NASA-Provided ELV Launch Services Ground Rules/Policy

This document provides additional information for NASA-provided launch services.

Any launch services provided by NASA will be procured and managed by the NASA/Launch Services Program (LSP) using government contracts.

Under this AO, the Proposer may not arrange alternate space access.

Under the provisions of the NASA Launch Service II (NLS II) contract, the launch service includes the launch vehicle (LV) and associated standard services, non-standard services (mission unique options), all engineering and analysis, and minimum performance standards. LSP also provides technical management of the launch service, technical insight into the LV production/test, coordinates and approves mission-specific integration activities, provides mission unique LV hardware/software development, provides payload-processing accommodations, and manages the launch campaign/countdown.

At the appropriate time following mission selection, LSP will competitively select a launch service for the mission based on customer requirements. The launch service is awarded to the Contractor that provides the best value in launch services to meet the Government's requirements based on technical capability/risk, reasonableness of proposed price, and past performance. Accordingly, assumption of a specific launch vehicle configuration as part of the AO proposal will not guarantee that the proposed LV configuration will be selected unless there is firm technical rationale for sole source. Any such rationale should be clearly identified and explained in the proposal.

All NASA-procured launch services are to be consistent with NASA Policy Directive (NPD) 8610.7D, NASA Launch Services Risk Mitigation Policy. Expendable launch services acquired by NASA will be managed in accordance with NPD 8610.23C, Technical Oversight of Expendable Launch Vehicle (ELV) Launch Services and NPD 8610.24C, Launch Services Program (LSP) Pre-Launch Readiness Reviews. These NPD's can be accessed through the URLs:

http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=8610&s=7D
http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=8610&s=23C
http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=8610&s=24C
Or, they are located in the AO library.

Dual manifested or secondary payloads will not be considered under this AO.

Contributed Domestic or Foreign Launch Vehicles

Foreign launch vehicles will not be considered under this AO.

Launch Vehicle Information/Configuration/Performance

The Offerors should select the minimum launch service performance class that meets their requirements including adequate performance margins. Attachment 1 describes these performance ranges in terms of mass to orbit (kilograms) for a range of C3 values. The performance data in Attachment 1 is based upon the NASA Launch Services II (NLS II) contracted performance data and is to be used for planning purposes only. Vehicle performance defined the "High Performance" curves exceed the capability of a standard class launch vehicle and are subject to the Cost Cap Adjustments defined in the AO (see sec 5.9.2.1) For variations from

what is found in Attachment 1, refer to the contact listed in this document for an assessment. The Offerors should specifically state in the proposal the launch service performance range to meet their requirements for this mission. For a NASA-provided ELV launch service, the proposal must be designed to the enveloping launch vehicle characteristics and capabilities provided in Attachment 1.

Launch Service Costs

The New Frontiers Program, within the Science Mission Directorate, will hold the launch service costs for any proposed mission requiring the baseline launch vehicle performance as defined in Attachment 1 of this summary, defined by the performance baseline curves in Figures 1 and 2. Any proposals requiring performance above baseline, as defined by the High Performance curves, or outside in Figure 1 and 2, will be subject to a Cost Cap Adjustments as defined in the AO Table 3 sec 5.9.2.1.

Services provided in the launch service costs to be covered by the New Frontiers Program are:

- the launch vehicle, engineering, analysis, and minimum performance standards and services provided by the NLS contract in place at the time of LV selection;
- mission integration;
- launch site payload processing;
- range safety support;

See Attachment 2 for a list of all services included in the New Frontiers AO.

See Attachment 2 for a list of launch services required for a mission utilizing radioactive material which is not contained in the baseline launch services costs. Additionally, an additional launch service mission-unique charge will be counted against the PI-Managed Mission Cost for missions utilizing radioactive materials. For estimated costs, see Table 4 in Section 5.9.2.

The New Frontiers LV budget set aside for this AO does not include funding for PI caused launch delays.

Evaluation Criteria

Attachment 3 shows a preliminary Evaluation checklist to be used as a guide for the evaluators during the proposal evaluation phase. This checklist should provide an indication of the types of information that are expected to be contained in the proposals. If the proposal does not provide sufficient information to be evaluated for each section, the launch vehicle section of the proposal may not be evaluated for full content and may be listed as a finding.

NASA Launch Services Program Point of Contact (POC) for Additional Information

Additional information including performance quotes, mission integration inquiries, and costs for non-standard services may be obtained from the point of contact below. Otherwise, questions must be directed as indicated in the Technical and Scientific Inquiries section of the AO.

