Spaceport Systems International

Commercial Processing Facilities

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2012

Space Launch Complex-8 (SLC-8) Launch Facility Handbook

SPACEPORT SYSTEMS INTERNATIONAL

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Revision History

Revisions	Date
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More MIV-HTV2a updates in Detailed Capabilities (see revisions list in Section B) Several Figure Changes in Section D (see revisions list in Section C) Added Figure 2-18: Electrical Receptacle Summary	18 June 2009
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Updated Figures 4-7 and 4-8	21 October 2010
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• Added new introduction • Deleted LCR • Updated Comm	23 April 2012
Revision D • Added Live Title Page and Configuration Control Number • Removed Detailed Capabilities and Figures Sections • Update of the Requirements Integration Process	29 Oct 2012

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Preface

This document is provided to give prospective customers of the California Spaceport an overview of the capabilities of the Spaceport's commercial launch facility Space Launch Complex 8 (SLC-8) to support launch processing.

The capabilities described in this document are either 1) in place, 2) in the process of being installed or 3) are budgeted and scheduled for installation within one year.

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30SW 30th Space Wing

A/C Air Conditioning

AASHTO American Association of State Highway and Transportation Officials

AFB Air Force Base

ANSI American National Standards Institute

AW Area Warning

AWG American Wire Gauge Standard

BLC Background Limit Check Console

BNC Bayonet Neil-Concelman

CCTV Closed Circuit Television

CID Capabilities and Definition

COFR Certificate of Facility Readiness

CSO Complex Safety Officer

DRC Data Reduction Console

EWR Eastern/Western Range

Fc Foot Candles

FCC FTS Control Console

FCD Facility Certification Document

FOTS Fiber Optics Transmission System

FSD Facility Support Document

FSK Frequency Shift Key

FSPO Flight Safety Console

GSE Ground Support Equipment

HVAC Heating, Ventilation and Air Conditioning

I/O Input/Output

ICD Interface Control Document

In. lb. Inch Pounds

In. Inches

IPF Integrated Processing Facility

IRIG Inter Range Instrumentation Group

KVA Kilovolt Amps

LAN Local Area Network

Lbs. Pounds

LCR Launch Control Room

LEV Launch Equipment Vault

LTP Launch Test Programs

LV Launch Vehicle

MIL-HDBK Military Handbook

MIL-STD Military Standard

MM II Minuteman II

MAT Mobile Access Tower

NCU Nozzle Control Unit

NEC National Electrical Code

NEMA National Electronics Manufacturers' Association

NFPA National Fire Protection Association

OSHA Occupational Safety and Health Administration

OSP Orbital/Suborbital Program

OSPSLV Orbital/Suborbital Program Space Launch Vehicle

OVS Operational Voice System

PA Paging and Announcement

PCC Power Control Console

QD Quantity Distance

REI Range External Interface (Bldg. 7011)

RLCC Remote Launch Control Center

RF Radio Frequency

SCC Strip Chart Console

SEB Support Equipment Building

SLC-8 Space Launch Complex 8

SSD Support Services Document

SSI Spaceport Systems International

Acronym List

T/E	Transporter/Erector
TDC	Telemetry Decom Console
TOY	Time of Year
TRR	Telemetry Receiver
UPS	Uninterruptible Power Supply
UT	Umbilical Tower
VAC	Volts Alternating Current
VAFB	Vandenberg Air Force Base
VCC	Vehicle Control Console
VDL	Vandenberg Direct Line
WAD	Work Authorization Document

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1 OVERVIEW

The California Spaceport® Launch Facility completed construction May 1, 1999 and was designated as Space Launch Complex 8 (SLC-8). The spaceport has been constructed to provide a clean pad approach that is highly flexible, with a capability to accommodate multiple launch vehicle configurations including MMII, Minotaur and Castor 120 based vehicles. Currently the spaceport is configured to support solid propellant vehicles. Site design allows for the development of accommodations for liquid propellant booster launch.

SLC-8 is the first Commercially owned and operated launch facility in the United States and is designed to provide a low-cost alternative for both Commercial and government launch vehicle providers. SLC-8 was financed using private investment dollars, with some grant funding from the Federal and California State governments.

The in-place infrastructure at the spaceport includes an exhaust duct with a steel launch mount and an interface for a customer provided launch ring. SSI proof-loaded the stand 28 May 2008 to 400,000 lbs. The launch duct is capable of handling 1,000,000 lbs of thrust at liftoff (without the requirement for acoustic attenuation or water deluge) from the solid rocket motors.

The SSI Commercial Spaceport is located on South Vandenberg AFB on approximately 108 acres of property leased from the US Air Force, and consists of two separate facilities – the commercial launch facility Space Launch Complex – 8 (SLC-8) and the Integrated Processing Facility (IPF) shown in the following figures.

Figure 1-1: Location of SLC-8

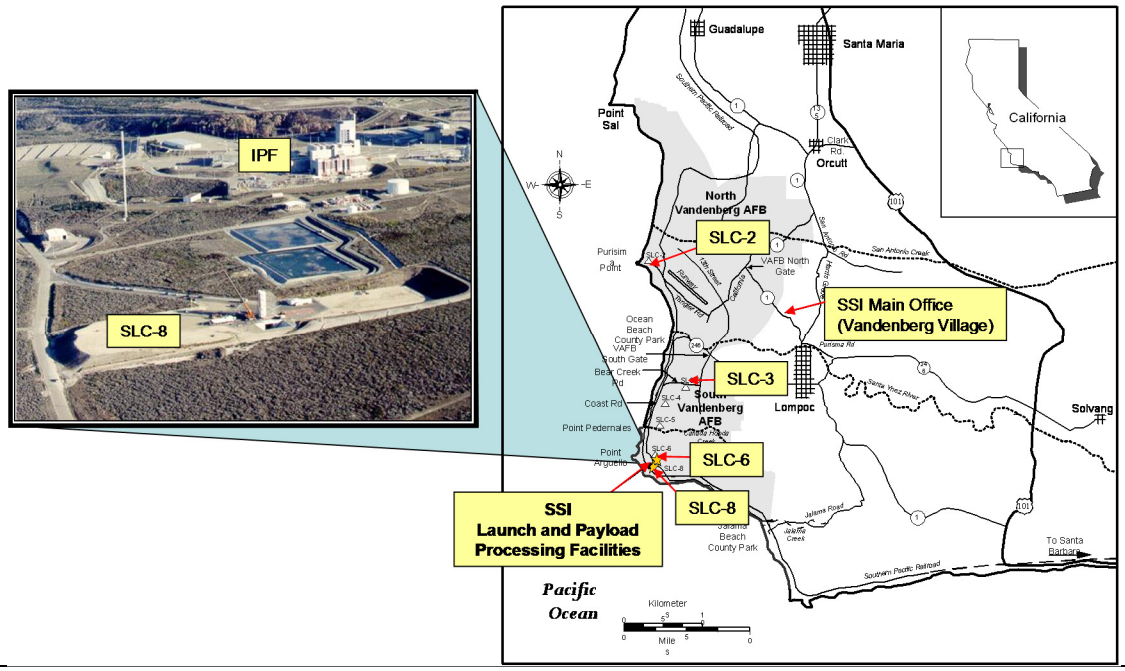

Figure 1-2: Location of SLC-8

The IPF, located on Space Launch Complex 6 (SLC-6), is the former Payload Preparation Room (PPR) originally designed and constructed to support the processing of satellites for launch on the Space Shuttle. The IPF is the location of SLC-8 administrative offices for the launch site. State-of-the-art Communications systems provide access to the Western Range Fiber Optics Transmission System (FOTS), and all other Range Communications systems. See the Payload Processing Facility Handbook for detailed information on the IPF.

Figure 1-3: The Integrated Processing Facility (IPF)

1.1 SPACEPORT LAUNCH AZIMUTHS

One of the primary advantages of SLC-8 is its location as the southernmost launch facility at Vandenberg AFB which supports a range of polar and westerly orbital inclinations. Its location provides unimpeded polar launches

without performance degradation from dogleg maneuvers to avoid the Santa Barbara Channel islands. Figure 1-4 illustrates the current range of approved launch azimuths available from SLC-8 spaceport which range from 168°–220° flight path with no over-flight of populated areas. Launches between 150° - 285° are feasible. SSI has coordinated approval of a flight designated launch azimuth of 285° demonstrating that alternate azimuths are possible.

Our easily accessible location offers a moderate climate for year-round polar launches for:

Low Earth Orbit (LEO)

Medium Earth Orbit (MEO)

Sun-Synchronous

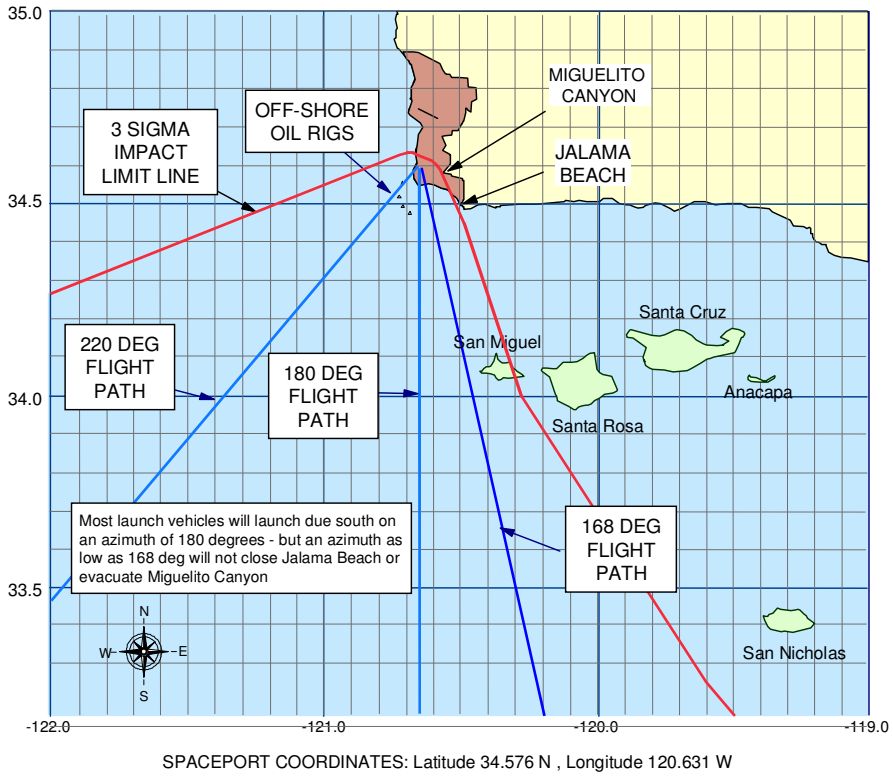

Figure 1-4: Launch Azimuth Location Map

1.2 LAUNCH PAD

One of the primary features of the launch pad is the Mobile Access Tower and its associated support buildings: the Support Equipment Building (SEB) and the Launch Equipment Vault (LEV). These facilities are shown in the figures below.

Figure 1-5: SLC-8 MAT, SEB and LEV

The overall layout of SLC-8 is shown in the figures below.

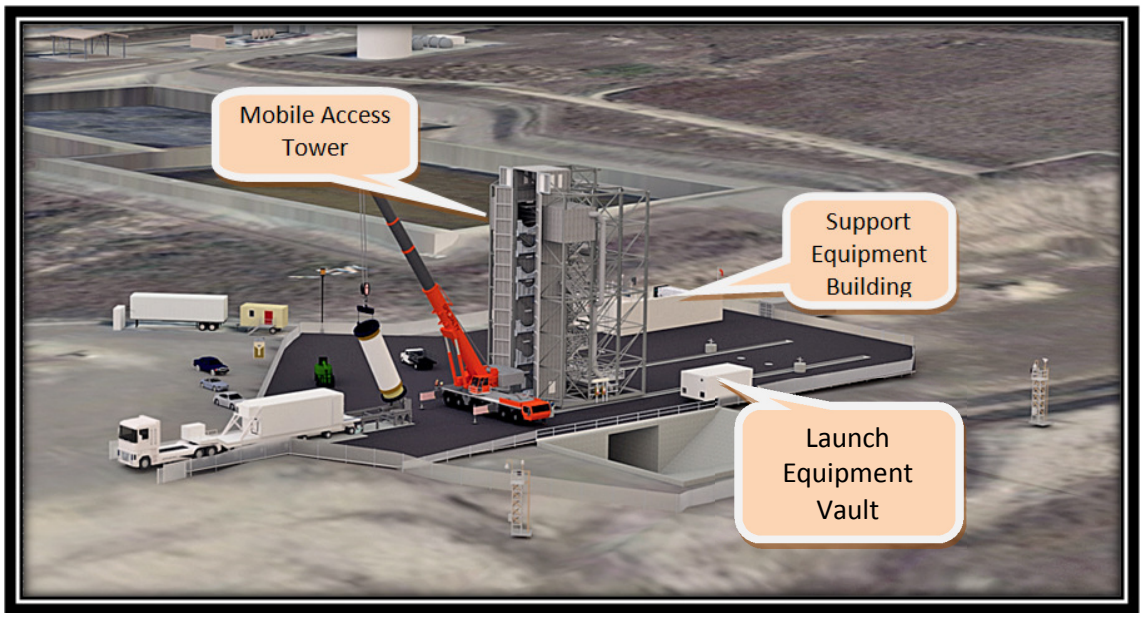

Figure 1-6: "Bird's Eye View" of SLC-8

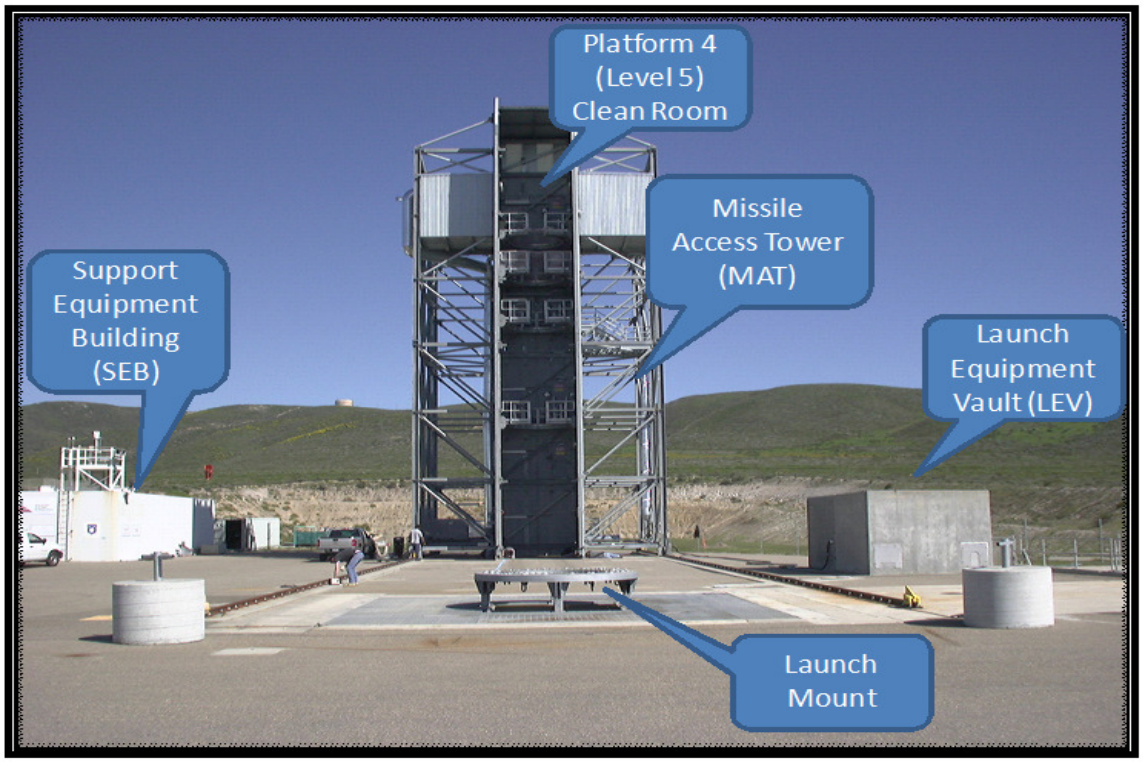

Figure 1-7: SLC-8 Facilities

SSI provides a launch structure that includes a launch stand that interfaces with the Launch Duct Adapter Ring and to support the Launch Vehicle (LV). SSI proof-loads the Launch Stand to the 30 SW/SE approved margins. The launch stand complies with the requirements of EWR-127-1(T) and documentation certifying compliance is provided to the customer. The launch ring provided by the LV contractor interfaces with the bolt pattern of the stand. The bolt pattern of the stand is specified in the SSI Launch Facility Handbook.

SSI provides road access to the pad and an access area at the launch pad with sufficient support capability and foundations for LV contractor handling and erection support equipment.

SSI provides site power capable of handling all equipment at the launch pad. SSI provides a standby generator power for pre-launch processing support at the launch pad and manually activated standby power for a LV contractor provided air conditioning unit and other miscellaneous pre-launch processing equipment. SSI provides communications for operations at the launch pad and provides certified ground and lighting to allow for work at night for this facility.

1.2.1 MOBILE ACCESS TOWER

Construction of the Mobile Access Tower (MAT) was completed in October 2004 and SSI has recently completed upgrades to expand the LV line. The MAT is an 82' tall structure which provides environmental protection to the launch vehicle and personnel. Moveable platforms provide access to booster sections and the payload during processing operations.

The level five platform of the MAT hosts a 10,000 clean room that is able to provide conditioned air to the Mobile Access Tower (MAT) to maintain temperature control and humidity.

1.2.2 LAUNCH EQUIPMENT VAULT (LEV)

SSI provides a Launch Equipment Vault (LEV) at the launch pad to house and protect Launch Vehicle (LV) and Space Vehicle (SV) Electrical Ground Support Equipment (EGSE) from the launch environment. The LEV is a building located on the southeast corner of the pad, located within 65 ft of the center of the launch duct.

SSI provides umbilical guy-wire tie-down mountings for a LV contractor-provided umbilical mast or other provisions as defined in the facility ICD and routing for LV contractor-provided umbilical cable(s) that will run from the LEV to the launch vehicle.

Battery carts and power supplies for payload battery charging can be placed in the LEV..

The 24 ft-6 in by 24 ft-6 in launch duct is sized for the largest expected vehicle taking into account all exhaust effects including acoustics.

The location of the duct at SLC-8 is shown in Figure 1-8.

