



National Aeronautics and Space Administration
John F. Kennedy Space Center, Florida

Launch Services Program

Launch Services Program (LSP) Capabilities Handbook

EXECUTIVE SUMMARY:

This capabilities handbook defines the available services the LSP can provide government or commercial entities. It will define the types of services, policies, functions, and operating structure.

Process Reference List				
Document Number		Document Title		
NPD 8610.7		Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions		
NPD 8610.23		Launch Vehicle Technical Oversight Policy		
NPD 8610.24		Launch Services Program Pre-Launch Readiness Reviews		
LSP-P-321.01		Engineering Review Process (ERP)		
LSP-PLN-353.01		Launch Services Program Risk Management Plan		
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Introduction

NASA's Launch Services Program (LSP) is offering a capabilities handbook in order to expand its customer base and assist these customers in maximizing their mission success by using NASA LSP's unique expertise. While LSP believes that providing full launch services to customers is the best way of supporting them, it recognizes that in some cases full LSP provided launch services are not always going to meet every customer's needs. LSP's capabilities handbook provides customers customizable ad hoc services to include facilities, expertise in launch vehicle engineering, safety and mission assurance, and mission management. Customers have included Jet Propulsion Laboratory (JPL), Goddard Space Flight Center (GSFC), and Johns Hopkins University Applied Physics Laboratory (APL), who are conducting a launch by means other than LSP's contracting mechanisms. Other types of services will include providing technical assistance to the developers of new launch systems, providing launch day control rooms, and technical or management expertise to non-traditional customers, such as the US Space Force or Commercial Resupply Services (CRS).

1 Scope

The LSP can provide the capabilities defined in this handbook to traditional or non-traditional customers where the support is less than the end-to-end launch service provided by the LSP under an LSP-managed launch services contract; i.e. NASA's Launch Services (NLS-II) contract or VCLS Acquisition of Dedicated and Rideshare Launch Services (VADR) contract. This would include providing consulting on launch services where LSP will likely not be provided with sufficient technical data for equivalent depth of penetration in order to perform its typical insight and oversight per [NPD 8610.23](#) and launch management readiness reviews per [NPD 8610.24](#). Providing the capabilities within this handbook means the launch service is not managed by LSP under the LSP contract, the Launch Services Program, in an advisory capacity to a Project or customer, is available to provide technical evaluation, recommendations and risk assessments without taking responsibility for launch vehicle mission success. The decision to accept LSP's recommendations, evaluations, and risk assessments as a result of a capability in this handbook will be at the discretion of the customer. Support for services will be supplied from resources already dedicated to LSP, subject to availability, unless the customer is providing funds, the agreement is sufficiently large and of a long enough duration to warrant augmenting the staff. Agreements using this capabilities handbook are required when services are more than a single event/activity with very short duration. These agreements may be through either a Memorandum (e.g. MOU, MOA), an LSP documented Category 1 Certification Plan, or appropriate partner document. Level of approval authority for any agreements will be determined on a case-by-case basis depending on the effort and the organizations involved. If the customer requests LSP to perform an [NPD 8610.23](#)-level of effort, then LSP would work to establish a full launch service on the LSP NASA Launch Services (NLS-II).

2 Overview of Services

LSP's capabilities handbook is an "as available" service to government and commercial organizations, providing expertise in mission management, safety and mission assurance, overall systems engineering and/or specific disciplines and launch campaign expertise and facilities; e.g. flight design, systems safety, launch day control rooms etc., as requested.

a. Supplemental Mission Advisory Risk Team (SMART)

