-free status. The site is currently self-sufficient (Ref [4]).

The KLC is located at 57 degrees North latitude. This 4.8-square mile site is 272 miles south of Anchorage and 25 miles southwest of the city of Kodiak. The markets served vary from military, space science payloads under 2,200 lbs, government and commercial telecommunications and some remote sensing. Kodiak is designed to launch up to the Castor 120-based vehicles and can launch suborbital as well as orbital payloads capable of reaching the Low Earth Orbit (LEO), Polar and Molniya elliptical orbits. Kodiak provides testing for the nation's missile defense system as well.

The associated facilities supplied at Kodiak include a Payload Processing Facility, a Launch Service Structure, an orbital Launch Pad, an assemblies/spacecraft transfer facility, a suborbital second launch pad, a Launch Control Center, a maintenance and storage facility a Range Safety and Telemetry System (RSTS), and an Integration and Processing Facility. New facilities are being planned for future expansion and may have already been implemented. Roadways are being improved upon and were scheduled to be completed in 2007.

California Commercial Spaceport, CA (1999)

California Commercial Spaceport is located at 34 degrees North latitude within Vandenberg Air Force Base, California. This FAA licensed port is operated by Spaceport Systems International (SSI) on a 25-year leased property as of 1995. Missions can range from a variety of low-polar-orbit inclinations of azimuths between 220 and 165 degrees. Minotaur launches can be completed at SLC-8 which has an infrastructure consisting of a pad deck, support equipment building, launch equipment vault, launch duct, launch stand, access tower, communications equipment, and Integrated Processing Facility (IPF) launch control room as well as Western Range interfaces needed to support a launch. In 2008 a modification was completed to the access tower at SLC-8 provide for 100k clean room operations. Orbital Sciences also announced that the inaugural flight of the Minotaur IV is scheduled to take place from the California Spaceport's launch pad in early 2009 (Ref [4]).

Original payload processing services revolved around the refurbishment of the Shuttle Payload Preparation Room. The clean room is large enough to process three space shuttle payloads at once and is now leased by California Spaceport as the IPF. A few examples of work completed here include booster processing, upper stage processing, encapsulation, satellite processing for military commercial and civil services, and related administrative activities. The IPF is believed to be capable of handling all customer payload processing needs.

Mojave Air & Space Port, CA (2004)

The Mojave Air & Space Port is located in Mojave, California and was licensed by the Federal Aviation Administration's Commercial Space Transportation (FAA/AST) in June 2004 to support horizontal launches of suborbital Reusable Launch Vehicles (RLV).

Infrastructure and facilities include but are not limited to an air traffic control tower, three runways with associated taxiways, terminal and industrial area, hangars, offices, maintenance shop, fuel services facilities and aircraft storage. The main runway has been extended to 12,500 feet for larger aircrafts and RLV's and was completed in 2006. Many upgrades have been completed with the majority of the cost s being covered by FAA airport improvement program funds. Many organizations call the airport home and it is the location of many new record-breaking events including the winner of the Ansari X Prize and SpaceShipOne. Suborbital tourism is planned for this site.

Oklahoma Spaceport, OK (2006)

The Oklahoma Spaceport is part of the Clinton-Sherman Industrial Airpark near Burns Flat, Oklahoma. In June 2006, Oklahoma Space Industry Development Authority (OSIDA), received the FAA/AST license to operate a launch site for horizontal takeoff and landing suborbital RLV. This port has its own airspace and does not require military permission to operate. The five year license granted by the FAA still requires individual operators to apply for a separate launch license or permit.

Oklahoma launch infrastructure consists of a 13,500 foot runway, a 50,000 square foot manufacturing facility, a maintenance and painting hangar, 6 commercial hangars, control tower, crash/rescue facility and 168 square miles of land for future construction.

Spaceport America, NM (2008)

Spaceport America, previously known as Southwest Regional Spaceport, is currently in development in Sierra County, New Mexico. While the spaceport has been hosting suborbital rocket launches since 2006, it only recently obtained the FAA/AST license for vertical launch activity in December 2008. Development of the spaceport continues going strong with an influx of state, local, and private financing. Virgin Galactic has signed a 20-year lease at the spaceport and onsite construction will begin this year with the goal of having the terminal and hanger facilities completed by 2010.

Cecil Field Spaceport, FL (Spaceport Application Pending)

Cecil Field Spaceport (FAA/AST Launch Site Operators License Application Pending) is located at Cecil Field Airport in Jacksonville, Florida and is planning to provide the capability to support missions for suborbital RLVs. Once the environmental assessment and final application for a launch site operator's license is approved, Cecil Field Spaceport will provide services and a runway for the takeoff and landing of RLV missions with a launch point located over the Atlantic Ocean. Cecil Field is targeting the suborbital space tourism market.

Space Florida Spaceport, FL (Spaceport Application Pending)

The Space Florida Spaceport (FAA/AST Launch Site Operators License Application Pending) is discussed in this Spaceport Master Plan. The Space Florida Spaceport will initially consist of three launch complexes located at Cape Canaveral Air Force Station, SLC-36, SLC-46, and SLC-47. All three of these launch complexes have a long history of supporting space launch activity. Space Florida is currently in the process of coordinating with the Air Force, DoD, FAA, and NASA to develop the Space Florida Spaceport and provide the appropriate facilities to support commercial access to space from these launch complex.

SLC-36 had historically been utilized for Atlas launch vehicles and most of the infrastructure at the site was demolished in 2007. Space Florida is coordinating to develop SLC-36 into a multi-user liquid-fueled launch complex. In the 1990's the State of Florida entered into an agreement with the Naval Ordnance Test Unit to build a dual-use government/commercial launch complex at SLC-46. This commercial launch complex supported two Athena launches in the late 1990's. Space Florida is currently planning to reestablish the previously existing launch capability to SLC-46. Space Florida has partnered with the 45th Space Wing, FAA/AST, and several Florida education institutes to provide SLC-47 as a launch site that is currently capable of launching Loki and Super Loki suborbital Rockets.

The Space Florida Spaceport also has access to a wide range of facilities and capabilities that are provided at KSC, CCAFS, and off-base such as processing facilities, the Space Operations Control Center (SOCC), Astrotech, an offsite solid rocket motor storage facility, the RLV support hanger, and more. Transportation access to Space Florida Spaceport also included access via road, rail, barge, and air.

Commercial Spaceport Licensing Status

Not every commercial spaceport is created equal and depending on the FAA/AST license obtained the spaceports may be limited to very specific launch activity. The following table provides a summary of the current status of FAA/AST launch site licensing for the identified commercial spaceports.

Table 1: Commercial Spaceport FAA/AST Licensing (Ref [4])

Spaceport	State	Orbital		Suborbital	
		Vertical	Horizontal	Vertical	Horizontal
MARS	VA	✓			
Kodiak Launch Complex	AK	✓		✓	
SSI Commercial Spaceport	CA	✓			
Mojave Air and Space Port	CA				✓
Oklahoma Spaceport	OK				✓
Spaceport America	NM			✓	
Cecil Field Spaceport	FL				Pending
Space Florida Spaceport	FL	Pending		Pending	

B.3 STATE STRATEGIC INTERMODAL SYSTEM (SIS)

Unlike existing or potential commercial spaceport facilities in other states, the proposed Space Florida Spaceport in Florida is served by a comprehensive network of intermodal access facilities (Ref [6] - "Cape Canaveral Spaceport Master Plan, July 2002"). From the north and south, I-95 provides highway access to the Space Florida Spaceport. Multilane arterial highways, including SR 50 and SR 528, provide for spaceport access from Orlando, located about fifty miles to the west of the Cape Canaveral.

To enhance Florida's economic competitiveness by focusing state resources upon the transportation facilities that are critical to Florida's economy and quality of life, the Florida Department of Transportation (FDOT) has identified a "Strategic Intermodal System (SIS)" of transportation facilities. The SIS is focused on a network of existing and emerging intermodal hubs, including airports, seaports, rail terminals and intermodal passenger facilities.

The SIS also includes one spaceport hub, i.e. the "Cape Canaveral Spaceport" hub. Based on the FDOT SIS plans, all space related activity that occurs at Kennedy Space Center and Cape Canaveral Air Force Station is considered to occur at the "Cape Canaveral Spaceport" hub. All activities of the proposed "Space Florida Spaceport" would occur within the SIS "Cape Canaveral Spaceport" hub. As additional spaceport facilities are developed at other locations within the State of Florida, the SIS provides for the designation of additional spaceport hubs. All of the hubs in the SIS are linked together via a network of designated corridor and connector facilities, including highway, rail, and waterway facilities. The officially designated SIS connectors to the "Cape Canaveral Spaceport" hub are listed in Table 2.

Table 2: Strategic Intermodal System (SIS) Connectors to Cape Canaveral

Connectors to Space Florida Spaceport at SIS Cape Canaveral Spaceport Hub	SIS	Highway	I-95 to SR 50 to Columbia Boulevard (SR 405) to Kennedy Space Center Entrance
		Highway	SR 528 to SR 401 to Cape Canaveral Air Force Station entrance
		Rail	Kennedy Space Center Railroad (owned by FEC) from spaceport property to Jacksonville-Miami FEC rail line
		Waterway	Port Canaveral provides access to a waterway and is located along the Beachline Expressway (SR 528)
	Non-SIS	Airport	Space Coast Regional Airport is located about 8 miles west of KSC along SR 405.
		Airport	The shuttle landing facility provides a 3 mile long runway and is located at the northwest corner of Kennedy Space Center.
		Airport	The Skid Strip is located within CCAFS and it runway is within 2 miles of SLC-36 and SLC-46

In addition to excellent highway accessibility, the Space Florida Spaceport is also accessible via aviation, water and rail facilities. Nearby aviation facilities include military, air carrier and general aviation airports within Brevard County, as well as the Orlando International Airport. The Orlando International and Sanford Orlando International Airports are located in Orange and Seminole Counties respectively, and are major international gateways to the USA. Both of these airports are located less than fifty miles from the Space Florida Spaceport.

Port Canaveral, a major cargo and cruise ship terminal, is adjacent to Cape Canaveral. To allow for barge delivery of large spacecraft components, additional deepwater port facilities are located within the Cape Canaveral Spaceport territory itself. For rail access, a spur line connects the Cape Canaveral Spaceport directly to the main line of the Florida East Coast Railroad.

As plans are developed for new and improved surface transportation facilities in Florida, the SIS will be used to prioritize the implementation of these plans on a statewide basis. The SIS for the State of Florida was initially designated in 2005. A "System Wide Data Review and Designation Update" was completed for the SIS in mid-2008. Space Florida representatives served an active role in the designation update process. Figure 5 shows the connectors to SIS Cape Canaveral Spaceport Hub based on Inset H of the 2008 SIS per District 5(a).

A comprehensive review of Florida's Strategic Intermodal System, the "2010 SIS Strategic Plan Update", is currently underway. The anticipated completion date for the 2010 SIS Strategic Plan Update is January 2010. A Leadership Committee is currently meeting on a monthly basis in order to guide the 2010 SIS update. Space Florida currently serves as an official member of the SIS Leadership Committee.

