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LAUNCH SERVICES PROGRAM

NASA
LAUNCH SERVICES PROGRAM

2022 HELIOPHYSICS SMEX
STEP 2 KICK-OFF

November 7, 2023

Shaun Daly

LSP Flight Projects Office

Launch Services Program Relationships (NASA HQ/SOMD/KSC)

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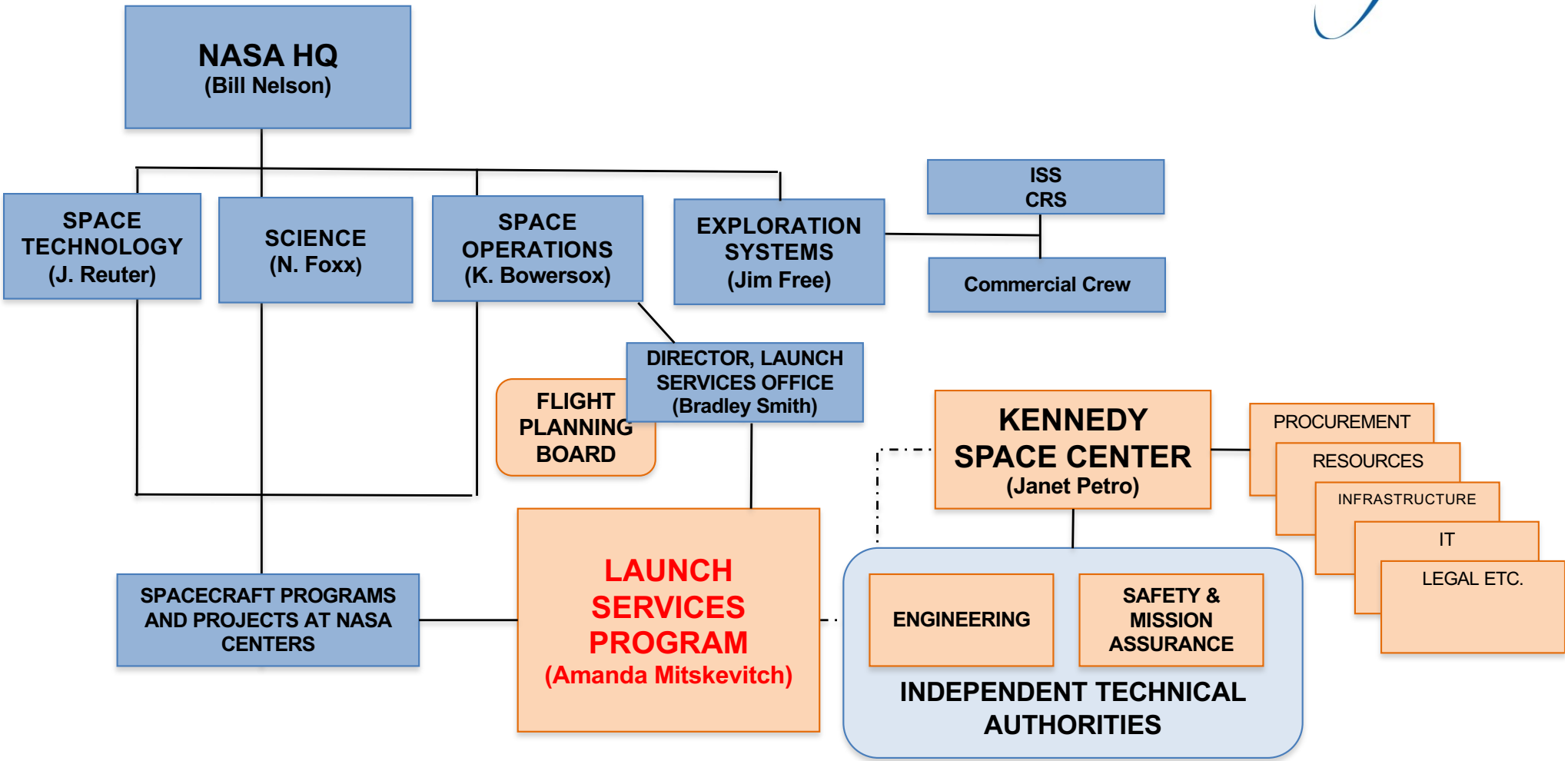
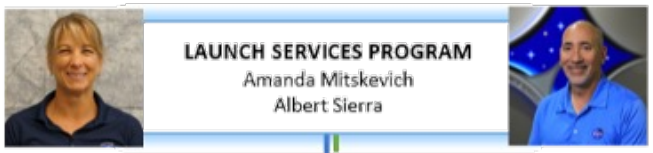