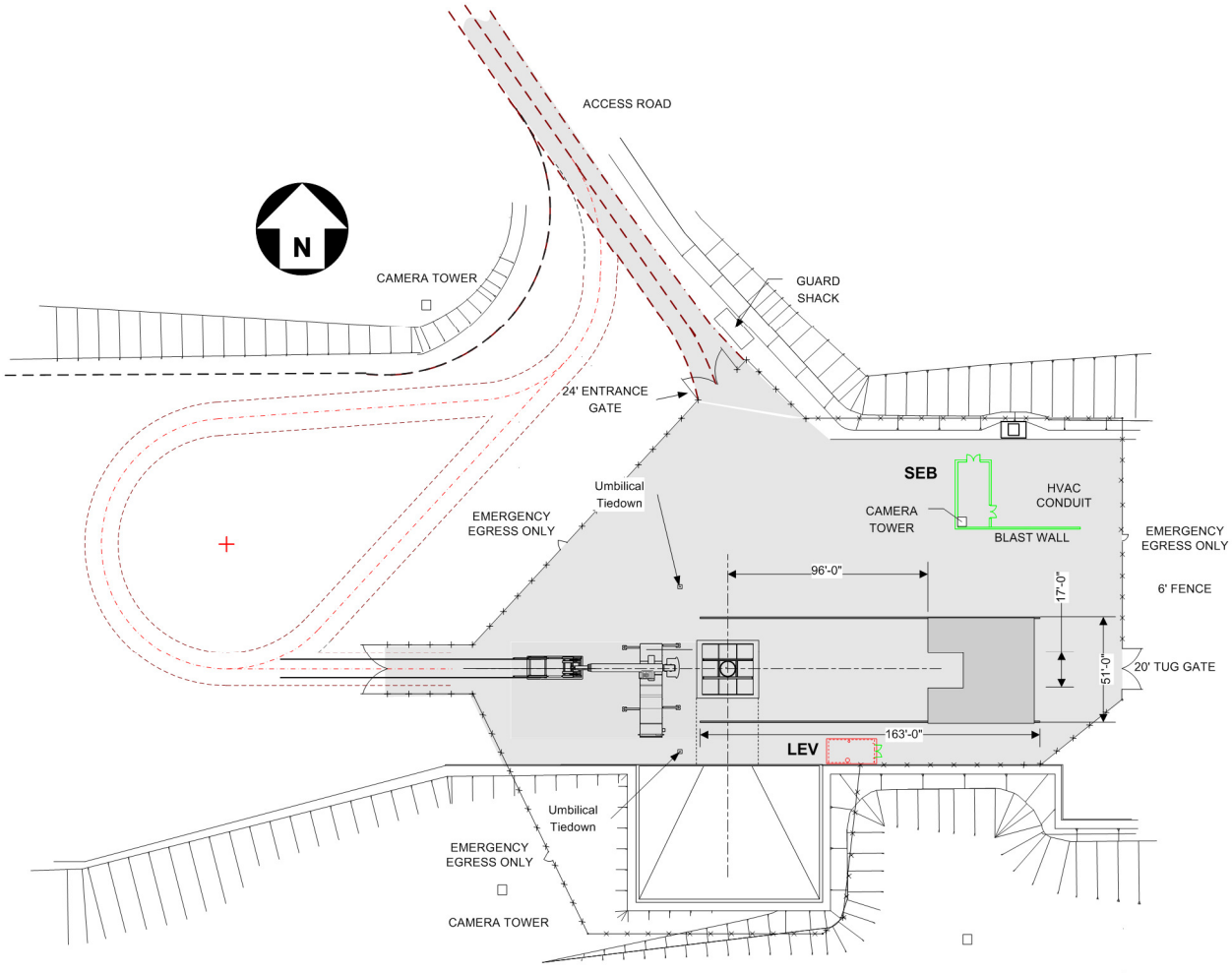

Figure 1-8:Spaceport Launch Facility Layout

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In addition, the figure shows the following:

- The location of an air-conditioned Support Equipment Building (SEB) (noted in green) containing communications and other interfaces.
- The LEV (noted in red) with dimensions 10'x 24' located within 65 ft of the launch ring containing power, access ports for umbilical and other ducting, and subterranean access to the SEB.
- A Launch Ring capable of holding a 200 ton vehicle.
- Camera towers (one is on the SEB and the locations of the others are shown
- Mobile Service Tower support rails.

1.3 LAUNCH SITE COMMUNICATIONS

SSI provides Spaceport communications for on- and off-site usage, including local and long-distance telephone services, internet access, dedicated data communication lines, and a dedicated on-site fax line. Launch nets for communications during launch operations, pre-launch checkouts and vehicle buildup, integration and checkouts will be available to support launch operations.

1.4 LAUNCH CONTROL ROOM

The Spaceport utilizes the 30 SW-provided LCR to support testing and launch of the vehicle. The LCR is located in Bldg. 8510, room 180D on north Vandenberg AFB. The room provides space and communication equipment for launch support equipment consoles. The facility provides UPS backup power capable of handling all equipment in the launch control facility. The LCR has full connectivity with the SLC-8 launch pad and Western Range

SSI provides personnel in the LCR on all critical operations including launch countdown, to monitor all critical data circuits and provide real-time anomaly resolution if needed.

1.4.1 LAUNCH CONTROL COMMUNICATIONS

SSI communications systems provide our customers access to the Western Range Fiber Optics Transmission System (FOTS) and all other Range communications systems.

1.5 PERSONNEL AND SITE SECURITY

SSI maintains a facility clearance approved by the Defense Security Service and all personnel employed with SSI maintain security clearances.

1.5.1 LAUNCH SITE SECURITY

SSI coordinates access control with the customer and provides access control to the Spaceport Launch Site and facilities. The geographic location of the SLC-8 site is within a fenced perimeter on a United States Air Force base, 10 miles inside base perimeter. Both the base and SLC-8 are guarded with 24/7 entry control. SLC-8 is monitored with four SSI-provided CCTV cameras providing pan/tilt/zoom controls. Additional customer-provided cameras can be supported. The physical security protection will be intended to prevent as well as detect physical access by unauthorized persons.

Personnel entry control is established for entry into the SLC-8 perimeter to the customer requirements. SSI's security plan accommodates requirements for specified security levels mandated by the mission and government protection levels. Security measures can easily be adapted to additional requirements such as DOD Cryptographic.

1.5.2 LAUNCH SITE ACCESS

All personnel are required to sign in at the main gate of SLC 8. All initial processing for access to the launch site is controlled at this location.

SSI coordinates with the customer the mission-specific Launch Site Access Control List (ACL) to determine access to the facility. This SLC 8 access control list will be maintained at the SLC 8 point of entry as a personnel control.

SSI provides security controls such as sign-in rosters to the facility, identification checks, Launch Site ID badges, and CCTV monitoring of the SLC. Site security personnel are responsible for implementing the requirements of the security program. The entrance to SLC - 8 will be manned by one person during contracted hours.

SSI responds to all security or fire alarms (at the proper security level). When customer personnel are/are not present we take control of the alarm site, and escort emergency response individuals as required.

1.6 LICENSES & DOCUMENTS

1.6.1 FAA LICENSE

SSI is authorized, subject to the provisions of the Commercial Space Launch Act of 1984, and the orders, rules, and regulations issued under it, to operate a commercial launch site. SSI was awarded the first commercial space transportation license by the US Department of Transportation, Federal Aviation Administration, Office of Commercial Space Transportation on 19 September 1996 and has successfully maintained the license to date.

1.6.2 EXPLOSIVE SITING

SLC-8 has been explosively sited for up to 206,000 lbs NEWHD 1.1. This approval is documented in the SLC-8 Explosive Site Plan dated 14 March 2008. SSI's Explosive Site Plan is in accordance with AFMAN 91-201, Explosive Safety Standard explosive equivalency rating.

1.6.3 INTERFACE CONTROL DOCUMENT

SSI develops an Interface Control Document in accordance with the corresponding mission requirements to define interfaces between Spaceport facility and the user Mission Requirements Document

The ICD has three major purposes:

1. Provide a mechanism for the allocation of SSI capabilities to meet the user-defined requirements.
2. Assure traceability back to each original user requirement
3. Define the method for certifying (verifying) the capability or interface

After the ICD is finalized by SSI Integration with comments from the Customer, the ICD is turned over to SSI Operations with a draft of the Verification Checklist. While the ICD describes the SSI capabilities and the user requirements for each area used, the Verification Checklist includes additional data concerning certification of each capability.

The Verification Checklist is used by the SSI Operations personnel as a checklist to perform the pre-arrival facility certification and becomes a part of the Certificate of Facility Readiness (COFR) process. SSI prepares the Verification Checklist to provide a controlled mechanism to sign-off on each requirement's verification. This happens both in the internal SSI review and the customer final review.

After a detailed in-house review, the Customer is offered the opportunity to participate in a detailed review of the final data. After all reviews are over SSI signs the Certificate of Facility Readiness (COFR). The COFR is typically generated approximately one month prior to facility occupancy.

2 CUSTOMER SUPPORT

2.1 FIELD INTEGRATION AND TEST

SSI supports all pre-launch, launch, and post-launch operations for the customer. SSI ensures that the facilities are ready to support processing activities on a daily basis.

The SSI-provided crane will be rated to the customer's requirements and will include a certified and licensed crane operator for all scheduled lifting operations.

SSI supports the transfer of the stages to the launch stand and during rotation of the stage to vertical and lift the stage for emplacement on the launch stand by use of a mobile crane. SSI provides the crane and lift plans designated to accommodate the site-specific layout, reach, and safety margins for the stages.

SSI coordinates and schedules launch pad preparations and support for stacking of the lower stages on the launch stand. SSI supports the LV checkout on the stand prior to emplacement of the encapsulated payload. SSI coordinates prior to initiating support for any on-site tasks that interface with flight hardware.

SSI provides on-site communications, power, and Range/site safety support for launch operations and for all systems required by the customer. SSI personnel support the customer and designated program personnel during launch day operations and ensure SLC-8 communications, power, facilities, and Range interfaces are operational and able to support launch.

2.1.1 FLIGHT, GROUND, AND OPERATIONAL SAFETY

SSI coordinates and supports flight safety reviews and the flight approval process. SSI ensures implementation of the Spaceport ground operations safety program and complies with EWR 127-1(T).

SSI implements the 30th SW-approved Spaceport ground safety program and Department of Defense (DOD)-approved SLC-8 Explosive Site Plan. SSI has been delegated limited ground safety control authority by 30th SW Commander. SSI reviews user-provided Hazard Analyses, System Safety Plans, Missile Systems Pre-Launch Safety Package (MSPSP), FTS Report, all hazardous procedures, updates to MSPSP and updates to system hardware, and flight trajectory analysis and approval for SSI Launch Site.

SSI supports the preparation of Accident/Incident Reports.

SSI provides on-call access to fire detection/protection services to protect personnel, facilities, and hardware.

2.1.2 ENVIRONMENTAL COMPLIANCE

SSI complies with all Federal, State, and local environmental laws, regulations, and policies for all activities on SLC-8. SSI makes available to the customer upon request applicable environmental permits and documentation. Support for National Environmental Policy Act (NEPA) Compliance.

SSI assumes responsibility for completing all environmental monitoring requirements detailed in the Environmental Assessment for the California Spaceport® dated 28 Feb 1995. SSI completes and submits, as required, AF Form 813 through 30 SW to comply with the NEPA process.

SSI provides support for hazardous waste containment, disposal, and documentation services to support processing, testing, and launch of the vehicle and the payload. SSI is solely responsible for the management, cleanup, protection, and disposal of all emissions, effluents, wastes, and hazardous materials used in, generated by, or associated with the actions required. Hazardous wastes typically include used solvents, lubricants, and sealants. SSI maintains a Small Quantity Generator (SQG) hazardous waste license with the State of California.

2.2 RANGE INTERFACE

SSI facilities are located on a National Range (Western Range). SSI has demonstrated the ability to work with the Air Force Range Documentation System and has provided range interface support to previous customers. SSI has also worked with Western Range personnel to provide off-site/remote site support from other ranges such as Pacific Missile Test Range and the National Aeronautical Space Administration (NASA) Antarctica Instrumentation Range.

2.3 LOGISTICS SUPPORT

SSI provides an administration facility and associated office equipment, communications, and security to support processing, testing, and launch of the vehicle and integrated payload. Trailers may be used to supplement administrative needs.

SSI provides receiving support such as inventory control, transportation and handling, and storage of hardware (including ordnance). SSI provides material handling equipment on site for the customer, to support receiving and off loading of hardware at the Spaceport. SSI conducts and maintains inventory control of all mission hardware under the control of the Spaceport.

SSI provides Spaceport interfaces to the Western Range to support activities associated with the launch of the program vehicle. SSI provides communication services for administrative and technical personnel at all facilities used. SSI will support the Government-provided Range services as required.

SSI provides on-call access to medical and environmental health services, including urgent care and emergency transport to support all personnel involved in the processing, testing, and launch of the vehicle and the integrated payload. SSI provides required safety equipment in compliance with local and Occupational Safety and Health Administration (OSHA) regulations.

SSI provides janitorial services for administrative and vehicle/payload areas at the Spaceport.

2.4 SUPPORT SERVICES FOR PROCESSING, TESTING AND LAUNCH

SSI supports LV testing by ensuring that sufficient power and communications are continuously available to support Range testing. SSI coordinates with the customer personnel and representatives to ensure testing power and communication requirements are clearly understood and provided to permit sizing and testing of all critical power systems to meet requirements. SSI ensures testing of all SSI-provided communication circuits and all SSI interfaces with the Government-provided Western Range. SSI provides technicians on site and at the Western Range interface during all LV Range tests. Once communication interfaces are established and verified from SSI to the Western Range, SSI does not alter configuration without prior customer approval.

SSI communications and power systems include a 30 Kilovolt Amps (KVA) Uninterruptible Power Supply (UPS) in the Launch Equipment Vault (LEV) and 10 KVA UPS in the Support Equipment Building (SEB) that will remain active and available for customer use through the entire launch campaign.

2.4.1 COMMODITY SUPPORT

SSI provides commodities as required to support processing, testing, and launch of the vehicle.

- Gaseous Nitrogen
- Breathing Air
- Helium
- High-Pressure Air

2.5 ENGINEERING SERVICES

SSI built the California Spaceport from the ground-up with the expertise from its engineering team. SSI has further demonstrated its ability to provide engineering services and modifications to facilities through its construction and modification contracts for the SLC-8 MAT. These construction efforts to accommodate additional vehicles were completed on-schedule and within budget.

2.6 FACILITY OPERATIONS SUPPORT

SSI has operated a cleanroom processing facility since 1995 and supported launch operations from SLC-8 since 2000.

2.6.1 CLEAN ROOM

SSI has a capability to provide 100K clean environment and a 10K Fairing Access Enclosure on Level 6 of the Mobile Access Tower.

2.6.2 STORAGE FACILITY

SSI has a 4,750 sq ft Operations Storage Building (OSB) that accommodates storage of large items such as transporters and slings. The OSB is located approximately 300 ft from the SLC-8 entrance.

2.6.3 SUPPORT EQUIPMENT BUILDING

A concrete SEB is provided to house Spaceport communications equipment and user-provided launch support equipment. The southwest corner of this building is 128 ft north and east of the launch duct centerline. The SEB is an enclosed and covered building that is 150 sq ft and 8 ft high. The SEB has power, communications, control air, and connectivity to SLC-8 launch duct and the LCR in the IPF, Building 375. The SEB also provides space and power to support the launch vehicle and payload interface consoles.

2.6.4 MAGAZINE

SSI has a certified ordnance storage capability in the IPF (Bldg 375). SSI can provide storage for initiation ordnance and small size support equipment at Spaceport facilities.

2.7 PROGRAM MANAGEMENT

SSI has demonstrated through successful completions of NASA, Air Force and National Reconnaissance Office (NRO) contracts that the California Spaceport® has the capability to provide excellent program management support for vehicle and ground hardware transportation, processing, integration, testing, and launch.

3 FACILITY DETAILS

[Please note that many interface details are provided in Section C: Detailed Capability Figures]

All SSI facilities have a certified ground and grounding points as required by ground safety. All ground points have been tested and are less than 1 ohm.

The in-place infrastructure at the Spaceport includes an exhaust duct with a steel frame capable of supporting loads of up to 400,000 pounds, and a launch ring tailored for use by the Minotaur vehicle.

SLC-8 has been explosively sited for up to 206,000 lbs NEWHD 1.1. This approval is documented in the SLC-8 Explosive Site Plan dated 14 March 2008. SSI's Explosive Site Plan is in accordance with AFMAN 91-201, Explosive Safety Standard explosive equivalency rating. The 24'-6" x 24'-6" launch duct entrance is designed to handle up to 1-million pounds of thrust.

3.1 PAD DECK

SSI provides a launch structure that includes a launch stand that interfaces with an LV-SSI provided Launch Duct Adapter Ring and supports the launch vehicle. SSI re-proof-loads the Launch Stand to the 30SW/SE approved margins for the launch vehicle. The launch stand complies with the requirements of EWR-127-1(T) and documentation certifying compliance is provided to the customer. The stand has an interface ring with a bolt pattern determined by the LV contractor and identified in the ICD.

SSI provides road access to the pad and an access area at the launch pad with sufficient support capability and foundations for LV contractor handling and erection support equipment.

SSI provides site power capable of handling all equipment at the launch pad. SSI provides standby generator power for pre-launch processing support at the launch pad and manually activated standby power for a LV contractor provided air conditioning unit and other miscellaneous pre-launch processing equipment.

The Pad Deck consists of the SLC-8 Common pad deck surfaces and all general structures, areas, commodities, program-peculiar facilities and interfaces. For example, the Launch Test Program's Transporter/Erector (TE) pylons shown in Figure 5-1 and TE power interfaces.

Capability type	Capability
1. Space/Access	OPSLV program support systems Transporter/Erector Area including the pylons and leveling jack pads Mobile Access Tower rails and tie-downs Paved road and area surrounding the Launch Pad Conduits for routing vehicle signal, power and Communications cables Underground air conditioning duct for routing air from the SEB HVAC area to the LEV Mobile crane area to support the 200-ton mobile crane
2. Handling	Liebherr LTM 1160/2 200-ton mobile crane

Capability type	Capability
3. Electrical	Utility and technical power provided from the SEB and LEV 1000-watt floodlights on the SEB and SW camera towers Mobile Access Tower grounding per MIL-STD-1542
4. Liquids	Eyewash Fire Hydrant
5. Pneumatics	None
6. Environment	None
7. Safety	None
8. Security	6-foot security fence with locking gate Guard shack
9. Comm/Data	Operational Voice System (OVS) CCTV cameras Area warning system Klaxons Paging system

3.2 LAUNCH MOUNT AND DUCT

A Launch Ring tailored for use with the Minotaur launch vehicle is provided (shown below) capable of holding a 15-ton vehicle

Figure 3-1: SSI Launch Ring

The 24’-6” x 24’-6” launch duct is designed to handle up to 1-million pounds of thrust. The exhaust duct is sized for the largest expected vehicle taking into account all exhaust effects including acoustics.

The location of the duct at SLC-8 is shown in Figure 1-6, Figure 1-7 and Figure 1-8.

Shown below is an artist’s 3D view of the Launch Mount and Duct.