Shaun Daly
Mission Manager
NASA Launch Services Program Code VA-C
Kennedy Space Center, FL 32899 Phone: 321-867-8400
Email: shaun.daly@nasa.gov

Attachment 1
Launch Service Characteristics/Capabilities

Performance Ground Rules (valid for both scenarios):

- The LV performance available on NLS-II generally does not include impacts associated with orbital debris compliance; this must be evaluated on a mission- specific basis.
  Depending on LV design, this could result in a significant performance impact to ensure full compliance with orbital debris policy.
- Guidance reserves have been allocated to account for 3-sigma flight performance.
- Performance is for a Baseline or Upper LV configuration where noted (see Attachment 2). Other non-standard, mission-unique hardware will require additional assessment.
- The mass of a separation system is assumed and is accounted for on the launch vehicle side. Proposers wishing to use a different separation system should contact the POC in this document for information on potential performance and cost impacts.

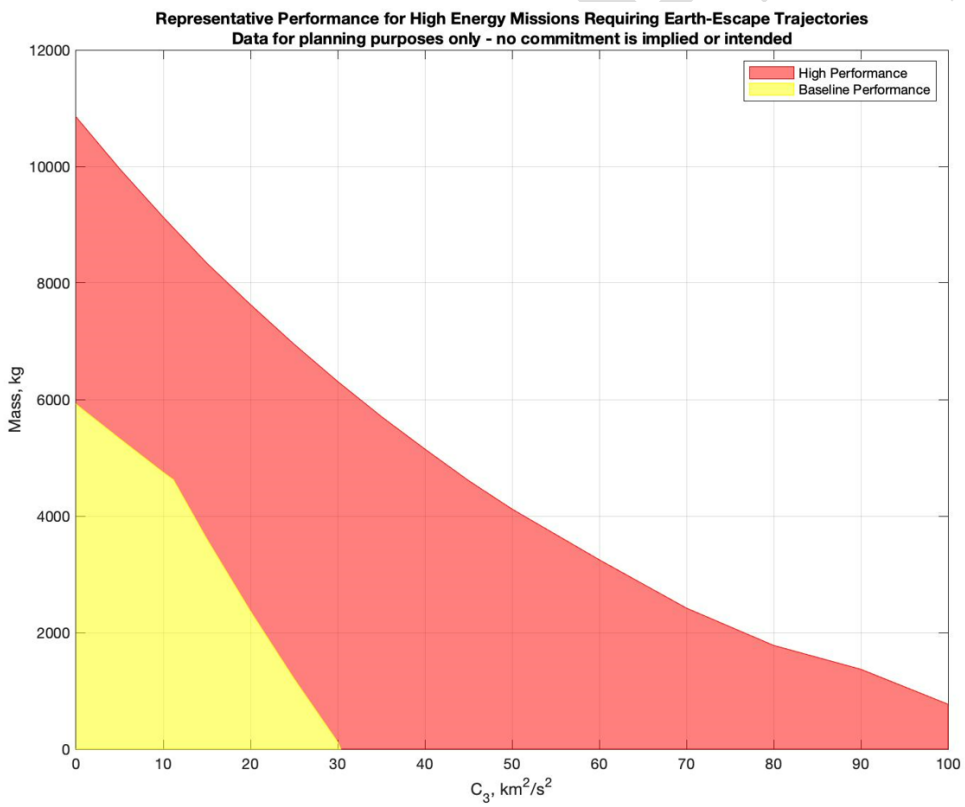

Figure 1: Constraining High Energy Performance Curves

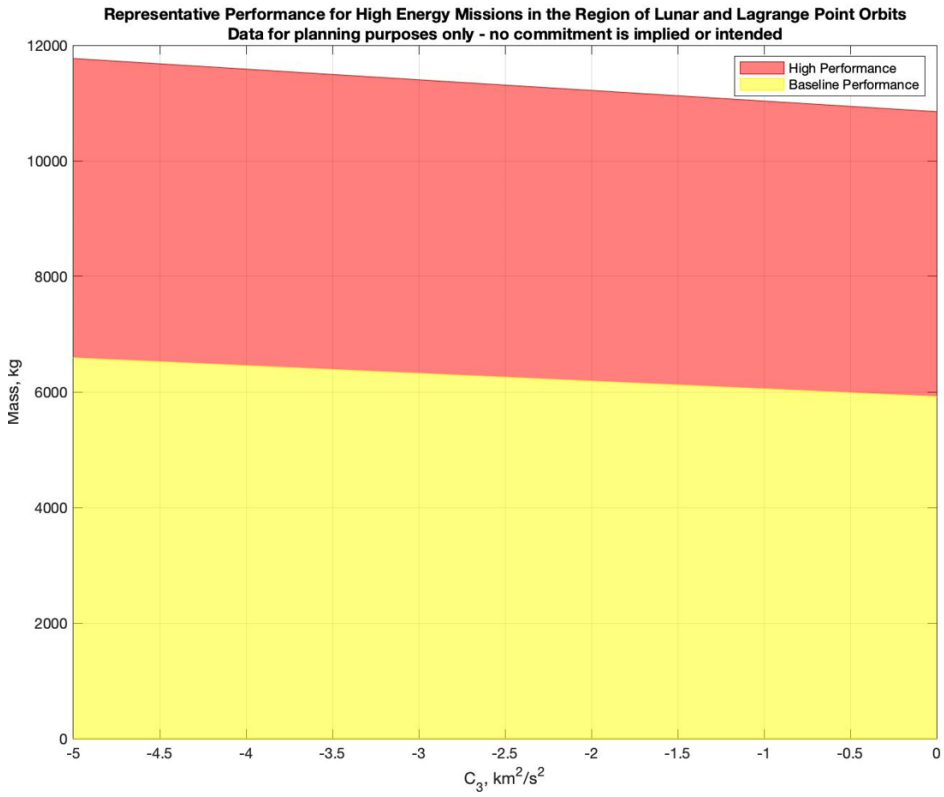

Figure 2: Constraining Near Escape Performance Curves

Payload Envelope:

Figure 3 shows the constraining static payload fairing envelopes that will enable compatibility with potential launch vehicle configurations projected to meet the performance capabilities shown in Figures 1 & 2.

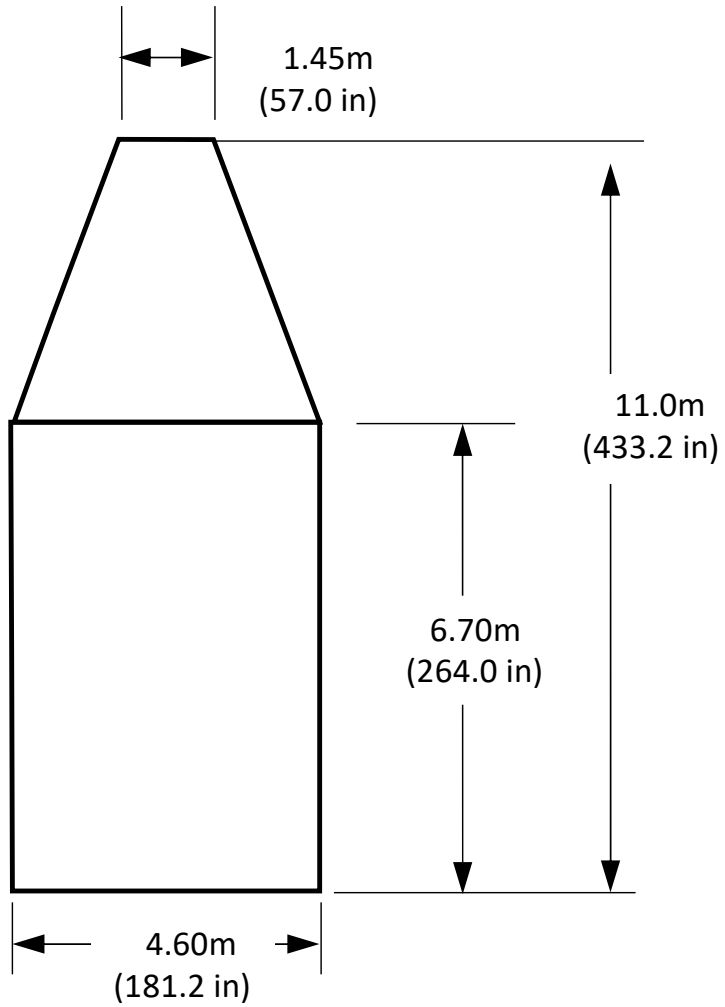

Figure 3: Constraining Fairing Static Envelope Dimensions

Launch Vehicle Enveloping Environments

CG Load Factors

Envelope	
Lateral (g's)	**Axial (g's)***
0.5	6.5
0.5	4.5
2	3.5
2	-1.5
0.5	-1.5
0.5	-2
-0.5	-2
-0.5	-1.5
-2	-1.5
-2	3.5
-0.5	4.5
-0.5	6.5
0.5	6.5