For NASA spacecraft projects and nontraditional customers who contract their launch service through means other than an LSP Launch Service contract, the LSP offers consultation services to provide technical evaluation, recommendations and risk assessments. As with all NASA missions, LSP has a primary role for the agency to evaluate options for LSP provided launch services. In these cases where the Agency is seeking an atypical launch service, the LSP will aid the Spacecraft Project in evaluating those services as well. This is part of the advance planning pre-mission authorization to proceed (ATP) efforts of the LSP. These consultation services are provided by formulating an LSP internal team known as the Supplemental Mission Advisory Risk Team (SMART). This team can advise customers on mission management functions, launch campaign management, launch day operations, safety and mission assurance, range safety compliance (dependent on launch site), quality and quality system related matters and day of launch on console support. However, the LSP will not give a "go" for launch under any advisory service. LSP will not be responsible for mission success under any advisor capacity. These services can apply to launch vehicles currently used by NASA/LSP and to launch vehicles that are not in the LSP available fleet (e.g foreign launch vehicles that are part of an international cooperative mission; USAF's Minotaur family).

The LSP will assist the customer project office in its determination of flightworthiness for those items, mutually agreed upon, to be assessed by LSP. Significant data is required from the customer's launch service contract and provided to the LSP to make this level of evaluation. Reporting of risks by LSP shall be coordinated with the Project or Customer. In the event of an LSP finding of residual technical risk, the LSP will strive to develop and evaluate the range of mitigation options and offer a coherent go-forward plan. For issues or findings identified by the LSP, which the Project is resolving to make their flight worthiness determination, the LSP will participate by bringing its recommendation to the requested forum in the requested format. The LSP reserves the right to maintain the Intellectual Property, tools and products utilized to provide recommendations. MOAs which document SMART agreements with NASA organizations will include a statement that the LSP SMART findings will be briefed at the appropriate readiness review to ensure visibility to the mission stakeholders; i.e., Science Mission Directorate (SMD), Office of Chief Engineer (OCE), Office of Safety and Mission Assurance (OSMA).

The SMART team may consist of a Mission Manager, an Integration Engineer or a Vehicle Systems Engineer. The Mission Manager of LSP will provide mission management advice, if required, and typically be the principal interface with the spacecraft customer project for advisory services. The proper technical team structure will be determined based upon the customer's requirements, LSP's available resources and type of advisory service requested.

Refer to **Appendix SMART** for a detailed list of possible tasks.

b. Flight Analysis

Through LSP's Flight Analysis Division, the LSP can provide customers with a variety of analytical support including Independent Verification and Validation (IV&V) services. This work involves LSP analysts developing independent models and simulations to assess the validity of the spacecraft project's and/or a launch service provider's analysis. Each discipline performing IV&V will define the best modeling approach and methodology to be used, as well as the model validation success criteria. Analytical support could be part of a SMART advisory role, or it could be a stand-alone service. Significant data is required to be provided to LSP from the customer's analyses and/or the launch services company for LSP to make this level of evaluation.

Refer to **Appendix Analytical Disciplines and Tasks** for a full list of analytic disciplines and examples of specific tasks for this service.

c. Independent Review Team (IRT)

NASA or Government projects may require technical personnel to assist them on Independent Review Teams (IRT) for launch activities or launch vehicle related hardware. LSP can offer to include a member on an IRT or in unique cases could form an IRT for a specific topic. Specific topic IRTs would typically be for spacecraft using common systems with launch vehicles. Examples: HAS/HyBoLT IRT, Pluto New Horizons Star 48 Upper Stage Review.

d. Launch Vehicle Development Consultation

Launch Vehicle Development Consultation services entail providing assessment and advice to existing and/or emerging launch service providers in order to assist them in the development of their launch systems that are not currently on an LSP contract. This assistance will normally include review and assessment of the data presented by the providers through documentation, design reviews, and Technical Interchange Meetings (TIM). Each LSP participant in a review is required to write an assessment of the data presented in his or her area of expertise. This assessment will be included in an ERS, and contain highlights of strengths and concerns identified by the participant. In addition, it will include areas where LSP could

potentially provide additional help, and any additional documents (analyses, drawings, specifications) desired for review.

