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# NASA LAUNCH SERVICES PROGRAM

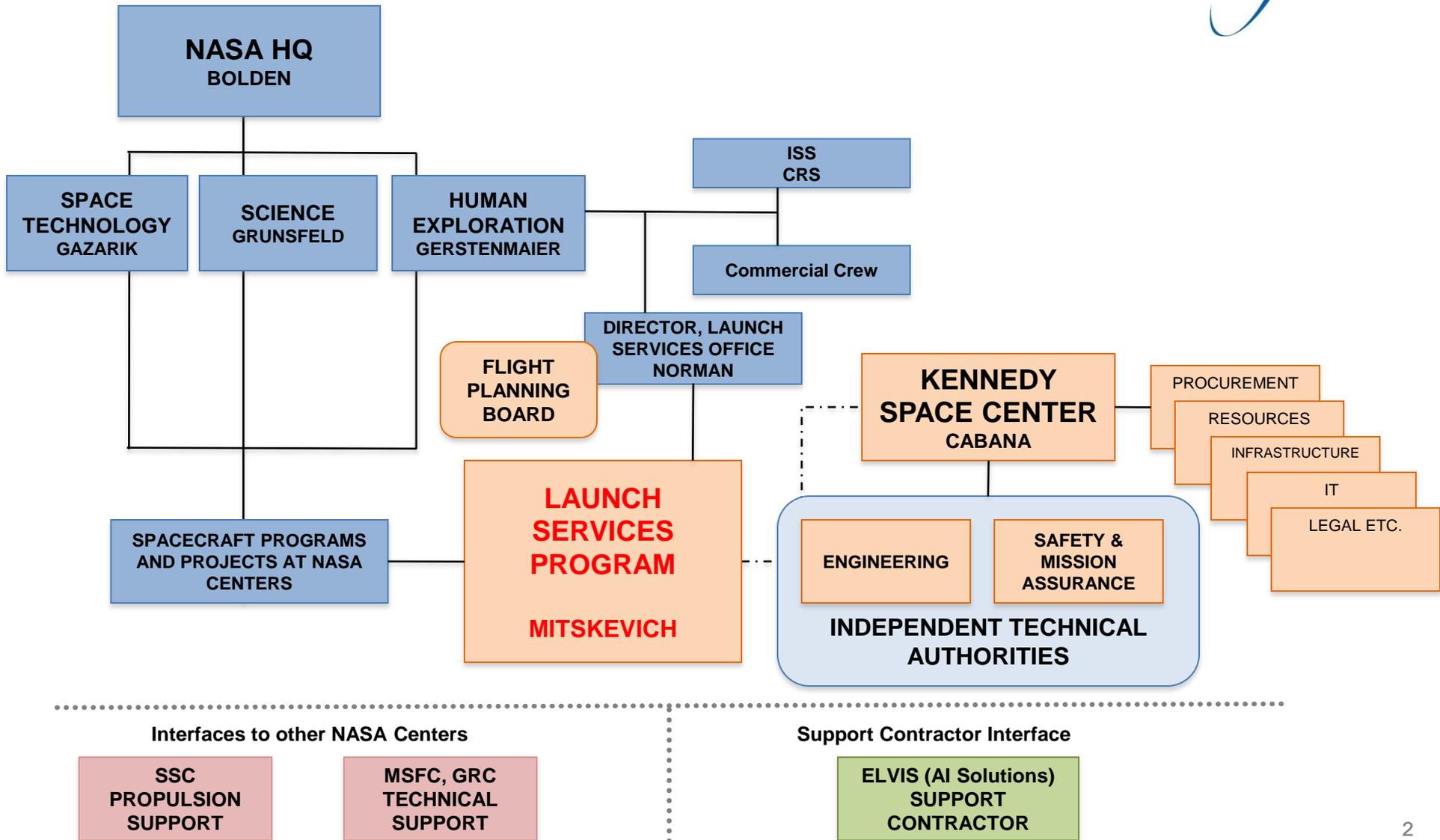
## SMEX AO PRE-PROPOSAL CONFERENCE OCTOBER 7, 2014

Shaun Daly  
Flight Projects Office



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# 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**



# Launch Services Program



## NASA Strategic Plan 2014

### Strategic Goal 3:

Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure.