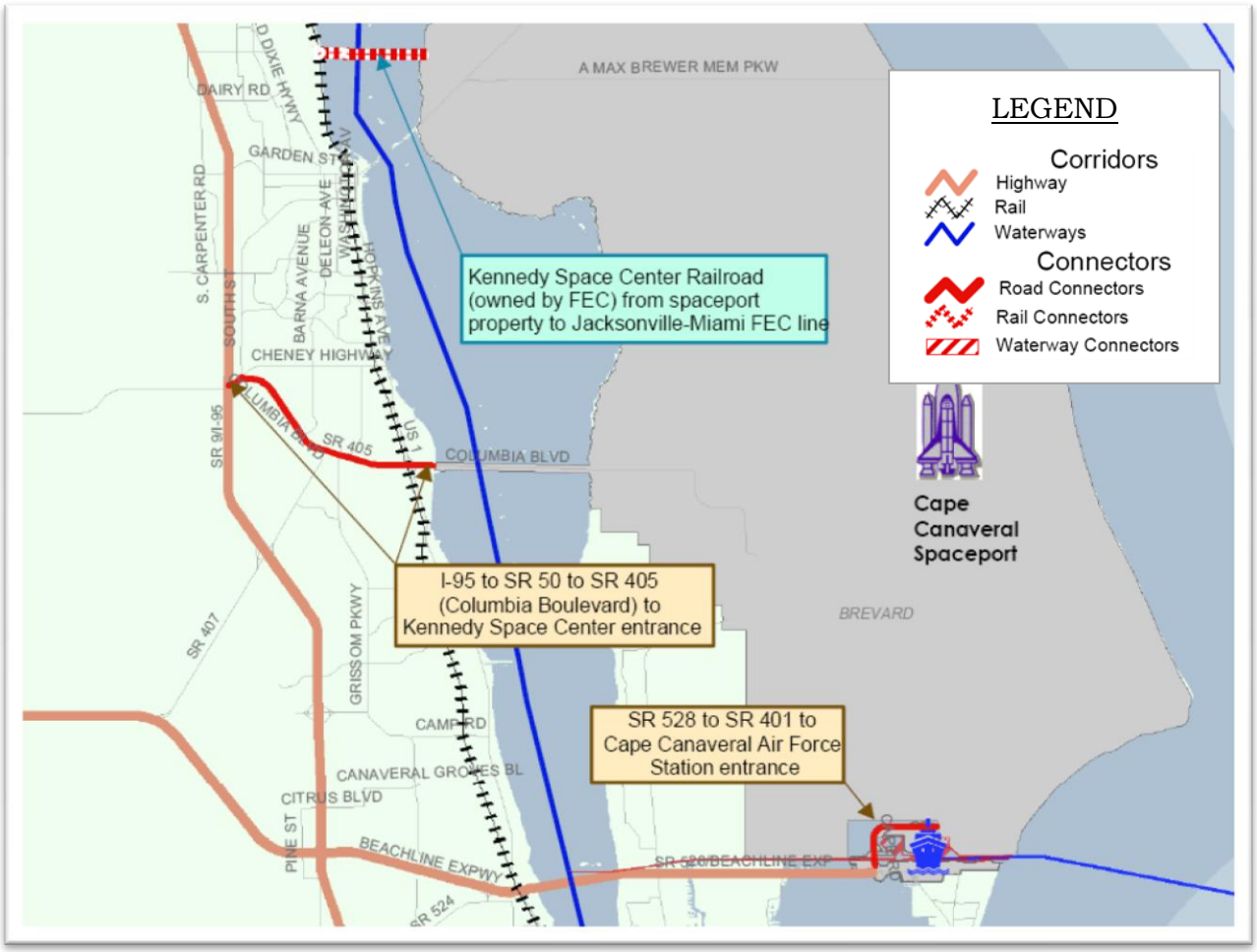

Figure 5: Connectors to Cape Canaveral Spaceport (District 5 SIS Maps) - Ref[20]

In addition to the Strategic Intermodal System (SIS), the State of Florida also maintains the Continuing Florida Aviation Systems Planning Process (CFASPP), as a means for identifying and prioritizing improvements to designated civil aviation facilities in Florida, including primary, reliever, and general aviation airports.

Of the 20 airports in the State of Florida that are designated as primary airports in the Florida Aviation Systems Plan (FASP), three of these airports are located within fifty miles of the Cape Canaveral Spaceport., i.e. Melbourne International Airport, Orlando International Airport, and Orlando Sanford Airport.

Even closer to Cape Canaveral Spaceport are the Space Coast Regional Airport and the Merritt Island Airport, which are both designated as FASP reliever airports. Space Florida is an active participant in the development and maintenance of the FASP, through its membership and participation in the CFASPP East Central Region Steering Committee.

For specialized space related shipments to Cape Canaveral Spaceport, the skid strip military airport is located at Cape Canaveral Air Force Station. Plans are also underway for the development of aviation facilities and supporting services at the Shuttle Landing Facility at Kennedy Space Center.

B.4 ROLE OF SPACE FLORIDA IN SPACEPORT DEVELOPMENT

As an independent special district of the State of Florida, Space Florida has unique financing capabilities that can significantly reduce the overall cost of an infrastructure project for aerospace customers. Space Florida's tax exempt status enables the organization to negotiate optimal terms on loans and reduce the overall tax burden associated with the construction of such facilities.

Space Florida is working with the State of Florida, NASA, United States Air Force, FAA and other important stakeholders to streamline the process of bringing space related businesses to Florida. Spaceport development is the foundation of Space Florida's efforts. In supporting this development, Space Florida is providing financial assistance, legislative support, general customer assistance, and pre-negotiated access to launch complexes.

B.4.a FINANCIAL ASSISTANCE

Within the past 16 years, the State of Florida has funded and creatively financed a number of unique projects supporting development of spaceport infrastructure and support facilities at Cape Canaveral Air Force Station, including:

- 2007 to present – SpaceX's development of Launch Complex 40's site engineering, pressure vessel requirements, construction of the Horizontal Integration Facility (HIF), primary use of the Space Operations Control Center, and over $2 Million in direct subsidies, and in-kind support. Space Florida continues to advocate, and secure funding for commercial launch support for SpaceX.
- 2002 – Conduit financing in the refurbishment of Launch Complex 41 (a former Titan IV launch pad) to accommodate the new generation Atlas V vehicle for United Launch Alliance. The State of Florida made a $235 million commitment to the project, valued at a total of $294,117,000.
- 2001 – State of Florida allocated $35 million for the building of the Space Life Sciences Laboratory.
- 1999 – $24 million in conduit financing to construct the 88,960 sq. ft. HIF, built to support the unique assembly and integration needs of the Delta IV
- 1995 – $16 million in conduit financing to construct the Solid Rocket Motor Upgrade Operational Storage Facility at Camp Blanding.
- 1993 - Over $8 million in a launch tower, launch stand, and other associated support infrastructure at Launch Complex 46.

Launch Facilities and Services

Space Florida has agreements in place for access to several launch facilities and launch complexes at CCAFS and KSC. Space Florida continues to explores ways to work with new customers by providing initial capital required to modernize and expand those facilities to support individual customer requirements.

Under a unique public private partnership, Space Florida has teamed with Astrotech Corporation, a leading provider of commercial space services, to offer end to end solutions for potential commercial space customers that will streamline the process for these companies to prepare and launch their important payloads into space. The partnership between Astrotech and Space Florida is designed to fully leverage and support commercial space business. This innovative partnership is intended to provide a competitive advantage for Florida and the U.S. in the global marketplace for commercial space businesses

B.4.b CUSTOMER ASSISTANCE SERVICE PROGRAM (CASPER)

Space Florida developed the Customer Assistance Service Program for the Eastern Range (CASPER) to help refine range policies and regulatory processes that will blend the needs of military and civilian users. New commercial customers bringing their

launch vehicle or payload to the Eastern Range can use this free service to work through the requirements and flight safety approval process.

CASPER can provide help with the preparation and review of all program, mission, and test requirement documents through the Universal Documentation System (UDS), including Program Introduction, Program Requirement Documents, and Operations Requirements. This program also provides assistance with FAA licensing, environmental impact measures, explosive site plans, ground operations plans, system safety program plans, and flight termination system reports.

Space Florida will continue to refine customer service requirements and implement innovative solutions to bring new aerospace business to Florida. Through this program, the 45th Space Wing has designated that any commercial launch provider wishing to launch from the Eastern Range must utilize Space Florida in their coordination efforts with the 45th Space Wing.

B.4.c CUSTOMER MARKETING

Education, R&D, exploration, defense and commercial payloads require launch vehicles. Space Florida is working to bring all payload customers and launch vehicle providers to Florida as part of the Commercial Launch Zone. The Space Florida Spaceport will support a diverse customer base bringing unique requirements for each launch vehicle and payload requiring “end-to-end” mission services and infrastructure.

In supporting this objective Space Florida has recently developed an innovative partnership with Astrotech Corporation that will provide multiple solutions for commercial space businesses in Florida, including:

- “End-to-End Mission Assurance Services” such as mission planning, spacecraft design and development, ground and launch operations, mission operations, and end user enhancement.
- Customer assistance with efficient and cost-effective navigation of the USAF. Eastern Range.
- Launch pad and ground operations facilities tailored to customer needs.
- World-class life sciences research capabilities at the Space Life Sciences Laboratory, with a legacy of preparing science payloads for flight to the ISS.
- Close proximity to sea, rail, air, and highway transportation.

See Space Florida Strategic Business Plan (Ref [13]) for more details.

B.5 SUBMITTAL TYPE

This is the 100% Final submittal of Phase 2a of the Space Florida Spaceport Master Plan. A Phase 2b and Phase 3 of the Spaceport Master Plan will be developed at a later time.

B.6 AUTHORS & INVITATION FOR COMMENT

The authors of this Spaceport Master Plan are Reynolds, Smith and Hills, Inc. (RS&H) of Merritt Island, FL. Please direct written comments and questions regarding this Master Plan to:

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SECTION C: SPACEPORT INFRASTRUCTURE IN FLORIDA

Florida is the place for space and the current spaceport infrastructure existing in Florida is a testament to its long history of supporting space launch activity. Presently all launch activity in Florida is conducted from either Kennedy Space Center or Cape Canaveral Air Force Station. In Phase 2a of the Spaceport Master Plan, Space Florida is proposing the development of the Space Florida Spaceport as the cornerstone site for commercial space transportation's access to space from launch sites in Florida.

C.1 EXISTING SPACEPORTS AND INFRASTRUCTURE

Figure 6: Kennedy Space Center, 1999 (Ref [21])

Presently there are two existing spaceports in Florida which are located at Kennedy Space Center and Cape Canaveral Air Force Station. Both KSC and CCAFS are federal spaceports. A detailed description of the two spaceports is provided in Section "B.2.a" of this Spaceport Master Plan.

C.2 CURRENTLY PROPOSED SPACEPORT AND INFRASTRUCTURE

Within the scope of this Spaceport Master Plan only the proposed concepts for Launch Complex 36, 46, and 47 are discussed here. All three of these launch complexes are contained within the boundary of CCAFS as shown in Figure 7.

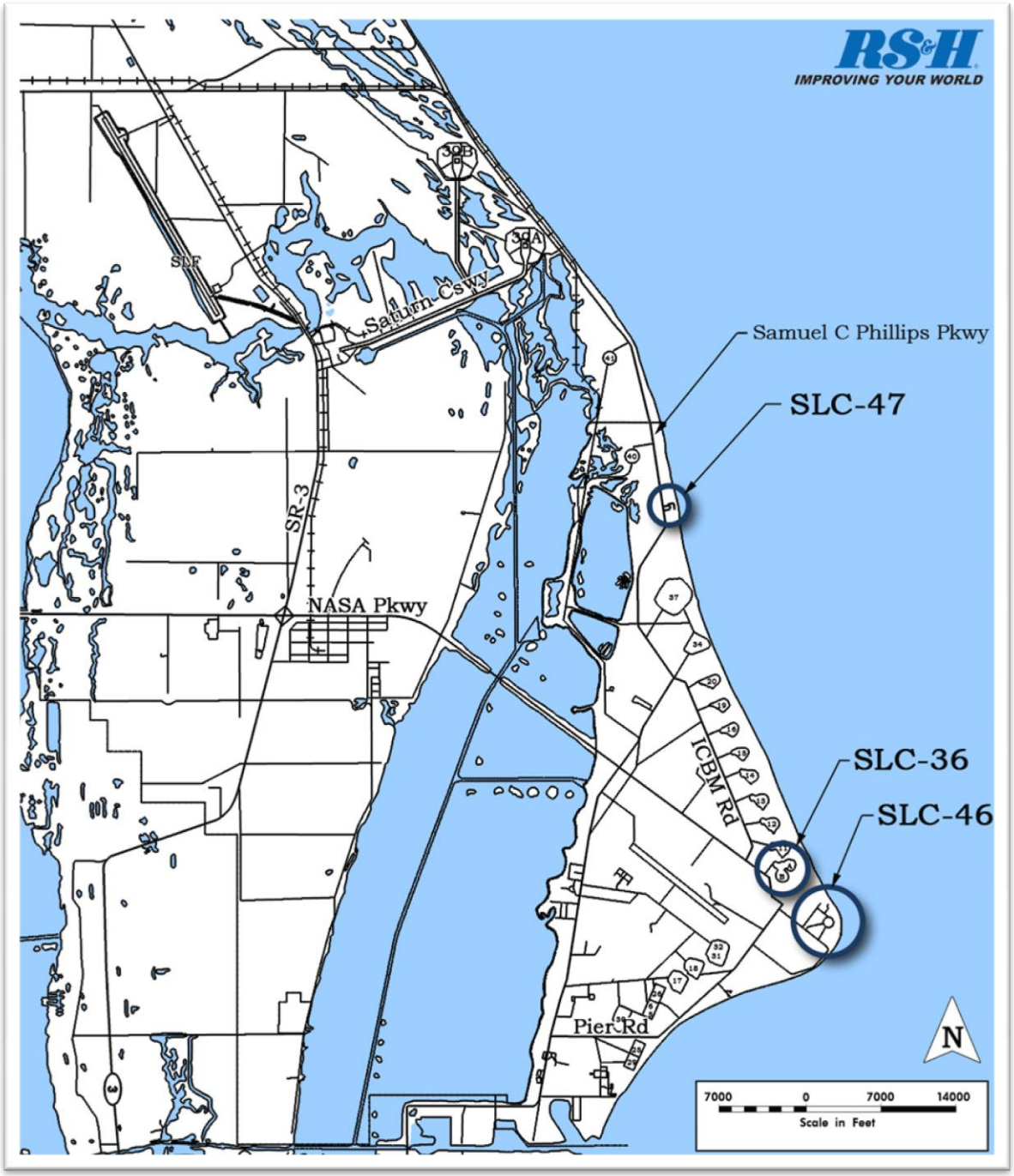

Figure 7: Location of SLC-36, SLC-46, and SLC-47 at CCAFS

C.2.a SPACE LAUNCH COMPLEX 36 (SLC-36)

History

Space Launch Complex 36 (SLC-36) at Cape Canaveral Air Force Station has a long and interesting history. SLC-36A & B were built under the sponsorship of NASA in support of the Atlas/Centaur program in 1961 and 1963 respectively. NASA surrendered the site to the Air Force and General Dynamics in 1989, at which time it was modified to support the Altas II/Centaur program. The first Atlas II launch was from 36B on December 7, 1991. In the late 1990's pad 36B was once again modified to support the Atlas III vehicle. Its first launch occurred on May 24, 2000. The final Atlas III launch from CCAFS occurred on February 3, 2005 from Pad 36B. In total, SLC-36 has launched a combined total of 145 rocket launches from its two pads.