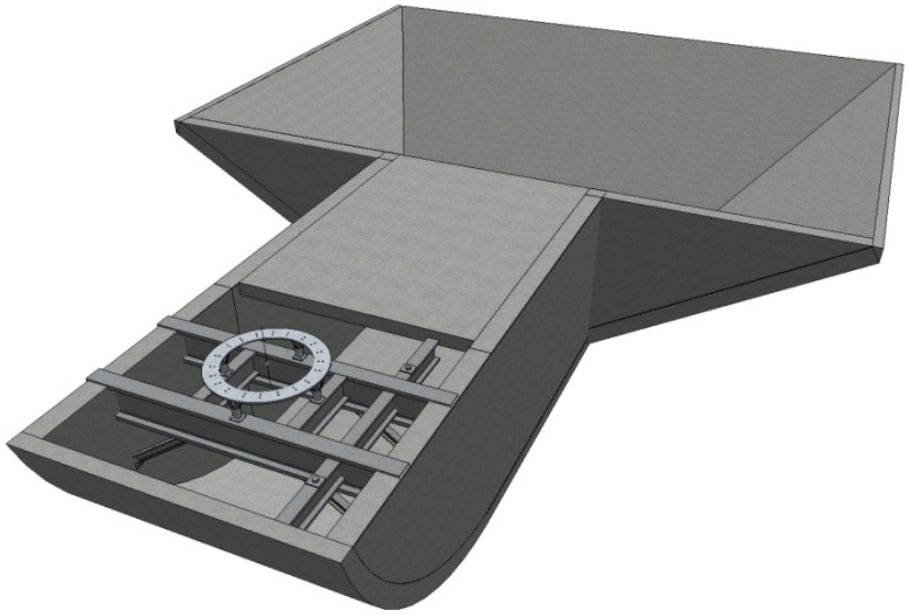


Figure 3-2: Launch Mount and Duct

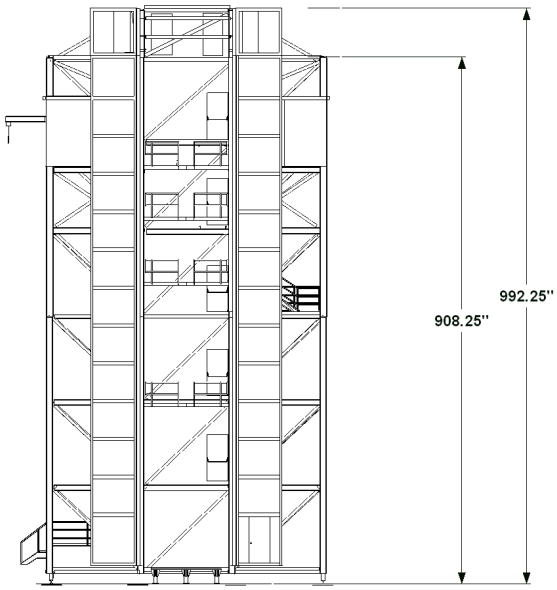
Capability type	Capability
1. Space/Access	24' x 24' Launch duct sized to handle up to 1-million pound thrust vehicles Frame structure capable of supporting a vehicle weighing 300,000 lbs. Scaffold platforms for access to aft end of launch vehicle Launch stand Umbilical mast tie-downs
2. Handling	None
3. Electrical	Facility ground
4. Liquids	None
5. Pneumatics	None
6. Environment	None
7. Safety	Removable exhaust duct handrails Personnel tie-off points

Capability type	Capability
8. Security	None
9. Comm/Data	Operational Voice System (OVS)

3.3 MOBILE ACCESS TOWER (MAT)

Figure 3-3: Mobile Access Tower

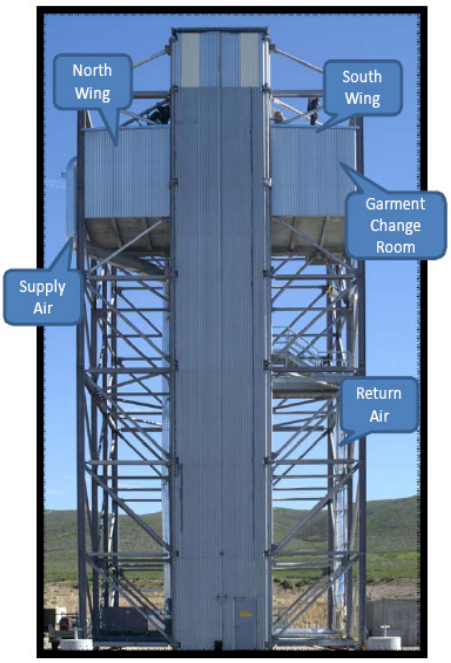
The galvanized metal tower measures 39’ x 39’ x 82.5’ high The 956.14” height of the Minotaur IV exceeded the 908” height of the original access tower. As a result, a 7’ “doghouse” was added to the top of the tower. This extension is only over the vehicle area and the stair area. The addition over the stair area is necessary to provide a platform for the sliding door on the top of the tower.



A 100,000 clean room is provided on Level 5 (platform 4). A stairway from the Level 6 stairway platform leads down to a door leading into the Garment Change Room. This room is separated from the South Wing of the Clean Area by a door on the west end. After entering into the Clean area, access to the larger North Wing is across the Level 5 platform.

Note also the beam hoist used to bring program GSE up to Level 5 (also shown above in Figure 3-4 (Looking South).

Figure 3-4: Mobile Access Tower Pictures



Looking East

Looking West

Looking North

Looking South

Figure 3-5: Level 5 Clean Room Cutaway

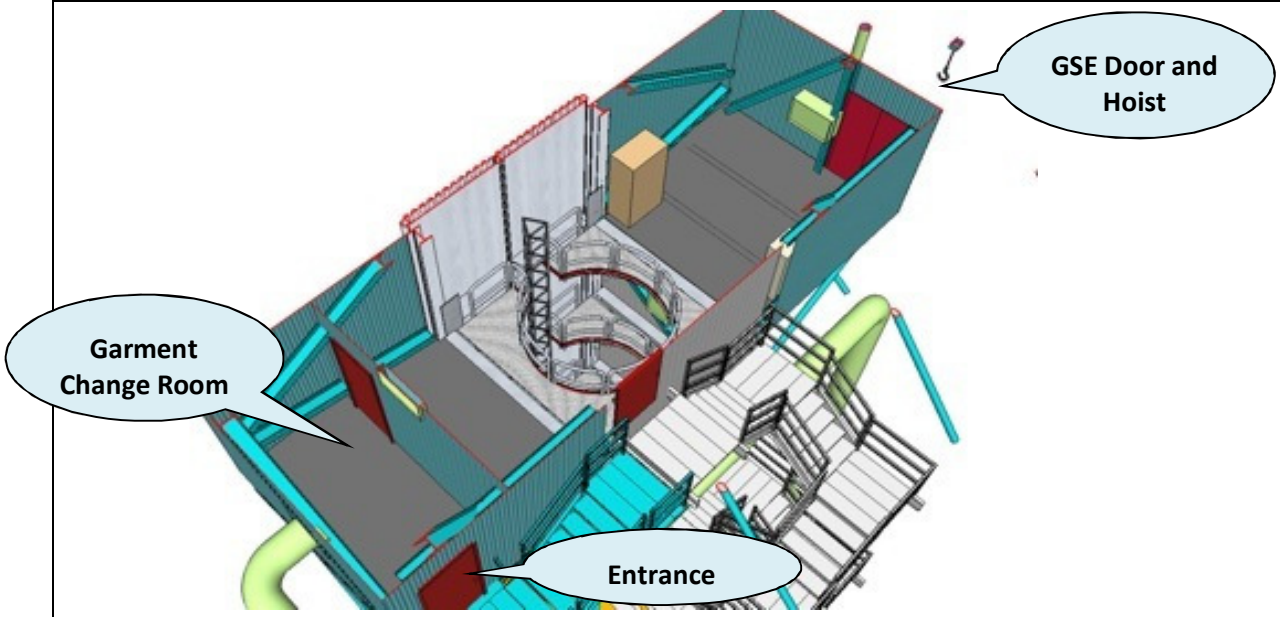
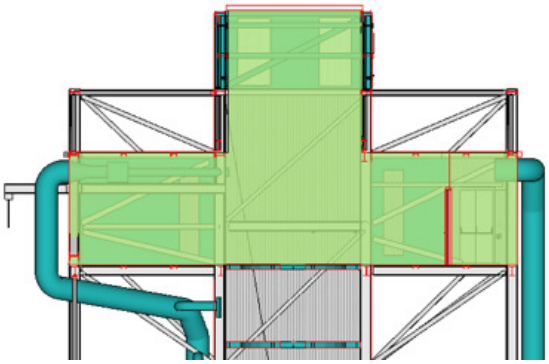


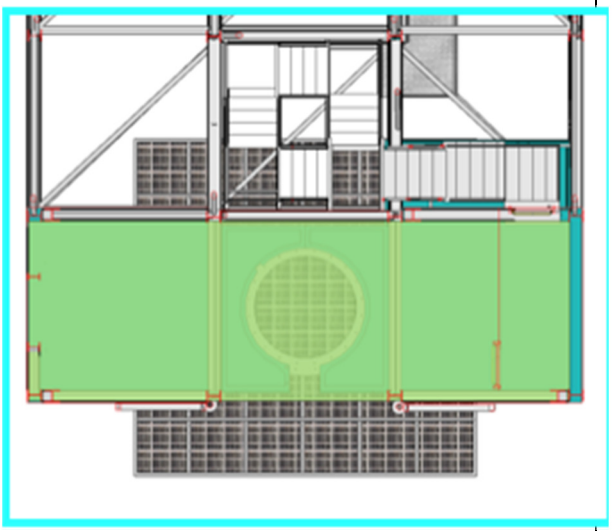
Figure 3-6: Clean Room

The Level 5 clean room area must, necessarily, extend up to the roof of the center section and into the garment change area as shown below.



Vertical Cross-Section of Clean Area

The Garment Change Room is at the right.



Horizontal Cross-Section of Clean Area. The Garment Change Room is at the right..

Figure 3-7: Clean Room Wings

View looking into the north wing from the central clean area.

View looking into the south wing. The door to the Garment Change Room is at the right.

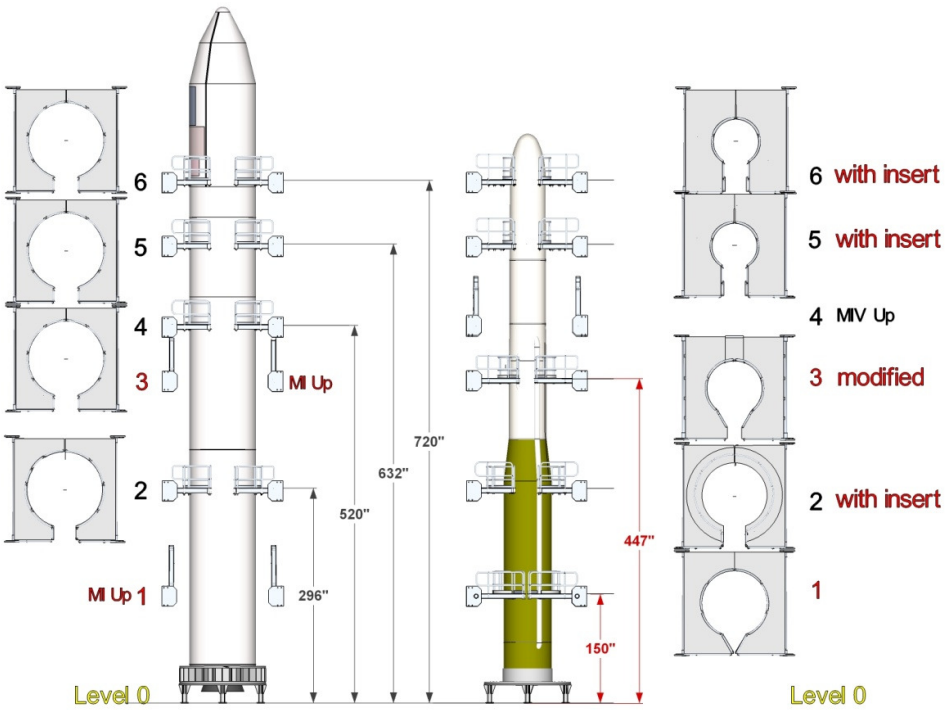
Figure 3-8: Clean Enclosure

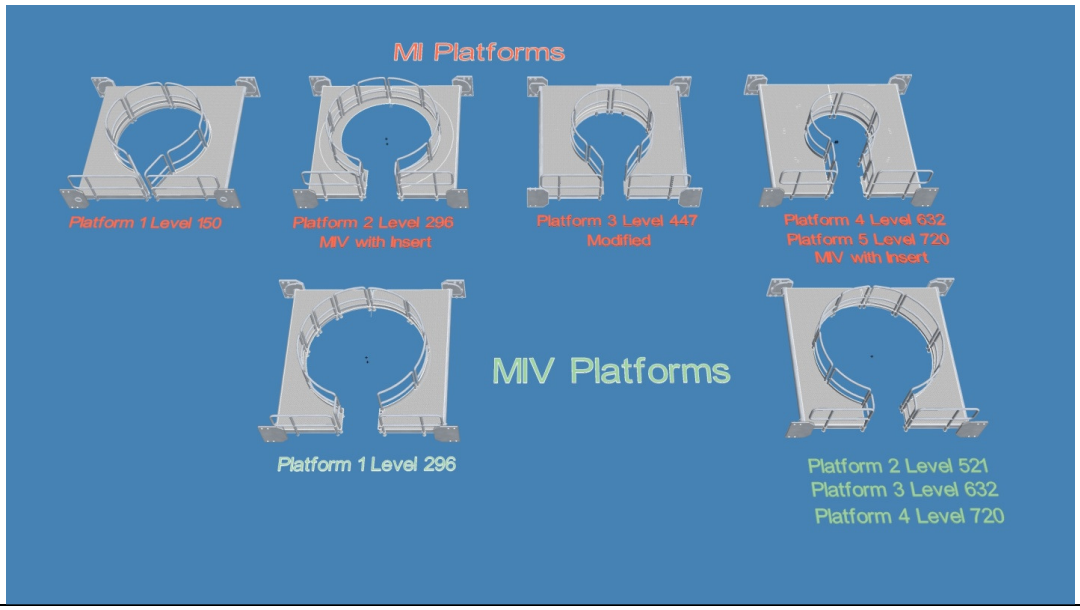
The clean "tent" is actually a hard structure put into place as required in the north-east corner of the central clean area. It is fed by its own HEPA filter to provide 1K air for operations inside the payload fairing. The top folds up against the MAT wall and the side panels are dis-assembled and stored.

The galvanized steel Mobile Access Tower provides access to the vehicle while on the launch mount via five platform levels for Minotaur I and four platforms levels for Minotaur IV. The platforms are retracted during stacking operations and movement of the MAT.

The Figure 3-9 shows the conversion required to go from Minotaur IV platforms to Minotaur I platforms.

Figure 3-9: MI and MIV Platform Configurations





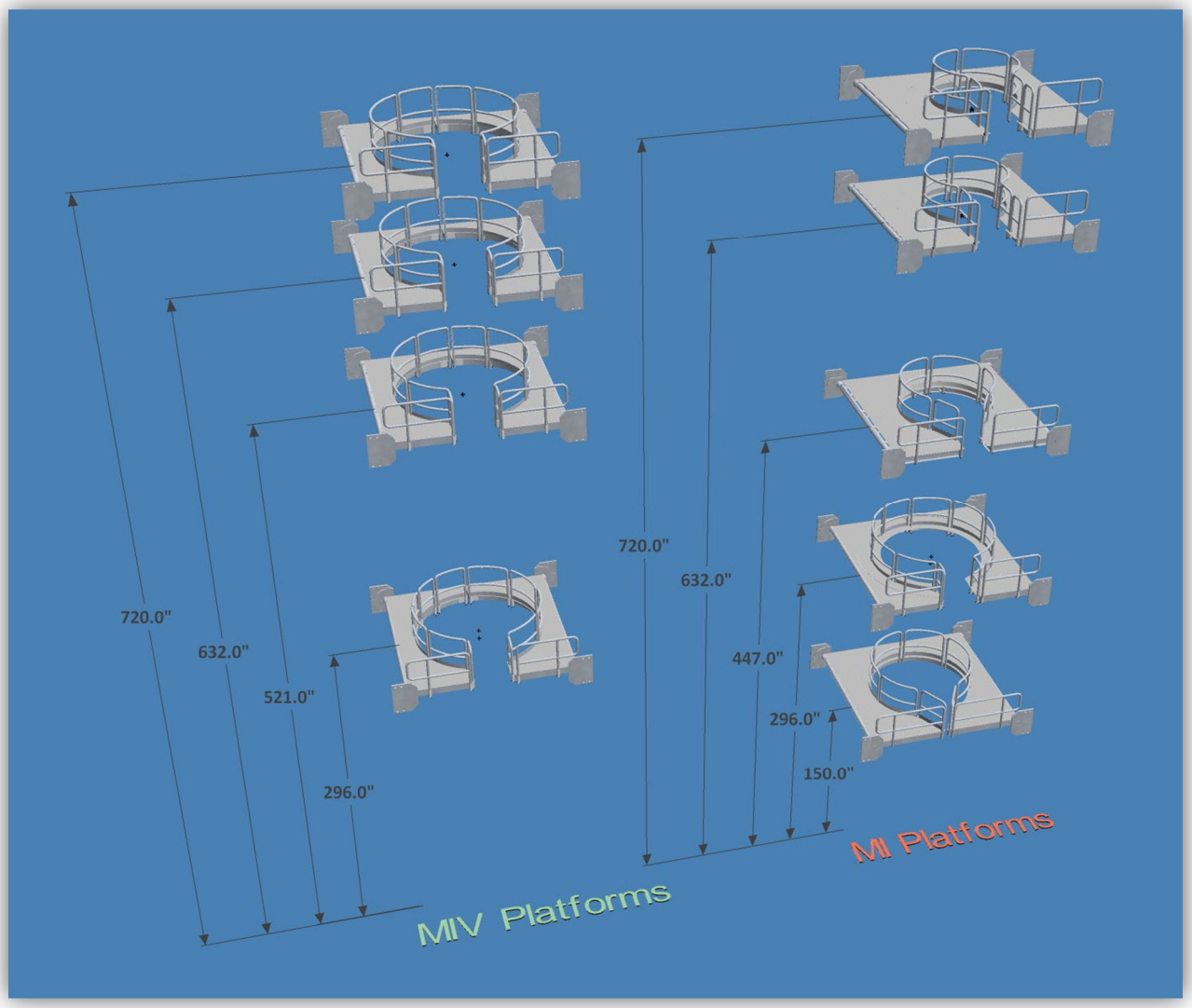
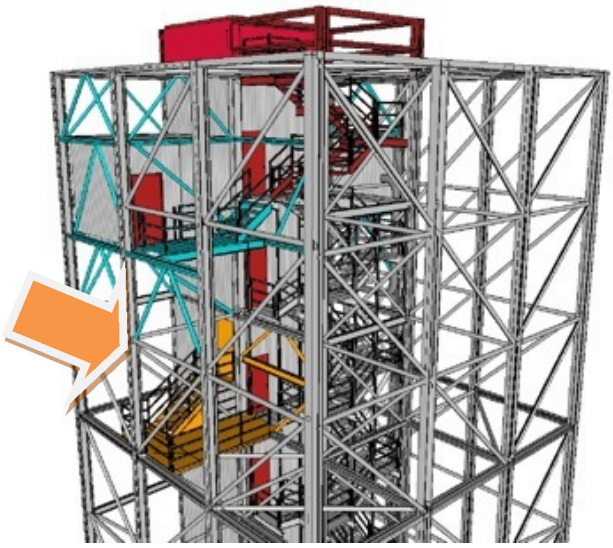


Figure 3-10: Minotaur I and Minotaur IV Platforms

Figure 3-11: New Level 3 Access



The Minotaur IV level 3 platform intersects the Minotaur I entry door. To avoid conflicts with Minotaur I missions a new way to enter Level 3 is provided as shown.