This service was initially done for Orbital's Taurus II and ATK's for the Space Launch Vehicle (SLV) A and B. Other examples include LSP participation in the Minotaur IV+ development as part of the Integrated Product Team (IPT) for the first mission and the Commercial Orbital Transportation Services (COTS) advisory team. Potential activities of this services include design review attendance, Test Like You Fly assessments, elements of a launch vehicle certification and launch system design assessments that are mutually agreeable to the service provider and LSP. The NLS II contract enables, when requested by the provider, LSP's advice to contracted companies for new vehicles not yet on contract. In addition, the LSP PRCB and NASA Flight Planning Board has approved a strategy to perform [NPD 8610.7](#) Category 1 Certification of new orbital launch vehicles from any U.S. provider with a U.S manufactured vehicle. Category 1 Certification is a risk assessment that results in recommendations to the providers. In a case where a new provider cannot meet the requirements to initiate a Category 1 Certification, LSP may provide services after a screening process which prevents the over extension of LSP resources on products that have little or no chance to enhance NASA's future ability to provide launch services for science and exploration missions. Ad hoc attendance by LSP personnel at widely attended launch vehicle development reviews is available without an agreement or plan based on personnel availability.

The Launch Services Development and Risk Manager will initiate these services and a Vehicle Systems Engineer (VSE) from the Fleet Systems Integration Branch will typically be the principal interface with launch service providers for these services. The advisory team will typically consist of a small team of engineers led by the VSE. The composition of the team will vary depending on the stage of the development of the launch vehicle and specific areas of assessment.

Refer to appendix **Launch Vehicle Development Consultation** for further details on activities performed from this advisory service and for criteria to undertake this service.

e. Comm and Telemetry Services (Hangar AE at KSC & B836 at VAFB)

As LSP's ground data station and communications center, Hangar AE at KSC and B836 at VAFB (for west coast launches) offers a wide range of ground support services for a customer's unique needs during any phase of launch operations. These services include but are not limited to real-time video, voice and data, control room and ground support facilities, flight operations coordination and utilization of either facility's telemetry lab capabilities. For all service needs, a single point of contact is provided to the customer to gather and ensure implementation of customer requirements. In addition, this facility can provide connectivity to any NASA center, the Western and Eastern Range, commercial launch providers, downrange sites and others to fulfill the customer's communication requirements. Hangar AE and B836 provide identical capabilities to support launches on the east (Hangar AE) or west coast (B836).

Refer to **Appendix Comm & Telemetry (Hangar AE)** for a full and detailed list of services that can be provided.

f. Launch Site Integration Support Services

The Launch Site Integration Branch (LSIB) provides spacecraft customer launch site support, including spacecraft-to-launch vehicle integrated activities. A Launch Site Integration Manager (LSIM) serves as the primary point of contact providing launch site processing expertise and knowledge of launch site services to the customer. A few examples of the services are contracting a spacecraft processing facility, scheduling the range, and arranging support from other contractors. LSIB draws expertise from missions such as EFT-1, CRS missions (ORB-4, OA-6, OA-7), and over 20 years of LSP missions, such as Parker Solar Probe and InSight. LSIMs are experienced with launch site all over the world and are stationed at Kennedy Space Center and Vandenberg Air Force Base.

Refer to **Appendix LSIB** for details on the facilities and a more comprehensive list of services and support provided.

Appendix SMART

Supplemental Mission Advisory Risk Team Functions	
Mission Management Functions	<ul style="list-style-type: none"> - Mission budget development - Mission Requirement Document development - Interface Control Document (ICD) development - Mission Requirement Verification - Payload Safety documentation - In these cases where the Agency is seeking an atypical launch service, the LSP will aid the Spacecraft Project in evaluating the potential services
Launch Campaign Management	<ul style="list-style-type: none"> - Readiness review process - Launch management structure - Launch day requirements definition & categorization - Status checks and Go/No-Go Calls - Communications protocol - Polling structure - Recycle requirements - Mission Dress Rehearsal process - Payload Processing requirements development and/or implementation
Day of Launch Operations	<ul style="list-style-type: none"> - Provide a Senior Systems Engineer to advise the Project manager. - Provide Systems Engineer(s) to interface with the launch team as requested (for technical purposes. Launch team will not contain any launch management functions). - Provide observations on launch vehicle telemetry, if made available by the customer, to the designated counterpart. Recommendations will be provided as requested by the customer.
Safety and Mission Assurance	<ul style="list-style-type: none"> - Mission Assurance issues and risk assessments - Safety Documentation - Ground Processing/Operation Safety - Range Safety Compliance (launch site dependent)