Figure 8: SLC-36 - Atlas 3 Launch Vehicles at Pad A (right) & B (left)

In June 2007, both Mobile Service Towers on SLC-36 were toppled as part of their overall site demolition. Since then most structures at both pads A and B have been removed, including the perimeter fence.

Current Condition

Following the recent demolition of all launch facilities at SLC-36, the only remaining structures include the Blockhouse and Annex (Building #5501) and Support Building (#5550) as identified in Figure 9. Underground utilities, including electrical power, communication lines, sewer, and potable water are still provided to the site. A new Environmental Baseline Study (EBS) is currently underway at the site to determine the current environmental status and to fulfill Air Force licensing requirements. Space Florida recently obtained approval from the FAA/AST office to consolidate the launch site operator's license request for SLC-36 into the SLC-46 request which is already underway.

Figure 9: View of SLC-36 in Present Configuration (Artists Rendition)

The existing blockhouse at SLC-36, shown in Figure 10, consists of a reinforced concrete, two story structure that is 150' in diameter. The blockhouse was originally built as a launch control center. Since new range safety evaluations, the blockhouse can no longer be occupied during a launch. The envelope of the building is in good condition however some rooms of the building suffered damage during demolition activities. Many power and data transmission lines from the CCAFS have terminations in the blockhouse. The termination points to CCAFS infrastructure are vital for the proposed launch complex.

The existing Block House Annex building is in moderately good condition although it requires some renovations. The envelope of the building is in good condition however some rooms of the building suffered damage during demolition activities.

Figure 10: SLC-36 Blockhouse & Annex Building

The envelope of the Support Building, shown in Figure 11, is in excellent condition and the interior is open and clean. This building is an ideal place for SLC-36 on-site office space and can be utilized minimal renovation.

Figure 11: SLC-36 Support Building (Building #5550)

Proposed Modernization

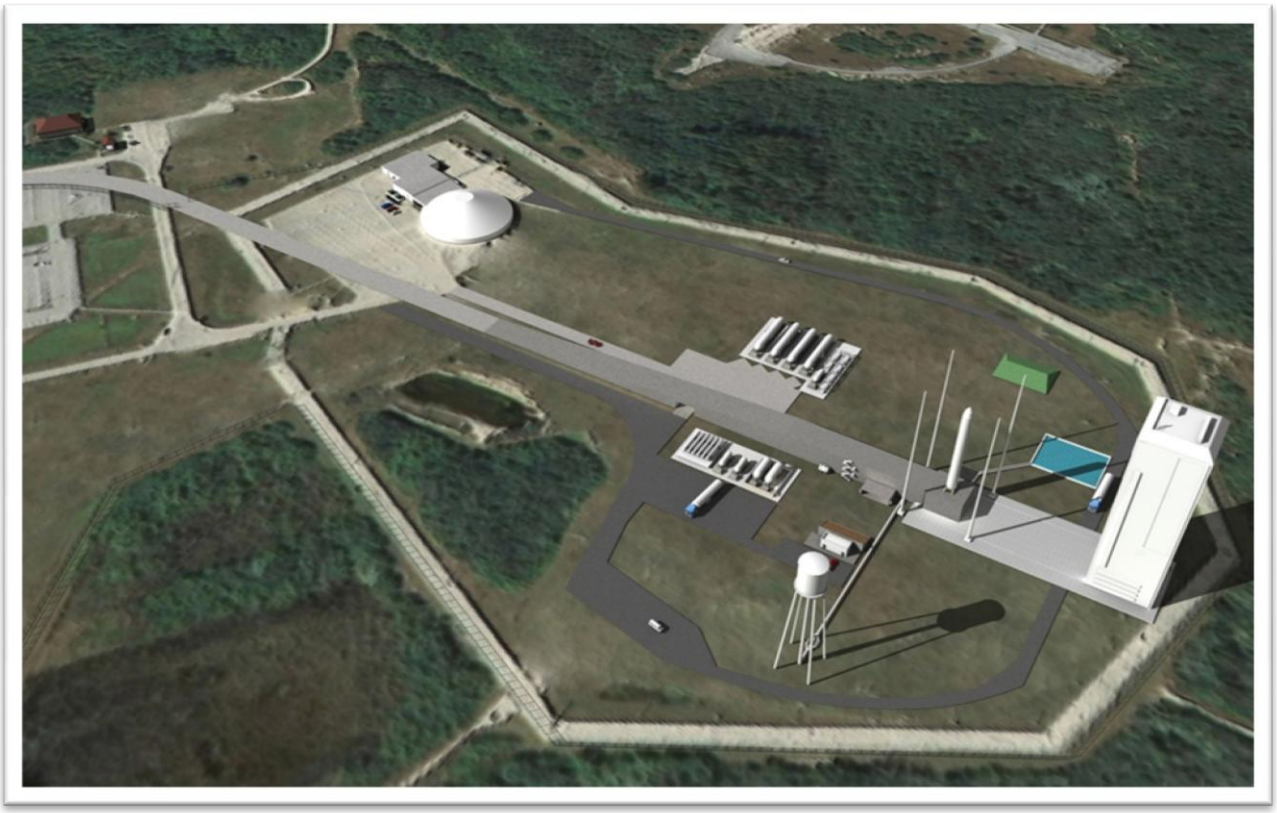

Figure 12: Rendering of Proposed Multi-Use Launch Complex at SLC-36

When the proposed Multi-Use Launch Complex, as shown in Figure 12 and Figure 13, is completed, SLC-36 will support vertical launches by multiple launch vehicle operators. The site can safely support launch vehicles up to and including the size of the Generic Launch Vehicle (GLV) as described in Space Florida's 2009 Strategic Business Plan (Ref [13]). SLC-36 will support the launch of RP-1 and LOX propelled vehicles with a limited number of possible strap-on solid fuel boosters.

There will be one launch pad located in the vicinity of the previous launch point for SLC-36A. The area previously supporting SLC-36B will remain empty and is available for expansion and future use. A ramp to facilitate a horizontally integrated vehicle will lead up to the launch pad deck. A Mobile Service Tower is sited to be used in the event that a vertically integrated vehicle selects to launch from SLC-36 or late payload access is required. Commodity storage will be provided for LOX, LN2, GN2, RP-1, GHe, and Deluge Water. Commodities provided for use via range utilities at SLC-36 will include water, sewer, electric power, communication/data, and GN2.

The existing blockhouse and annex are planned to be renovated to provide additional office space for launch operators. The first floor of the blockhouse will be cleaned to

provide safe access to power and communication line terminations. Additional office space will be provided in the support building southwest of the blockhouse.

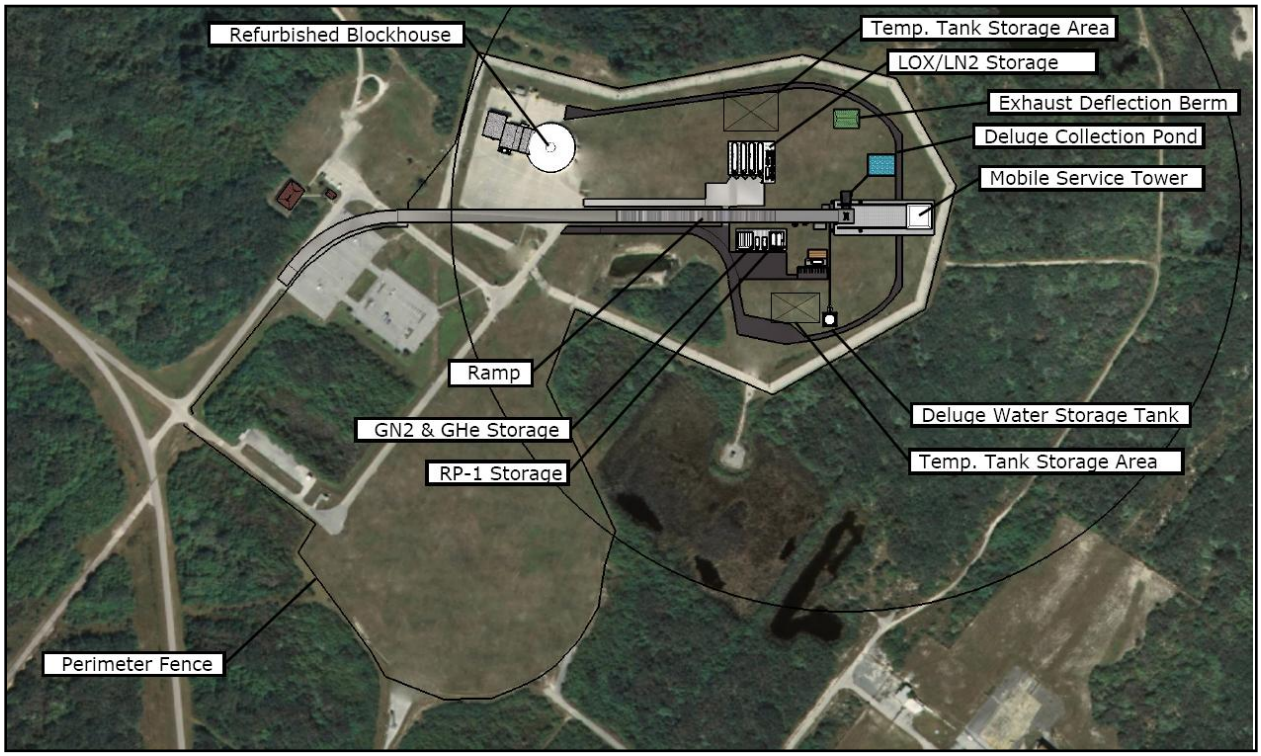

Figure 13: SLC-36 Conceptual Site Plan

C.2.b SPACE LAUNCH COMPLEX 46 (SLC-46)

History

The SLC-46 site was established in 1954 as a fire-fighter training area and utilized for this purpose until 1965. SLC-43, located adjacent to SLC-46's current location, was used for meteorological rocket launches from 1962 through 1985. When operations on SLC-43 ceased in 1985, it was demolished in preparation for construction of SLC-46. In 1984, SLC-46 was redesigned to support the US Navy's Trident II ballistic missile efforts at CCAFS. The first Trident II missile was launched from SLC-46 in 1987. A subsequent eighteen more Trident IIs were launched between March 1987 and January 1989 before Trident II launch operations were moved out to sea in late 1989.

Figure 14: SLC-46 Mobile Access Structure (MAS)

In 1993 the State of Florida entered into an agreement with the 45th Space Wing and Naval Ordnance Test Unit to build a dual-use government/commercial launch complex at SLC-46. Over the next few years a Mobile Access Structure (MAS), launch stand, and associated support infrastructure was constructed and installed. In

January 1998, Spaceport Florida supported its first commercial launch, an Athena II, from SLC-46. A second commercial launch took place from SLC-46 in 1999. Since then SLC-46 has not been utilized for commercial space activities and minimal maintenance has been completed on the structure. In 2004 the MAS received some minor damage as a result of Hurricane Frances. By November 2007, Space Florida had completed numerous repairs and maintenance procedures including corrosion mitigation, cleaning, hardware and pneumatics testing, and exercising the movable platforms.

Current Condition

Presently the MAS is in a "safed" configuration and must be renovated before it can be used for future commercial space activities. The primary structural steel is in very good condition; the mechanical systems on the tower need significant upgrade or possible replacement. The roads are in good condition and the area is fenced with security gates. Although the current use license has expired, Space Florida is presently pursuing a renewal of the license with the 45th Space Wing and Naval Ordnance Test Unit. Space Florida is also in the process of renewing its FAA Launch Site Operators License.