The new entry structure (gold colored) is entered from the Level 3 door entry stair platform, crosses to the south side and then stairs are provided to get to the Level 3 entry door.

As shown in Figure 3-12: The HVAC System (below), the 100,000 clean environment is provided by an external HVAC unit on the ground level of the MAT. Ducting runs up the MAT and splits to provide air to the north side of each platform level and to the north side of North Clean Area. Air flows north-to-south and is returned to the HVAC unit at the base of the tower.

A separate duct splits from the main supply, runs through its own HEPA filter and feeds the clean tent with 1K air. See the left picture in Figure 3-8

The 100K airflow ranges from 3290 cfm to 3380 cfm with an average of 3340 cfm.

The 10K airflow averages 300 cfm with the diffuser attached and 400 cfm with the diffuser removed. This results in 90 air changes per hour with the diffuser.

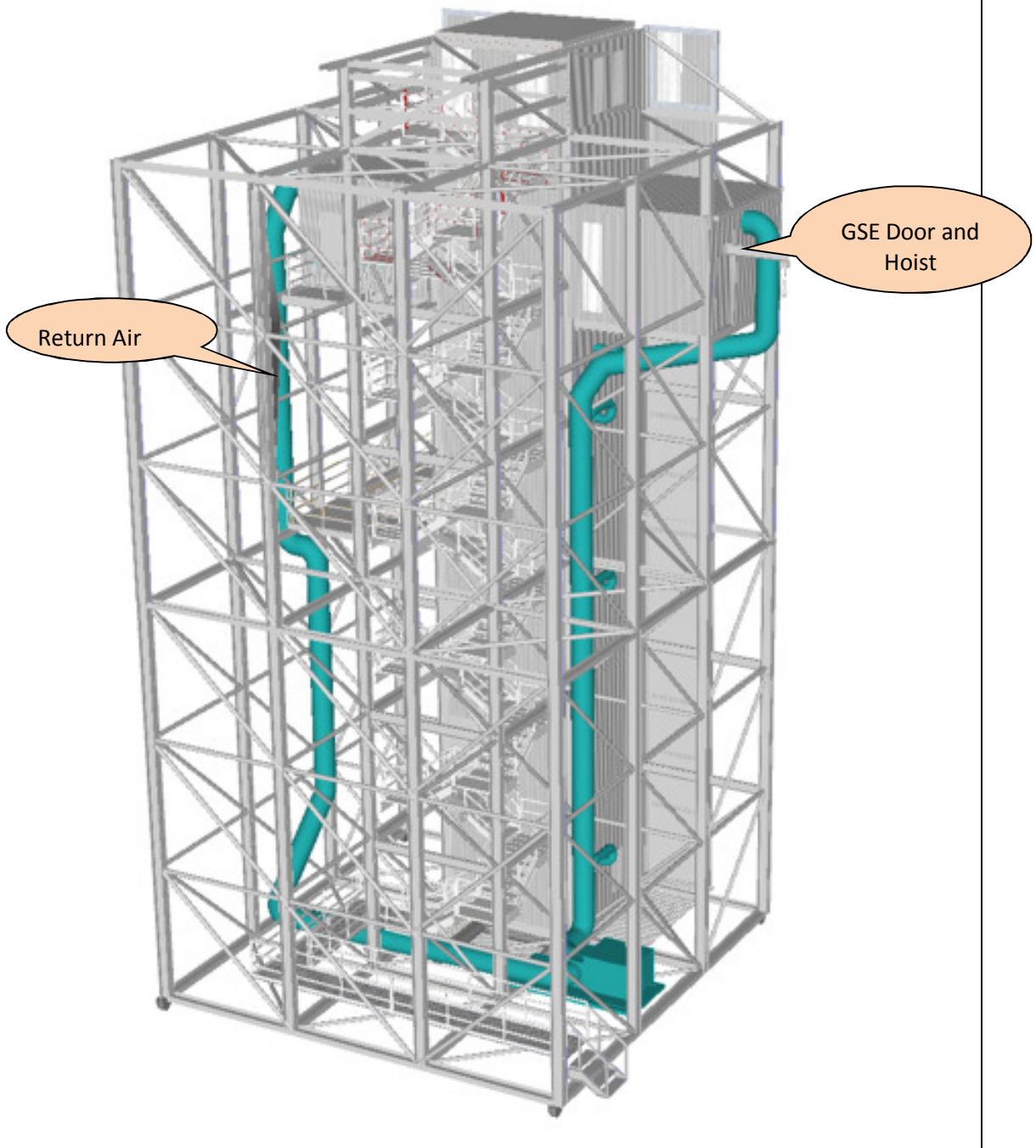


Figure 3-12: The HVAC System

Capability type	Capability
1. Space/Access	The Mobile Access Tower is a 75 foot structure with growth capability built in to the basic structure for a 90 foot structure A minimum of 12 foot structural clearance (less flip platforms) is provided inside the processing compartment. The main doors open 180 degrees to open one whole side of the processing compartment. Provides five infinitely variable platform levels with tolerance of plus or minus approximately 12”. Platform rated workload = 70 lb/ft^2. An easily removable work platform access is provided below the base of the launch vehicle to support umbilical connections and pre-launch processing operations. The Mobile Access Tower design supports an umbilical pole that is free-standing and self-supporting while the Mobile Access Tower Environmental Enclosure is in the fully closed position. Provision is made for tensioning the umbilical guy wires prior to Mobile Access Tower roll back. A 24”x24” cable trench is provided under the rails for vehicle cables and HVAC duct. This trench allows direct, straight access from the LEV to the center point of the launch stand. Access is provided for rocket thermal cover HVAC duct and vehicle umbilicals to the base of vehicle with Mobile Access Tower in place and doors closed. Mobile Access Tower doors are capable opening and the Mobile Access Tower is capable of retracting without disconnecting these items. Two different platform configurations are available: For Minotaur I platforms are provided at five levels: 150”, 270”, 450”, 570” and 690” above ground level. The SSI provided launch stand is 36” tall. For Minotaur IV four platforms are provided at Levels, 331.04”, 521.04”, 632.04”, and 720.04”above ground level.
2. Handling	A 1000 lb hoist and sling are provided at level 5 to lift support equipment into the MAT.
3. Electrical	Provides lightning protection and certified grounding points Conduits for 120VAC electrical power are provided to each work platform level. Minimum electrical distribution is provided to support 120VAC service at each level. Lighting is provided in stairways and in the processing area for OSHA access (plug in halogen units are available for high intensity spot lights at specific work areas.)
4. Liquids	None
5. Pneumatics	None

Capability type	Capability
6. Environment	The Mobile Access Tower provides protection for launch vehicle against open exposure to wind and rain on all four sides and the top of the processing and stairwell compartments. In support of Minotaur IV: A garment change room at Level 5 (Platform 4) A clean room at Level 5 provides HEPA filtered 100,000 clean air. Clean air is also piped to each of the other Minotaur IV platforms A clean "tent" at Level 5 provides Class 1K HEPA filtered air for payload fairing access.
7. Safety	The Mobile Access Tower was designed to meet International Building Code (IBC) with Seismic Zone 4 requirements and 90 mph 3 sec wind gusts without contacting the emplaced vehicle. Three rated fall protection tie off points (one on each wall) and guardrails are provided on all work platforms. Guardrails are provided on all staircases. Fire extinguishers are available at each work level.
8. Security	Locked Doors at each level
9. Comm/Data	Conduits for Communications stations are provided to each work platform level. Communications are provided to the Mobile Access Tower by portable Communication panels with the capability of reaching each platform level.

3.4 SUPPORT EQUIPMENT BUILDING (SEB)

An air-conditioned Support Equipment Building (SEB) containing Communications and other interfaces as shown in Figure 1-8 (which shows the layout of the launch facility), and Figure 3-13.

The SEB is provided to house Spaceport Communications equipment and user-provided launch support equipment. The southwest corner of this building is 128 ft. north and east of the launch duct centerline. The SEB is an enclosed and covered building greater than 150 sq ft., at least 8'high. SSI provides copper wire land lines and fiber optic cable to the launch control facility. SSI provides a minimum of six fibers, single mode (9/125) and 50 pair copper wire, 19 AWG telephone. SSI provides underground cable conduit from inside the LEB to the LEV, as identified in the ICD.

The SEB provides, 120/208 volts AC, 3 phase 60 Hz, 30 amps facility power source for the LV at the SEB. SSI also provides UPS power for 208VAC 30 amp 3 phase, 208VAC 20 amp single phase and four each 120VAC 20 amp single phase for SV EGSE in the SEB. The 208VAC UPS power is extended to level 5 of the MAT for contingency EGSE operations.

User HVAC units can be located on a pad next to the Support Equipment Building. Power and underground conduits are provided with the output airflow routed through the conduit to the Launch Equipment Vault (LEV) for distribution to the Exhaust Duct. Other air conditioning units to supply air directly to the launch vehicle can

be installed in close proximity to the MAT to maintain the temperature of the stages within specified limits during the processing flow and countdown. Power for the air conditioning units is obtained from the LEV.

Customer-supplied equipment racks are housed inside the SEB, where power is provided and temperature conditions maintained to assure proper operation during pre-launch checkout and launch operations. The Spaceport Fiber Optics Transmission System (FOTS) connects the support equipment in the SEB to launch control equipment located in Room 8903 in the IPF Launch Control Facility. The Vandenberg FOTS interfaces with Spaceport FOTS and provides connectivity with Building 7011 (Range). Some signals are routed from the equipment in the SEB through the underground conduit to the LEV, which in turn routes the signals to the customer-provided Umbilical Tower and finally to launch vehicle components. In turn, vehicle status monitors are routed from the UT, through the LEV to equipment in the SEB and back to the consoles in Room 8903. In addition, conditioned power provided by the Spaceport transformer is also routed to the LEV via the underground conduit system.

Figure 3-13: Support Equipment Building (SEB)

A concrete Support Equipment Building is provided to house Spaceport Communications equipment and user-provided launch support equipment. The southwest corner of this building is 128 ft north and east of the launch duct centerline

Capability type	Capability
1. Space/Access	Comm/Data conduits to the LEV Air conditioning duct for routing air from the SEB HVAC area to the LEV User rack space Two double doors
2. Handling	None
3. Electrical	Facility Power:

Capability type	Capability
	120 VAC 15 and 30 Amp 120/208 VAC 30 Amp, 3-phase 208 VAC 30 Amp single-phase 480 VAC 200 Amp 3-phase Critical (UPS-backed) Power 5 KVA UPS 120 VAC 15 and 30 Amp Grounds Facility Ground Equal potential ground for Comm Lighting
4. Liquids	Eyewash/Shower Flushing water (hydrant)
5. Pneumatics	None
6. Environment	Air conditioning for user SE and Comm equipment
7. Safety	None
8. Security	Lockable doors
9. Comm/Data	Operational Voice System (OVS) Single and Multi-mode fiber optics Copper cable CCTV camera on the roof IRIG-B timing signal Area Warning System Paging Voice recording (from IPF) Administrative telephone SEB UPS monitor (in the LCR in the IPF)

3.5 LAUNCH EQUIPMENT VAULT (LEV)

SSI provides a Launch Equipment Vault (LEV) at the launch pad to house and protect LV and SV EGSE from the launch environment. The LEV is within 65 feet of the launch ring and provides power, access ports for umbilical and other ducting, and subterranean duct access to the SEB. Battery carts and power supplies for payload battery charging can be placed in the LEV.

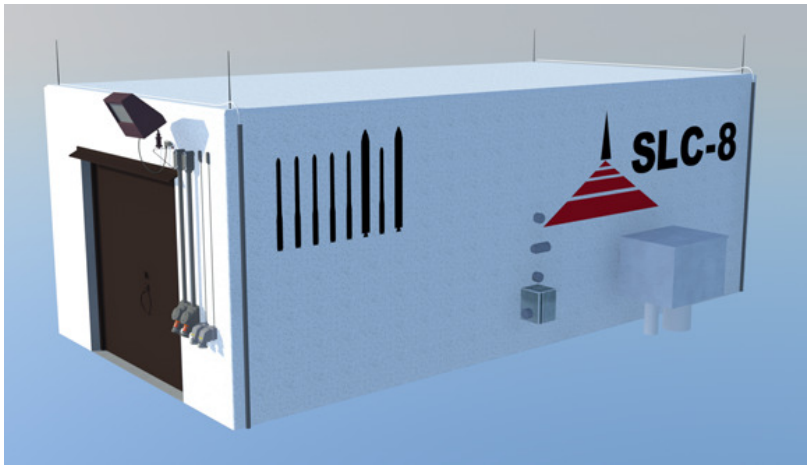


Figure 3-14: Launch Equipment Vault (LEV)

Umbilical guy-wire tie-down mountings are provided for a LV contractor provided umbilical mast or other provisions as defined in the facility ICD and routing for LV contractor provided umbilical cable(s) that run from the LEV to the launch vehicle.

Capability type	Capability
1. Space/Access	Single 12’ x 25’ room with a maximum ceiling height of 8' The northwest corner of the LEV is located 59’ from the center of the exhaust duct. Air conditioning duct for routing air from the SEB HVAC area Comm/Data conduits from the SEB User rack space Two (2) 24" x 24" block-outs in the west wall of the LEV to provide access to and from the LEV services and user support equipment within the LEV. One double door
2. Handling	None
3. Electrical	Facility Power: 120 VAC 15 and 30 Amp 120/208 VAC 30 Amp, 3-phase 208 VAC 30 Amp single-phase Technical Power: 120VAC 15, 20 and 30 Amp 120/208VAC 30 and 60 Amp Facility ground Lighting

4. Liquids	None
5. Pneumatics	None
6. Environment	None
7. Safety	None
8. Security	Lockable door
9. Comm/Data	Operational Voice System (OVS) Single and Multi-mode fiber optics Copper cable Paging Voice recording (from IPF) Administrative telephone

3.6 ADMINISTRATION FACILITY

The SSI Integrated Processing Facility (IPF) provides an administration facility and associated office equipment, Communications and security to support processing, testing and launch.

Trailers may be used to supplement administrative needs.

Administrative areas with copy machines fax machines, desks, chairs, and bookcases. User supplies filing cabinets.

Capability type	Capability
1. Space/Access	6622 sq. ft. of administrative space' 45 person conference room Break room Rest rooms
2. Handling	None
3. Electrical	125 VAC 15 Amp Facility ground Lighting
4. Liquids	Drinking water Fire detection and suppression
5. Pneumatics	None
6. Environment	Temperature control
7. Safety	None
8. Security	Access control by Proximity Card system or mechanical cipher Intrusion detection system and steel doors with built-in 3-number S&G lock in

Capability type	Capability
	8914, 10102 and 10111
9. Comm/Data	Operational Voice System (OVS) in the conference room LAN interfaces CCTV monitor in conference room Paging Administrative telephones with voicemail

3.7 REMOTE LAUNCH CONTROL CENTER (RLCC)

The Western Range provides a Launch Control Center in Building 8510 on north Vandenberg for Range Operations personnel and for the program management team with access to launch information, Communication nets and telephone lines.

The Remote Launch Control Center (RLCC) in Building 8510 on North Vandenberg has been designated as the launch control room for future SLC-8 launches.

3.8 COMMUNICATIONS OVERVIEW (IPF LCR)

Although Communications has been addressed for each processing area, the following table provides an complete overview of the significant Communications capability available to users of the SSI launch facilities.

COMM	Capability
	SLC-8 Pad: • Four (4) each 20 key DICES III communications panels custom configured with any combination of Nets, Public Address, VDLs and access to both VAFB and long distance Dial lines. These stations can be located wherever the customer requires at SLC-8 or on the MAT and will be programmed with the required Range and local nets (Countdown, BU Countdown, Engineering/Anomaly, Mission Director, Safety, Launch Vehicle Contractor and Payload) per the ICD. • Two (2) each analog 5 net select communications panels. One in the SEB and one in the LEV.
1	4 each, 20-key DICES III communications panels custom configured with any combination of nets, public address, Voice Direct Lines (VDL), and access to both Vandenberg AFB and long-distance dial lines. These stations can be located wherever the customer requires at SLC-8 or on the MAT and will be programmed with the required Range and local nets (Countdown, BU Countdown, Engineering/Anomaly, Mission Director, Safety, Launch Vehicle Contractor, and Payload) per the ICD. • Two (2) each analog 1 net stations. One at each AF Film Camera interface station on SLC-8. • Three (3) each telephone instruments. One instrument is located at the guard trailer, one in the SEB and one in the LEV, all with base and long distance access. Note: Additional dial lines can be provided in the 4 each 20 key panels and additional dial/modem lines are available as required by the ICD. • Two (2) each 10/100 Ethernet circuits shall be available for customer use between the SLC-8 Pad and the LCR via a fiber optic link. • Eight (8) Film Camera interfaces on the SLC-8 pad and control circuits to the LCR. • Four (4) CCTV cameras with Pan/Tilt/Zoom capability on the SLC-8 pad and control from the LCR. • 24 each T1 circuits shall be available for customer use between the SLC-8 Pad and the LCR via a fiber optic link. • 30 each unused Multi-mode fiber circuits shall be available for customer use between the SLC-8 Pad and the LCR.

COMM	Capability
	• 72 each unused Single-mode fiber circuits shall be available for customer use between the SLC-8 Pad and the LCR. • 50 unused 19AWG, CAT-3 pairs shall be available for customer use between the SLC-8 Pad and the LCR. • Area Warning lights, Public Address and Klaxon systems are installed. **Range Interface Capability:** • Digital data circuits shall be available for customer use via an SSI provided OC-12 Multiplexer with both DS-3 (45Mbs) and T1 (1.544Mbs) interfaces between the SLC-8 and the Range over a fiber optic link. All base telephone trunks and Range data interface circuits (Nets, VDL's, Countdown clock, Area Warning, Status and Alert, Missile Lift-Off and Telemetry) use this path. All circuits are fully 1:1 redundant. • Digital Video circuits shall be available for customer use via SSI provided 1.2Gbs uncompressed video transport between SLC-8 and the Range over a fiber optic link. This transport shall be capable of 8 NTSC standard video signals in each direction simultaneously. All circuits are fully 1:1 redundant. • One (1) each 45Meg Ethernet circuit with 5Mb Internet access shall be available for customer use between the LCR and SLC-8. • One-way RF S-Band Telemetry repeater system and connectivity from SLC-8 to the Range are available via a Cypress Ridge to Oak Mountain link. • Two-way RF C-Band Radar and transponder connectivity from SLC-8 to the Western Range are available via a Honda Ridge to Tranquillion Peak link. • One-way S-Band Telemetry signal from SLC-8 to the LCR is available via an SSI provided antenna on the IPF roof transported via fiber optic cable to the LCR (Room 180D, Bldg. 8510).