Quality and Quality Systems-Related matters	<ul style="list-style-type: none">- Launch site surveillance- Production site surveillance- Procedure review- Nonconformance review- Mission Success Review (MSR)/Hardware Acceptance Review/ (HAR)/Pedigree review support- Vehicle Subsystem Turnover Review (VSTR) support- Audit support- Limited Life Item Tracking- Government-Industry Data Exchange Program (GIDEP) Tracking- Mishap preparedness and contingency planning
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Appendix Flight Analysis

Flight Analysis - Analytic Disciplines and Tasks	
Flight Design	<ul style="list-style-type: none"> - Assess trajectory design and associated vehicle performance elements - Develop 3DOF Trajectory Model. - Validate model against performance reports and flight data. - Validate launch provider trajectory design results – including vehicle margin and trajectory constraints - Define trajectory requirements and analysis inputs - Review/verify injection accuracy
Guidance, Navigation & Controls (GN&C)	<ul style="list-style-type: none"> - Develop and validate high fidelity nonlinear time domain simulation to assess controllability and control system performance. - Develop and validate high fidelity linear frequency models to assess stability. - Rigid and flexible body dynamics analysis (e.g., spacecraft separation) - Assess adequacy of guidance, navigation, and controls (GN&C) design - IV&V has been performed on the following items for, advisory tasks: <ul style="list-style-type: none"> o Controllability o RCS gas budget o Separation analysis o Injection accuracy - Develop and validate high fidelity time domain software model.
Flight Software	<ul style="list-style-type: none"> - Assess adequacy of flight software (FSW) design, testing and implementation <ul style="list-style-type: none"> o Assess processes and practices against industry standards o Maintain cognizance of the impact of mission requirements on flight software o Evaluate algorithm/code changes o Evaluate new software capabilities o Review and assess FSW test procedures and results
Thermal	<ul style="list-style-type: none"> - Develop integrated Spacecraft/Launch Vehicle thermal analyses - Develop thermodynamic analysis to validate propellant conditioning - Develop aeroheating and plume heating models and validate against LSC contractor data - Develop payload fairing ECS models to predict gas conditioning and humidity

<p>Fluids</p>	<ul style="list-style-type: none"> - Develop Venting Analyses - Develop ECS impingement analyses - Develop Computational Fluid Dynamics models for external and internal flows - Develop propellant slosh models
<p>EM/RF</p>	<ul style="list-style-type: none"> - Develop RF Link Analysis - Develop mission failure probabilities for space radiation environments - Coordinate Launch processing facility magnetic surveys for magnetic sensitive payloads - Coordinate lightning monitoring for payloads - 3D full wave electromagnetic simulation to assess for LV, SC and Range electromagnetic effects (i.e. lightning effects, radiated emissions of a new RF sources, magnetic environment concerns, cavity reverberation analysis, etc.) - Circuit analysis/simulation to assess LV, SC and Range electromagnetics effects (i.e. electrical grounding concerns, lightning effects, transient voltage suppression systems, RF coupling effects, etc.)
<p>Loads</p>	<ul style="list-style-type: none"> - Implement and validate generic CLA (with KSC code) using LSC contractor models and forcing functions - “End to End” Validation of Coupled Loads Analysis (CLA) includes: <ul style="list-style-type: none"> o Review of launch vehicle model validation & forcing function o Independent methodology implementation - Review LSC contractor dynamic event selection and associated forcing function development
<p>Dynamic Environments</p>	<ul style="list-style-type: none"> - Perform analyses/assessments to verify spacecraft and launch vehicle components qualification to high frequency random vibration, shock and acoustic environments - Perform test and post flight data review/analysis to develop and verify acceptance and qualification dynamic test criteria - Develop analytical models and perform dynamic analyses to characterize high frequency structural responses
<p>Strength and Fatigue/Fracture Mechanics</p>	<ul style="list-style-type: none"> - Perform structural analysis to verify hardware integrity and certification stress margins - Develop linear and non-linear finite element models/analyses - Support structural testing for qualification and acceptance of flight hardware - Perform fatigue and fracture mechanics analyses to assess/verify safe-life predictions