LSP Organizational Structure



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FLIGHT ANALYSIS
Mike Carney

Flight Dynamics Flight
Structures and Environments

Launch Service for this AO

- **NASA provided primary launch service**
  - **Launch services expected to be provided under VADR contract or PI provided launch**
  - **Charges against PI-Managed mission costs for any service beyond standard launch service offered** *(Helio SMEX 2022 AO, Launch Services Program Information Summary, Page 7 in the AO library)*
- **Awarded SMEX missions are Class D**
- **For a NASA/LSP-provided launch service, the proposal must be designed to the enveloping launch vehicle characteristics and capabilities provided in Attachment 1**

NASA/Explorers Program Launch Service Budget

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- **Under a NASA provided Launch Service for this AO, a standard launch service includes:**
  - **Payload processing facility (ISO 14644-1 Class 8 PPF) and non-fueling related support**
  - **Standard LV-provided Payload Separation System**
  - **Standard Payload Adapter**
  - **Hardware that accurately simulates the mechanical interfaces and dynamic characteristics of the payload separation system, to be used by the payload project during shock and vibration testing**
  - **Single-Spacecraft Collision/Contamination Avoidance Maneuver (CCAM) capability if needed**
  - **Mission Specific Reviews**
  - **Contractor-led Readiness Reviews**
  - **Risk Identification**
  - **Launch Vehicle insight and approval per NPD 8610.23C; Attachment C**
  - **Mission integration management & engineering support**
  - **Launch campaign management**
  - **Orbital Parameter Message (OPM) for payload separation**

NASA/Explorers Program Launch Service Budget

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***Nominal Non-Standard/Mission-Specific Services included* for SMEX 2022**

- **Mission-specific payload isolation system (if required)**
- **T-0 GN2 or pure air purge (if required)**
- **Spacecraft Spin/de-spin capability for separation (if required)**
- **Class 10K integration environment (if required)**

The following list provides examples, but not limited to, non-standard/mission-specific services that are not included in this AO's NASA-provided launch service, and whose cost *would need to be included* as part of the PI-Managed Mission Cost.

- **Custom Payload Adapters**
- **Auxiliary Propulsion for target orbit achievement**
- **Deployable Telemetry Tracking Assets for multiple spacecraft missions**
- **Post separation communication resource availability and coordination**
- **LV mods/analyses for non-separating interface with multiple SC deployments**
- **Hazardous Fuel, PPE, and fueling operations**
- **Test Payload Adapter**

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NASA LSP Functional Structure

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- **NASA Launch Services Program (LSP) procures/provides a Launch Service**
  - **We don't buy a tail number**
  - **This is a commercial Fixed Firm Price (FFP) procurement with additional insight and oversight over a traditional commercially procured launch**

- **For VADR missions LSP does not maintain the final go or no-go for launch**
  - **For Dedicated and Primary Rideshare procured missions the RLSP has a SC go-no go on launch day**
  - **For Traditional Rideshare missions under the SC does NOT have a go-no go on launch day**

- **Interface with Safety and Mission Assurance**
  - **Safety - SC PM responsible to run the Payload Safety Working Group under VADR missions**

Options available for this AO

Several options are available to proposers for the 2022 Heliophysics Explorer AO

SMEX Launch Option Summary	**Representative Orbit**	***Maximum* Mass to Representative Orbit**
1 or 2 × Option A	500 km Sun-Synchronous*	1 or 2 × 300 kg
1 × Option B	500 km Sun-Synchronous*	1 × ~~960~~ **910** kg
1 or 2 × ESPA or *1 or 2* × ESPA Grande Port *(Option C)*	**Low Earth Orbit,** Geosynchronous Transfer Orbit **or Cis-Lunar Space**	1 or 2 × 220 kg per ESPA Port or **1 or 2** × 465 kg per ESPA Grande Port
1 × Option A and 1 × Option C	**As per Option**	**As per Option**

* For other orbits, refer to the *Launch Services Program Information Summary*

Note: A reimbursement of up to $6M (Fiscal Year 2022), covering the proposed cost, is offered as an increase to the AO Cost Cap for missions utilizing Option A or B or C that require a PI-provided propulsive stage or a propulsion system augmentation (e.g., tank size or thrusters) necessary to achieve insertion or phasing into a target orbit. [amended August 30, 2022]

Options available for this AO, Cont.