3.9 STORAGE FACILITIES

A 4750 sq. ft. facility - the Operations Storage Building (OSB) shown in Figure 2-8 for storage of large items such as transporters, slings, etc. The OSB is located across the street from the entrance to SLC-8.

A 400 cu ft Magazine with a certified facility ground for storing initiation ordnance classified as 1.1, 1.3 and 1.4 is available in the IPF.

Figure 3-15: Operations Storage Building (OSB)

3.10 CAMERA TOWERS

As shown in Figure 1-6, there are three standalone camera towers: One to the northwest of the pad deck, a second southwest of the pad deck and the third southeast of the pad deck. A fourth camera tower is located on the roof of the SEB.

Figure 3-16: Southwest Camera Tower

Figure 3-17: Camera Tower on the Support Equipment Building (SEB)

3.11 ELECTRICAL RECEPTACLE SUMMARY

The table below summarizes the type and locations of the electrical interfaces at SLC-8

SLC-8								
Sym	Receptacle Type	WP	Phase	Volts	Amps Location ®	LEV	Gantry	SEB
					Breaker Panel ®	PPLEV LEV-UPS PPHLEV	Panel-G Panel-GA LGAN	LP2401 LP2501 LP2601 A-UGPS
A	NEMA 5-15R Duplex		Single	120	15			
A2	Hubbell 4700 (NEMA L5-15R) Duplex		Single	120	15			(1)T
A3	Hubbell 4710 (NEMA L5-15R)		Single	120	15	(2) F (2) T		
C	HUBBELL 2610 NEMA L5-30R		Single	120	30	(2) T	(1) T	(1)T (1) F
F	Hubbell 2810A (NEMA L21-30R)		3 Phase	208	30	(1) F (1) T		(1) F
F1	Hubbell 2620 (NEMA L6-30R)		Single	208	30	(2) F	(2) T	(1) F
G	NEMA 5-20R Duplex		Single	120	20	(5) F (1) T	(28) F * (1) T	(1) F
G1	CH WLRS NEMA L5-20R		Single	120	20	(1) T		
G3	NEMA 5-20R Duplex - GFI		Single	120	20	(1) F		(1) F
I	Leviton CS 63-69		Single	208	50	(1) F		
I1	Hubbell CS8264C		Single	208	50			
K2	Killark VR331E2		Single	120	30	(1) T		
N	Hubbell 2430 (NEMA L16-20R)	X	3 Phase	480	20	(1) F		
O	Leviton 560C9W		3 Phase	120/208	30			
O1	PYLE ZZM-3120-36		3 Phase	120/208	30			
Q	Appleton ADR-1034	X	3 Phase	480	100			(1) F
Q1	Hubbell 5100C7W	X	3 Phase	480	60	(1) F		
T1	(CH) AR658	X	3 Phase	120/208	20			(1) F
U	Hubbell 2320 (NEMA L6-20R)		Single	208	20		(2) F	
V1	Hubbell 5124R6W	X	3 Phase	120/208	125	(1) F		
W	Killark VR6414W	X	3 Phase	120/208	60	(1) F		
W1	Hubbell 560R9W	X	3 Phase	120/208	60	(1) T		

Notes:
*1 Receptacles are protected by GFI breakers
"T" indicates UPS backed
"F" indicates facility powered
( ) Indicates Quantity

Figure 3-18: Electrical Receptacle Summary

3.12 RF ENVIRONMENT

The following was extracted from an RF Test Report done by the SBSS program in July 2010.

A quick analysis was done to estimate the amplitude of RF that might be seen at the SLC-8 launch site from a mobile Naval RF source. This should be considered a fictitious scenario since the typical transit routes for NAVY ships is unknown. For this example, the surveillance RADAR on a typical Aegis missile cruiser was considered. The AN/SPY-1 RADAR has a peak power of 6 megawatts in the 2 – 4 GHz frequency band and uses a highly directional scanned antenna array. Using the classic RADAR range equation and a random distance of 4 miles the field strength at the SLC-8 site was found to be 206 V/m at 3 GHz. This calculation assumes a direct line of sight and does not consider diffraction or interference effects of the ocean surface that would tend to reduce the field strength levels. The damage warning level from Figure 3-19 is found to be 381 V/m at 3 GHz. This indicates that there is a low potential for damage from the Aegis RADAR at a distance of greater than 4 miles. The ship would need to approach to within 2 miles of the launch site and directly scan the SLC-8 site at full power for the radiated field strength to exceed the damage threshold shown in Figure 3-19.

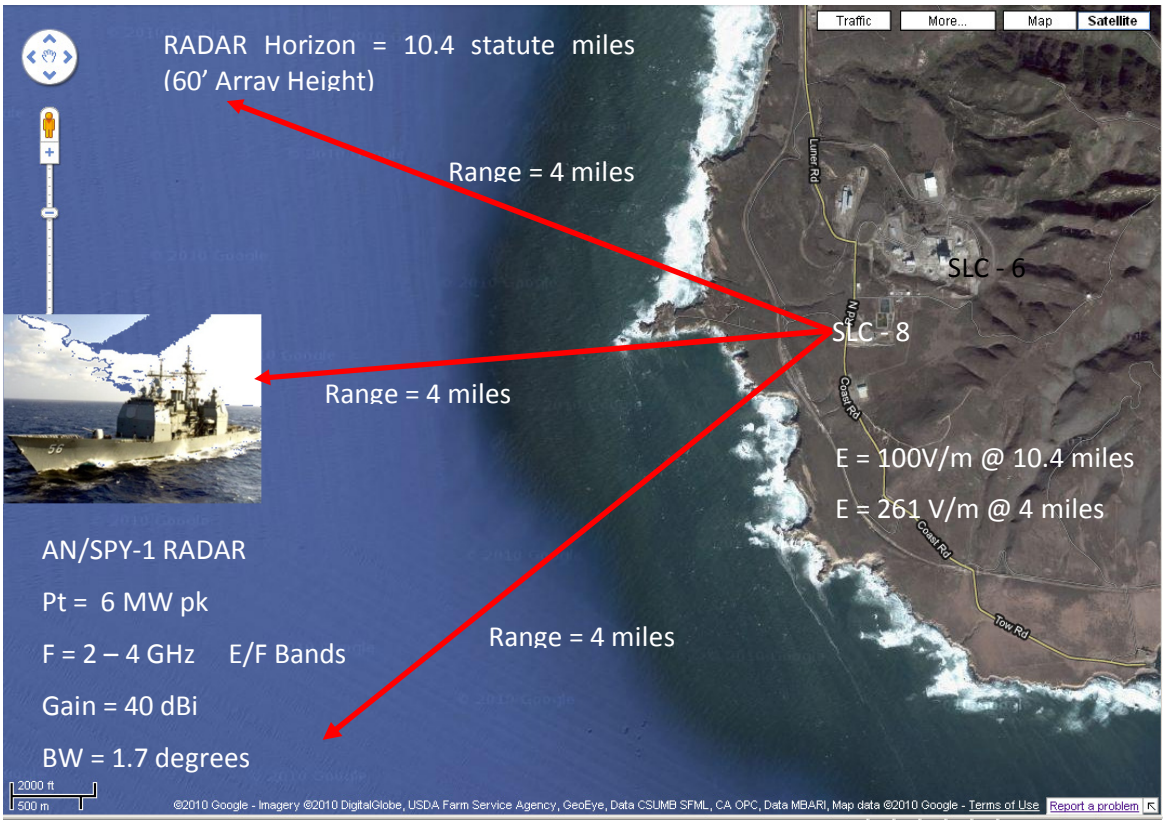


Figure 3-19: Aegis Radar Example

4 LAUNCH SITE PROCESSING

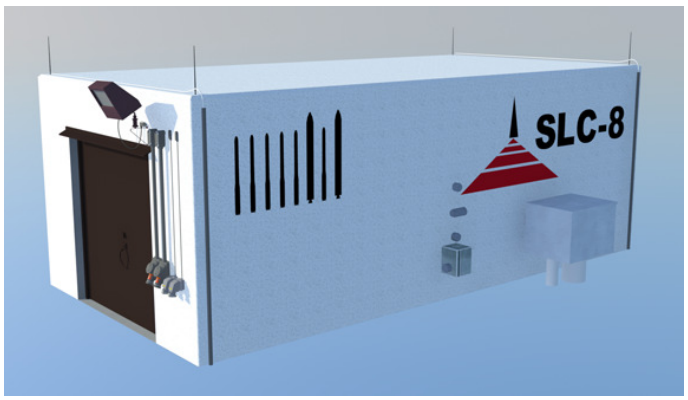
Prior to facility occupancy, SSI verifies all facility interface conditions specific to the mission. Upon completion of this verification, a Certificate of Facility Readiness (COFR) is presented to the customer to demonstrate facility readiness.

Figure 4-1: Support Equipment Building

HVAC units can be located on a pad next to the Support Equipment Building (SEB) shown in Figure 4-1. Power and underground conduits are provided with the output airflow routed through the conduit to the Launch Equipment Vault (LEV) for distribution to the Exhaust Duct. Other air conditioning unit to supply air directly to the launch vehicle can be installed in close proximity to the scaffold to maintain the temperature of the stages within specified limits during the processing flow and countdown. Power for the air conditioning unit will be obtained from the LEV.

Customer-supplied equipment racks are housed inside the SEB, where power is provided and temperature conditions maintained to assure proper operation during pre-launch checkout and launch operations. The Spaceport Fiber Optics Transmission System (FOTS) connects the support equipment in the SEB to launch control equipment located in the IPF Launch Control Room, located in Room 8903. The Vandenberg FOTS interfaces with Spaceport FOTS and provides connectivity with Building 7000. Some signals are routed from the equipment in the SEB through the underground conduit to the LEV, which in turn routes the signals to the customer-provided Umbilical Tower and finally to launch vehicle components. In turn, vehicle status monitors are routed from the UT, through the LEV to equipment in the SEB and back to the consoles in Room 8903. In addition, conditioned power provided by the Spaceport transformer is also routed to the LEV via the underground conduit system.

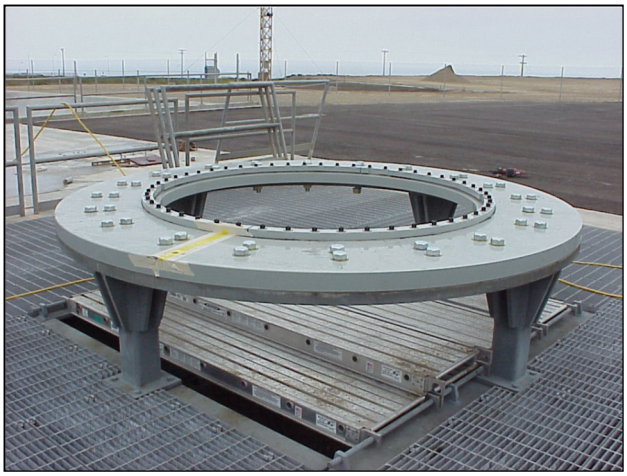
Figure 4-2: Launch Equipment Vault



Battery carts and power supplies for payload battery charging can be placed in the LEV, which is a small building on the southeast corner of the pad, located within 65 ft of the center of the launch duct.

For Minotaur I processing, after the Lower Stack Assembly has been fully integrated and tested at the MPF 2 facility and loaded into the T/E, the assembly is transported to the Spaceport launch site. The T/E is driven to the T/E pad and the vehicle is secured with tie-downs and jacks properly located on the SSI installed pylons and jack pads Figure 4-3. The T/E is used to erect the Lower Stack Assembly. From this position, the 200-ton Liebherr crane rented from Specialty Cranes is used to lift the assembly from the T/E and place it on the launch stand.

The Launch Duct Adapter Ring is the interface between the SSI exhaust duct frame/launch stand and the base of the Lower Stack Assembly, as shown in Figure 4-4. The T/E is then routed to Bldg. 1555 to pick up the Upper Stack Assembly. The erection process is repeated with the upper assembly.

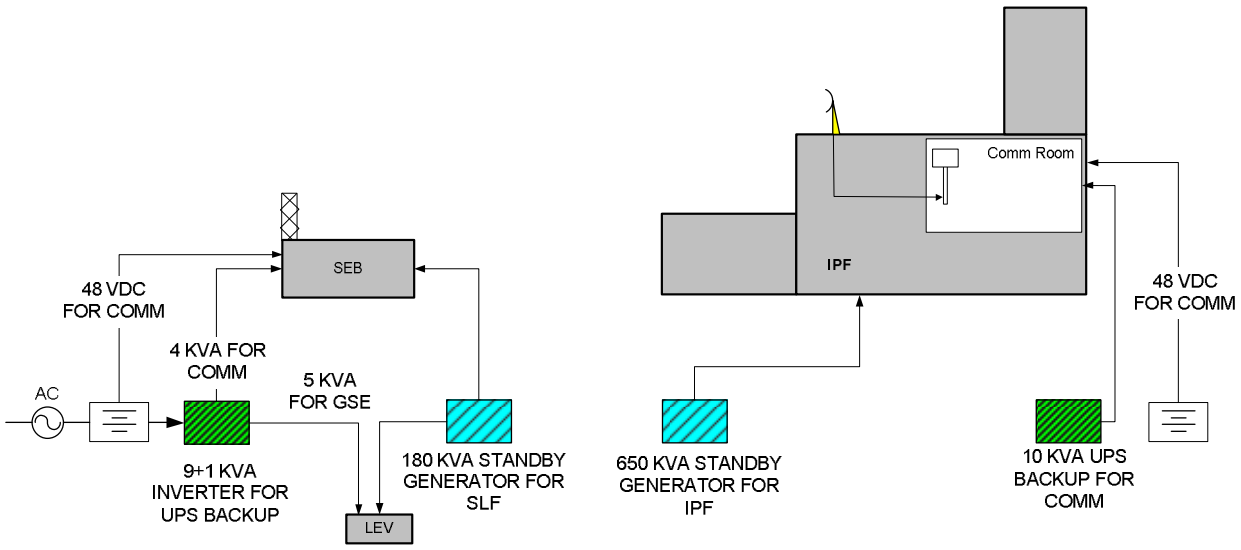
Figure 4-3: T/E Pylons Installed at the Spaceport	Figure 4-4: Minotaur Launch Ring on the SSI Launch Platform
	

After the emplacement of the Lower Stack Assembly, the mobile work stand is positioned to provide access to the upper end for integration with the Upper Stack Assembly. Following the emplacement of the upper assembly, the umbilical tower and retractor mast are installed, electrical connections made, environmental enclosures positioned and HVAC systems mated.

On the day of launch, final vehicle closeout and appropriate arming operations are performed, then the work stand is retracted in preparation for terminal countdown and launch. The scaffold work stand can be rolled and secured within two hours.

Backup and Standby power are provided to the SEB and LEV as shown in Figure 4-5

Figure 4-5: Backup and Standby Power



POWER = COMMERCIAL POWER
BACKUP = UPS POWER
STANDBY = GENERATOR POWER

5 LAUNCH CONDUCT

5.1 MINOTAUR I

5.1.1 READINESS

Prior to arrival of the booster at the launch site, SSI configures the exhaust duct frame and the customer-specific launch stand. In addition, SSI identifies and verifies all launch site support requirements in the launch site Interface Control Document (ICD) discussed in more detail in Section 8.

For Minotaur I, the Transporter/ is positioned at the T/E tie-down area as shown in Figure 5-2: LTP T/E at the Tie Down Area. Tie-downs and jacking pads, identical to those found at Minuteman operational sites, are provided to facilitate erection of the booster container.

Prior to vehicle arrival at the launch pad, SSI has conducted the Certification of Facility Readiness (COFR). The T/E pylon installation may be seen in Figure 5-1: T/E Pylons Installed at the Spaceport and Figure 5-2: LTP T/E at the Tie Down Area

Once erected on the T/E pylons, the Lower Stack Assembly is extracted from the T/E container and placed on the launch stand using a rented 200-T hydraulic crane.

Figure 5-1: T/E Pylons Installed at the Spaceport	Figure 5-2: LTP T/E at the Tie Down Area
	

5.1.2 BOOSTER PROCESSING

For Minotaur launches, a Mobile Access Tower provides access to the vehicle during pre-launch operations and to provide an environmental enclosure for temperature sensitive booster components.

The Mobile Access Tower is mounted on SSI provided rails to allow for rapid movement just prior to launch.

Following booster stacking and alignment, the Mobile Access Tower is positioned around the vehicle and platforms deployed to allow access to interface umbilical cables and the 2/3 inter-stage interface

The Mobile Access Tower is moved using a tug provided by SSI.

The Minotaur I Lower Stack Assembly requires environmental control to maintain bulk temperature of the Stage 1 and 2 propellants and the Stage 1/2 Inter-stage bond-line. SSI provides power for an customer-provided unit that supplies conditioned air at 70^{0}F +/- 10^{0}F with a relative humidity of 30-50% at the base of the work stand.

The customer provides ducting from the base of the Umbilical Tower (UT), up to a temporary enclosure which distributes the air to the sensitive components.

Safe & Arm (S&A) devices must be accessed on launch day. Since the Mobile Access Tower provides access to the booster while at the launch pad, removal of the safe pins and installation of arming plugs is performed just prior to rollback of the Mobile Access Tower.

5.2 MINOTAUR IV

The processing scenario for the Minotaur IV is similar to that of the Minotaur I. The vehicle is brought to SLC-8 one stage at a time and erected by a 360-ton mobile crane. After the payload and its fairing are attached, the tower doors are closed; if required, the 10K Clean Enclosure is erected in the 100K clean room; and final closeouts are performed.