### Objective 3.2:

Ensure the availability and continued advancement of strategic, technical, and programmatic capabilities to sustain NASA's Mission



### Key Strategy:

Provide access to space

Lead Office: **HEOMD**

Contributing Program: **LSP**

## Key Strategy "Provide access to space" citation:

"...certify and procure domestic commercial space transportation services for the launch of robotic science, communication, weather, and other civil sector missions"

"...provide robust, reliable, commercial and cost-effective launch services"

"...assured access to space through a competitive 'mixed Fleet' approach utilizing the breadth of U.S. industry's capabilities"



## LSP Strategic Goals 2014

**Goal 1: Maximize Mission Success**

**Goal 2: Assure Long-Term Launch Services**

**Goal 3: Promote Evolution of a U.S. Commercial Space Launch Market**

**Goal 4: Continually Enhance LSP's Core Capabilities**





# LSP Functional Structure



- **LSP procures/provides a Launch Service**
  - Its more than the basic launch vehicle
  - We don't buy a tail number
  - This is a commercial FFP procurement with additional insight and oversight
- **To enable this, LSP has two functional sides**
  - **Mission integration**
    - » Mission Integration Team (MIT) assigned to each mission
    - » Manages mission specific procurement, integration, and analysis
    - » Includes launch site integration and processing
  - **Fleet management**
    - » Personnel assigned to each contracted rocket
    - » Includes resident offices within the production facilities of all active providers
    - » We watch the production and performance of entire fleet – we certify the manufacture's production line, not just a particular unit (tail number)
    - » We have a say in any change/upgrade/anomaly
- **LSP maintains the final go or no-go for launch**
- **Interface with Safety and Mission Assurance**
  - Safety
  - Quality