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Several options are available to proposers for the 2022 Heliophysics Explorer AO

- **Section 5.9.2 AO-Provided Access to Space (FAA-Licensed Launch Services under VADR) for Options A and B**
  - » **Launch services expected to be provided under new VADR Contract for:**
    - **Option A 300 kg to 500 km Sun-synchronous orbit**
    - **Option B 910 kg to 500 km Sun-synchronous orbit**
  - » **Domestic launch vehicle certified as category 1 (at time of launch) per NPD 8610.7D**
  - » **Modified technical oversight approach per NPD 8610.7D *Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions* will be executed for AO for Class D payloads.**
  - » **PI-Managed Mission Costs must cover services beyond standard launch service offered (see attachment 5 in *NASA Launch Services Program (LSP) Information Summary*)**

- **AO-Provided Rideshare Access to Space for Option C**
  - » **Via ESPA/ESPA Grande (or equivalent adapter) as a secondary payload**
  - » **May utilize one or two SPA ports**

Options available for this AO, Cont.

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- **Section 5.9.2 AO-Provided Access to Space (FAA-Licensed Launch Services under VADR) for Options A and B**
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  - » **Via ESPA/ESPA Grande (or equivalent adapter) as a secondary payload**
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Options available for this AO, Cont.

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Several options are available to proposers for the 2022 Heliophysics Explorer AO

- **Alternative Access to Space arrangements by PI are permitted under this AO**
  - » **PI will be required to meet NPD 8610.23C *Launch Vehicle Technical Oversight Policy***
  - » **LSP will not be performing an advisory role for a mission using Alternative Access to Space.**
    - **PI will be required to present to NASA Flight Planning Board (FPB) to seek approval on the approach of how the PI ensure compliance for insight to satisfy NPD 8610.23C requirements**

Section 5.9.2 AO-Provided Primary Launch Services

(Commercial FAA-Licensed Launch Services LSP Procured under VADR)

