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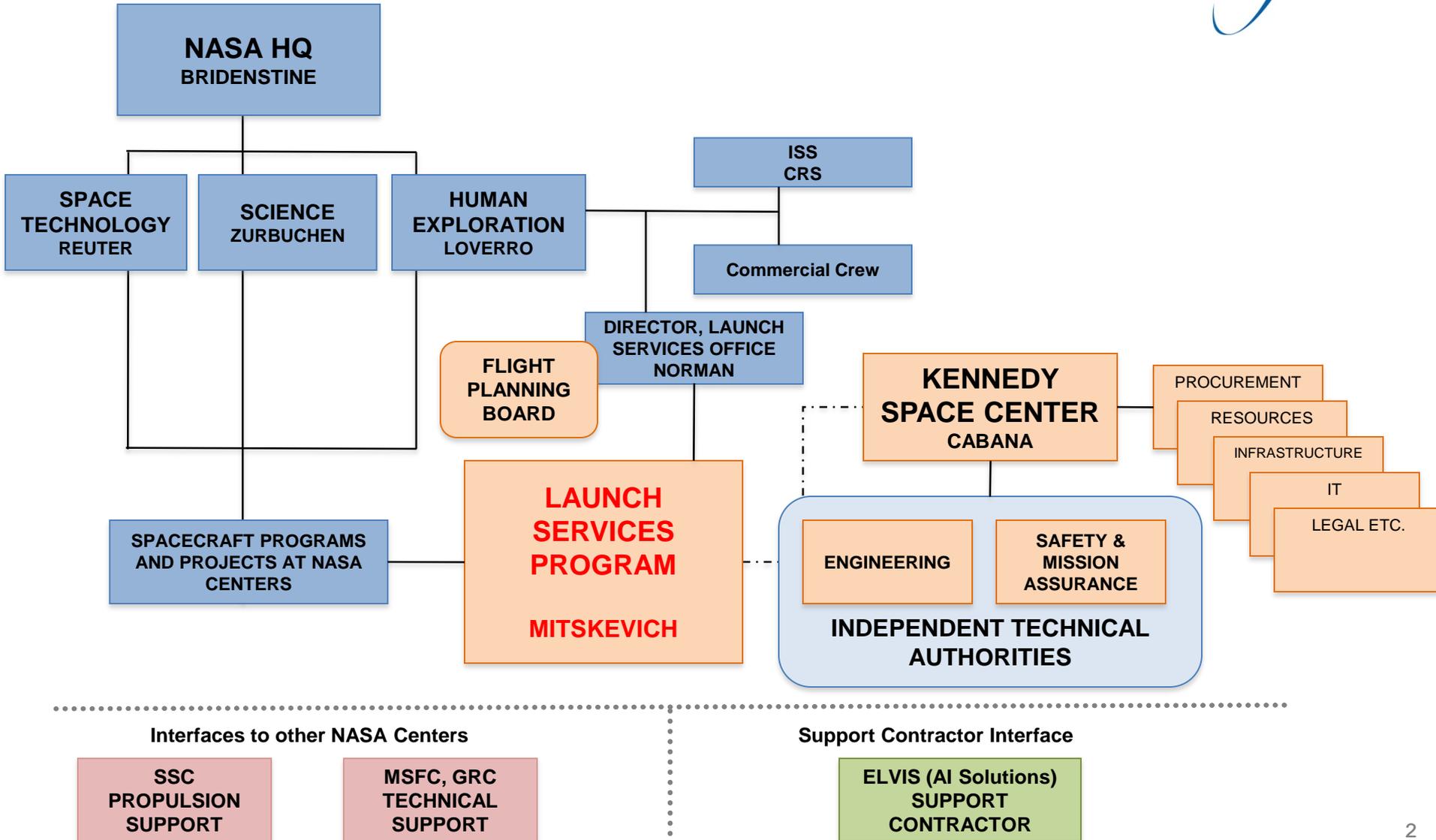
NASA LAUNCH SERVICES PROGRAM