The current capabilities of SLC-46 provide for the support of solid-fueled launch vehicles with a maximum height of 120 feet and payloads up 10 feet (3m) in diameter.

Proposed Modernization

The primary goal of modernizing SLC-46 is to reestablish the capability for immediate support of Athena I, Athena II, Taurus I, and other similar Castor 120 solid-motor based launch vehicles. The return to operational status will require the following steps:

- Completion of FAA Launch Site Operators License Renewal.
- Complete renovation/modernization of Mobile Access Structure (MAS).
    - Complete corrosion mitigation of primary and secondary steel.
    - Verify requirement for replacement of wheels and refurbishment of wheel trucks.
    - Replacement of mechanical hardware & upgrade hoists.
    - Testing/checkout / load testing of refurbished MAS
    - Refurbishment of communications and electrical services.
    - Miscellaneous repairs (handrails, fiberglass siding, lighting fixtures).
- Verify requirement for replacement of rail between MAS and the launch point.
- Verify requirement for refurbishment of flame duct.

C.2.c SPACE LAUNCH COMPLEX 47 (SLC-47)

Space Launch Complex 47 (SLC-47), shown in Figure 15, is located at Cape Canaveral Air Force Station along Samuel C. Phillips Parkway, south of SLC-40 and north of SLC-37. In 1984, the site was developed and SLC-47 constructed. Space Florida currently has a Real Property License from the 45th Space Wing in order to operate and maintain SLC-47. Space Florida has partnered with the 45th Space Wing, FAA/AST, Florida Space Institute (FSI), University of Central Florida (UCF), and Brevard Community College (BCC) to provide a launch site that is capable of launching Loki and Super Loki suborbital rockets to altitudes exceeding 200,000 ft. As part of its role in enabling the continuation of small rocket launches for research and education, Space Florida acts as liaison between the 45th Space Wing and potential customers to support planned and future launches from SLC-47. In September 2008, Space Florida hosted a successful Super Loki launch from SLC-47.

Figure 15: SLC-47 at CCAFS

While SLC-47 is currently a small launch complex that is used for small suborbital rockets, the possibility exists for potential expansion of the launch are to the west of its currently location to provide for a horizontal or vertically integrated, vertical launch pad that would be capable of supporting larger orbital vehicles. For an expansion of this launch complex to be successful, any potential plan would have to be coordinated with Cape Canaveral Air Force Station and an extensive environmental assessment would have to be completed. In addition, the Samuel C. Phillips Parkway would potentially have to be shifted around the new launch complex.

SECTION D: GUIDELINES FOR EVALUATION OF POTENTIAL SPACEPORT SITES

Two evaluation methods are utilized in this Spaceport Master Plan, Phase 2a. The Spaceport Evaluation Mechanism (SEM) is used to assess commercial viability of the Spaceport at KSC/CCAFS. Additionally, a Launch Site Viability Evaluation (LSVE) was used to identify additional site factors, such as orbital performance factors and physical and natural environmental factors of launch complexes within the Spaceport. These evaluations can be applied to spaceports around Florida, as well as other potential launch sites within those spaceports.

D.1 SPACEPORT EVALUATION MECHANISM (SEM) RATINGS

The Spaceport Evaluation Mechanism (SEM) rating system is a tool used in assessing the commercial feasibility of existing and potential spaceports. The SEM also includes recommendations based on the results of the assessment. The methodology is identified in Chapter 9 of the Futurist Report dated 2008 (Ref [7]). The SEM criteria presented in Table 3 are those defined as critical path items by the SEM rating system. See Table 4 for the complete SEM chart of the Space Florida Spaceport.

Table 3: SEM Critical Path Criteria

SEM Ref #	SEM Critical Path Criteria	Description
1	Have basic business plan areas been addressed?	For a business to be viable, basic business plan areas need to be addressed. This includes a description of the business, an opportunity/market overview, an assessment of competition that includes a competitive analysis, an examination of financing issues, and an exit strategy.
2	Have financiers and multiple revenue streams been identified?	Financing for any large project is an essential element of development. Research has shown that a spaceport will not be profitable if it only focuses on providing space-specific services. Other areas for non-space-specific revenue streams must be explored and included in a spaceport business plan e.g. test facility rental or terrestrial tourism.
13	Is the spaceport subject to a regulatory framework?	Lack of a regulatory framework may cause uncertainty in planning and operations. If there is no regulatory framework specific to spaceports or space activities, regulations applicable to aviation should

		be used as guidelines, and/or consultation with aviation sector/aerospace sector regulators would be necessary.
14	Does the spaceport operate in accordance with principles of international and national aviation regulations, concerning, amongst other things, minimizing the effects of operations on air traffic, and obtaining rights of over-flight from neighboring States?	Issues that aviation regulations govern include: air traffic management to ensure the space access vehicle has a free and safe airspace corridor, access to space without endangering local communities, and absence of conflict with civil aviation activities. Aviation regulations at national or international levels also (depending on the type of space transport) pertain to: infrastructure requirements, warning signage and markings, wind indicators, building evacuation plans; and, the sovereignty of states over their airspace.
16	Are all local, regional and national laws, including those required for licensing considered?	Environmental and planning laws, health and safety regulations, employment law, and ultimately licensing requirements (if provided for) should be taken into account.
17	Does the spaceport provide for communication radio frequency allocation, tracking and telemetry in accordance with international requirements (ITU) with respect to the spaceport airspace?	The spaceport should have its own assigned frequency, and appropriate tracking infrastructure.
21	Is there a comprehensive emergency medical response plan?	A comprehensive plan would include: on-site triage, immediate emergency facilities, and/or transport for patients to regional facilities with advanced healthcare. Integral to such a plan is the relationship with local authorities.
35	Does the spaceport launch site support the appropriate space access vehicles?	The spaceport launch infrastructure must be space access vehicle specific. Examples of launch site infrastructure that would support the space access vehicle would be a launch/landing pad, runway, etc.
47	Has an environmental impact study been completed in accordance with local law?	Local licensing may be dependent upon the acceptable completion of an environmental impact analysis. Additionally, reducing the environmental impact is a beneficial sustainable practice.

D.2 LAUNCH SITE VIABILITY EVALUATION (LSVE)

The second method of evaluation completed for the Space Florida Spaceport is a Launch Site Viability Evaluation (LSVE). This method of evaluation looks at additional factors that are not considered in the SEM rating system. Some of these additional factors include orbital performance factors and physical and natural environmental factors.

D.2.a ORBITAL PERFORMANCE FACTORS

No spaceport can provide launches at all azimuths or achieve any desired orbital inclination. A spaceport has a limited range of allowable launch azimuths so that, in the event of a launch anomaly, the risk to populated areas is minimized. Therefore, it is important to understand what launch azimuths and inclinations can be achieved at each spaceport.

Launch Azimuth and Orbital Inclination

Typical launch azimuths for the Eastern Range, per Air Force Space Command Manual 91-710 (ref [2]), are between 37 and 114° measured clockwise from 0° North. These launch azimuths correlate to orbital inclinations of 28.5° to 57° for Northeast launches and 28.5° to 36° for Southeast launches. A spaceport located at CCAFS can support all of these launch azimuths and orbital inclinations. Orbital inclinations outside this typical range can be achieved; however they require the use of orbital maneuvers that can substantially reduce the size of the payload capacity of a launch vehicle.

Flyover Considerations

For specific launch sites at a spaceport it may be desired to restrict the range of launch azimuths to prevent over-flight of other launch sites or critical assets. While this limitation will not eliminate the consideration of a specific launch site, it will be one factor in its evaluation. For launch sites located directly on the coast there is typically no over-flight concern.

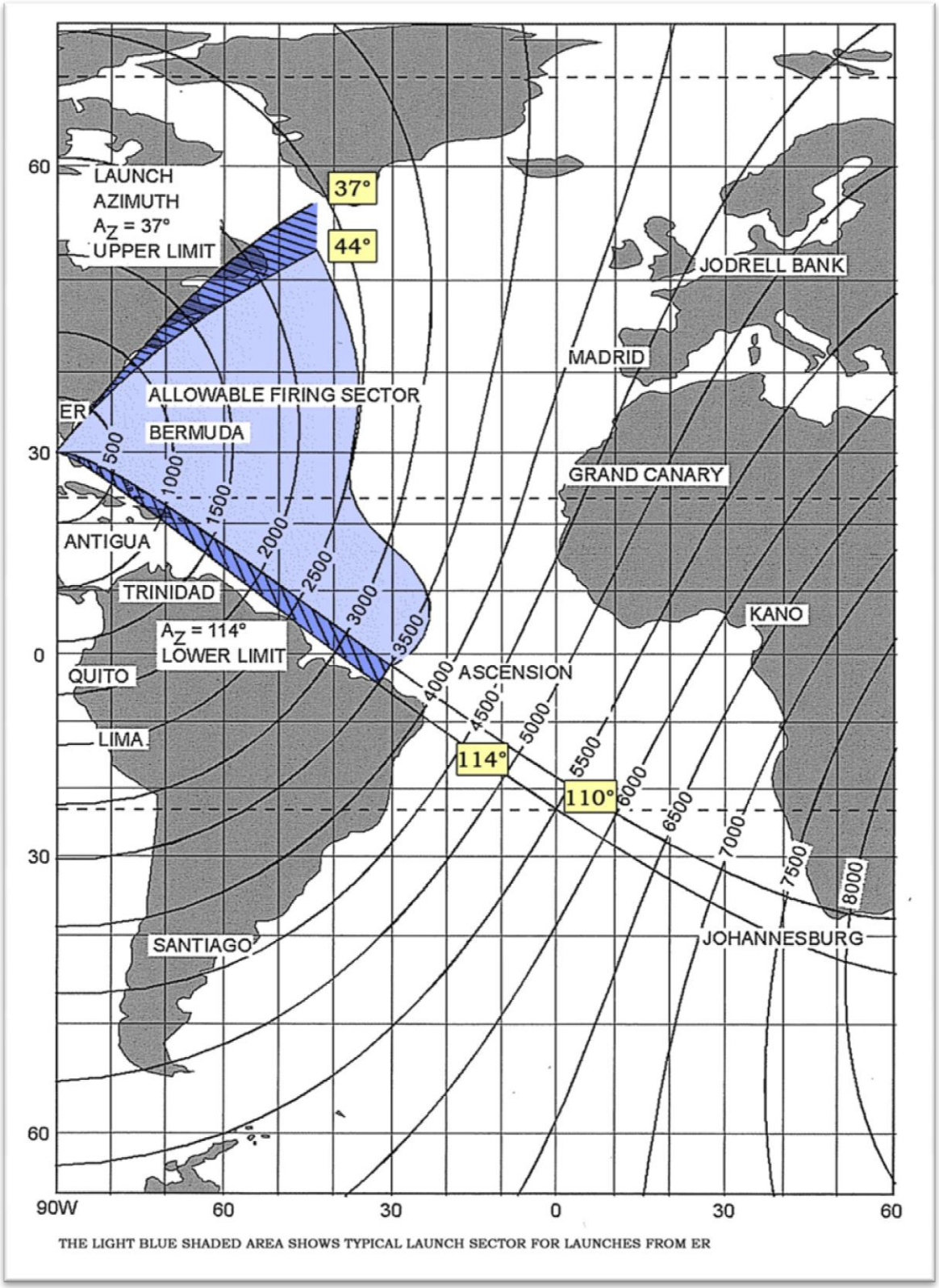

Figure 16: Launch Azimuths for Eastern Range (Ref [2])

D.2.b PHYSICAL AND NATURAL ENVIRONMENTAL FACTORS

Some physical and natural factors include environmental impacts, such as scrub jay habitat, bald eagle nesting, sea turtles (i.e.: site lighting impacts), hurricane tidal surge, and known historic/cultural sites. For each site the Environmental Baseline Study (EBS) should be reviewed. Additional physical factors include proximity to public areas, proximity to salt laden air, proximity to transportation routes, and proximity to seismic areas.

Environment

Environmental evaluation criteria include identifying wetlands, fauna and contamination. Areas that are identified as having a larger concentration of wetlands will receive lower ratings than those with more upland. Areas identified as prime habitat for scrub jay, gopher tortoise, bald eagle or other threatened species will also receive a lower rating than those areas with less.

Archeological

It is a priority to preserve cultural and historic resources; therefore it is advantageous to find a site with a low impact to archeologically significant areas. Depending on the density of cultural and historical resources located at or near each of the areas, there may be an impact to design, location and schedule of a construction project. A higher rating is given to areas with a lower probability of archeological constraints.