Appendix Launch Vehicle Development Consultation

Launch Vehicle Development Consultation	
Test Like You Fly Assessments	A thorough review of testing strategies, plans, and/or test data to assess if the qualification or acceptance testing performed to show flightworthiness adequately reflects the manner in which the environments will be encountered, or the functions performed.
Category 1 Launch Vehicle Certification	A generic Category 1 Certification Plan can be provided upon request.
Services Criteria	<ol style="list-style-type: none">1) U.S. launch vehicle from a U.S. company, with existing funding thru the predetermined development milestone.2) Systems Requirements Review Level of maturity with a credible schedule (based on vehicle concept, partnerships in place, company experience, test schedule etc.) for achieving a first launch attempt within 3 years.3) Willingness to give NASA substantial insight into the launch vehicle development activities, in requested area(s) of assessment, by providing items such as company documents (qualification plans, risks, analyses memos, environments definitions, etc.) and/or access to major design reviews, testing, IPT meetings, and any regularly scheduled company status meetings.4) Vehicle can place at least 30 kg of payload to a 500 km circular orbit.

Appendix Comm & Telemetry (Hangar AE)

Voice Services	
Redundant and reliable Voice Communications	Reliable communications during critical ops via redundant voice system. Fully redundant voice switch capable of supporting T1's, Voice over IP, Dial Ins, Dial outs and others.
Established Voice Net Connectivity	Voice Net connectivity and T1 communication to all NASA centers, (NLS-II Contract) launch service contractors, Spacecraft MOC, NASA and commercial payload processing facilities, and the Eastern and Western AF Range.
Voice Net Recordings	Record 96 voice nets simultaneously and provide audio playback for simulations, rehearsals or customer reviews of operations.
LSP Personnel Support	LSP personnel support during mission operations to actively monitor system and implement configuration changes.
MOCS Matrix	Provide a custom easy-to-use Voice Application with individually customizable voice net permissions.
Console Headsets and VDL's	Provide wireless headsets, split console headsets for shared console utilization and VDL's for critical personnel.
Video Services	
264 HD Video Sources	Can receive up to 264 high-definition video signals from commercial launch providers, spacecraft processing facilities, tracking cameras.
Console Video	Display up to eight unique, customizable size-and-location video windows on each operations console within the facility.
Password Protected Streamed Video	Stream up to 8 password protected videos over internet.
Deployable Cameras	Provide deployable cameras and transmit view back to AE and/or B836.

PAO Video booth	PAO video booth with live HD feed as well as uplink and downlink of simultaneous video sources for broadcasting and streaming.
Multi View Video Displays	Create multi view video displays and transmit as needed.
Timestamped Video	Implement time lapse and/or burned in timecode with video.
Recorded Video and Playback	Record up to 16 of mission's video channels simultaneously and provide playback of critical mission operations (e.g roll out, tanking ect.) Can also preset a recorder for up to 31 next day or unattended operations.
BCDS/EVCDN Distribution	Provide BCDS/EVCDN views to locations around KSC such as the MOSB, EOC, RADCC, etc.
Data Services	
Distributed and Monitored Network Connectivity	Provide network connectivity, distribution and monitoring for telemetry, data, voice and video assets between launch pads, processing facilities, other NASA centers and commercial launch monitoring facilities both foreign and domestic.
Connectivity Support	Provide network connectivity during all phases of launch and throughout a spacecraft's stay to support launch vehicle and spacecraft critical operations.
Dedicated Mission Comm Engineer	Provide single point of contact of for all spacecraft customer communication requirements and interface with communications organizations to meet customer support needs.
Redundant Communications	Provide redundancy during critical operations by utilizing diverse routing platforms and the replication of data between both Hangar AE and Building 836.
Data Archival and Retrieval Infrastructure	Provide the infrastructure for data archival and retrieval for both real time, post operations, and enable access both locally and remotely.