The figures below illustrate the Minotaur IV stacking process

Figure 5-3: Minotaur IV Stage I Lifting Operation Using a Portable Crane

Figure 5-4: Minotaur IV Stage 2 Lifting Operation Using a Portable Crane

Figure 5-5: Minotaur IV Stage 3 Stacking Operation Using a Portable Crane

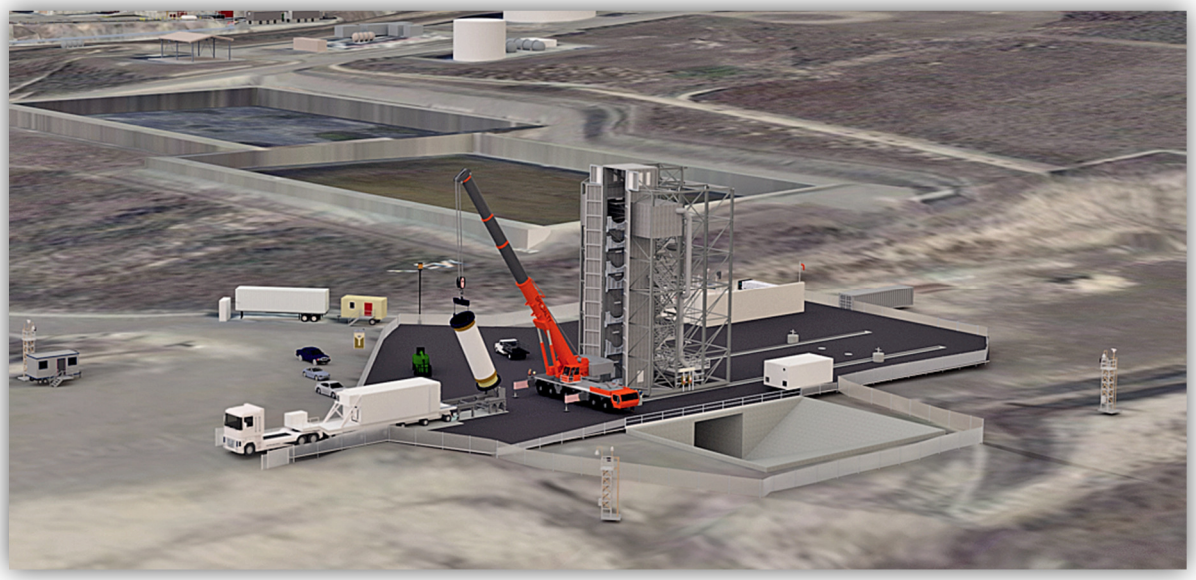


Figure 5-6: Artist's Depiction of Minotaur IV Operations

Figure 5-7: Artist's Depiction of Minotaur IV Night Operations

6 RANGE OR SITE SUPPORT

SSI interfaces with the GFE Western Range, and provides Communications and facilities to meet the program requirements.

SSI also has a exacting process by which user requirements are integrated to ensure readiness and the ability to trace satisfaction of requirements. SSI's experienced staff produces several key documents to document user requirements. We also use these documents to integrate requirements into the Spaceport infrastructure and verify that they have been met to the satisfaction of the user. The culmination of this process is a Certification of Facility Readiness (COFR). OSP is welcome to participate in SSI's process to the extent desired. This is fully described in Section 8: The Requirements Integration Process.

6.1 SITE DOCUMENTATION

SSI provides facility documentation to the customer in support of planning range operations. SSI shall respond to the detailed Minotaur IV Mission requirements for both the range instrumentation support and Spaceport-provided support and services.

SSI develops an Interface Control Document (ICD) to define interfaces between the Spaceport facilities and the launch vehicle, the payload and associated support equipment.

SSI supports the preparation of Accident/Incident Reports.

SSI provides Spaceport facility inputs to the customer in support of the development of ground safety documentation necessary to obtain approval from the 30 SW for ground operations/processing and the development of flight safety documentation.

Prior to facility occupancy, SSI prepares and submits a Certificate of Facility Readiness (COFR) upon successful completion of facility certification activities 30 days prior to the first day of the launch window. Upon completion of this verification, a Certificate of Facility Readiness (COFR) is presented to the customer to demonstrate facility readiness.

6.2 SITE SCHEDULING

SSI prepares an integrated schedule of Spaceport facility use, maintenance, outages, and other program operations and restrictions during customer site operations. SSI accommodates facility access 90 days prior to the launch date and launch pad access at 60 days prior to the launch date. SSI also schedules and supports site surveys, as required. SSI identifies single points of contacts for the Launch Site agencies, Launch vehicle contractor and Western Range personnel. SSI interfaces with these entities through telecoms, scheduling meetings, technical meetings, readiness reviews and Program meetings.

6.3 COMMUNICATIONS

SSI provides the following Communications equipment:

6.3.1 SLC-8 PAD:

Four (4) each 20 key DICES III Communications panels custom configured with any combination of Nets, Public Address, VDLs and access to both VAFB and long distance Dial lines. These stations can be located wherever the customer requires at SLC-8 or on the MAT and will be programmed with the required Range and local nets (Countdown, BU Countdown, Engineering/Anomaly, Mission Director, Safety, Launch Vehicle Contractor and Payload) per the ICD.

Two (2) each analog 5 net select Communications panels. One in the SEB and one in the LEV.

Two (2) each analog 1 net stations. One at each AF Film Camera interface station on SLC-8.

Three (3) each telephone instruments. One instrument is located at the guard trailer, one in the SEB and one in the LEV, all with base and long distance access. Note: Additional dial lines can be provided in the 4 each 20 key panels and additional dial/modem lines are available as required by the ICD.

Two (2) each 10/100 Ethernet circuits shall be available for customer use between the SLC-8 Pad and the LCR via a fiber optic link.

Eight (8) Film Camera interfaces on the SLC-8 pad and control circuits to the LCR.

Four (4) CCTV cameras with Pan/Tilt/Zoom capability on the SLC-8 pad and control from the LCR.

24 each T1 circuits shall be available for customer use between the SLC-8 Pad and the LCR via a fiber optic link.

30 each unused Multi-mode fiber circuits shall be available for customer use between the SLC-8 Pad and the LCR.

72 each unused Single-mode fiber circuits shall be available for customer use between the SLC-8 Pad and the LCR.

50 unused 19AWG, CAT-3 pairs shall be available for customer use between the SLC-8 Pad and the LCR.

Area Warning lights, Public Address and Klaxon systems are installed.

6.3.2 RANGE INTERFACE CAPABILITY:

Digital data circuits shall be available for customer use via an SSI provided OC-12 Multiplexer with both DS-3 (45Mbs) and T1 (1.544Mbs) interfaces between the LCR and the Range over a fiber optic link. All base telephone trunks and Range data interface circuits (Nets, VDL's, Countdown clock, Area Warning, Status and Alert, Missile Lift-Off and Telemetry) use this path. All circuits are fully 1:1 redundant.

Digital Video circuits shall be available for customer use via SSI provided 1.2Gbs uncompressed video transport between the LCR and the Range over a fiber optic link. This transport shall be capable of 8 NTSC standard video signals in each direction simultaneously. All circuits are fully 1:1 redundant.

One (1) each bi-directional 0-1.2Gbs digital fiber optic circuit shall be available for customer use between the LCR and the Range interface via a fiber optic link.

One (1) each 10/100 Ethernet circuit shall be available for customer use between the LCR and the Range via a fiber optic link.

One-way RF S-Band Telemetry repeater system and connectivity from SLC-8 to the Range are available via a Cypress Ridge to Oak Mountain link.

Two-way RF C-Band Radar and transponder connectivity from SLC-8 to the Western Range are available via a Honda Ridge to Tranquillion Peak link.

One-way S-Band Telemetry signal from SLC-8 to the LCR is available via an SSI provided Omni antenna near the LCR.

Western Range safety systems including C-band tracking and destruct systems are available from the Government provided Range. The Communications systems have been used successfully on all launch operations and are mission capable.

6.3.3 CAMERAS

6.3.3.1 CCTV

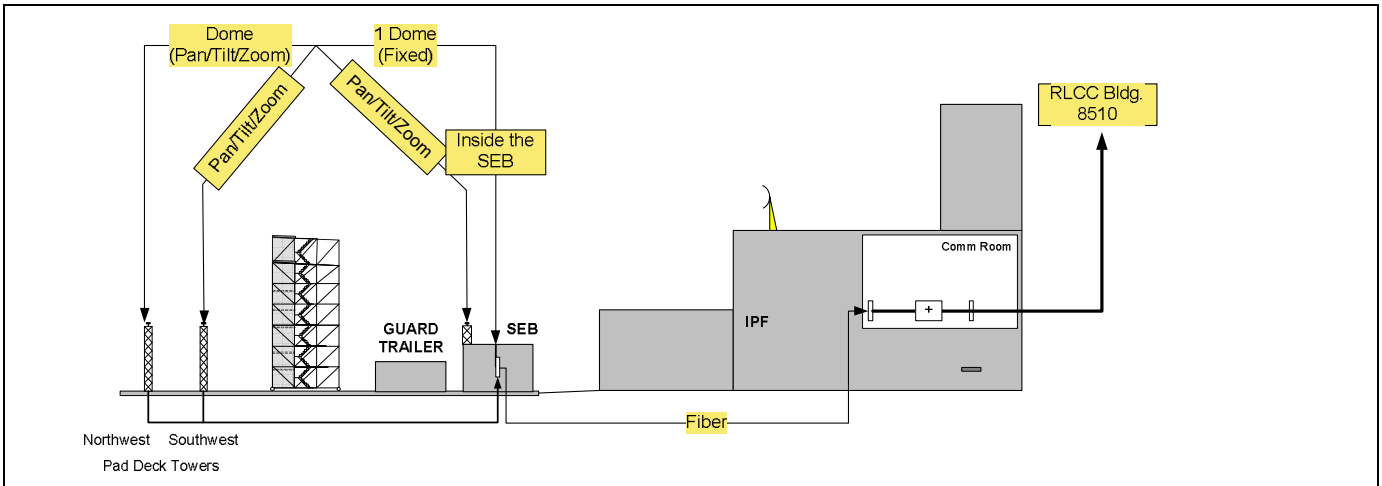


Figure 6-1: CCTV

6.3.3.2 FILM CAMERAS

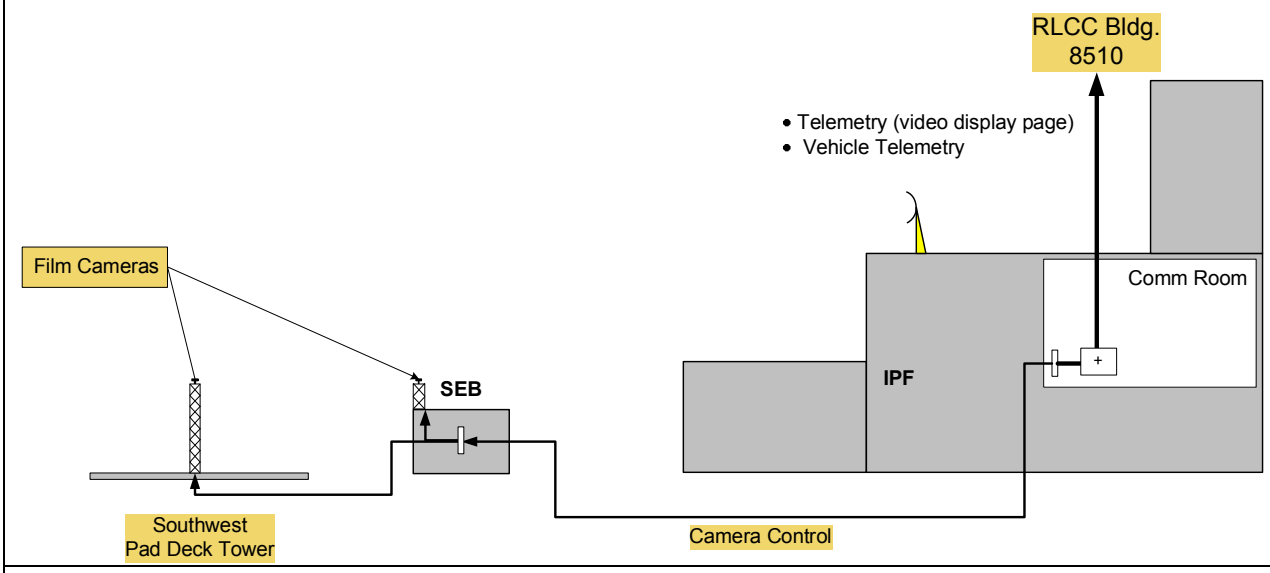


Figure 6-2: Film Cameras

6.3.4 DATA FLOW

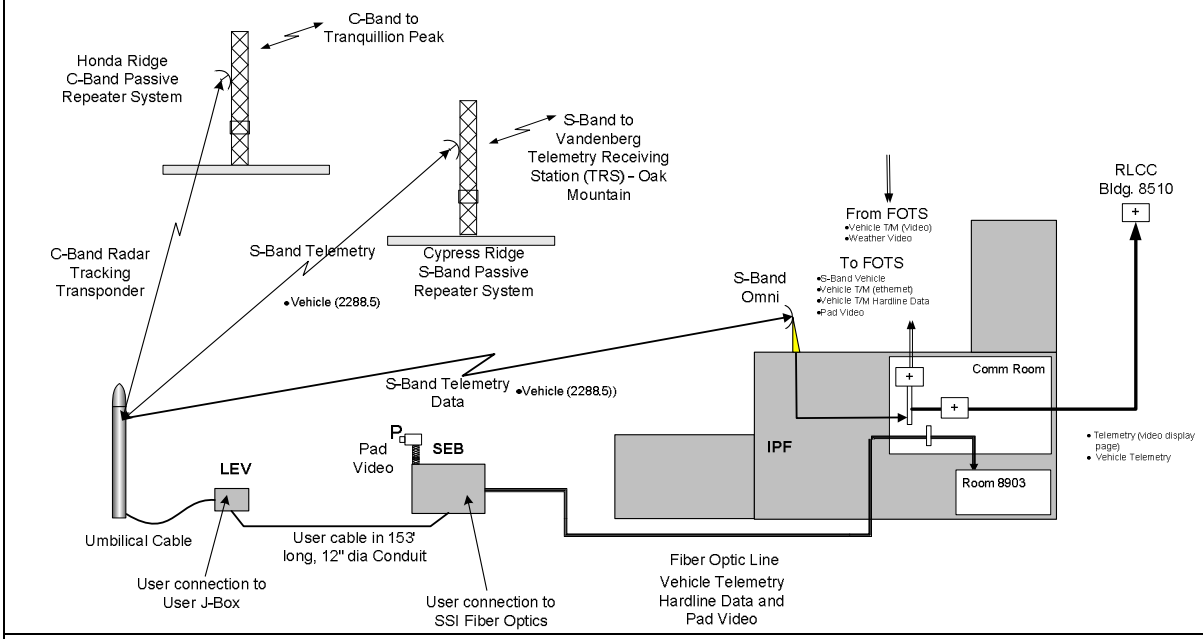


Figure 6-3: Typical Data Flow

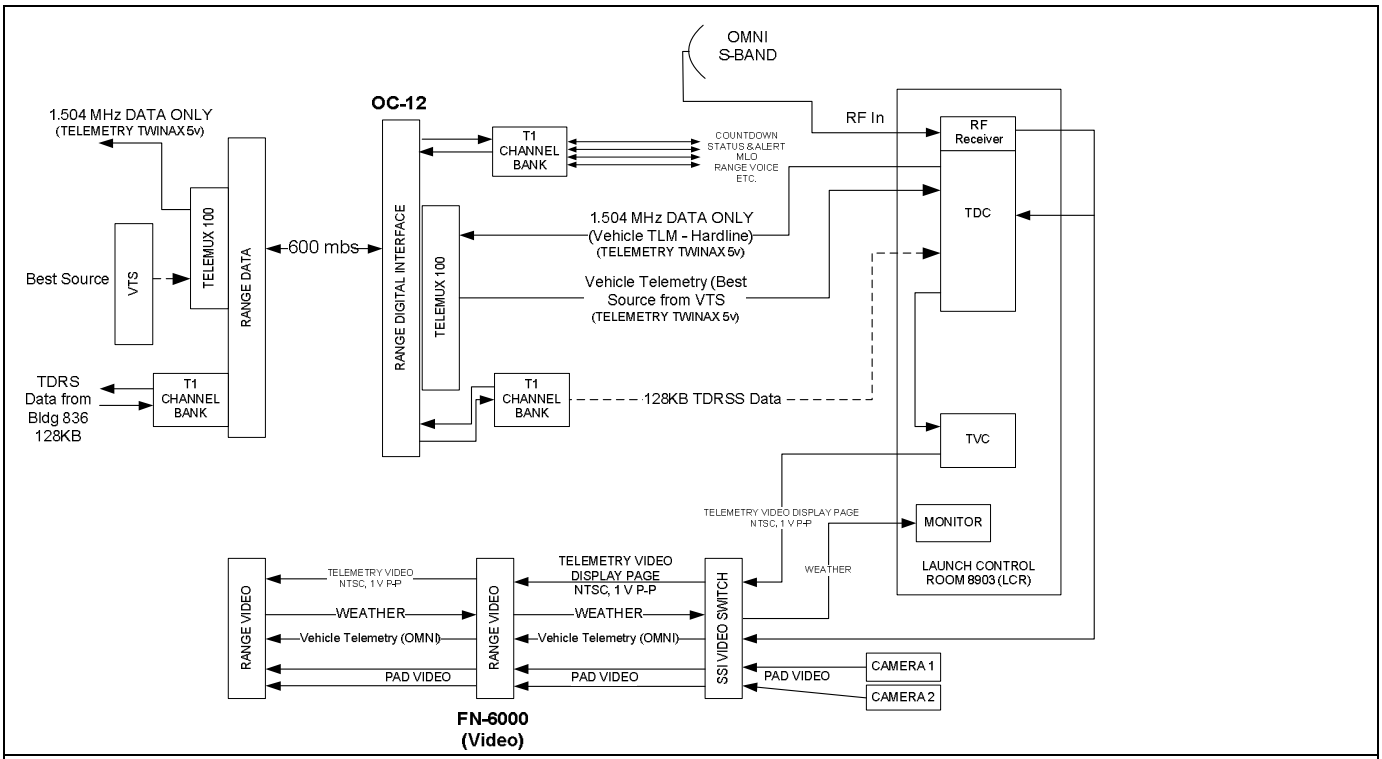


Figure 6-4: Typical Telemetry, Video and Timing

6.4 FLIGHT, GROUND AND OPERATIONAL SAFETY

SSI coordinates and supports flight safety reviews and the flight assessment process by the appropriate agencies, and assists in obtaining the Government Range safety approval of LV contractor procedures. SSI obtains Government approval and ensures implementation of the Spaceport ground operations safety program and complies with EWR 127-1(T).

SSI implements the 30th Space Wing approved Spaceport ground safety program and DOD approved SLC-8 Explosive Site Plan. SSI has been delegated limited ground safety control authority by 30th SW Commander. SSI reviews user provided Hazard Analyses, System Safety Plans, Missile Systems Pre-Launch Safety Package (MSPSP), FTS Report, all hazardous procedures, updates to MSPSP and updates to system hardware and launch vehicle flight trajectory analysis and approval for the SSI Launch Site.

6.5 LOGISTICS SUPPORT

SSI provides receiving support such as inventory control, transportation and handling, and storage of hardware (including ordnance).

6.5.1 RECEIVING SUPPORT

SSI provides material handling equipment for LV contractor personnel to support receiving and off loading of hardware at the Spaceport.

6.5.2 INVENTORY CONTROL

SSI conducts inventory control of all mission hardware under the control of the Spaceport.

6.5.3 TRANSPORTATION AND HANDLING

SSI provides standard material handling equipment as needed (i.e. forklifts, cranes, etc.) for LV contractor personnel to support receiving and off loading of hardware at the Spaceport.