Contiguous Un-submerged Land

Wetlands are prevalent throughout CCAFS and are an important environmental asset to the state of Florida. Wetland mitigation can be accomplished with restoration, enhancement or creation. Areas with a higher density of submerged lands will receive lower ratings while areas with the largest amount of contiguous un-submerged land will receive higher ratings.

Category 1 (3) Hurricane Tidal Surge

Each hurricane season presents the possibility for a hurricane event at KSC/CCAFS. The effects of tidal surge are known to be more severe than that of wind. To reduce the possible impact of hurricane tidal surges, this evaluation identifies all areas that are susceptible to the effects of the tidal surge from a Category 1 or 3 Hurricane based on the Saffrin-Simpson Hurrican Scale.

Proximity to Salt Laden Air (Corrosion)

Corrosion control of launch facilities is a recurring cost that can be reduced by locating a facility farther from salt-laden air and the coastline. Experience has shown that launch facilities near the coast (such as LC-39A) experience more corrosion than those farther away (such as the Vehicle Assembly Building). A location that is farther from salt-laden air will be viewed favorably.

Proximity to Populated Areas

To increase the level of safety to the public, a proximity limit is used for the evaluation criteria. Ideally the farther a launch complex is away from public areas the safer the general public is in the event that there is a catastrophic space launch vehicle malfunction on the launch pad or within the first seconds of a launch.

Previous Explosive Quantity Distances Siting

Explosive Quantity Distance (QD) pertains to the amounts and kinds of explosives that can be stored and the proximity of such storage to buildings, highways, railways, magazines, or other installations. Locations are rated favorable when the quantity distances of stored propellants, integrated vehicles, and fueled vehicles have the lowest impact on existing facilities and public transportation routes.

Launch Vehicle Size Range/Class Requirements

Launch Complexes are typically designed, sized, and licensed for specific sizes/classes of space launch vehicles and specific propellant types. It is favorable for the launch complex to safety meet the specific requirements of the particular launch vehicle class identified to operate from the launch site. It is also favorable for a site to provide flexibility to adapt to variations of launch vehicle sizes and classes.

Proximity to Usable: Road, Rail, Barge Dock, Aircraft Runway

Proximity to transportation modes are dependent on both the requirements of the launch vehicle components and the relative distance of the launch facility to existing transportation infrastructure. A favorable rating is given to locations that have existing infrastructure nearby or have a greater ease of providing access to a variety of transportation methods. Transportation improvements are compared for roads, rail, barge docks, and aircraft runways. Short distances to all these items were deemed positive for vehicle component transportation.

Proximity to Active Seismic Areas

Ideally a launch facility would be constructed away from a location with a high potential for seismic activity. It is important, not only for reducing the likelihood of death and injury, but also for reducing the potential for losses associated with earthquake damage repair and space flight interruption.

D.3 SURPLUS FEDERAL FACILITIES AND EQUIPMENT

The availability of surplus federal facilities and equipment vary from time to time. Space Florida continues to work with NASA and the 45th Space Wing to identify potential facilities or equipment that may be available for use by commercial entities for space-related activities. At this time a comprehensive listing of available facilities and equipment is not publicly available. Once requirements for a facility are identified, Space Florida will coordinate with the Air Force to determine what facilities are available that meets those requirements.

SECTION E: EVALUATIONS AND/OR STATUS OF SPACEPORT SITES

The two evaluation methods identified in Section E are utilized in this Spaceport Master Plan, Phase 2a. The Spaceport Evaluation Mechanism (SEM) is used to assess commercial viability of the Spaceport at KSC/CCAFS. Additionally, separate Launch site Viability evaluations are completed for SLC-36, SLC-46, and SLC-47.

E.1 SPACE FLORIDA SPACEPORT EVALUATION

The following spaceport evaluation is based on the Spaceport Evaluation Mechanism (SEM) Rating identified in Section E. Again, the following criteria are those that are defined as critical path items by the SEM rating system. This provides a qualitative assessment of potential spaceports. See Table 4 for the complete SEM evaluation of the Space Florida Spaceport and Table 8 for comparisons of SEM evaluations of Space Florida Space to two other spaceports, one within the United States and the other located internationally.

Table 4: SEM Evaluation of the Proposed Space Florida Spaceport

Ref. No	Criterion	Result	Discussion and Recommendations
Business			
1.	Have basic business plan areas been addressed?	Potentially Fulfilled	See Space Florida Strategic Business Plan
2.	Have financiers and multiple revenue streams been identified?	Potentially Fulfilled	See Space Florida Strategic Business Plan
3.	Can the spaceport secure a substantial share of the spaceport market?	Sufficiently Fulfilled	The Space Florida Spaceport includes SLC-36, 46, and 47 which together encompass small, medium and potentially large lift capacity vehicles both liquid and solid fueled.
4.	Can the spaceport take advantage of a particular customer segment, and/or does it address a specific customer need?	Sufficiently Fulfilled	SLC-36 is developed to meet the needs of small and medium sized liquid fueled commercial vehicles.
5.	Are the engineering and development costs plus capital expenditures reasonable based on analogous projects?	Sufficiently Fulfilled	Cost estimates are within the scope of previously built, vertical launch complexes.
6.	Has an analysis of the business risks and costs of failure, including potential business	Sufficiently Fulfilled	See Space Florida Spaceport Financial Plan. Proximity to the Atlantic Ocean keeps risk to human

	interruption, been conducted?		life minimized. Risk of earthquakes is very low.
7.	Are there healthy financial ratios and financial figures after the 'break-even' point?	Potentially Fulfilled	See Space Florida Spaceport Financial Plan
8.	Are there manageable quarterly expenses after the 'break-even' point?	Potentially Fulfilled	See Space Florida Spaceport Financial Plan
9.	Is the break-even point achievable in a reasonable amount of time?	Potentially Fulfilled	See Space Florida Spaceport Financial Plan
10.	Is a return on investment achievable in a reasonable amount of time?	Potentially Fulfilled	See Space Florida Spaceport Financial Plan
11.	Has an exit strategy been defined?	Potentially Fulfilled	See Space Florida Spaceport Financial Plan
12.	Is the spaceport well situated geographically to access the orbits/sub-orbits which are desirable to the targeted market?	Sufficiently Fulfilled	Latitude aids with orbital launches of low degree. Location allows for launch angles of 45 to 90 degrees. Sub orbital flights have good scenery and opportunity for ocean splashdown or horizontal landing at CCAFS skid strip or SLF.
Regulatory Issues			
13.	Is the spaceport subject to a regulatory framework?	Sufficiently Fulfilled	FAA License, Cape Canaveral Air Force Station License, DDESB approval of explosive siting.
14.	Does the spaceport operate in accordance with principles of international and national aviation regulations, concerning, amongst other things, minimizing the effects of operations on air traffic, and obtaining rights of over-flight from neighboring States?	Sufficiently Fulfilled	SLC-36 and SLC-46 have supported over 150 launches since 1962. This criterion must have been met.
15.	Are the international obligations of the State within which the spaceport is located taken into consideration by the spaceport management?	Sufficiently Fulfilled	SLC-36 and SLC-46 have supported over 150 launches since 1962. This criterion must have been met.
16.	Are all local, regional and national laws, including those required for licensing considered?	Sufficiently Fulfilled	SLC-36 and SLC-46 have supported over 150 launches since 1962. This criterion must have been met.
17.	Does the spaceport provide for communication radio frequency allocation, tracking and telemetry in accordance with international requirements (ITU)	Sufficiently Fulfilled	SLC-36 and SLC-46 have supported over 150 launches since 1962. This criterion must have been met.

	with respect to the spaceport airspace?		
Operational			
18.	Is there adequate nominal and emergency ventilation?	Not Evaluated	Data not available at this time.
19.	Does the spaceport have the fire, HAZMAT, and Emergency crews (with access to emergency onsite fire station) to respond to any operational emergencies?	Sufficiently Fulfilled	As part of CCAFS.
20.	Are there built-in redundant power systems for contingency operations?	Sufficiently Fulfilled	Back-up power requirements for critical GSE will be provided for with portable generators.
21.	Is there comprehensive emergency medical response plan?	Sufficiently Fulfilled	As part of CCAFS.
22.	Does the spaceport emergency health care plan have redundancy in the event of failure, i.e. do they demonstrate fault tolerance?	Sufficiently Fulfilled	As part of CCAFS.
23.	Are spaceport personnel performing operations according to applicable occupational health and safety standards?	Not Evaluated	
24.	Is there a manifest that will document in real-time the location of users and personnel and their proximity to areas of higher risk?	Not Evaluated	
25.	Can the spaceport management provide appropriate training to personnel?	Not Evaluated	
26.	Is informed consent obtained from personnel who may be exposed to hazardous areas related to space access vehicle operations and launch?	Not Evaluated	
27.	Does the spaceport have sufficient access to utilities?	Sufficiently Fulfilled	Utilities include communication fiber, power, water, sewer, and nitrogen gas.
28.	Is there an environmentally sustainable plan for waste management and removal?	Sufficiently Fulfilled	Yes, per SLC-36 procedures.
29.	Is adequate provision made for hazardous and toxic material management?	Potentially Fulfilled	Environmental Assessment (EA) with FAA-AST is ongoing, not yet approved.
30.	Does the spaceport have a propellant management plan?	Potentially Fulfilled	New siting for propellants does not yet have an approved management plan.

31.	Does the spaceport have a security plan?	Sufficiently Fulfilled	Location within gated perimeter of CCAFS.
32.	Has the spaceport management performed a safety risk analysis based on identified risks for pre-launch, launch, and re-entry operations?	Not Evaluated	
33.	Is there a downrange emergency recovery, search and rescue plan?	Sufficiently Fulfilled	As part of CCAFS
34.	Is the spaceport located where suitable prevailing weather conditions meet the requirements of the appropriate space access vehicle?	Sufficiently Fulfilled	Yes, Cape Canaveral has ideal weather conditions for launches year round.
Infrastructure			
35.	Does the spaceport launch site support the appropriate space access vehicles?	Sufficiently Fulfilled	Yes, design of facilities includes propellant handling, vertical launch stand, flame deflector, inert commodities, payload and vehicle support systems.
36.	Has an emergency response plan been developed for the contingency situation where a failure occurs within the boundaries of the spaceport?	Sufficiently Fulfilled	Operations to be coordinated with the Air Force.
37.	Does the spaceport have space access vehicle and payload specific assembly and integration facilities?	Sufficiently Fulfilled	There are many assembly and integration facilities available for use within the Cape Canaveral region.
38.	Are there storage and maintenance facilities for space access vehicles?	Sufficiently Fulfilled	There are many assembly and integration facilities available for use within the Cape Canaveral region.
39.	Is there capacity for future infrastructure expansion?	Sufficiently Fulfilled	Yes, future expansion can take place on Pad B, as well as other adjacent launch pads.
Location, Community, and Environment			
40.	Is the location of the spaceport publicly accessible?	Sufficiently Fulfilled	SLC-36 is within the perimeter of CCAFS as part of the Commercial Launch Zone (Space Florida Spaceport). Space Florida Spaceport areas can be located anywhere in the state of Florida.
41.	Is the spaceport situated near transportation infrastructure that facilitates transport outside the region (national/international)?	Sufficiently Fulfilled	Transportation infrastructure includes highways, railways, seaports and airports.

42.	Is there existing local tourism infrastructure (hotels, attractions, etc) and can the spaceport absorb seasonal fluctuation in tourism activities?	Sufficiently Fulfilled	There are many hotels, and attractions at nearby Cocoa Beach. SLC-36 is within 60 miles of Orlando, FL.
43.	Does the spaceport provide or intend to provide entertainment venues and activities for terrestrial tourists?	Sufficiently Fulfilled	Entertainment venues and activities are available at the adjacent NASA visitor's center.
44.	Is there an expandable commercial airport with a passenger terminal on-site?	Sufficiently Fulfilled	No. The nearest commercial airport is Space Coast Regional Airport in Titusville, located within 20 miles.
45.	Does the spaceport infrastructure harmonize with the landscape of the location?	Insufficiently Fulfilled	Existing buildings were not designed with aesthetics in mind.
46.	Is there a wildlife hazard assessment, management, and protection plan?	Sufficiently Fulfilled	Yes, as part of the EA adjacent wetlands will not be disturbed.
47.	Has an environmental impact study been completed in accordance with local law?	Sufficiently Fulfilled	Yes, as part of the EA.
48.	Does the spaceport have a plan to minimize noise pollution in local community?	Sufficiently Fulfilled	Yes, as part of the EA.
49.	Is there an ethical communication strategy that facilitates community feedback?	Sufficiently Fulfilled	Space Florida has quarterly updates, has numerous public engagements, and an informative website with many opportunities for community feedback.
50.	Does the spaceport management have a corporate social accountability plan?	Sufficiently Fulfilled	Space Florida is accountable to the State of Florida under Florida Statutes.
51.	Does the spaceport promote human resource development within local and regional communities?	Sufficiently Fulfilled	Space Florida offers students and teachers innovative workshops and programs, and is engaged with the Space Coast Economic Development Commission and Brevard Workforce Development Council
Human Spaceflight			
52.	Is there infrastructure necessary to perform screening, training and flight preparation of passengers and flight crew?	Insufficiently Fulfilled	The scope of the Space Florida Spaceport does not include human spaceflight at this time.
53.	Can the spaceport provide ground-based in-flight physiological monitoring and medical management?	Insufficiently Fulfilled	The scope of the Space Florida Spaceport does not include human spaceflight at this time.
54.	Is there luggage storage and processing infrastructure?	Insufficiently Fulfilled	The scope of the Space Florida Spaceport does not include human spaceflight.