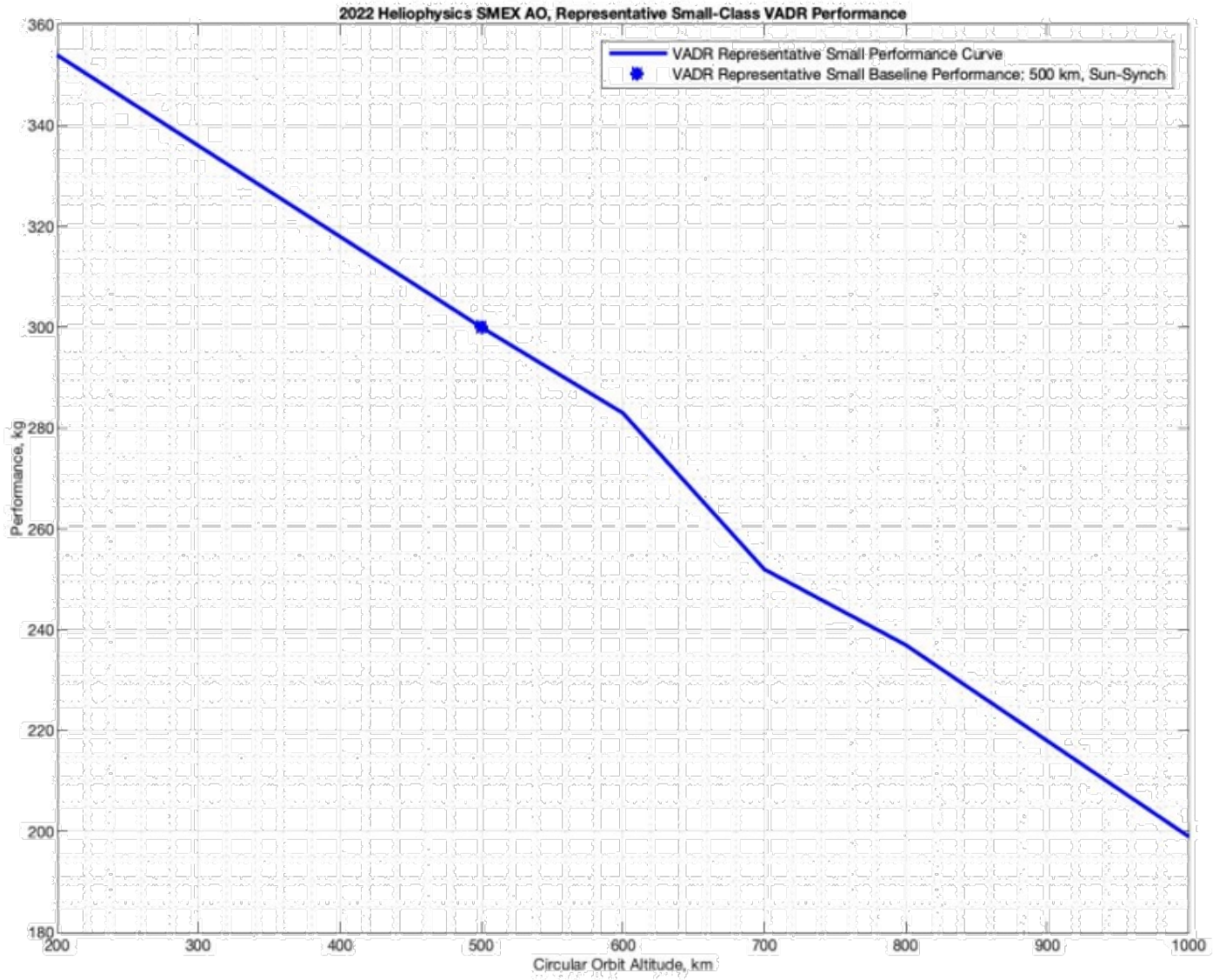
Option A and B

Commercial FAA-Licensed Launch Services

- **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 required to plan for compatibility with the launch vehicle summary through spacecraft Preliminary Design Review (PDR).**
  - **Payload design should accommodate the limiting/enveloping launch characteristics and capabilities included in "Commercial FAA-Licensed Launch Services Program Information Summary" document provided as part of the AO**
- **Domestic launch vehicle on its first flight will be permitted; however, prior to launch the vehicle will be certified as Category 1 per NPD 8610.7D, *Launch Services Risk Mitigation Policy for NASA-Owned or NASA-Sponsored Payloads/Missions* (see AO Library).**
- **A modified technical oversight approach per NPD 8610.7D Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions will be used for Class D missions.**