# Technical Information flow into the MIT

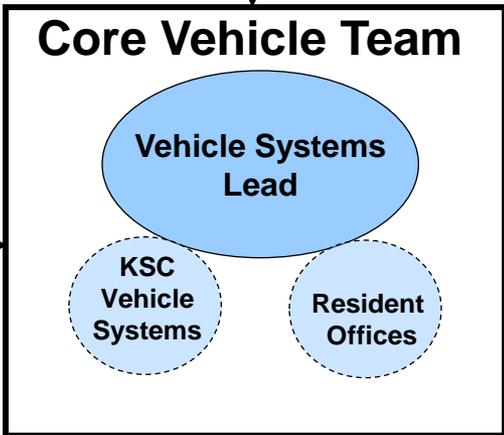


## Core Vehicle Test & Build

Integration & Test Facilities

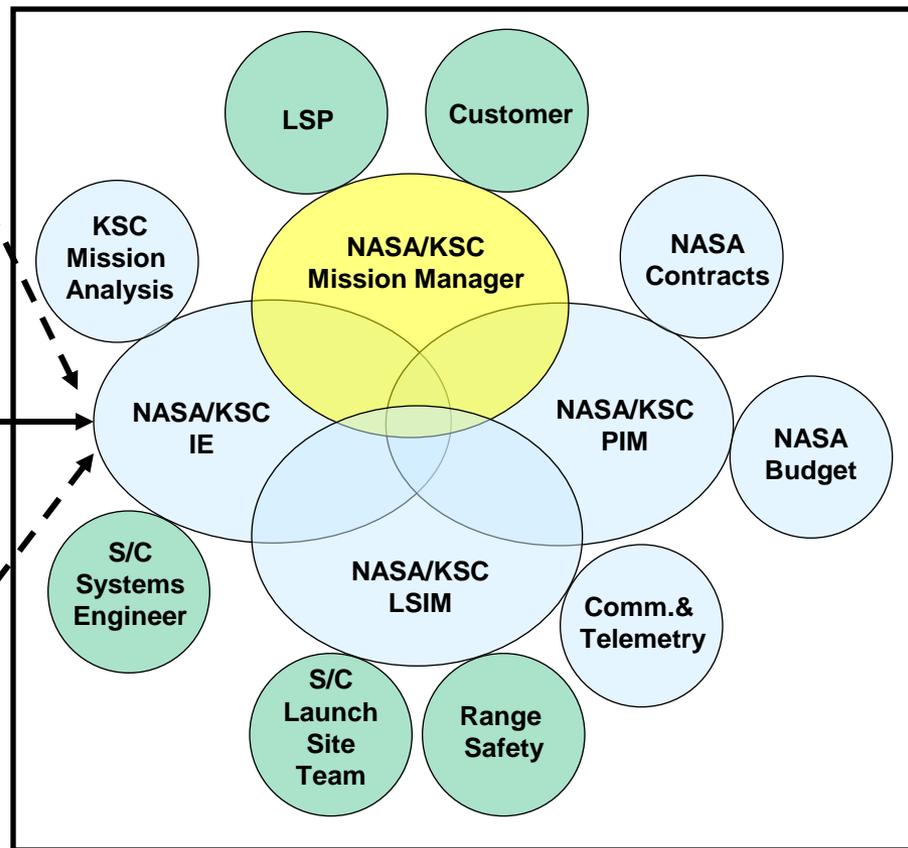
Integrated Product Teams

ELV Chief Engineer



Safety & Mission Assurance

## Mission Integration





# Options available for this AO



- **Several options are available to proposers for this SMEX AO**
  - **NASA provided launch services may be proposed at a charge of \$50 million in FY 2015 dollars against the PI-Managed Mission Cost (provided under NLS II Contract)**
  - **Alternative access to space (including contributed launch services), must be arranged by the proposer and funded within the PI-Managed Mission Cost, may also be proposed**
    - » **A charge to the PI cost cap of \$2.0 million will be levied for the expected NASA launch vehicle monitoring functions and advisory services**



# Supplemental Mission Advisory and Risk Team Tenets



- **SMART (Supplemental Mission Advisory and Risk Team) services integrate LSP Program, Engineering, and SMA positions as advice to our customer/partner**
  - Offering advisory services, but not inserting ourselves without customer request
  - Overall Advisory Plan Exists, but LSP will document each advisory service separately to define what LSP will do, responsibilities, and resources required
- **LSP utilizes existing insight and risk management processes to provide evaluations of mutually agreeable items**
  - Subject to constraints and data provided by the partner/customer
  - Reporting of risks by LSP shall be coordinated with the customer project and will include a range of mitigation options and offer a coherent go-forward plan
- **LSP will not take overall mission assurance responsibility when in an advisory role because mission assurance is a complex combination of the full complement of LSP services**
- **The responsibility for overall mission success of the Mission rests with the Spacecraft Project and SMD**
- **A Memorandum of Understanding (MOU) will be created between LSP and the Project defining the roles and responsibilities associated with a SMART with SMD agreement and Agency Stakeholder knowledge**

***For additional information on SMART visit the AO Program Library (Item 6)  
<http://explorers.larc.nasa.gov/APSMEX/SMEX/programlibrary.html>***



# NASA Provided 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**



# NLS II Contracts Overview – 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
  - \$50M from the PI-Managed Mission Cost is allocated to the Explorer Program to pay all standard and some mission unique launch service costs
  - Costs not covered by the Explorer Program include
    - » Launch delay costs
    - » Some non-standard services such as a payload isolation system or costs due to a requirement for a unique launch site may require additional funding



## NLS II Contracts Overview – Cont'd



- **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



# Launch Service Budget



- **Under a NASA provided Launch Service 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, a GN2 or pure air purge prior to T-0 and 10,000 Class integration environment.**
  - **Potential additional funding needed to support selectees requiring launch from sites other than the LV base launch complex**
- **Budget does not include launch delays**



# Example Non-Standard Services Costs



<b>Additional Options</b>	<b>Launch Date NLT</b>	<b>Total (\$M)</b>
Mission Unique Adapter	12/18	1.08
Payload Isolation System*	12/18	1.63
Supplemental Propulsion**	12/18	Proposer Provided
<b>Additional Options</b>	<b>Launch Date NLT</b>	<b>Total (\$M)</b>
Mission Unique Adapter	12/19	1.14
Payload Isolation System*	12/19	1.73
Supplemental Propulsion**	12/19	Proposer Provided
<b>Additional Options</b>	<b>Launch Date NLT</b>	<b>Total (\$M)</b>
Mission Unique Adapter	12/20	1.21
Payload Isolation System*	12/20	1.83
Supplemental Propulsion**	12/20	Proposer Provided

\* Bidders may choose to provide their own isolation system.