**ASTROPHYSICS SMALL EXPLORERS 2019
ANNOUNCEMENT OF OPPORTUNITY
CONCEPT STUDY REPORT
APRIL 23, 2020**

**Chuong Nguyen
LSP Flight Projects Office**



Launch Services Program Relationships (NASA/HEOMD/KSC)





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Launch Services Program



The Launch Services Program provides:

- **Management of the launch service**
- **Technical oversight of the launch vehicle production/test**
- **Coordination and approval of mission-specific integration activities**
- **Mission unique launch vehicle hardware/software development**
- **Payload-processing accommodations**
- **Launch campaign/countdown management**



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Launch Service for this AO



- **NASA provided primary launch service**
 - Launch services expected to be provided under NLS II Contract
 - Domestic launch vehicle certified as category 1, 2 or 3 per NPD 8610.7D
 - Charges against PI-Managed mission costs for any service beyond standard launch service offered (see Launch Services Program Information Summary)
- **Alternative Access to Space arrangements are NOT available under this AO**



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NASA/Explorers Program Launch Service Budget



- **Under a NASA provided Launch Service for this AO, a standard launch service includes:**
 - **The launch vehicle, engineering, analysis, and minimum performance standards and services provided by the contract.**
 - **Mission integration**
 - **Launch Site Payload Processing**
 - **Range Support**
 - **Down Range Telemetry support (launch vehicle only)**
 - **Standard Mission Uniques – these are items typically necessary to customize the basic vehicle hardware to meet spacecraft driven requirements. Already budgeted for are items like:**
 - » **Pre-ATP studies such as coupled loads and/or trajectories analysis**
 - » **Payload isolation system**
 - » **GN2 pure air purge prior to T-0**
 - » **Class 100,000 integration environment**



NASA Launch Services



- **The NLS II Contract is LSP's primary method to acquire all classes of Category 2 and Category 3 commercial launch services for spacecraft customers**
- **Provides NASA with domestic launch services that are safe, successful, reliable, and affordable**
- **Provides services for both NASA-Owned and NASA-Sponsored payloads through multiple Indefinite Delivery Indefinite Quantity (IDIQ) Launch Service Task Order (LSTO) contracts with negotiated Not To Exceed (NTE) Prices**
- **Provides services on a Firm-Fixed-Price (FFP) basis**
 - **Incorporates best commercial practices to the maximum extent practical**
 - **Includes Standard and Non-Standard services**
 - **Mission unique modifications**
 - **Special studies**
- **Allows LSP to turn on a Task Assignment or Non-Standard Service at any time for analyses**



NASA Launch Services (cont'd)



- **Launch Services Risk Mitigation Policy for NASA-owned and/or NASA-sponsored Payloads/Missions can be found under NPD 8610.7. Document can be found at <http://nodis3.gsfc.nasa.gov>**
 - Risk Category 1: Low complexity and/or low cost payloads-Classified as Class D payloads pursuant to NPR 8705.4
 - Risk Category 2: Moderate complexity and/or moderate cost payloads-Classified as Class C payloads and, in some cases, Class B payloads, pursuant to NPR 8705.4
 - Risk Category 3: Complex and/or high cost payloads-Classified as Class A payloads and, in some cases, Class B payloads, pursuant to NPR 8705.4
- **NLS II Launch Service Costs**
 - Acquisition process begins at approximately L-36 months
 - Authority to Proceed (ATP) concurrent with Task Order Award at approximately L-30 months
 - Explorers Program will provide a single expendable launch vehicle as GFE (outside of PI-Managed Mission Cost) including all standard and some mission unique launch service costs.
 - Examples of costs not covered by the Explorers Program include:
 - » Payload-caused launch delay costs
 - » Some mission unique services such as a custom payload adapters, auxiliary propulsion, or costs due to a requirement for a unique launch site may require additional funding (See Attachment 2 of SMEX 2019 LSP Info Summary)