SSI provides local transportation of GFE or launch vehicle contractor equipment as required prior to launch vehicle contractor arrival on site.

6.5.4 STORAGE

SSI provides storage for initiation ordnance and small size support equipment at Spaceport facilities. SSI provides a 4750 sq. ft. Operations Storage Building (OSB) which accommodates storage of large items such as transporters and slings. The OSB is located across the street from the entrance to SLC-8.

6.6 SUPPORT SERVICES

SSI provides Spaceport interfaces to the Western Range to support activities associated with the launch vehicle. SSI provides Communication services for administrative and technical personnel at all facilities used.

6.6.1 METEOROLOGY

SSI supports the Range in providing meteorological services/data to support processing, testing and launch of the launch vehicle, including real-time weather status.

6.6.2 PHOTOGRAPHY

SSI supports the Western Range in providing photographic services, including still photos, high speed film. SSI provides real time video at the pad, in support of processing, testing, anomaly/failure analysis and launch.

6.6.3 PAD LIGHTING

SLC-8 has 5,000 watts of existing pad lighting for nighttime processing. SSI provides additional portable on-pad lighting, as required.

6.6.4 MEDICAL AND ENVIRONMENTAL HEALTH

SSI provides on-call access to medical and environmental health services, including urgent care and emergency transport to support all personnel involved in the processing, testing and launch of the lauch vehicle and the integrated payload. SSI provides required safety equipment in compliance with local and OSHA regulations

6.6.5 SITE VEHICLES

SSI provides access to site vehicles to support processing, testing and launch. Specific requirements are typically finalized in the integration planning process and include site transportation, forklifts and a tug to move the Mobile Access Tower.

6.6.6 INTRUSION DETECTION AND SECURITY

SSI coordinates access control with the customer and the Western Test Range, and provides access control to the Spaceport launch site and facilities. SSI provides 24 hr physical security when the launch vehicle is on site. 24 hr physical security controls and access, certified to the Top Secret (TS) level, can be provided by SSI in any area where the SV is present or where CCIs are removed from their safes. Additionally, SSI provides 24 hr physical security to any SV GSE with installed crypto keys this same TS level. SSI provides a secure location for a GFE Crypto safe in the SEB. SSI shall ensure that SV personnel are present for all activities at platform level.

The geographic location of the SLC-8 site is within a fenced perimeter on a United States Air Force base, 10 miles inside base perimeter. Both the base and SLC-8 are guarded with 24/7 entry control. SLC-8 is monitored with four SSI-provided CCTV cameras providing pan/tilt and zoom controls. Additional customer provided cameras can be supported. The physical security protection are intended to prevent as well as detect physical access by unauthorized persons.

Personnel entry control is established through an SSI generated badge used for entry into the SLC-8 perimeter. SSI's security plan conforms to all requirements currently mandated by the mission and can easily be adapted to additional requirements as needed.

6.6.7 Hazardous Waste Containment and Disposal

SSI provides support as required for hazardous waste containment, disposal and documentation services to support processing, testing and launch of the launch vehicle and the integrated mission payload. Hazardous wastes typically include used solvents, lubricants, and sealants. SSI maintains a SQG hazardous waste license with the State of California.

6.6.8 Gases

SSI provides the following gases as needed to support processing, testing and launch of the launch vehicle and integrating the Contractor payload as listed below:

1. Gaseous Nitrogen: Tube Truck or 6 kpsig K-bottles supplying supply of 99.995% pure N_2 at the launch pad.

2. High Pressure Air: Portable, filtered, at least 100 psig for pneumatic tools.

6.6.9 Janitorial Services

SSI provides janitorial services for administrative and vehicle/payload areas at the Spaceport.

6.6.10 Fire Protection

SSI provides on-call access to fire detection/protection services to protect personnel, facilities and hardware.

6.6.11 Potable Water

SSI provides water at the Launch Control Room (LCR) and launch pad for personnel consumption, not to exceed 20 gal per day for the duration of mission site operations.

6.7 Facility Engineering

6.7.1 Analysis

SSI provides analysis to integrate and verify the mission interfaces with the Spaceport launch pad and facilities.

6.7.2 Design

SSI provides design of facility interfaces as required for the launch vehicle, the integrated mission payload and associated support equipment, per the ICD.

6.7.3 Facilities Modifications

SSI provides facility modifications within the established schedule, as required to ensure that the launch vehicle, integrates with the payload and associated Ground Support Equipment (GSE) per the ICD. Facility readiness is presented in a Facilities Readiness Review normally held 30 days prior to first operations at the launch site.

Facility modifications are verified as mission capable and a Compliance and Risk Matrix shows potential risk and mitigation actions for the proposed MAT modifications.

6.8 PROGRAM SUPPORT

6.8.1 PROGRAM SCHEDULES

SSI prepares an integrated of Spaceport facility use, maintenance, outages, planned support, etc. during the mission.

6.8.2 MEETING CONDUCT AND ATTENDANCE

SSI attends Mission and Range planning meetings, as required to support processing and launch activities, and a Facility Readiness Review held prior to LV contractor arrival on site. During on-site processing and launch support operations, meetings typically occur daily.

6.9 ENVIRONMENTAL CONCERNS

6.9.1 ENVIRONMENTAL COMPLIANCE

SSI (and its subcontractors) comply with all federal, state, and local environmental laws, regulations, and policies for all activities defined in the customer requirements document, whether conducted at government or, upon request, at contractor facilities. SSI makes available to the government applicable environmental permits and documentation. SSI is solely responsible for the management, cleanup, protection, and disposal of any and all emissions, effluents, wastes, and hazardous materials used in, generated by, or associated with the actions required by this operation. SSI reports the current status and impacts to program cost, schedule, and performance from the above mentioned at each management review.

Upon receipt of government provided Hazardous Material Listing and supporting MSDS documentation, SSI compiles and submits required usage reports.

6.9.2 SUPPORT FOR NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE.

SSI complies with the monitoring requirements detailed in the Environmental Assessment for the California Spaceport dated 28 Feb 1995. SSI uses the sonic boom modeling program to determine if a booster-induced boom will impact the Northern Santa Barbara Channel Islands. If required, SSI surveys the marine mammals present for three days prior to the Minotaur IV Launch and continues monitoring for two days following the launch. If a launch occurs during pupping season, a follow-up survey is conducted two weeks after the launch. If data is needed by the government to develop applicable environmental analysis required under provisions of the NEPA, SSI completes and submits, as required, AF Form 813 through 30 Space Wing to comply with NEPA process.

7 SUPPORT SUMMARY

7.1 GENERAL PROCESSING SUPPORT

This section contains an outline overview of SSIs general capabilities in three areas:

1 Safety

2 Environmental (It is to be noted that there are No recurring mitigation costs to customer)

3 Operational Support

7.1.1 SAFETY

Support Type	Capability
SAFETY	1 Licensed by DOT as Commercial Spaceport 2 First spaceport to be granted DOT license 3 Spaceport Explosive Site Plan Approved by DoD Explosive Siting Board (DDESB) 4 Up to Delta II 5 EWR 127-1 Tailored for SSI's Commercial Spaceport Approved by 30 SW Safety 6 DoD standards replaced with Commercial standards where applicable 7 Ground safety requirements established

7.1.2 ENVIRONMENTAL SUPPORT

Support Type	Capability
ENVIRONMENTAL SUPPORT	1 Mitigation Programs 2 NVAFB vegetation restoration completed 3 54 Peregrine Falcons released during 3-year program 4 Final Archeological report submitted 5 Pelicans, nesting seabirds and sea otters video completed 6 Snowy Plover beach signs and educational materials approved 7 Launch Monitoring Plans Approved 8 Pinniped sound level and response monitoring 9 Red-legged frog response monitoring 10 Acid deposition impact on vegetation and wildlife 11 Media Management Programs 12 Separate stationary air source granted by APCD 13 Emergency response roles & responsibilities developed and assigned 14 HazMat, HazWaste and Water management programs provided by SSI 15 Comprehensive training program provided by SSI 16 Environmental Insurance In Place

7.1.3 OPERATIONAL SUPPORT

Support Type	Capability
OPERATIONAL SUPPORT	1 Integrated Schedule 2 User-Specific Processing Tasks 3 Range Support Tasks 4 Multiple Program Integration 5 Logistics 6 Receiving and Inventory Control 7 Ordnance and Small Item Storage 8 Support Services 9 Meteorology 10 Photography 11 Environmental Management 12 Shops & Labs 13 Janitorial Services 14 Documentation 15 Standard Operating Procedures 16 Test and O&M Procedures 17 Interface Verification Documentation 18 Integrated Procedures 19 Training

8 THE REQUIREMENTS INTEGRATION PROCESS

This section summarizes the general process required for the new user to contract for use of the SLC-8 Launch Facility. Further, this section describes the flow of SSI documentation associated with identifying and assuring compliance with user requirements for processing at SLC-8.

A potential user's initial contact with SSI is best made with a request for a copy of the *SLC-8 Launch Facility Support Questionnaire*. This questionnaire allows identification of all of the support the new user feels they will need from SSI to process and launch their vehicle from SLC-8. The answers provide the basis for a meaningful dialog for the development of an initial ROM price.

This section outlines the process of obtaining and responding to the user processing support requirements after a contract has been made to launch from SLC-8.

8.1 REQUIREMENTS INTEGRATION

8.1.1 PROGRAM REQUIREMENTS INTEGRATOR

This evolutionary process of requirements identification and response assurance is coordinated by a Program Requirements Integrator (PRI) assigned to every mission.

In addition to factory build and test, there are three process phases for launching a space vehicle:

1. Identification of user requirements
2. Planning in response to the requirements
3. Processing and launching vehicle hardware

Requirements Integration is concerned with the first two of these phases.

A central figure in orchestrating the integration process is the PRI. This is an individual highly experienced not only in launch process management, but attuned to pursuing better and more cost effective methods - without sacrificing safety or quality.

SSI provides a PRI responsible to ensure each program aspect meets critical milestone dates previously established in an integrated schedule. Moreover, he ensures good Communication between the customer and each program support element. The following lists standard PRI responsibilities:

- Direct interface between Spaceport and all agencies to identify requirements for support during the Launch process
- Program development (Long Range facility support planning, Integration milestone schedules)
- Development of the Program Interface Control Document between the Program and SLC-8
- Provide standard and ad hoc reports to assist in the tracking of requirement status
- Assist SLC-8 Operations in the Verification Process by preparing the Verification Checklist
- In coordination with SLC-8 Operations, prepare the Certificate of Facility Readiness
- Obtain support for other user-specific requirements, as required

8.1.2 REQUIREMENT INTEGRATION PROCESS TIMELINE

The requirement integration process, of necessity, is a structured process and can take from 6 to 9 months or longer. Figure 8-1 illustrates the Integration Timeline from initial Task Order turn-on to Initial Facility Occupancy (IFO). The rest of Section 8 will cover the documents shown in this timeline.

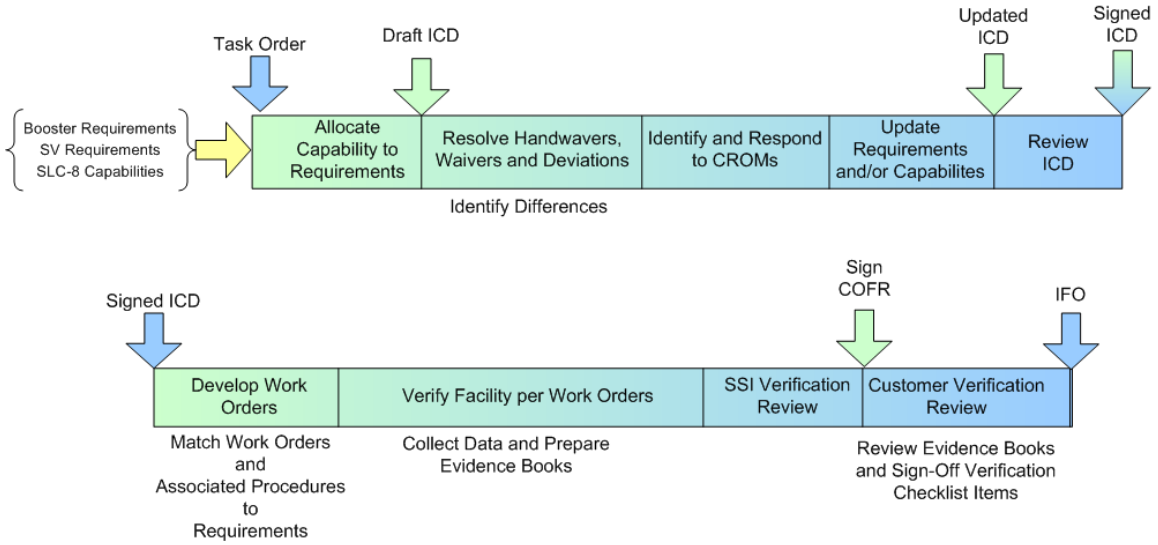


Figure 8-1: Integration Timeline

8.2 REQUIREMENTS TRACKING DATABASE (RTD)

As shown in the Figure below, all requirements integration documentation is produced from the SSI Requirements Tracking Database. The figure summarizes the documentation sources that feed into the RTD, the documents produced, and the association with the Operations AMMS Database. The RTD contains three main tables:

1. Capabilities Table – detailed description of the capabilities and interfaces of the IPF. Each record has a unique identifying number so even if the data is sorted with different paragraph structures (IPF Location or Function) the identifying ID remains the same.
2. Requirements Table – user requirements from all sources containing the requirement document numbering structure to allow tracking from any output document. In addition each requirement has a unique identifying number.
3. Work Order/Purchase Order Link Table – data provided from the Operations group that identifies the links between the Work Orders and Purchase Orders to the requirements

It should be noted that the detailed capabilities and figures produced from the RTD are contained in document 37-100002, *SLC-8 Detailed Capabilities Document (DCD).*

As is well known, the main advantage of use of the RTD is to assure that any document, standard or ad hoc, comes from the same source. Whenever a Requirement, Capability or Comment is changed the date is automatically updated to assure accurate revision pages.

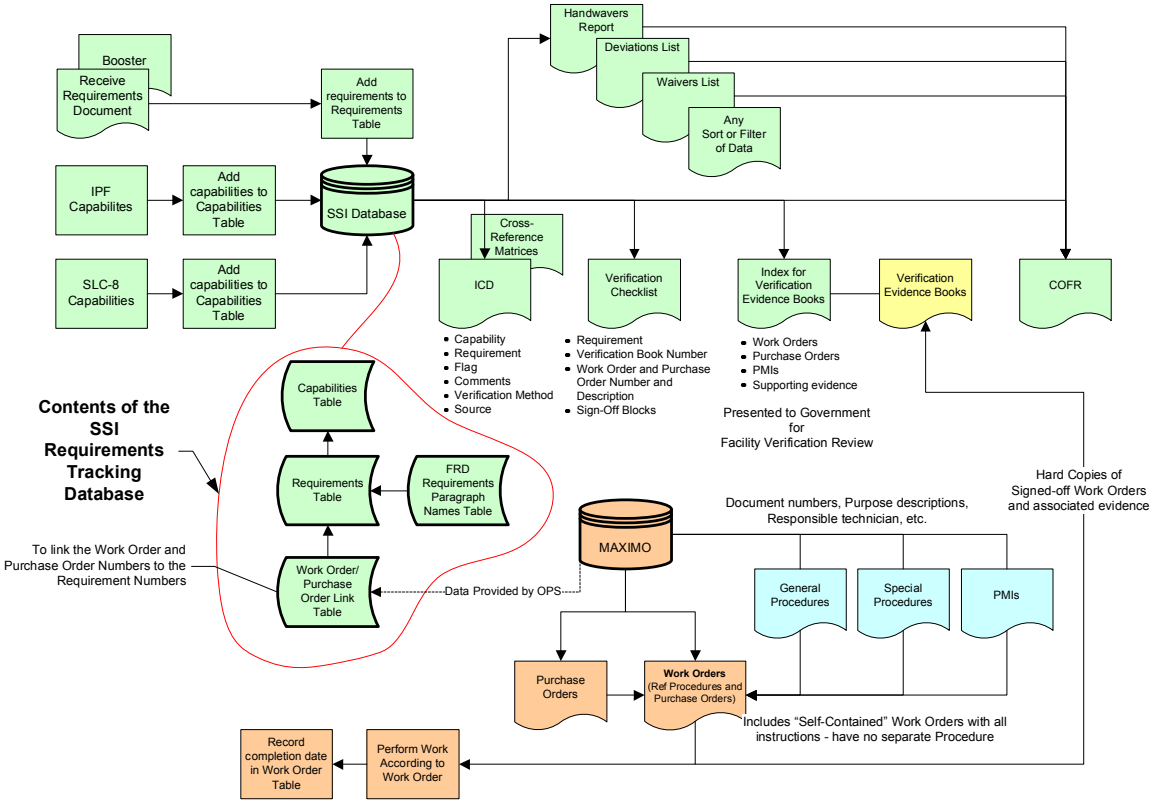


Figure 8-2: Requirements Tracking Database (RTD)

8.3 REQUIREMENTS IDENTIFICATION AND IMPLEMENTATION

The documentation is logically structured as follows:

The definition of the SLC-8 Interfaces and Capabilities - *SLC-8 Detailed Capabilities Document (DCD)*

Definition of user requirements – from whatever form the user chooses for documentation

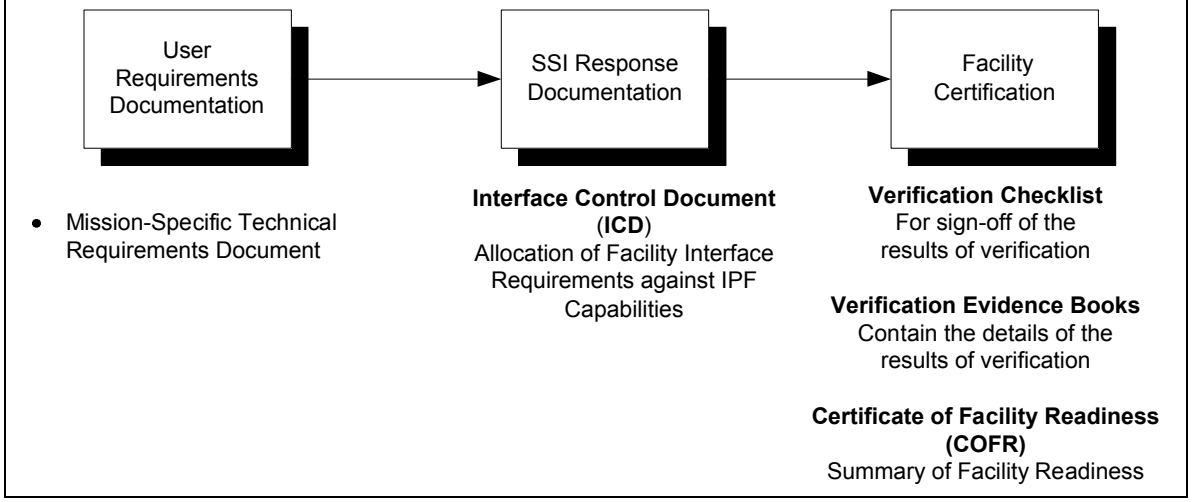
Allocation of the user requirements to the applicable IPF capabilities and interfaces – the Interface Control Document (ICD)

Documentation to assure verification of the required facility interfaces and capabilities prior to hardware processing

In addition there are standard and ad hoc documents to identify and track the resolution of requirements that do not match the IPF capabilities and interfaces

In the simplest terms the flow of documentation from requirements to facility readiness is shown in the figure below:

Figure 8-3: Simplified Flow of Readiness Documentation for SLC-8



8.3.1 THE REQUIREMENTS IDENTIFICATION AND RESPONSE PROCESS

The fundamental SSI Facility document is the *SLC-8 Detailed Capabilities Document (DCD).* This document describes in explicit detail, the capabilities and interfaces of the facilities. The DCD describes, in detail, the capabilities of the Launch Facility and are sorted both **by Function** and **by Location**.