Commercial FAA-Licensed Launch Services Perfomance

Option A



Commercial FAA-Licensed Launch Services Perfomance

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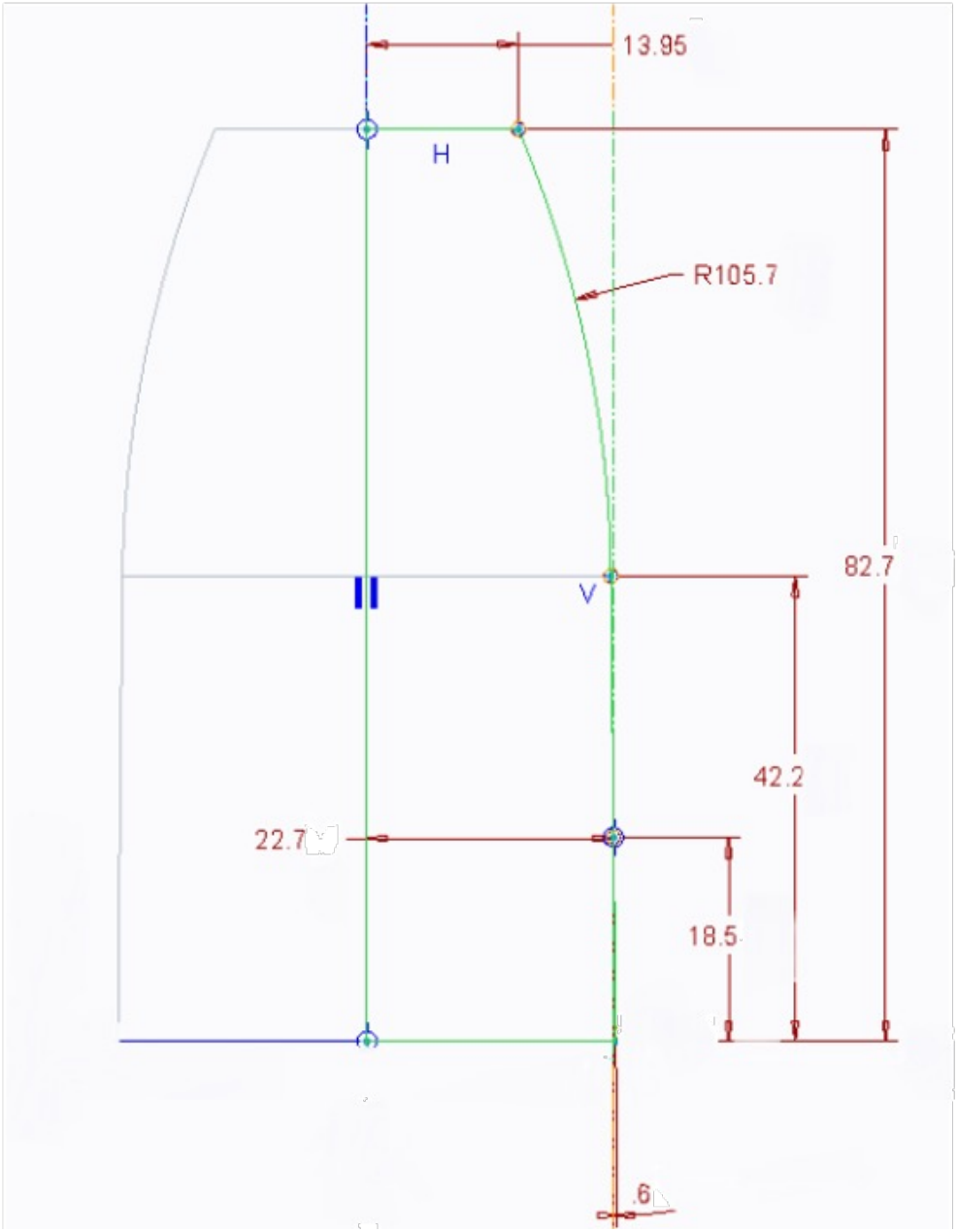

Figure 2
Static Fairing Envelope (in.)

- 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 Spacecraft is providing its own isolation system, 1.5 inches may be added to overall height shown.

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Commercial FAA-Licensed Launch Services Perfomance