Launch Delays

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- **Each Provider has their own unique Launch Delay Table**
 - Delay terms are identical for both parties (Contractor/NASA)
 - **No-fault Launch delays**
 - » Include: range constraints, floods, acts of God, strikes and other conditions
 - » No adjustment made to mission price
 - » No limit on number of days
- **For the remaining delay cases grace days are based on sliding scale for both Contractor and NASA delays**
 - 150 days of grace at ATP through L-24
 - Sliding down to 7 days of grace at L-10 days
- **For limited launch periods (i.e., Planetary), there are no grace days available and delays outside of the defined launch period are subject to equitable adjustment**



Examples of Non-Standard Services/ Mission Unique Costs



Additional Options	Launch Date NLT	Total (\$M)
Mission Unique Adapter	12/2025	0.5
Multiple Spacecraft Deployment Launch Vehicle Analyses	12/2025	0.75
Deployable Spacecraft telemetry tracking asset (ocean vs airborne vs ground)*	12/2025	1.4 – 4.0*
Supplemental Propulsion**	12/2025	Contact LSP POC

*Cost depends on locations of spacecraft separations and type of asset required (Contact LSP POC for cost for your specific configuration)

**Due to the multiple launch vehicle configurations within the launch vehicle class, supplemental propulsion systems must be defined and described by the proposer to meet mission requirements. The system proposed and the spacecraft shall remain within the fairing envelopes provided.

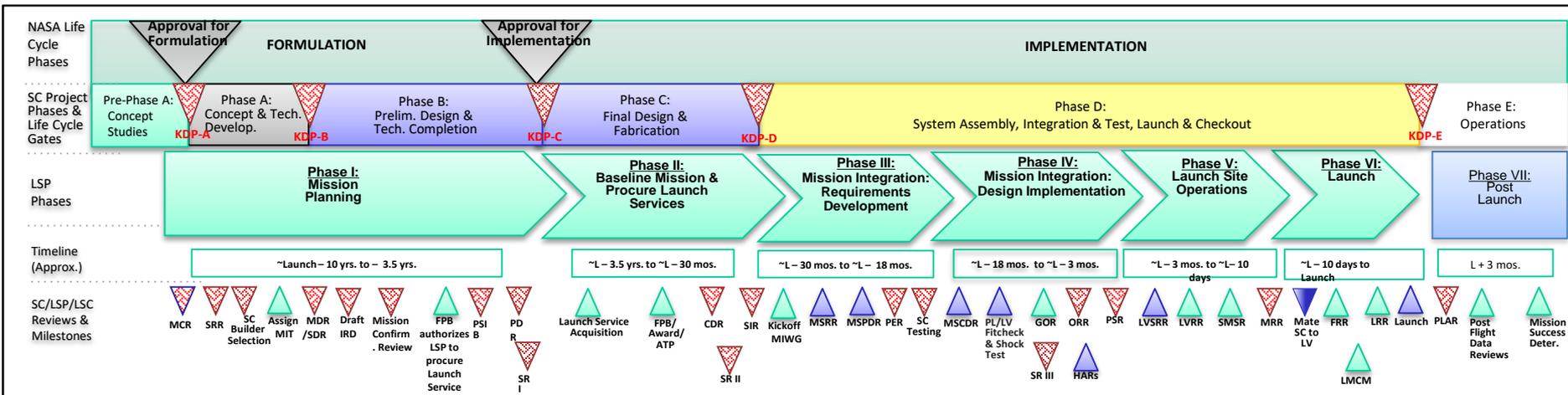


Launch Vehicle Acquisition

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- The acquisition of a NASA-provided domestic expendable launch vehicle proposed for this AO will be procured and managed by the NASA/Launch Services Program (LSP) via the NASA Launch Services II (NLS II) contract.
- The LSP will competitively select a launch service provider for these missions based on customer requirements and NASA Flight Planning Board (FPB) approval.



Printed documents may be out of date; please validate with the LSP Flight Projects Office (FPO) prior to use. Update: Dec. 2015

Spacecraft reviews shown in red.