Figures are provided to complement the text. The Figures are presented in Function order.

8.3.2 THE INTERFACE CONTROL DOCUMENT (ICD)

The **ICD** has four major purposes:

1. Provide a mechanism for defining user requirements as a subset of the total interface capabilities of the Spaceport launch facility (SLC-8).
2. Assure traceability back to the user requirement for each requirement
3. Define the method for certifying (verifying) the capability or interface
4. Provide a date and certification of the verification for each Interface and Capability

To achieve these goals the ICD works together with the SSI Facility Verification Checklist. While the ICD describes the user requirements and SLC-8 capabilities for each area used, the Verification Checklist includes additional data concerning certification of each capability. The Verification Checklist is used by the SSI Operations personnel as a checklist to perform the pre-arrival facility certification and becomes a part of the Certificate of Facility Readiness (COFR) process.

Figure 8-4 illustrates the structure of ICD and the following documents. The starting point is the Capabilities and Interface Definition section of this Handbook. As the user requirements are identified and inserted using the structure of the Handbook (as shown in Figure 8-4), the result becomes the ICD.

The "Flag" field highlights those interfaces that need attention by the customer or SSI during the ICD development phase. The following are typical Flags:

Handwaver: Item of special note most often an exception to the requirement that needs to be resolved

Question: Need More Information: Uncertainty about the statement of or need for a requirement that needs to be resolved

Waiver: A permanent waiver has been granted for this requirement

Waiver Requested: A waiver has been requested but not yet granted

Deviation: A deviation (temporary waiver) has been granted for this requirement

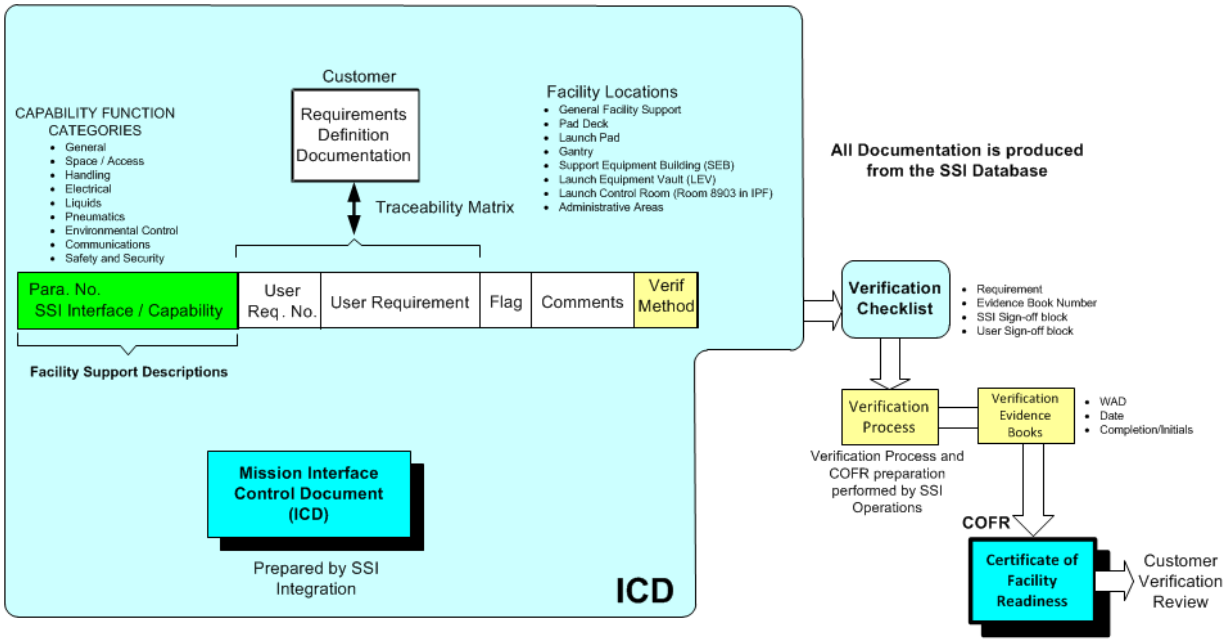


Figure 8-4: Facility Requirements Documentation Structure

As shown, after the ICD is finalized, SSI Integration turns the ICD over to SSI Operations and prepares the Facility Verification Checklist.

Figure 8-4 shows the structure of a single record in the ICD. The full ICD itself is composed of 15 sections as shown in the following figure:

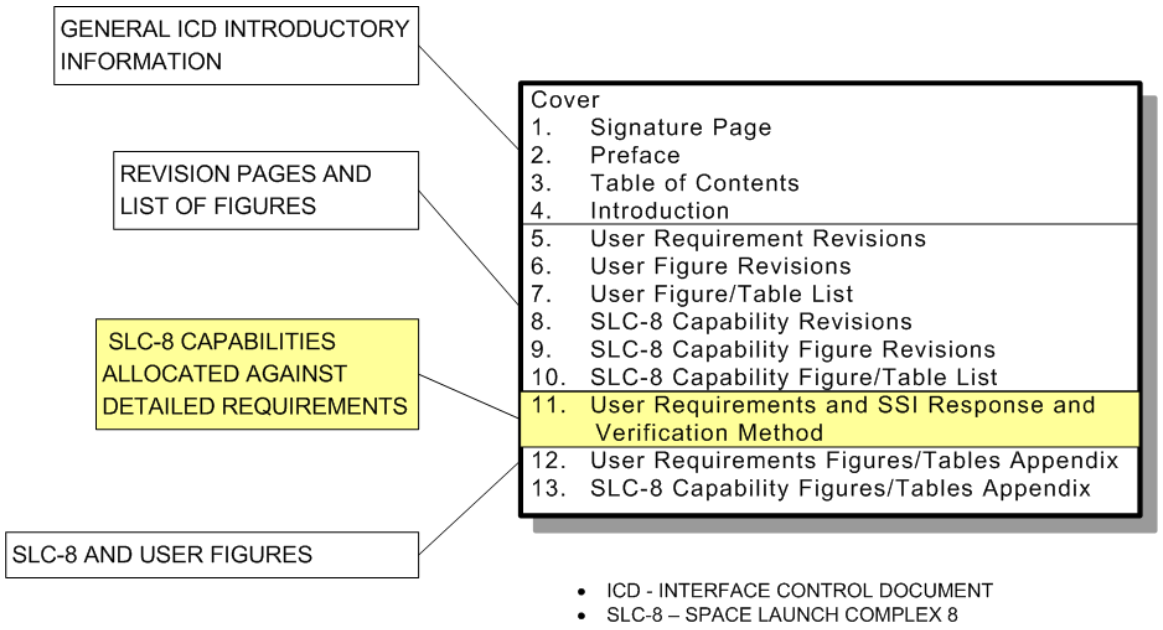


Figure 8-5: Full ICD Content

Great care is taken to keep track of revisions of capabilities, requirements and figures. The ICD section 11 is in User Paragraph Number order.

8.4 FACILITY VERIFICATION AND CERTIFICATION

The last process performed by SSI prior to facility occupancy is the verification of the facility interfaces and preparation of the Certificate of Facility Readiness (COFR).

As shown in Figure 8-4, the next to the last column in the ICD is the Verification column. The standard methods of verification are used by SSI.

8.4.1 VERIFICATION METHODS

8.4.1.1 DEMONSTRATION

Demonstration is the method used to verify requirements by exercising or operating the element or a part of the element **using instrumentation or special test equipment inherently provided in the element being verified**. In the demonstration method, sufficient data for requirements verification can be obtained by observation of the functional operation of the element. When this verification method generates data that is recorded by inherent instrumentation, inherent test equipment or operational procedures, any analysis that must be performed using that data is verification by analysis is as described below.

8.4.1.2 TEST

Test is the method used to verify requirements by exercising or operation the element of a part of the element using instrumentation (hardware and/or software) or special test equipment that is not an integral part of the element being verified. The test method by its nature generates data, which is recorded by the instrumentation, test equipment or procedures. Analysis or review is performed on the data derived from testing. This analysis,

as described here, is an integral part of this method and should not be confused with the analysis method described below.

8.4.1.3 ANALYSIS

Analysis is the method used to verify requirements by determining qualitative and quantitative properties and performance through studying and examining engineering drawings, software, and hardware flow diagrams, software and hardware specifications, and other software and hardware documentation (e.g., COTS vendor documentation), or by performing modeling, simulation, and/or calculations, and analyzing the results. Analysis techniques include interpretation or interpolation and extrapolation of analytical data or empirical data under defined conditions or reasoning to show compliance with requirements.

8.4.1.4 INSPECTION

Inspection is the verification by comparison of physical characteristics to specified design requirements. Inspection is normally used to verify construction features, workmanship, physical conditions ore requirements, (e.g., physical dimension, marking, wire coding, surface finish).

8.4.1.5 SIMILARITY

Similarity is the verification by evaluation of analytical or test data from an analysis or test program for an item, which is sufficiently similar to the required item for the data to be valid. The data must show that the item used as a basis for the verification has satisfied equivalent or more stringent requirements. Similarity is not shown as a drawing requirement, but is negotiated separately to satisfy specific requirements **VERIFICATION PROCESS**

After the ICD is finalized by SSI Integration with Comments from the Customer, the ICD is turned over to SSI Operations with a draft of the Verification Checklist. SSI Operations then finalizes the methods for verification:

- Work Order or Preventative Maintenance Instruction
- Procedure to implement the Work Order or Maintenance Instruction
- Sub-Contractor Certification
- Purchase Order

With these decisions made, the verification process begins. The Customer participates as observer for identified Critical Verification Items during this process. As the process continues, the documentation generated is gathered in preparation for the detailed In-House Technical Data Review. At this review the verification documentation for every item in the ICD is reviewed to assure that the requirements as stated in the ICD have been verified. The Verification Checklist is signed-off for these items.

After this detailed in-house review, the Customer is offered the opportunity to participate in a detailed review of the final data (see large arrows in Figure 8-6 for these Customer insight activities). After all reviews are over SSI signs the Certificate of Facility Readiness (COFR) as defined in Section 8.4.4. The COFR is typically generated approximately one month prior to facility occupancy.

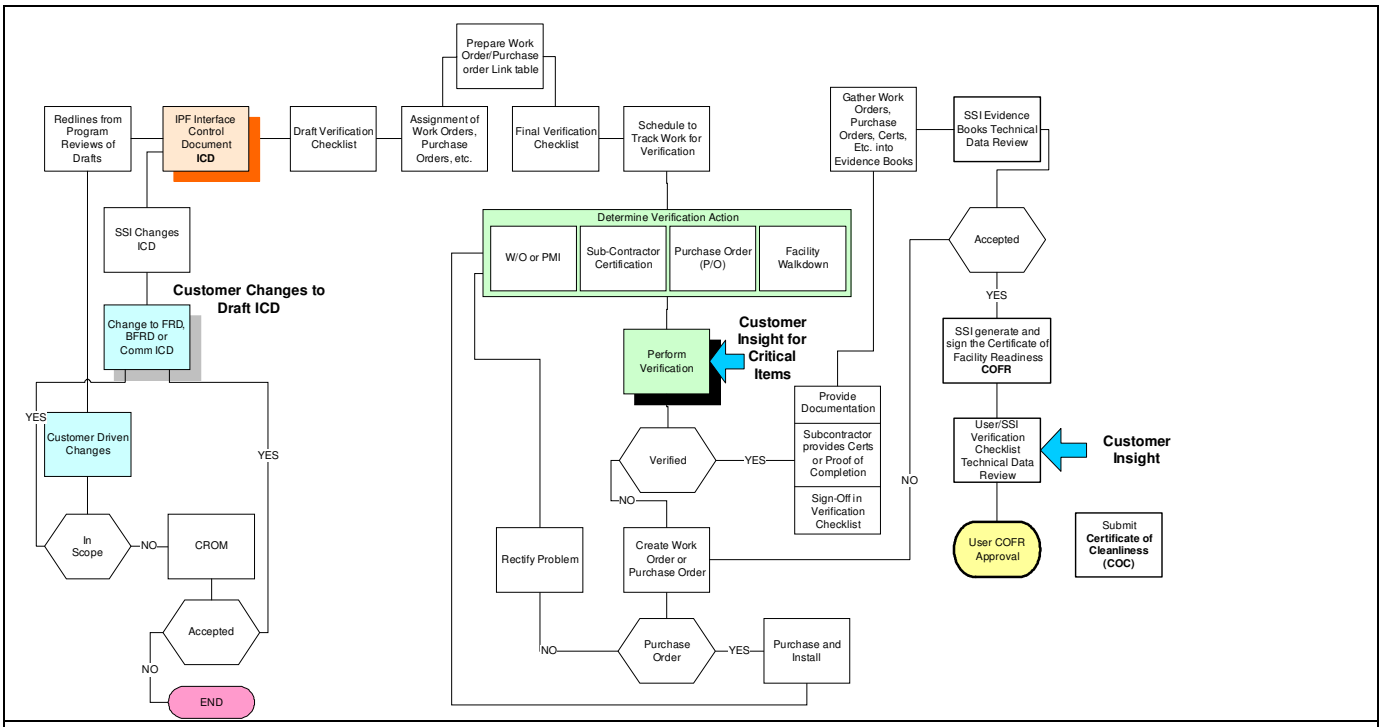


Figure 8-6: Facility Verification/Certification Process

8.4.3 THE VERIFICATION CHECKLIST

As discussed earlier, after the ICD is signed, SSI prepares the Verification Checklist to provide a controlled mechanism to sign-off on each requirement's verification. This happens both in the internal SSI review and the user final review. The structure of the Checklist is shown in the following figure:

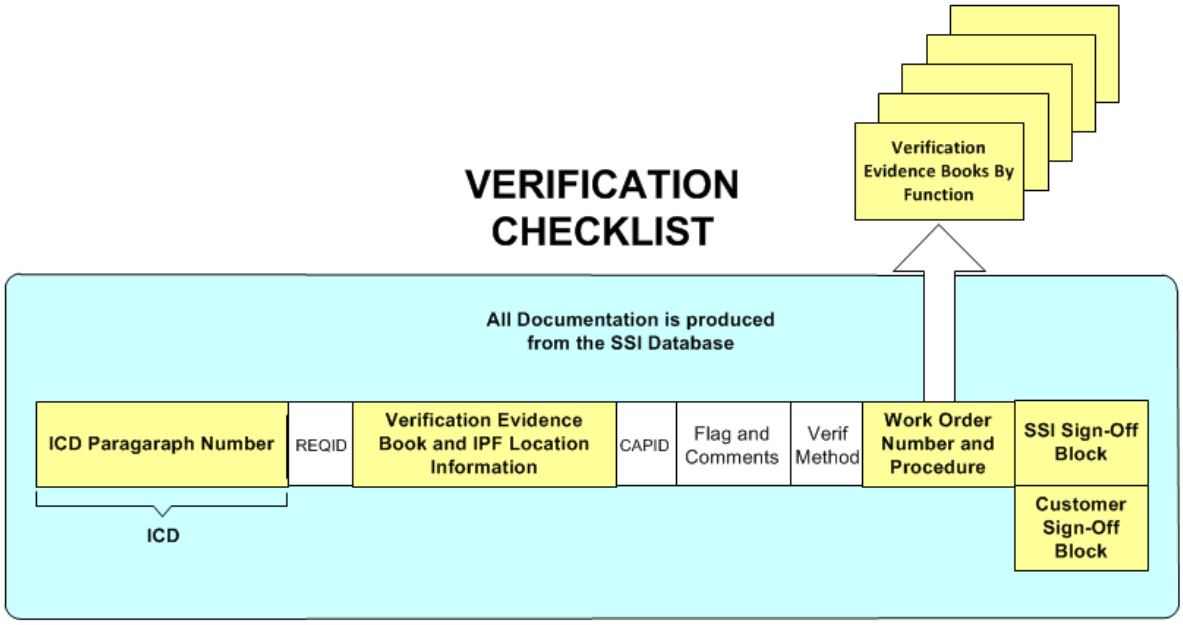


Figure 8-7: The Verification Checklist Structure

The utility of the Verification Checklist is that it provides the four primary ingredients that the user desires:

- the Requirement listed by User Requirement Paragraph number
- the Verification Evidence book number to look for the data supporting the verification
- The Work Order or other document and/or Purchase Order that was associated with the verification
- a Sign-off block which, after the review is over, provides assurance that each requirements verification data was reviewed and approved.

If, during the review process, the customer is not satisfied with the resulting data, a decision is made at that time to do one of three things:

1. Decide that it is "good enough" as it is
2. Write a Deviation which will be included in the final COFR.
3. Identify it as a "Significant Item" and prepare an Action Plan for resolution. These Significant Items will be presented at the Ground Operations Readiness Review (GORR)

8.4.4 THE CERTIFICATE OF FACILITY READINESS (COFR)

The COFR is the final document of the verification process. Once signed by the SSI Director of Operations it signifies that all parties are satisfied (perhaps with identified exceptions) that the facility is ready to support the mission.

The COFR is composed of the following parts:

A. Support Objectives

B. Readiness Process

C. Groundrules and Assumptions

D. System Identification Tables (Appendix A)

E. Security

F. Safety and Environmental Plans

G. IPF Facility Open Item Status

H. Items Open for the Pathfinder 2 Mission (Appendix C)

I. Significant Issues, Concerns, Unexplained Anomalies, etc

J. Deviations (Exceptions), Waivers, Variances, etc (Appendix B)

K. Constraints

L. Summary

Appendix A – System Identification Tables

Table A: SLC-8 General Systems

Table B: SLC-8 Space/Access Systems

Table C: SLC-8 Handling Systems

Table D: SLC-8 Electrical Systems

Table E: SLC-8 Liquids Systems

Table F: SLC-8 Pneumatics Systems

Table G: SLC-8 Environmental Systems

Table H: SLC-8 Communications Systems

Table I: SLC-8 Security Systems

Table J: SLC-8 Safety Systems

Appendix B – Handwavers, Deviations and Waivers