55.	Does the spaceport have on-site food handling and storage infrastructure?	Sufficiently Fulfilled	A restaurant can be included in the Space Florida Spaceport as required.
Cargo and Satellite Operations			
56.	Are there space cargo processing facilities?	Sufficiently Fulfilled	Many payload and cargo processing facilities are within a short distance of SLC-36, and 46. These facilities will be included in the Space Florida Spaceport as required.
57.	Does the spaceport provide testing infrastructure for space access vehicle and payload operations?	Sufficiently Fulfilled	Test facilities are within a short distance of SLC-36, and 46. These facilities will be included in the Space Florida Spaceport as required.
58.	Does the spaceport have a clean room?	Sufficiently Fulfilled	Clean room facilities are within a short distance of SLC-36, and 46. These facilities will be included in the Space Florida Spaceport as required.

E.2 SLC-36 – SITE EVALUATION

The Launch Site Viability Evaluation discussed in Section E has been applied to Space Launch Complex 36 (SLC-36). Table 5 contains a discussion of this evaluation. The result of this evaluation identifies SLC-36 as a good candidate site for development of a launch complex to host space launch vehicles of a similar class and size as were previously launched from the complex.

Table 5: SLC-36 Evaluation Matrix

Evaluation Criteria / Factors	Discussion
Overall Spaceport Evaluation Mechanism (SEM) Review	This launch complex is included in the SEM evaluation of the Space Florida Spaceport and satisfactorily meets the criteria identified.
Launch Azimuth & Orbital Inclination	Since the launch complex is located on the Eastern Range, it can accommodate launch azimuths between 37° and 114°.
Flyover Considerations	For normal launch azimuths there is no concern of over flying other active launch complexes or facilities.
Environmental Considerations	A final environmental baseline survey (EBS) was conducted on SLC-36A/B in September 2005 and a Finding of No Significant Impact (FONSI) was issued for the deactivation of the complex. Demolition of the site began in 2006; all launch (support) structures and related facilities on SLC-36A/B have been demolished except the Launch Control Building (Bldg 5501) and the Atlas Ops Annex (Bldg 5550). RS&H is currently preparing an EBS for Space Florida for this launch site.
Archeological Considerations	Since all development at this launch complex will be completed within the existing disturbed area, there is no current archeological concerns.
Contiguous Un-submerged lands	Since this site has been previously developed there are currently no concerns with wetland mitigation.
Category 1 (3) Hurricane Tidal Surge	SLC-36 is not affected by Category 1 Hurricane tidal surge but is affected by Category 3 Hurricane tidal surge.
Proximity to Salt Laden Air	SLC-36 is located on the eastern portion of CCAFS on the Cape Canaveral seashore and is affected by salt laden air.
Proximity to Populated Areas	The SLC-36A/B launch complex is located approx 6 miles from the nearest populated area (Port Canaveral).
Explosive Quantity Distance of Previous Propellants	SLC-36 was previously sited to support storage and collocation of Liquid Oxygen, Liquid Hydrogen, RP-1, and Solid Boosters.
Vehicle Size Range/Class Requirements	SLC-36 has previously supported medium class vehicles, such as the Atlas II and III, capable of approximately 1 million lbs of thrust.

Proximity to Usable: Road, Rail, Barge Dock, Aircraft Runway	As part of CCAFS, SLC-36 is served by a comprehensive network of roads (I-95, SR 50 and SR 528), railway (NASA rail, Balloon Siding rail causeway and rail yard), deep-water port (USAF controlled dock at Port Canaveral), and runway (CCAFS skid strip and Shuttle Landing Facility).
Proximity To Seismic Areas	SLC-36 is not located in an active seismic zone.

E.3 SLC-46 – SITE EVALUATION

The Launch Site Viability Evaluation discussed in Section E has been applied to Space Launch Complex 46 (SLC-46). Table 6 contains a discussion of this evaluation. The result of this evaluation identifies SLC-46 as a good candidate site for development of a launch complex to host space launch vehicles of a similar class and size as were previously launched from the complex.

Table 6: SLC-46 Evaluation Matrix

Evaluation Criteria / Factors	Discussion
Overall Spaceport Evaluation Mechanism (SEM) Review	This launch complex is included in the SEM evaluation of the Space Florida Spaceport and satisfactorily meets the criteria identified.
Launch Azimuth & Orbital Inclination	Since the launch complex is located on the Eastern Range, it can accommodate launch azimuths between 37° and 114°.
Flyover Considerations	For normal launch azimuths there is no concern of over flying other active launch complexes or facilities.
Environmental Considerations	An EBS was conducted on SLC-46 in August 2006 to determine potential for past/present contamination of the complex facilities by hazardous substances. The EBS states that no evidence of environmental impairment was identified at the SLC46 facility.
Archeological Considerations	Since all development at this launch complex will be completed within the existing disturbed area, there is no current archeological concerns.
Contiguous Un-submerged lands	Since this site has been previously developed there are currently no concerns with wetland mitigation.
Category 1 (3) Hurricane Tidal Surge	SLC-46 is not affected by Category 1 Hurricane tidal surge but is affected by Category 3 Hurricane tidal surge.
Proximity to Salt Laden Air	SLC-46 is located on the easternmost point of CCAFS on the Cape Canaveral seashore and is affected by salt laden air.
Proximity to Populated	The SLC-46 launch complex is located approx 6 miles

Areas	from the nearest populated area (Port Canaveral).
Explosive Quantity Distance of Previous Propellants	SLC-36 was previously sited to support space launch vehicles based on Castor 120 solid rocket motors.
Vehicle Size Range/Class Requirements	SLC-46 can accommodate medium class space launch vehicles and has previously supported launches of Athena I & II and Trident II missile testing.
Proximity to Usable: Road, Rail, Barge Dock, Aircraft Runway	As part of CCAFS, SLC-46 is served by a comprehensive network of roads (I-95, SR 50 and SR 528), railway (NASA rail, Balloon Siding rail causeway and rail yard), deep-water port (USAF controlled dock at Port Canaveral), and runway (CCAFS skid strip and Shuttle Landing Facility).
Proximity To Seismic Areas	SLC-46 is not located in an active seismic zone.

E.4 SLC-47 – SITE EVALUATION

The Launch Site Viability Evaluation discussed in Section E has been applied to Space Launch Complex 47 (SLC-47). Table 7 contains a discussion of this evaluation. The result of this evaluation identifies SLC-47 as a good candidate site for continued development and launch support of space launch vehicles of a similar class and size as are currently launched from the complex.

Table 7: SLC-47 Evaluation Matrix

Evaluation Criteria / Factors	Discussion
Overall Spaceport Evaluation Mechanism (SEM) Review	This launch complex is included in the SEM evaluation of the Space Florida Spaceport and satisfactorily meets the criteria identified.
Launch Azimuth & Orbital Inclination	Since the launch complex is located on the Eastern Range, it can accommodate launch azimuths between 37° and 114°.
Flyover Considerations	For normal launch azimuths there is no concern of over flying other active launch complexes or facilities.
Environmental Considerations	In February 2008 an EBS was conducted on SLC-47 and it was determined that no environmental violations exist at the launch site.
Archeological Considerations	Archeological considerations are not currently a concern, however if future development of this launch site involves its expansion to the west of Samuel C. Phillips Parkway, an archeological survey may be required.
Contiguous Un-submerged lands	Since this site has been previously developed there are currently no concerns with wetland mitigation.

Category 1 (3) Hurricane Tidal Surge	SLC-47 is not affected by Category 1 Hurricane tidal surge but is affected by Category 3 Hurricane tidal surge.
Proximity to Salt Laden Air	SLC-47 is located on the northeastern portion of CCAFS on the Cape Canaveral seashore and is affected by salt laden air.
Proximity to Populated Areas	The SLC-47 launch complex is located approx 9 miles from the nearest populated area (Port Canaveral).
Explosive Quantity Distance of Previous Propellants	SLC-47 currently supports launches of Loki and Super Loki rockets containing less than 100 lbs of HTPB solid propellant.
Vehicle Size Range/Class Requirements	Small Loki/Super Loki suborbital sounding rockets are currently launched from SLC-47.
Proximity to Usable: Road, Rail, Barge Dock, Aircraft Runway	As part of CCAFS, SLC-47 is served by a comprehensive network of roads (I-95, SR 50 and SR 528), railway (NASA rail, Balloon Siding rail causeway and rail yard), deep-water port (USAF controlled dock at Port Canaveral), and runway (CCAFS skid strip and Shuttle Landing Facility).
Proximity To Seismic Areas	SLC-47 is not located in an active seismic zone.

SECTION F: ANALYSIS OF EVALUATION RESULTS

Through the SEM analysis, we are able to subjectively compare the capabilities of Space Florida Spaceport (SLC-36, SLC-46, and SLC-47) to other Spaceports around the world. Information regarding the capabilities of Mojave, CA and Guiana Space Center (GSC) were readily available for comparison, so these were the two benchmarks for comparison as shown in Table 8. The benefits of development of SLC-36, SLC-46, and SLC-47 per this Spaceport Master Plan are evident by the increase in satisfactory evaluation ratings obtained for the Proposed Space Florida Spaceport.

Table 8: Comparison of Space Florida Spaceport to Other Spaceports (Ref [7])

Ref. No	Space Florida Spaceport as of April 2009	Proposed Space Florida Spaceport with development of SLC-36, 46, and 47	Mojave Air & Space Port	Guiana Space Center (GSC)
Business				
1.	◉	◉	●	✕
2.	◉	◉	●	●
3.	✕	●	●	●
4.	◉	●	●	●
5.	●	●	●	✕
6.	●	●	○	●
7.	◉	◉	○	✕
8.	◉	◉	○	◉
9.	◉	◉	○	✕
10.	◉	◉	○	✕
11.	◉	◉	○	●
12.	✕	●	●	●
Regulatory Issues				
13.	●	●	●	●
14.	●	●	●	●
15.	●	●	●	●
16.	●	●	●	●
17.	●	●	●	●
Operational				
18.	○	○	●	●
19.	●	●	●	●
20.	✕	●	●	●
21.	●	●	●	●
22.	●	●	○	●
23.	○	○	●	●
24.	○	○	●	●
25.	○	○	✕	●

26.	○	○	○	●
27.	✕	●	●	●
28.	◉	●	●	●
29.	✕	◉	●	●
30.	✕	◉	●	●
31.	●	●	●	●
32.	○	○	○	●
33.	●	●	●	✕
34.	●	●	●	●
Infrastructure				
35.	✕	●	●	●
36.	◉	●	●	●
37.	✕	●	●	●
38.	✕	●	●	●
39.	✕	●	●	●
Location, Community, and Environment				
40.	●	●	●	✕
41.	●	●	●	●
42.	●	●	●	✕
43.	●	●	✕	●
44.	●	●	●	●
45.	✕	✕	✕	✕
46.	●	●	●	●
47.	●	●	●	●
48.	●	●	●	●
49.	●	●	●	✕
50.	●	●	○	●
51.	●	●	●	●
Human Spaceflight				
52.	✕	✕	✕	●
53.	✕	✕	✕	●
54.	✕	✕	○	✕
55.	✕	●	●	✕
Cargo and Satellite Operations				
56.	◉	●	●	●
57.	◉	●	✕	●
58.	◉	●	✕	●

Legend

● Sufficiently Fulfilled ◉ Potentially Fulfilled
✕ Insufficiently Fulfilled ○ Not Evaluated

Space Florida is modifying and streamlining processes and procedures to be more responsive to commercial space transportation business interfacing with KSC and CCAFS. The full commercial utility of the Space Florida Spaceport can be realized with the planned development of SLC-36 and SLC-46. This plan is in the best interest of the State of Florida.