Flight Ops Services	
Down Range Acquisitions and Tracking Assets	Provide services to procure and assess launch vehicle and spacecraft down-range data acquisition and utilize land, air, and water deployable tracking services. Collaborate with other NASA center, government agencies and foreign space agencies for down range tracking services.
Telemetry Services	
Processed, Recorded and Displayed Telemetry	Receive, record, process and display telemetry data from prelaunch checkout, through launch, spacecraft separation and orbital insertion.
De-commutated Telemetry	De-commutate real time telemetry into individual engineering unit measurements for real time monitoring.
Reformatted Telemetry	Reformat telemetry data streams based on customer requirements.
Spacecraft Data	De-interleave spacecraft data from a launch vehicle telemetry stream.
Customized Data Graphic Displays	Display data at launch operations facilities using graphical software tools and build customized data displays for customer needs.
Launch Vehicle Support	Provide connectivity to NASA centers, U.S Air force, commercial sites and networks downrange to support any vehicle from any location.
Best Source Selection	Select best source from multiple assets during launch.
Local RF Antennas	Utilize local RF antennas and receivers to capture test data without range coordination.
Multiple Channel Processing and Recording	Process and record multiple timestamped channels of data streams in parallel.
Receive Data from Multiple Sites	Receive data from multiple sites and assets to include the Range, TDRS Satellite Constellation and ground stations throughout the world.

AE Facilities	
Launch Vehicle Data Center's (LVDC'S)	Multipurpose control rooms developed to support multiple operations in parallel or single launches each with consoles that are fully custom configurable for voice, video, timing, telemetry and internet services.
	Provide bicoastal support by linking with NASA'S West Coast control Rooms at VAFB.
	Provide requested video views from launch pad, spacecraft processing facility, and tracking cameras on each console as well as mission video wall in each control room.
	Each console equipped with multichannel voice net instrument to provide viewing, talk, or monitor of 40 voice nets simultaneously with connectivity to NASA centers, launch providers, MOCS and the range.
	Provide access to processed telemetry data at each console through WinPlot (allows for comparison of real time vs archived data via graphs) and/or IRIS (allows users to build own display pages with web-based applications or widgets that display numeric engineering units, graphs, etc.)
LVDC1	23 console positions.
	Large central video mission wall and 2 room video cameras.
LVDC2	18 console positions.
	Large central video mission wall and 2 room video cameras.
LVDC3	28 console positions.
	Large central video mission wall and 2 room video cameras.
Mission Director's Center	Executive control room designed for senior managers' support launch operations.

(MDC)	Capable of supporting missions at both CCAFS and VAFB.
	Consists of consoles that are fully custom configurable for voice, video timing, telemetry and internet services.
	39 console positions.
	Dedicated area for 2 Public Affairs Officers.
	32-foot mission video wall.
	VIP Launch and Operations observation area.
Launch Site Support Trailer (LSST)	The LSST is a transportable engineering and spacecraft support center with capabilities for voice, data, telemetry services, timing, and video in remote locations. The LSST is designed with the flexibility to provide various capabilities that can be tailored to multiple user's requirements (e.g air-conditioned admin space at remote locations).
	The trailer only requires access to power and data transport (Fiber or Ethernet Services).
Telemetry (TLM) Lab	Telemetry ground station designed to receive; process and record ground and/or airborne telemetry from launch vehicle and spacecraft.
	Capable of supporting multiple and simultaneous launch vehicles from both the east and west coast facilities.
	Provides and maintains an online archive of launch vehicle telemetry from up to 15 years ago.
	User console area with 16 consoles with video displays.
Building 836 Facilities (VAFB)	
Launch Vehicle Data	Multipurpose control rooms developed to support multiple operations in parallel or