Available Vehicles under NLS II Contract

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- **Likely candidate/competitive vehicles for this SMEX AO that are currently available on the NLS II contract are:**
 - Pegasus XL
 - Falcon 9 Full Thrust
- **Assumption of a specific launch vehicle configuration as part of the AO proposal will not guarantee that the proposed LV configuration will be selected**
- **Proposers are advised to plan for compatibility with all vehicles that are expected to be available through spacecraft Preliminary Design Review.**
 - **Payload design should accommodate the limiting/enveloping launch characteristics and capabilities included in “ELV Launch Services Information” document**

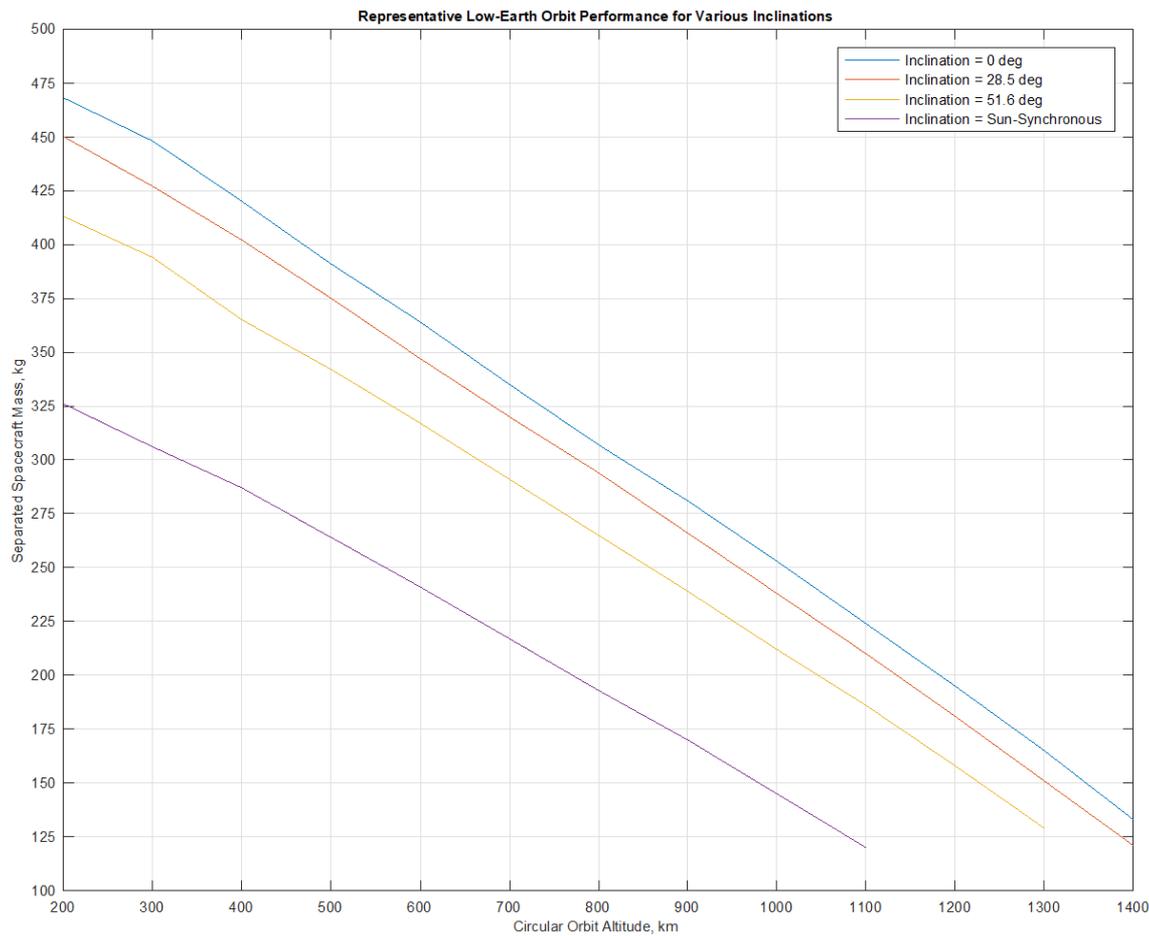
<i>Launch Vehicle</i>	Pegasus XL	Falcon 9 FT
<i>Provider</i>	NGSS	SpaceX
<i>Approx Perf @ 600km Sun Sync</i>	240 kg	8000+ kg
<i>Certification Category</i>	Cat 3	Cat 3
<i>Launch Sites</i>	CCAFS WFF KWAJ VAFB	CCAFS VAFB

<http://elvperf.ksc.nasa.gov/Pages/Default.aspx/>

For mission specific information, utilize the LSP performance website and/or the LSP POC.