*** positive sign in axial load factor denotes compression**

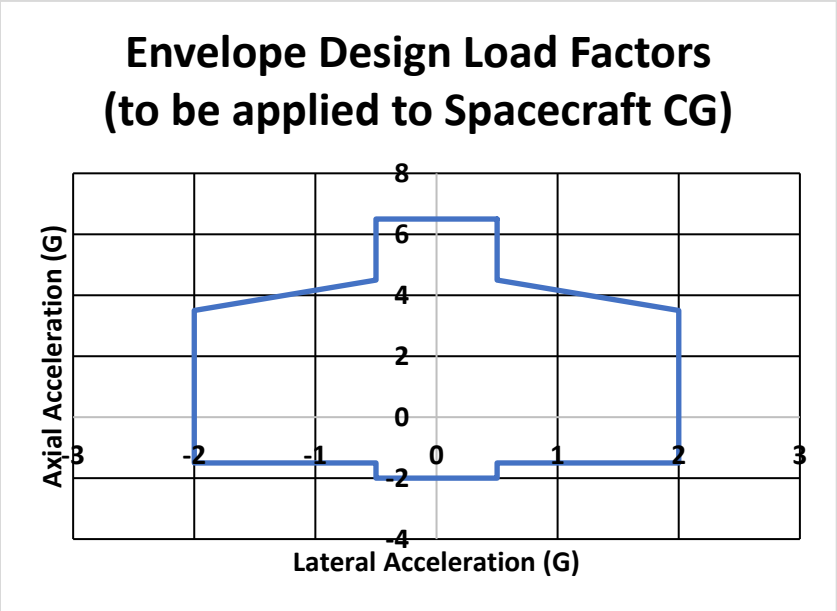

Figure 4: Design Load Factors (to be applied to CG of Spacecraft)

Equivalent Sine Environment is dependent on SC Mass:

Values for SC with mass between 1800-6000kg (if less than 1800kgs contact LSP POC)

Envelope			
Frequency (Hz)	Axial (g)	Frequency (Hz)	Lateral (g)
2	0.6	2	0.5
10	0.6	80	0.5
20	0.8	80	0.55
35	0.8	85	0.55
35	0.6	85	0.6
60	0.6	100	0.6
60	0.8		
82	0.8		
85	0.9		
100	0.9		

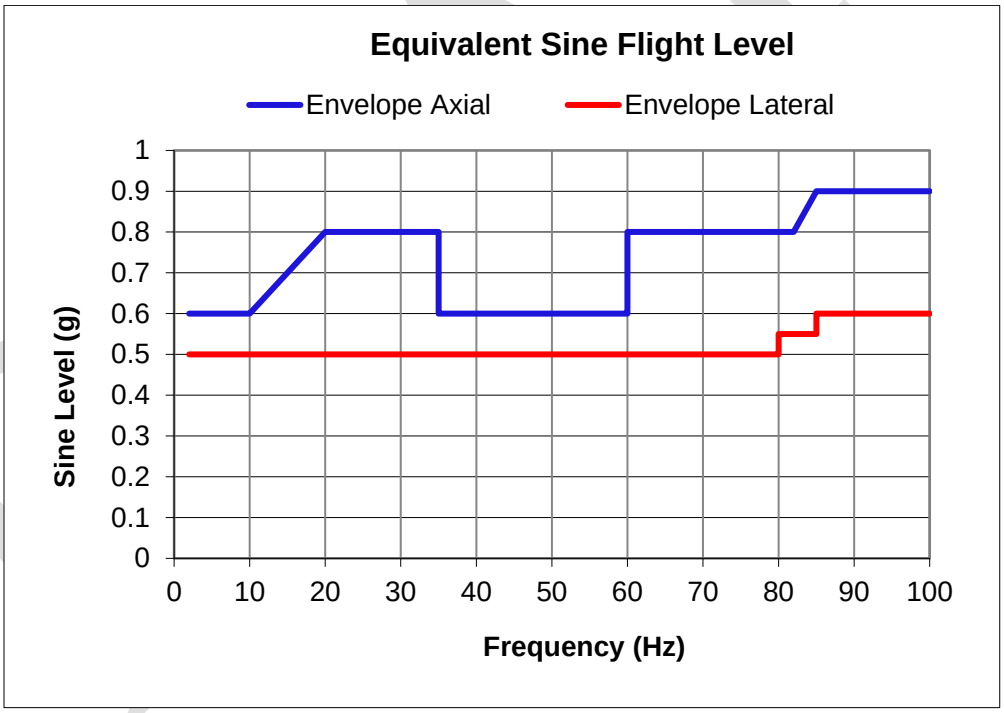

Figure 5.1: Equivalent Sine MPE Level at Spacecraft Interface

Equivalent Sine Environment is dependent on SC Mass:

Values for SC with mass between 6000-11000kg

Envelope			
Frequency (Hz)	**Axial (g)**	**Frequency (Hz)**	**Lateral (g)**
5	0.5	5	0.5
20	0.8	80	0.5
35	0.8	80	0.55
35	0.6	85	0.55
75	0.6	85	0.6
85	0.9	100	0.6
100	0.9		