In addition to the SEM evaluation, a Launch Site Viability Evaluation was completed on each site. A summary of each evaluation is provided in Table 9 . The result of the evaluation rated all three complexes 'Favorable' with the exception of the hurricane tidal surge and proximity to salt laden air. All three sites are expected to be safe from the tidal surge of a Category 1 hurricane but might have some flooding from a Category 3 or higher hurricane. With proper design and maintenance practices the effects of the salt laden air can be minimized. For example, SLC 46's structure, while over fifteen years old, is in excellent condition due to quality building materials and regular maintenance.

Table 9: Launch Site Viability Evaluation Summary

Evaluation Criteria / Factors	SLC-36	SLC-46	SLC-47
Overall Spaceport Evaluation Mechanism (SEM) Review	●	●	●
Launch Azimuth & Orbital Inclination	●	●	●
Flyover Considerations	●	●	●
Environmental Considerations	●	●	●
Archeological Considerations	●	●	●
Contiguous Un-submerged lands	●	●	●
Category 1 (3) Hurricane Tidal Surge	⊙	⊙	⊙
Proximity to Salt Laden Air	×	×	×
Proximity to Populated Areas	●	●	●
Explosive Quantity Distance of Previous Propellants	●	●	●
Vehicle Size Range/Class Requirements	●	●	●
Proximity to Road, Rail, Barge, and Airport Facilities	●	●	●
Proximity To Seismic Areas	●	●	●

Legend
● Favorable
⊙ Moderately Favorable
× Unfavorable

F.1 STRENGTHS & WEAKNESSES IDENTIFIED

With the planned development of SLC-36 and SLC-46, small and medium lift commercial launch vehicles can be accommodated at the Space Florida Spaceport. The current spacing of the complexes is compatible with the safety requirements for these two classes of launch vehicle. Current Spaceport development plans propose siting for liquid propellants at SLC-36, and solid propellants at SLC-46.

Strengths identified by evaluations include:

Regulatory Issues:

- Previous launches set good precedent for future launches.

Operational:

- Working within CCAFS allows great access to emergency response, contingency operations, security and utilities.
- Robust Safety culture.
- Warm seasonal temperatures, no snow/ice concerns
- Proximity to the Atlantic Ocean for downrange recovery.
- DOD level security.

Scope:

- Large range of capability for launch vehicles.

Location:

- Ease of geographical access.
- Proximity to support facilities.
- Room for expansion.

Other Strengths:

- Broad range of Launch Azimuths for Equatorial Orbits.
- Established launch pads.
- Reuse of this land is environmentally responsible.
- Available selection of launch pads offers diverse capabilities.
- Workforce experienced in spaceport operations is readily available.

Weaknesses identified by SEM analysis include:

While SLC-36, 46, and 47 are currently set up for only unmanned commercial launches, future planning and financing could bring human spaceflight capabilities at these locations. Space Florida also has agreements with other geographic locations within Florida that can meet these requirements in the future.

Cape Canaveral is adjacent to the Canaveral National Seashore, and it is environmentally responsible to redevelop existing launch sites rather than to create new ones. Due to a multitude of design criteria, there are a limited number of viable launch complex sites available on Cape Canaveral. Development of LC-36, 46, and 47 preserves these alternate sites for future development.

Of the three launch sites, none are currently configured for a large- or heavy-lift vehicle. Requirements for these two classes of vehicle may be met on other existing launch pads at CCAFS.

Business plan:

- Due to the cyclical nature of the aerospace business and long lead time for payload and launch technology development, revenue sources are unknown.
- Break-even points and Return on Investment to be determined by actual activity.
- Exit strategy to be determined.

Scope:

- Vertical Launch sites are not ideally set up for space tourism.
- No near-term site capability to launch large/heavy -lift vehicles.

F.2 AREAS REQUIRING ENHANCEMENT

Before a commercial space launch operator can utilize either SLC-36 or SLC-47, several enhancements must be completed. The following is a list of recommended enhancements to prepare the launch complexes for commercial space access.

Space Launch Complex 36 (SLC-36)

- Completion of FAA Launch Site Operators License Process
- Renovate existing buildings
- Continue maintenance on Support Building (Building #5550)
- Provide access to power and communication line terminations
- Add perimeter fence

Space Launch Complex 46 (SLC-46)

- Completion of FAA Launch Site Operators License Renewal
- Renovate the Mobile Access Structure (MAS)
- Verify requirement for replacement of rail between the MAS and launch point
- Inspect and establish requirement for refurbishment of flame duct
- Upgrade communications and launch control infrastructure

While SLC-47 is currently active, several enhancements are recommended to keep the launch complex in condition to continue to support Super Loki rocket launches.

Space Launch Complex 47 (SLC-47)

- Refurbish Launch Rails
- Refurbish Launch Control Center

Space Florida developed the Space Operations Control Center (SOCC) to serve commercial customers as a full launch control or satellite operations center. Currently SpaceX is using the facility to support their launch operations on SLC-40. The SOCC will continue to be used as launch property to support commercial space transportation.

SECTION G: RECOMMENDED PLAN

For the State of Florida to be competitive in the commercial launch industry, options must be available for potential customers. It is recommended that Space Florida invest in launch and facility infrastructure that will serve as a foundation for Space Florida Spaceport customers. By providing these capabilities, the State of Florida and Space Florida will incentivize and encourage commercial space business development.

The integration of commercial space transportation launch and payload facilities construction and processes depends on continued work on the development of State and Federal government policies, statutes, rules and regulations. The architecture, engineering, and construction of launch sites require Space Florida to seamlessly interface with existing civil and defense components at KSC and CCAFS. As a tenant operating within the respective land use plans and according to the current operational requirements and processes, Space Florida's master plan must compliment those of NASA and the 45th Space Wing (45 SW).

G.1 PROJECT RECOMMENDATION FOR 5 YEAR PLAN

Space Florida recommends the development of the Space Florida Spaceport, consisting of SLC-36, SLC-46, and SLC-47. By modernizing and continuing to develop these launch sites, the State of Florida will make available launch sites for use by commercial launch operators. The Space Florida Spaceport will provide the commercial capability to support both orbital and suborbital missions as well as launch vehicles fueled by either liquid or solid propellants.

Future expansion of the Space Florida Spaceport and Florida Spaceport System can provide further modernization and expansion capable of supporting suborbital and orbital Reusable Launch Vehicles.

Table 10: Launch Vehicle Types Supported at Space Florida Spaceport

	SLC-36	SLC-46	SLC-47
Orbital Liquid Propellant Launch Vehicles (LOX/RP-1)	✓	--	--
Orbital Solid Propellant Launch Vehicles (e.g., Castor 120 based)	--	✓	--
Suborbital Launch Vehicles (Super Loki / Univserity Rockets)	--	--	✓

G.1.a SPACE LAUNCH COMPLEX 36 (SLC-36)

Figure 17: SLC-36 Recommended Development Phases

The development of SLC-36, as shown in Figure 17 and Figure 18, is proposed to occur in four phases:

Phase 0 – Planning and Licensing

Space Florida is in the process of obtaining both the Air Force Real Property License and FAA Launch Site Operators License. Once both of these licenses have been obtained construction can begin on the site. Concept development for the entire launch facility is complete and a topographical survey will be conducted in the near future. Space Florida will continue to maintain the SLC-36 property and will be use the property for temporary storage of assets that will eventually be incorporated in the operational infrastructure.

Phase 1 – Launch Complex Construction

The initial construction projects will include new paving, new security fence, reconditioning of existing buildings, upgrade of utility terminations, and construction design work to the PER (Preliminary Engineering Review) level. These projects have been selected because they are independent of any particular launch operator or a vehicle-specific requirement.

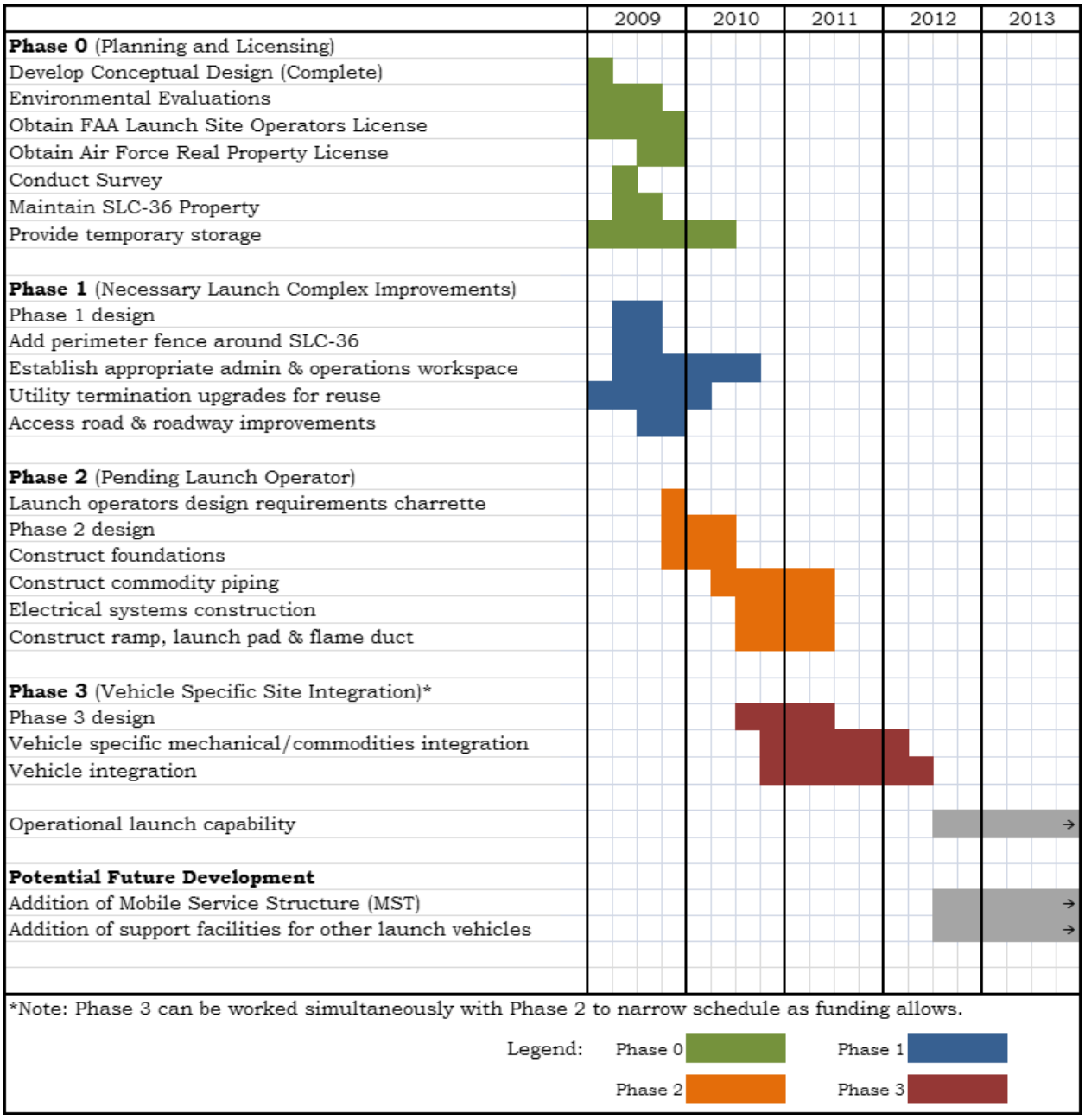

Figure 18: SLC-36 - 5 year Plan

Phase 2 – Universal Support Systems

Before Phase 2 can begin a vehicle operator or payload customer must be identified. A launch operator "design requirements charrette" will be completed to identify requirements for designing the shared universal systems and infrastructure. This will ensure all elements are captured for the multi-use capability of this launch complex. The shared systems, which include the pad foundations, commodity storage systems

and piping, electrical systems, and launch pad infrastructure, will be constructed during this phase.

Phase 3 – Vehicle Specific Site Integration

Once a specific launch vehicle operator has committed to using SLC-36 Phase 3 wil begin. This phase can be coordinated in parallel to Phase 2. In Phase 3, vehicle-specific equipment is installed and integrated with the existing pad infrastructure.

Future Development

As the development of SLC-36 continues, the potential exists for expansion of the capabilities at the launch site. For example, adding a Mobile Service Structure, support facilities for other launch vehicles, and a second pad.