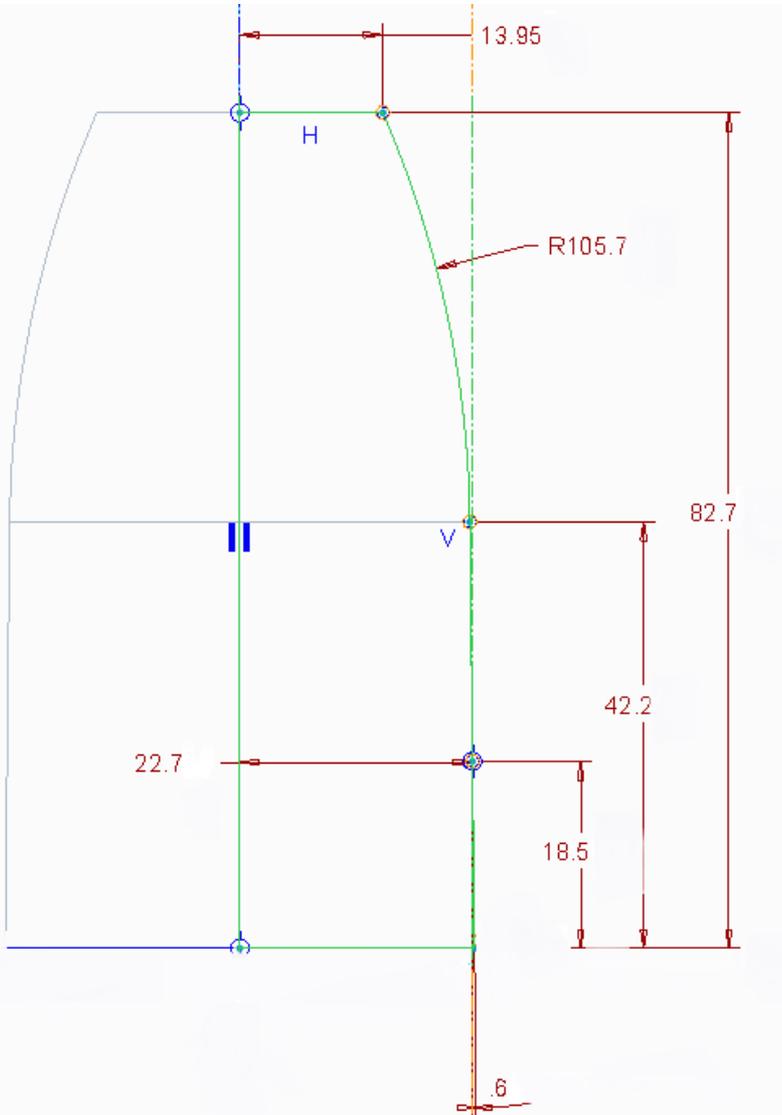
Enveloping Performance Curves



- Figure depicts expected representative nominal performance to a common range of altitudes/inclinations (circular orbits).
- Vehicle-specific injection dispersion capabilities will determine the accuracy to which the orbit targets can be achieved.
- Performance is for a baseline LV configuration; non-standard, mission-unique hardware is not included and will require additional assessment
 - If a payload isolation system is needed, the available performance shown should be reduced by 10 Kg.



Static Payload Fairing Envelope



- Proposals should include sufficient S/C dimensions to validate fit within this PLF static envelope, including any close approaches.
- Figure has been reduced by 1.5" to account for a typical payload isolation system. If the proposer is providing own isolation system, or one is not needed, 1.5 inches may be added to overall height shown.



Summary



- It is the Launch Service Program's goal to ensure the highest practicable probability of mission success while managing the launch service technical capabilities, budget and schedule.
- Questions must be officially submitted to:

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Kennedy Space Center, FL 32899
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LSP is ready to respond to your mission specific questions.