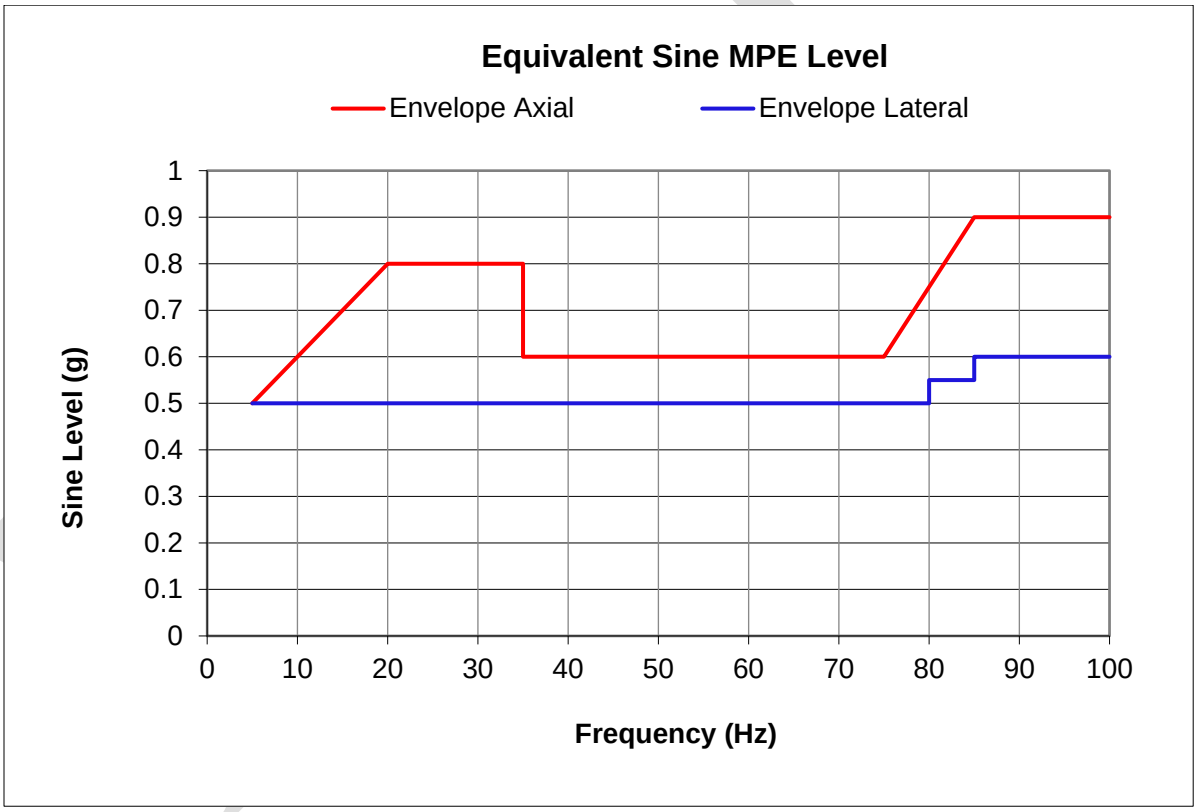

Figure 5.2: Equivalent Sine MPE Level at Spacecraft Interface

Random Vibration Environment:

Candidate LV Random Vibration Design Envelope (P95/50 MPE)	
Frequency [Hz]	**PSD [G^2/Hz]**
20	0.0044
100	0.0044
300	0.01
700	0.01
800	0.03
925	0.03
2000	0.00644
Grms	**5.13**