Center's (LVDC'S)	single launches each with consoles that are fully custom configurable for voice, video, timing, telemetry and internet services.
	Provide bicoastal support by linking with NASA'S East Coast control Rooms at CCAFS.
	Provide requested video views from launch pad, spacecraft processing facility, tracking cameras, etc. on each console as well as mission video wall in each control room.
	Each console equipped with multichannel voice net instrument to provide viewing, talk, or monitor of 40 voice nets simultaneously with connectivity to NASA centers, launch providers, MOCS and the range.
	Provide access to processed telemetry data at each console through WinPlot (allows for comparison of real time vs archived data via graphs) and/or IRIS (allows users to build own display pages with web based applications or widgets that display numeric engineering units, graphs etc.).
LVDC1	23 console positions.
	Large central video mission wall and 2 room video cameras.
LVDC2	18 console positions.
	Large central video mission wall and 2 room video cameras.
Mission Director's Center (MDC)	Executive control room designed for senior managers' support launch operations.
	Capable of supporting missions at both CCAFS and VAFB.
	Consists of consoles that are fully custom configurable for voice, video, timing, telemetry and internet services.
	32 console positions.
	Dedicated area for 2 Public Affairs Officers.

	32-foot mission video wall.
	VIP Launch and Operations observation area.
Launch Site Support Trailer (LSST)	The LSST is a transportable engineering and spacecraft support center with capabilities for voice, data, telemetry services, timing, and video in remote locations. The LSST is designed with the flexibility to provide various capabilities that can be tailored to multiple user's requirements (e.g air-conditioned admin space at remote locations.).
	The trailer only requires access to power and data transport (Fiber or Ethernet Services).
Telemetry (TLM) Lab	Telemetry ground station designed to receive; process and record ground and/or airborne telemetry from launch vehicle and spacecraft.
	Capable of supporting multiple and simultaneous launch vehicles from both the east and west coast facilities.
	Provides and maintains an online archive of launch vehicle telemetry from up to 15 years ago.
	User console area with 16 consoles with video displays.

Appendix Launch Site Integration Branch (LSIB)

Facilities	
PHSF	<p>The Payload Hazardous Servicing Facility (PHSF) located at KSC is a government owned processing facility capable of supporting hazardous operations.</p> <p>The ISO Class 8 capable servicing bay area is roughly 6,400 sq ft (107 ft x 60 ft 4 in), and has two 50-ton cranes with nominal hook heights of 74 ft 6 in. The airlock is ISO Class 8.5 capable, is roughly 4250 sq ft (85 ft x 50 ft 4 in), and has a 15-ton crane with a nominal hook height of 72 ft 6 in. A facility handbook is available with more extensive information on this facility can be provided by the LSIB.</p>
MOSB	<p>The Multi Operations Support Building (MOSB), located just north-east of the PHSF, is a facility designed to be the office area and control center for customers using the PHSF. It contains office area, support rooms, and a storage shed.</p>
RTGF	<p>The Radioisotope Thermoelectric Generator Facility (RTGF) is a 3,788 square foot facility located at KSC. It is used for storage, testing, and monitoring of RTGs/RHUs used in spacecraft programs.</p>
Hangar AE Electrical Ground Support Equipment (AE EGSE)	<p>Spacecraft ground support area at Hangar AE with raised-floor power, data, voice, and video connectivity for custom room configuration to support mission unique requirements.</p>
Other NASA KSC Facilities	<p>There are other facilities at KSC such as the Space Station Processing Facility (SSPF). Although not controlled by LSP, the SSPF has laboratory and cleanroom areas that can be scheduled and used as available. An example is the Planetary Protection Sample Analysis Lab.</p>
VAFB Lab 1	<p>Spacecraft ground support area with a controlled environment, raised-floor power, data, voice, and video connectivity for custom room configuration to support mission unique requirements.</p>