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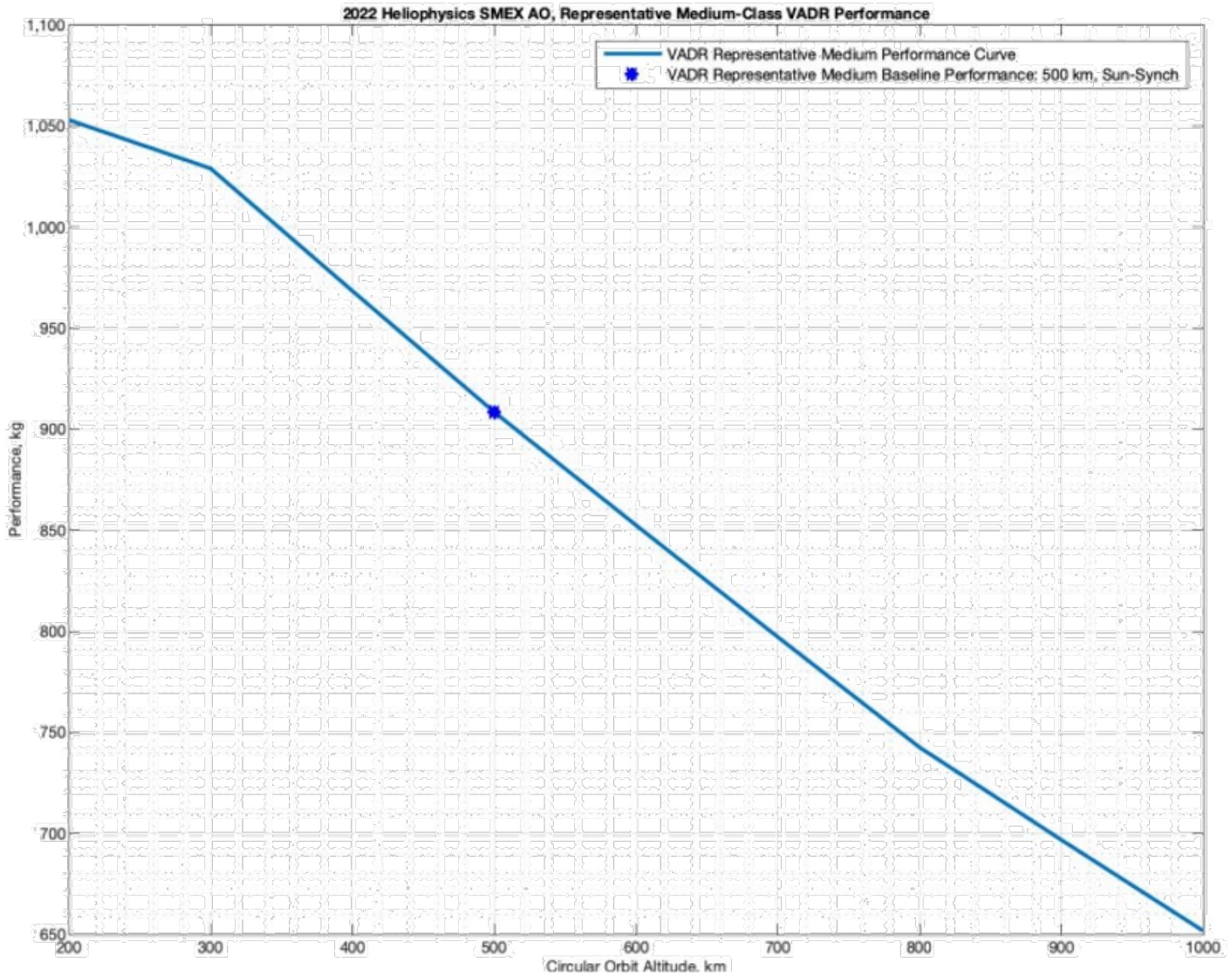
Option B



Commercial FAA-Licensed Launch Services Perfomance

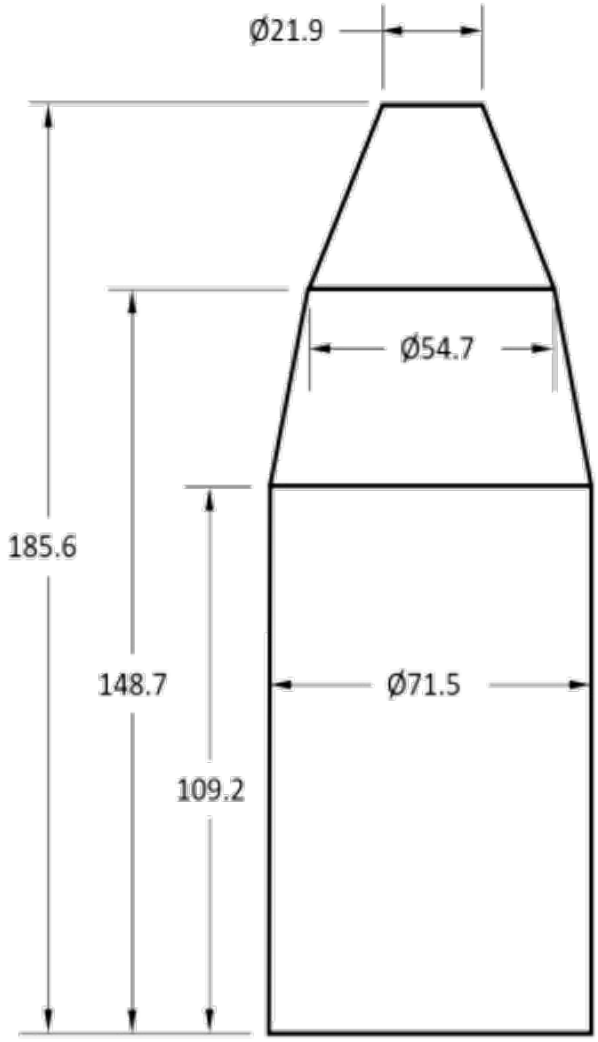


Figure 4
Static Fairing Envelope (in.)

- 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 Spacecraft is providing its own isolation system, 1.5 inches may be added to overall height shown.