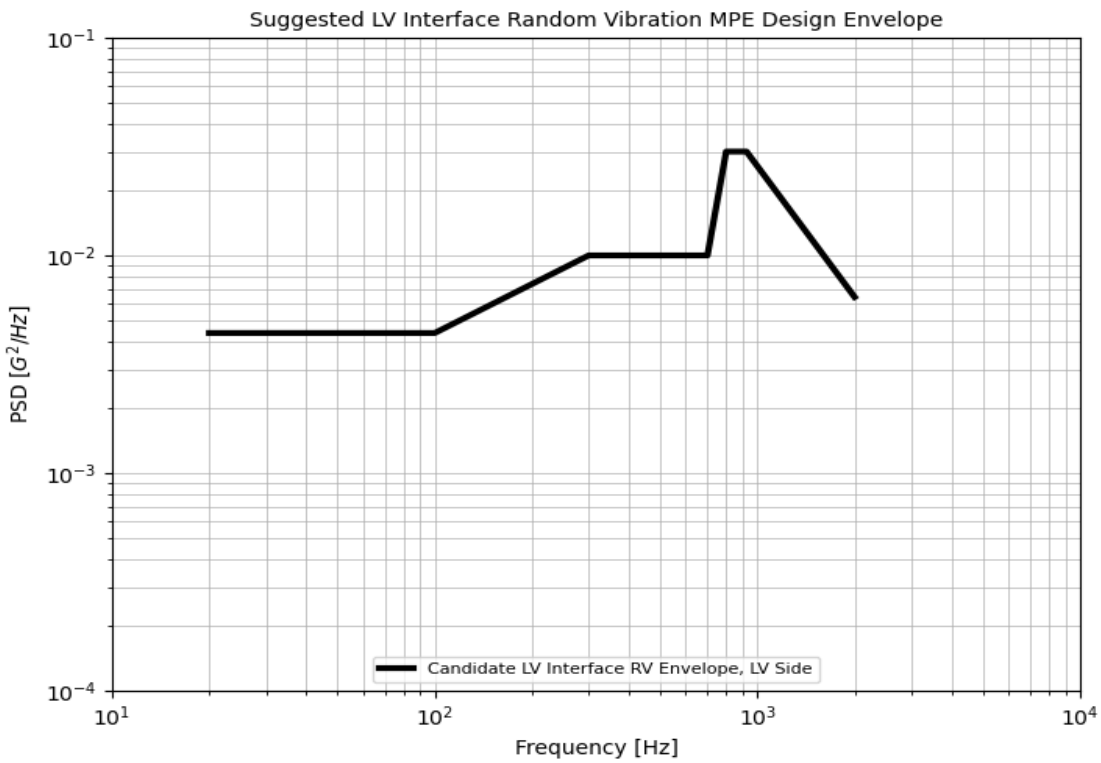

Figure 6: Random MPE Levels at Spacecraft Interface

Acoustic Environment:

Candidate LV Payload Acoustics Design Envelope (P95/50 MPE)	
Frequency [Hz]	**SPL [dB]**
25	120
31.5	125
40	126.5
50	127
63	127.5
80	128.3
100	130
125	131
160	131
200	131
250	130
315	128
400	126
500	124
630	122
800	119.5
1000	117.8
1250	116.4
1600	115
2000	113.6
2500	112.3
3150	110.9
4000	109.5
5000	108.1
6300	106.8
8000	105.4
10000	104
OASPL	**140.1**

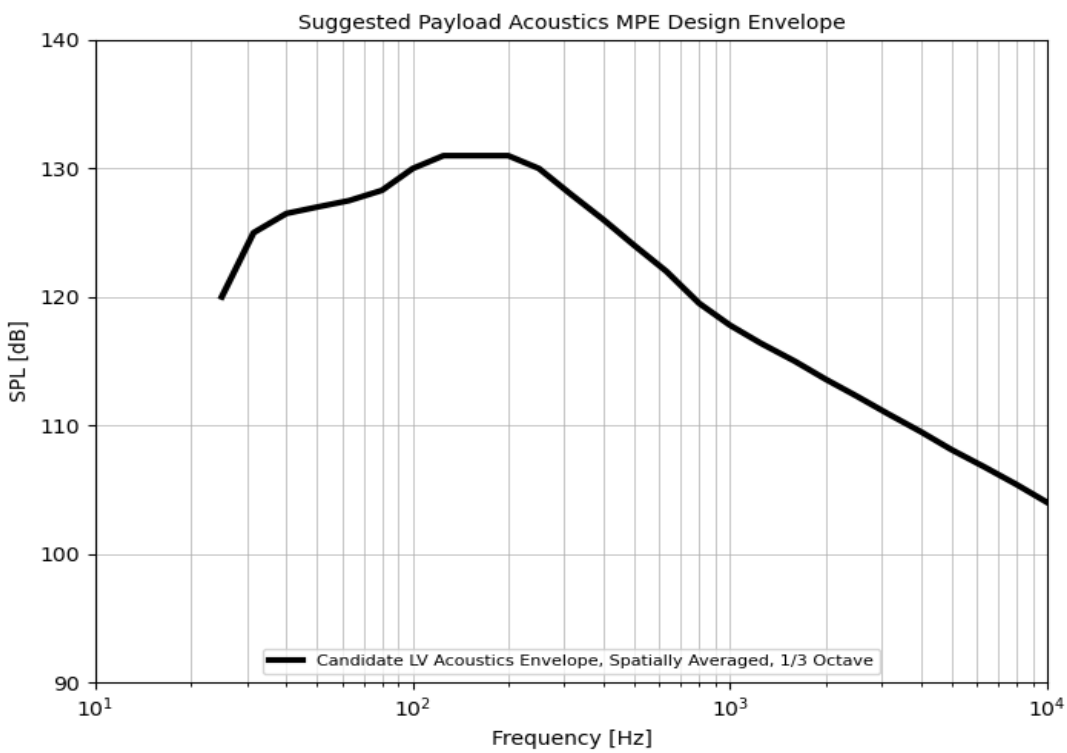

Figure 7: Payload Acoustic Levels

Shock Environment:

Candidate LV Separation Shock Design Envelope (P95/50 MPE)	
Frequency [Hz]	**SRS [G-peak]**
100	74
1000	2000
10000	2000

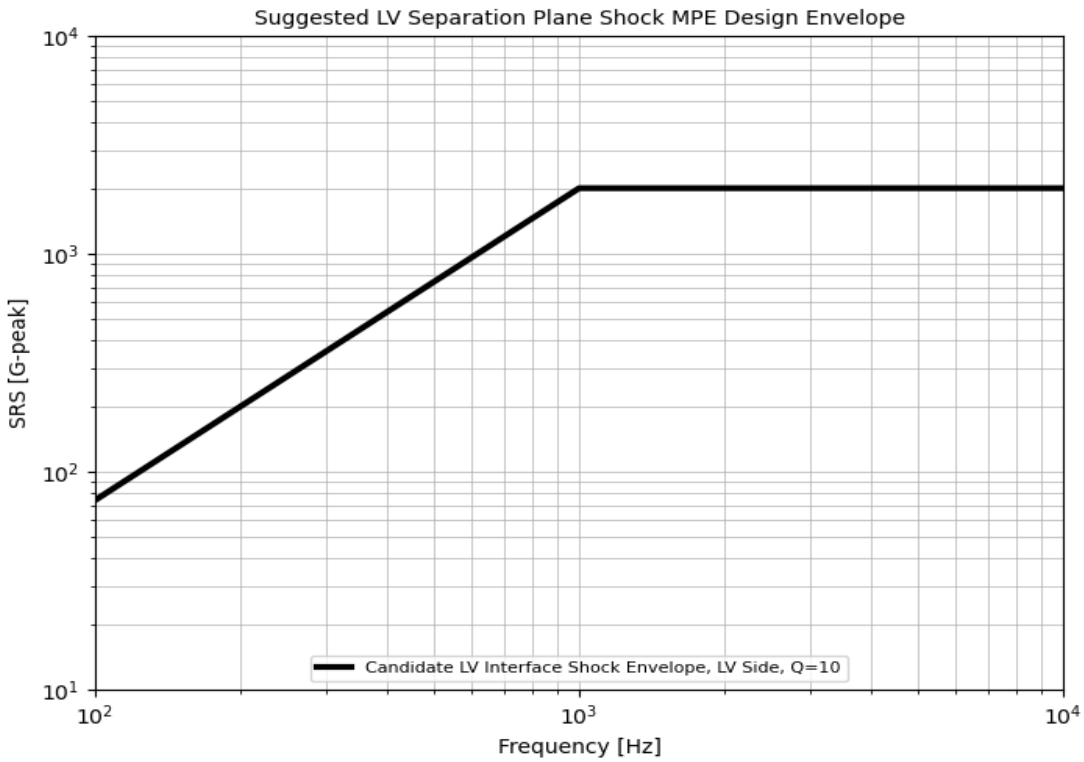

Figure 8: Shock MPE Levels at Spacecraft Interface

Attachment 2
NASA-LSP Standard Launch Services

This list provides an overview of the standard and mission-specific services that the spacecraft customer receives with the NASA-LSP **Baseline** launch service for this AO. If additional services are required but not listed herein, or for any questions, please contact the NASA LSP POC listed in this document.

Integrated Services:

- Range support and services
- Payload processing facility and support
- Contractor Engineering support
- Base Support contractors and logistics
- Hazardous support

Launch Vehicle:

- Launch vehicle that meets customer's performance needs
- Payload Fairing with a minimum of 1 access door in a standard location, with thermal and/or acoustic blankets
- Standard LV-provided clampband Payload Separation System
- Standard Payload Adapter
- Standard Test Payload adapter availability
- Spacecraft Spin/De-spin capability for separation (if required)
- Single-Spacecraft Collision/Contamination Avoidance Maneuver (CCAM) capability if needed
- Electrical interface connectors (approximately 3 sets)
- Mission-Unique Reviews (approximately 3)
- Readiness Reviews (approximately 4)
- Risk Management
- Launch Vehicle insight and approval per NPD 8610.23
- Mission integration management & engineering support
- Launch campaign management
- Down range telemetry assets for LV data

Baseline Mission-Unique Services

- Mission-Unique payload isolation system
- T-0 Grade B GN2 or pure air Purge
- ISO 14644-1 Class 7 (Class 10K) integration environment
- Pre-ATP studies such as coupled loads and/or trajectories analysis

NASA-LSP Mission Unique Nuclear Launch Services for Missions utilizing a Radioisotope Heater Unit (RHU) and / or Multi-Mission Radioisotope Thermoelectric Generator (MMRTG):