<p>VAFB Lab 1 Clean Room</p>	<p>Lab 1 is a 2,450 ft² (227.6 m²) temperature and humidity-controlled hardware processing area with a certified laminar flow clean room. The area outside the laminar flow clean room is maintained as a clean work area but has no cleanliness designation. The laminar flow clean room within Lab 1 is 775 ft² (72 m²) and can be certified to an ISO 14644-1 Class 7 or 8 standard.</p> <p>Lab 1 can accommodate limited hazards RF and small ordnance, with pre-coordination.</p>
<p>VAFB Lab 3</p>	<p>Spacecraft ground support area with a controlled environment, raised-floor, power, data, voice, and video connectivity for custom room configuration to support mission unique requirements.</p>
<p>Building 836 High Bay</p>	<p>The Building 836 High Bay is a large, 3-story high, open hangar area that serves principally as storage. Space can be made available for spacecraft nonhazardous storage.</p>
<p>Customer Office Areas</p>	<p>Office suites, conference rooms, and break rooms that provide areas for spacecraft customers' daily administrative activities are available at both KSC/CCAFS and VAFB.</p>
<p>Commercial Payload Processing Facility (PPF) contracting</p>	<p>Both coasts have commercial PPF options that can be procured. The LSIB has over 20 years of experience working with spacecraft teams to develop requirements, contract commercial PPFs (with the support of the LSP Procurement office) and manage commercial PPF operations.</p>
<p>Spacecraft Processing Support</p>	
<p>Commodities</p>	<p>Purchasing mechanisms and accommodations for fluids and gases: Propellants, oxidizers, gases (for test stands, purge, blanket pressure, etc.), isopropyl alcohol and demineralized water (cleaning).</p>
<p>Consumables</p>	<p>Purchasing mechanisms and accommodations for consumable items such as cleanroom garments, cleaning wipes, cleanroom paper.</p>
<p>Spacecraft Fueling Service</p>	<p>Purchasing mechanisms and accommodation to obtain a complete fueling service that includes ground support equipment, personnel, procedures, commodities, and support services required to load spacecraft propellants (e.g. hypergolic, gases, cryogenic, and xenon).</p>

Spacecraft Fueling Support Service	Purchasing mechanisms and accommodations to obtain support services required by customers that provide their own fueling equipment, personnel, and procedures. Support services include but are not limited to SCAPE, commodities, decontamination, hazardous waste disposal, hypergolic gas detection, and sampling & lab analysis.
Furnishings	Furnishings for cleanrooms, controls rooms, and offices.
Equipment	Light and Heavy Equipment used during processing such as purge equipment, tie down straps, dolly's, forklifts and trucks.
Services	
Launch Site Requirements Development	Expertise on the facility, support and services necessary for spacecraft processing at the launch sites. Includes local natural environment considerations, such as hurricane season (East Coast) or seismic restraining (West Coast). Also includes knowledge of the requirements, capabilities and processes of the local government and contractor organizations.
Spacecraft Operations Support	This includes a wide variety of applications. A few services are detailed below, but this does not include every capability.
	Scheduling support with Range and local contractors.
	Coordination with Range and local contractors for local activities that might impact spacecraft operations (e.g., other launch activities, controlled burns, resource conflicts, emergency preparedness protective measures, etc.).
	Sampling and analysis services, including sampling of commodities, environmental samples for cleanliness, and identification of contaminants. Completed using a variety of methods such as Non-Volatile Residue (NVR) plates, particle counters, and obtaining particulate analysis.
	Transportation services such as airfield support, equipment, security escorts. LSIB can schedule transportation from port of entry, if by sea or air, as well as between facilities during processing.

	Establish RF monitoring of the processing facilities or scheduling RF silence during transportation.
	Coordinate machine shop support or calibration services.
Launch Vehicle Contractor Launch Site Coordination	Experienced coordination with the Launch Vehicle Contractor (LVC) for integration, schedules and processes.
Launch Day Coordination	Extensive experience with spacecraft launch day operations such as console operations, countdown procedures, and integration with vehicle processes.

LSP Capabilities Handbook Points of Contact

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