5.92 AO-Provided Secondary Launch Services

(AO-Provided Rideshare Access to Space LSP Procured)

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ESPA Configuration

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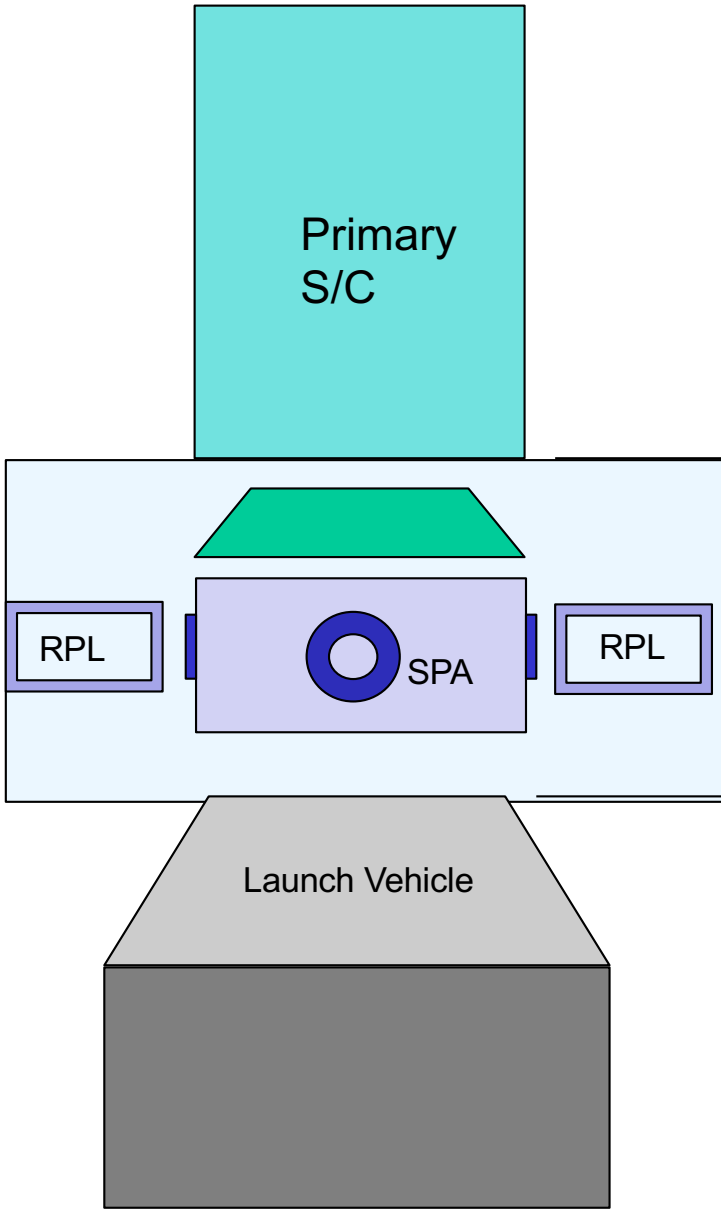

- **LSP will procure the launch service for the Primary spacecraft and the ESPA ring through the Launch Service Task Order (LSTO) process**
- **LSP will coordinate the mission integration process with the Launch Service Contractor, the Primary spacecraft customer, and the SPA mission aggregator**
- **A Mission Aggregator will be identified that will coordinate the mission the integration process with the RPLs**
- **The Aggregator will be the interface between LSP and the RPLs**
- **There will be an ICD between each of the RPL and SPA System**
- **The SPA and RPLs will be integrated into one assembly and delivered to Launch Services Contractor**
- **The Launch Service Contractor is responsible for the build and check out of the launch vehicle with NASA involvement/insight**