- The following services are not included in the baseline launch services costs, and must be added to the PI- Managed Mission costs, but are required for missions utilizing a RHU and or MMRTG:
- No earlier than 1/1/2031 launch
- Radiological Control Center (RadCC) Support
  Additional Pad, RTGF, PHSF Security
  (Nuclear) Additional Mission Unique Nuclear

Requirements FTS/ADS launch vehicle modifications

- NEPA/Launch Approval support Tasks (Nuclear Databooks and launch service contractor support) Range Support

Attachment 3
Risk Assessment/Evaluation Form

Proposal Name: _____

Proposal #: _____

Evaluator POC: _____

Phone: _____

Email: _____

Launch Service Risk Evaluation:

Overall Assessment: - Given the ground rules in the AO, is the proposed launch vehicle (LV) concept feasible for this application? (☐Yes or ☐No)

Areas of Risk: _____

LV Performance: Area of concern (☐Yes or ☐No)

Proposed LV configuration (Baseline or Upper): _____

Proposed Launch Date: _____

Launch Period (MM/DD/YYYY to MM/DD/YYYY): _____/____/_____ to _____/____/_____

Launch Window (On any given day of the launch period Minutes:Seconds): _____ : _____

Orbit requirements: Apogee: _____ km Perigee: _____ km Inclination:_____deg.

High Energy requirements: C3: _____ km^2/sec^2 DLA: _____deg RLA: _____deg

CBE Mass (including reserves) Dry Mass: _____ kg Wet Mass: _____ kg

NTE Mass (including reserves) Dry Mass: _____ kg Wet Mass: _____ kg

Dry Mass Margin: _____ kg _____ %

Wet Mass Margin _____ kg _____ %

Formulas:
Mass Margin kg = LV Performance – S/C Mass (including reserves)
Mass Margin % = [(Mass Margin kg)/ S/C Mass (including reserves) kg] X 100

LV Performance Comments/issues/concerns:

_____

_____

NEW FRONTIERS V 2023
ANNOUNCEMENT OF OPPORTUNITY (AO)
LAUNCH SERVICE INFORMATION SUMMARY

LV Integration: Area of risk/concern (☐Yes or ☐No)

Does the proposer have experience in LV integration? (☐Yes or ☐No)

LV to Spacecraft Interface: Area of risk/concern (☐Yes or ☐No)

Proposed Payload Fairing (PLF) _____

Spacecraft (S/C) Dimensions: Radial:_____ m Height _____ m

Any excursions outside of the AO Baseline PLF usable *static* volume? (☐Yes or ☐No)

Mechanical Interface:

Standard Adapter: _____ Custom Adaptor: _____

Electrical Interface:

Standard _____ Pin(s) Connector(s): (☐Yes or ☐No)

Mission Unique requirements:

Instrument T-0 GN2 Purge: (☐Yes or ☐No)

T-0 S/C Battery Cooling: (☐Yes or ☐No)

Planetary Protection Requirements: (☐Yes or ☐No)

Contamination Control Requirements: PLF: (☐Yes or ☐No) LV adapter: (☐Yes or ☐No)

Cleanliness Level: _____ other: _____

List of Mission-Unique or Non-Standard Services proposed that are not part of the AO Baseline launch service offered:

_____

Unique Facility Requirements: (☐Yes or ☐No)

Pad: _____

S/C Processing Facility: _____

S/C Environmental Test Plans

Environmental Test Plan/Flow described: (☐Yes or ☐No)

Comments/issues/concerns/risks:

_____

NEW FRONTIERS V 2023
ANNOUNCEMENT OF OPPORTUNITY (AO)
LAUNCH SERVICE INFORMATION SUMMARY

Launch Service Budget Assessment Summary

Are any additional Mission-Unique or Non-standard Services costs, not included in the AO Baseline service, addressed in the proposal? (☐Yes or ☐No)

If not, list risks:_____

Has additional funding been identified in the PI-Managed Mission Cost (PI-MMC)? (☐Yes or ☐No) If not, list risks:_____

Spacecraft Schedule: Area of concern (☐Yes or ☐No)

Adequate timing of: Launch Service Integration Start Time: ☐Yes or ☐No)

S/C Environmental Test Program: (☐Yes or ☐No)

S/C ship date: (☐Yes or ☐No)

S/C to LV integrated Operations: (☐Yes or ☐No)

Missions with Radiological material Area of risk/concern? (☐Yes or ☐No)

List the Radiological Sources: _____

Are unique facilities required to store/process the Radiological Sources? (☐Yes or ☐No)

Any LV modifications required for additional safety or Launch approval? (☐Yes or ☐No)

Other identified cost, technical schedule risks?: Area of risk? (☐Yes or ☐No)

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