G.1.b SPACE LAUNCH COMPLEX 46 (SLC-46)

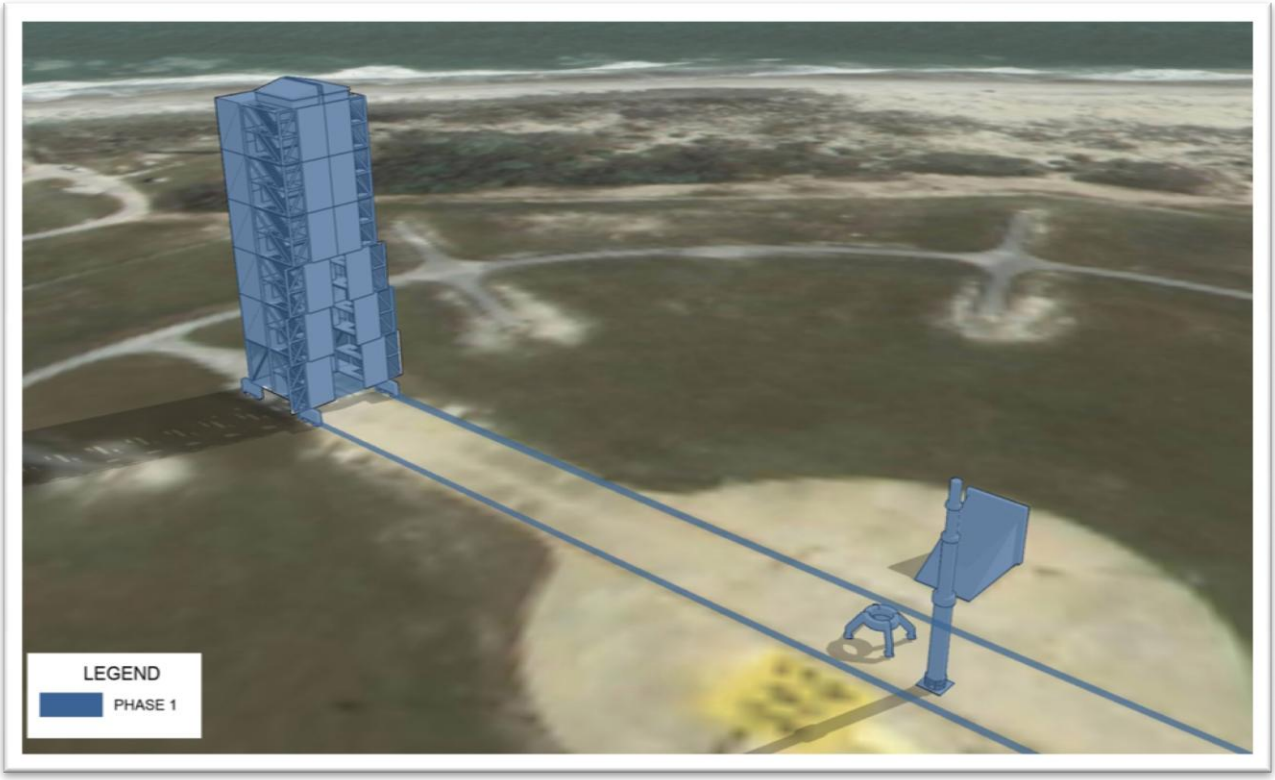

Figure 19: SLC-46 Recommended Development Phases

Market conditions are creating renewed interest in launching from Complex 46. For example, a major launch services provider has submitted a Program Introduction to the 45 SW specifically requesting access to Complex 46 for a small launch vehicle similar to those previously launched from this facility. This request has been favorably received by the 45 SW.

The development of SLC-46, as shown in Figure 19 and Figure 20, is proposed to occur in 2 phases:

Phase 0 – Planning and Licensing

Space Florida is in the process of developing an explosive site plan and working with the Navy to develop a Memorandum of Agreement (MOA) for access to SLC-46. Additionally Space Florida is also in the process of obtaining both the Air Force Real Property License and FAA Launch Site Operator's License. Once both of these licenses have been obtained construction can begin on the site.

Phase 1 – Restore Operational Capability

Once a launch service provider has been identified for SLC-46, renovation activities can begin to restore major infrastructure at the site such as the Mobile Access Structure (MAS) and communications and launch control system. An assessment will be completed to determine if the MAS rail or flame deflector require refurbishment.

Future Development

As the development of this site continues, the potential exists for an expansion of the capabilities at the launch site to support additional space launch programs. In support of any additional future space launch programs modifications to the MAS and integration of vehicle-specific launch mounts and hardware will be required.

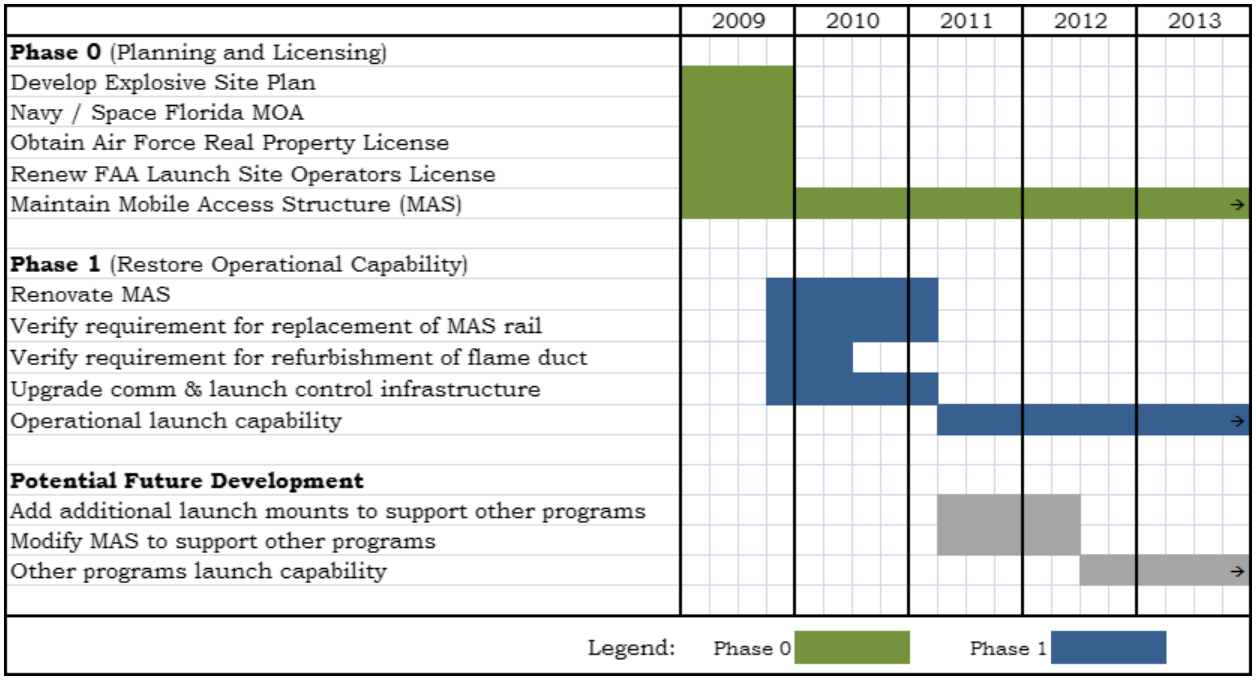

Figure 20: SLC-46 - 5 year Plan

G.1.c SPACE LAUNCH COMPLEX 47 (SLC-47)

SLC-47 is anticipated to continue supporting Super Loki suborbital launch vehicles for education and research. The current five-year plan, as shown in Figure 21, for SLC-47 is to continue operating as normal and to expand the capability to include University sounding rockets. Phase 1 of the development efforts include refurbishing the current launch rail and launch control center. Phase 2 of the development effort includes the integration of University launch programs and adding sounding rocket launch capability to the site.

There are no launch sites within the Space Florida Spaceport that are capable of supporting a solid-propellant launch vehicle larger than an Athena II. As future needs dictate, development of a launch site capable of supporting a solid-propellant launch vehicle larger than an Athena II can be considered at SLC-47. This would require an extensive study to determine conceptual site layouts and environmental impacts.

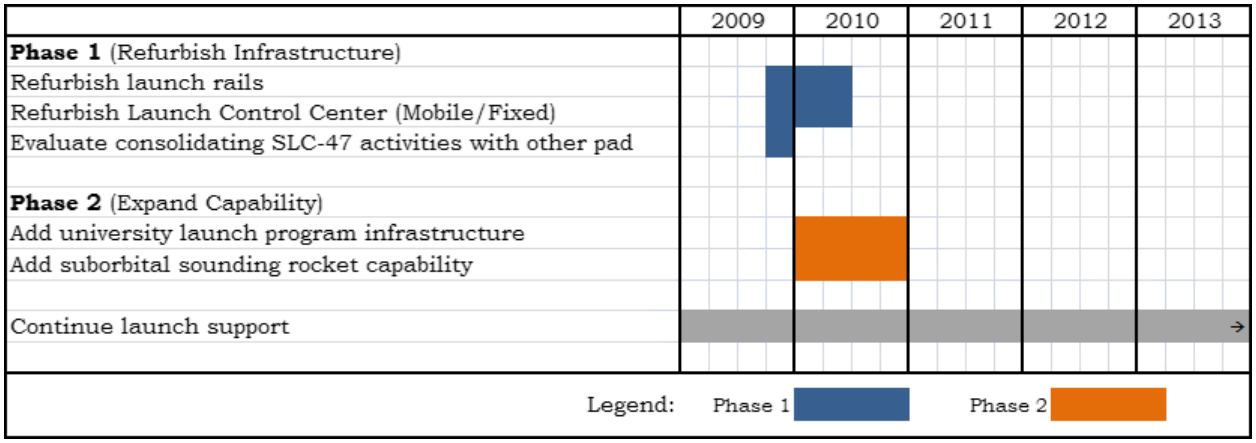

Figure 21: SLC-47 - 5 year Plan

G.1.d REQUIRED SUPPORT FACILITIES

For the successful implementation of the launch complexes identified in this phase of the Spaceport Master Plan, several support facilities will be required. A more thorough evaluation of the require support facilities will be completed in Phase 2b of the Spaceport Master Plan. The evaluation will look at options for launch control, horizontal integration, payload processing, and storage.

APPENDIX A: ACRONYMS

AIAA	American Institute of Aeronautics and Astronautics
AST	FAA Office of Commercial Space Transportation
BCC	Brevard Community College
CASPER	Customer Assistance Service Program for the Eastern Range
CCAFS	Cape Canaveral Air Force Station
CFASPP	Continuing Florida Aviation Systems Planning Process
CLZ	Commercial Launch Zone
COMM	Communication
COTS	Commercial Orbital Transportation Services
DDESB	Department of Defense Explosives Safety Board
DoD	Department of Defense
EBS	Environmental Baseline Study
ESMC	Eastern Space & Missile Center
FAA	Federal Aviation Administration
FAA/AST	Federal Aviation Administration Commercial Space Transportation
FASP	Florida Aviation Systems Plan
FDOT	Florida Department of Transportation
FONSI	Finding of No Significant Impact
FS	Florida Statues
FSI	Florida Space Institute
FTZ	Free Trade Zone or Foreign Trade Zone
GN2	Gaseous Nitrogen
GHe	Gaseous Helium
GLV	Generic Launch Vehicle
GN2	Gaseous Nitrogen
HB	House Bill
HIF	Horizontal Integration Facility
HLS	Homeland Security
HTPB	Hydroxyl Terminated Polybutadiene
ISS	International Space Station
ITU	International Telecommunications Union
KSC	Kennedy Space Center
LC	Launch Complex
LCC	Launch Control Center
LEO	Low Earth Orbit
LM	Lockheed-Martin
LN2	Liquid Nitrogen
LOX	Liquid Oxygen
MARS	Mid-Atlantic Regional Spaceport
MAS	Mobile Access Structure

MOA	Memorandum of Agreement
MPO	Metropolitan Planning Organization
MST	Mobile Service Tower
NASA	National Aeronautics and Space Administration
NOTU	Naval Ordnance Test Unit
O&C	Operations and Checkout
OPF	Orbital Processing Facilities
OSIDA	Oklahoma Space Industry Development Authority
PER	Preliminary Engineering Review
QD	Quantity Distance
ROI	Return on Investment
RLV	Reusable Launch Vehicles
RP-1	Rocket Propllant-1 or Refined Petroleum-1
RTS	Reagan Test Site
RS&H	Reynolds, Smith & Hills, Inc.
SB	Senate Bill
SEM	Spaceport Evaluation Mechanism
SF	Space Florida
SIS	Strategic Intermodal System
SLC	Space Launch Complex
SLF	Shuttle Landing Facility
SLVR	Small Launch Vehicle Research Project
SMP	Spaceport Master Plan
SOCC	Space Operations Control Center
SR	State Road
SSP	Navy Strategic Systems Program
TMP	Transportation Master Plan
TSA	Transportation Security Administration
UCF	University of Central Florida
UDS	Universal Documentation System
USAF	United States Air Force
VAB	Vehicle Assembly Building
VAFB	Vandenberg Air Force Base
VCSFA	Virginia Commercial Space Flight Authority
WFF	Wallops Flight Facility

APPENDIX B: REFERENCES

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