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ESPA type Interfaces

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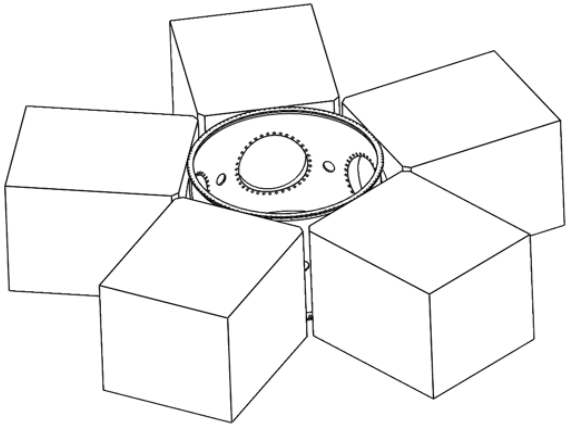
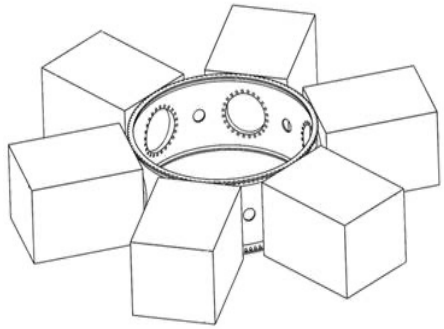
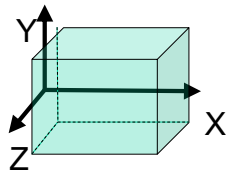


ESPA Grande



ESPA

ESPA	Max RPL Mass	Allowable RPL Volume	RPL Interface
ESPA Grande 5 Port	465 kg	42”x46”x38” Y, Z, X	24” circular
ESPA 6 Port	220 kg	24”x28”x38” Y,Z,X	15” circular



NASA will provide the Separation System as GFE: **RUAG PAS 381S (15”) for ESPA**
RUAG PAS 610S (24”) for ESPA Grande
PSC MkII MLB (15” or 24”)

Please see the NASA Science Mission Directorate (SMD) Launch Vehicle Secondary Payload Adapter Rideshare Users Guide. AO Library

RPL Do No Harm

All ESPA class RPL will be subject to a Do-No-Harm (DNH) assessment process to ensure that they will not pose a threat to the mission success of the Primary spacecraft or Launch Vehicle (LV) – Some general DNH considerations include:

- **RPL Design**
  - **Design should follow the NASA RUG guidelines Link to item 6a in Program Library Proposal will include information**
  - **Include filled in for the *Rideshare Accommodations Worksheet Template* data associated with your proposals**
  - **Design must physically comply with the space allotted and remain constrained and sufficiently stiff to not make contact with launch vehicle or other spacecraft hardware during flight**
  - **Dynamic modes of the auxiliary payload must be sufficiently understood and communicated to ensure no detrimental dynamic loading onto the launch vehicle or primary spacecraft (guidance provided in the NASA RUG)**
  - **RPL must maintain integrity and not separate prematurely under worst case predicted loads and environments (acoustic, shock, vibe, thermal, depressurization)**

RPL Do No Harm

- **Flight Risks associated with guidance in the NASA RUG**
  - **Separation analysis must ensure no re-contact with the LV, Primary spacecraft, or other RPLs during RPL separation event(s)**
  - **RPL separation indications must be included in the LV telemetry stream**
  - **RPL will show mitigations are in place to ensure any potentially hazardous functions are redundantly inhibited until well after the RPL is clear of the LV, Primary spacecraft, or other RPLs**
  - **RPLs must not generate debris that may contact the LV, Primary spacecraft, or other RPLs**
  - **RPLs contamination sources must be understood and provided to the LV, Primary spacecraft, or other RPLs for impact assessment**
  - **RPLs must not generate environments (e.g. thermal, separation shock, etc.) which detrimentally impacts the qualification of the LV, Primary spacecraft, or other RPLs**

RPL Do No Harm

- **Launch Schedule Support**
  - **RPL integration schedules must support launch vehicle/primary payload integration schedules**
  - **RPLs must not impact the launch date for the primary mission in the event that the RPL is not able to support launch date – This is typically accomplished by having a mass simulator available and ready to integrate**
  - **RPLs must support the full launch window defined by the primary spacecraft**

- **Personnel Safety**
  - **RPLs must comply with applicable OSHA, DOT AFSPCMAN 91-710**
  - **RPLs must be stable and safe without services (power, commodities) once integrated**

Please see the NASA Science Mission Directorate (SMD) Launch Vehicle Secondary Payload Adapter Rideshare Users Guide AO Library

Summary

- **It is the NASA 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:**

Shaun Daly
Mission Manager
NASA Launch Services Program Code VA-C
Kennedy Space Center, FL 32899
Phone: 321-289-6426
Email: shaun.daly@nasa.gov

NASA LSP is ready to respond to your mission specific questions.