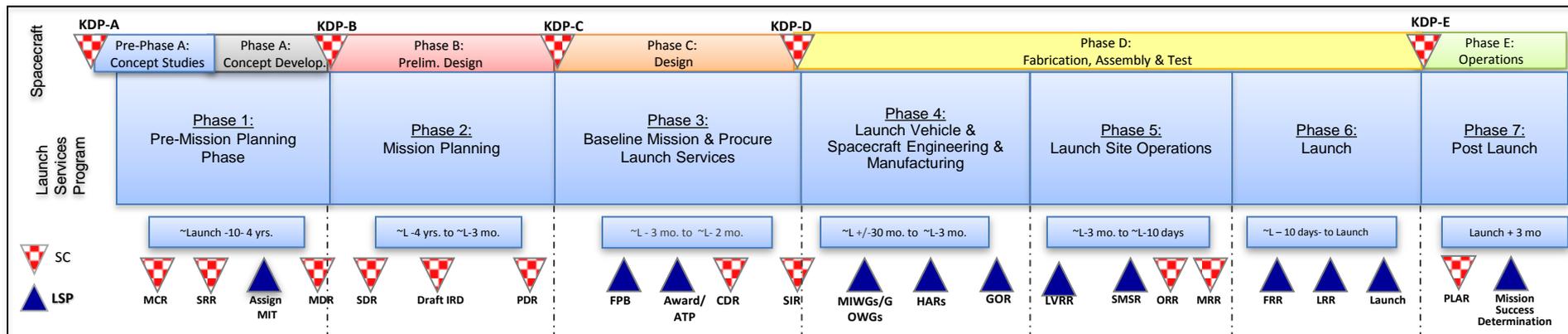
\*\* Due to the multiple launch vehicle configurations within this launch vehicle class, supplemental propulsion systems must be defined and provided by the proposer to meet mission requirements. The system proposed and the spacecraft shall remain within the fairing envelopes provided.



# Ground Rules



- Any acquisition of a non-contributed 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 obsolete; validate with the LSP-Flight Projects Office Prior to use.

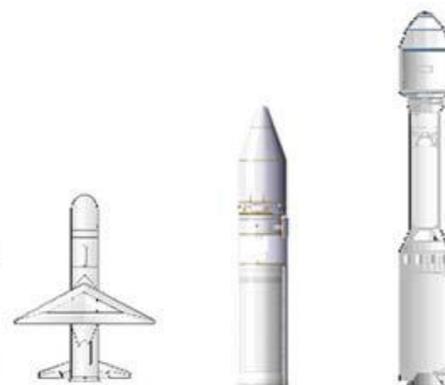


# Available Vehicles under NLS II



- Most likely candidate vehicles for the SMEX AO that are available on the NLS II contract are
  - Pegasus XL
  - Athena 1C
  - Taurus XL
- Bidders must remain compatible with vehicles that provide their performance requirements
- LSP uses the NLS II contract and not the launch vehicle providers users guides when determining LV configurations and performance

Performance shown below rounded down to nearest 50kg in the Small class and nearest 100 kg in the Medium and Intermediate classes. For detailed performance data see <http://elvperfor.ksc.nasa.gov>



Vehicle Class	Small		
Launch Vehicle	Pegasus XL	Athena 1C	Taurus XL
Offeror	OSC	LMSSC	OSC
Perf@ 600 km Sun Synch	200 kg	300 kg	800 kg
Certification Category	Cat 3	n/a	Cat 2
Launch Sites	CCAFS WFF KWAJ VAFB	CCAFS KLC WFF	CCAFS WFF VAFB



## Available Vehicles under NLS II



- **Assumption of a specific launch vehicle configuration as part of this AO proposal will not guarantee that the proposed LV configuration will be selected for award of a launch service competitive procurement**
  - Firm technical rationale for sole source justification is required in the proposal, and NASA would have to obtain appropriate approvals
- **The Agency policy, NPD 8610.7, “Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Mission” has been modified so newer launch service providers are eligible earlier to compete for any of NASA’s missions**



# Performance by Launch Site



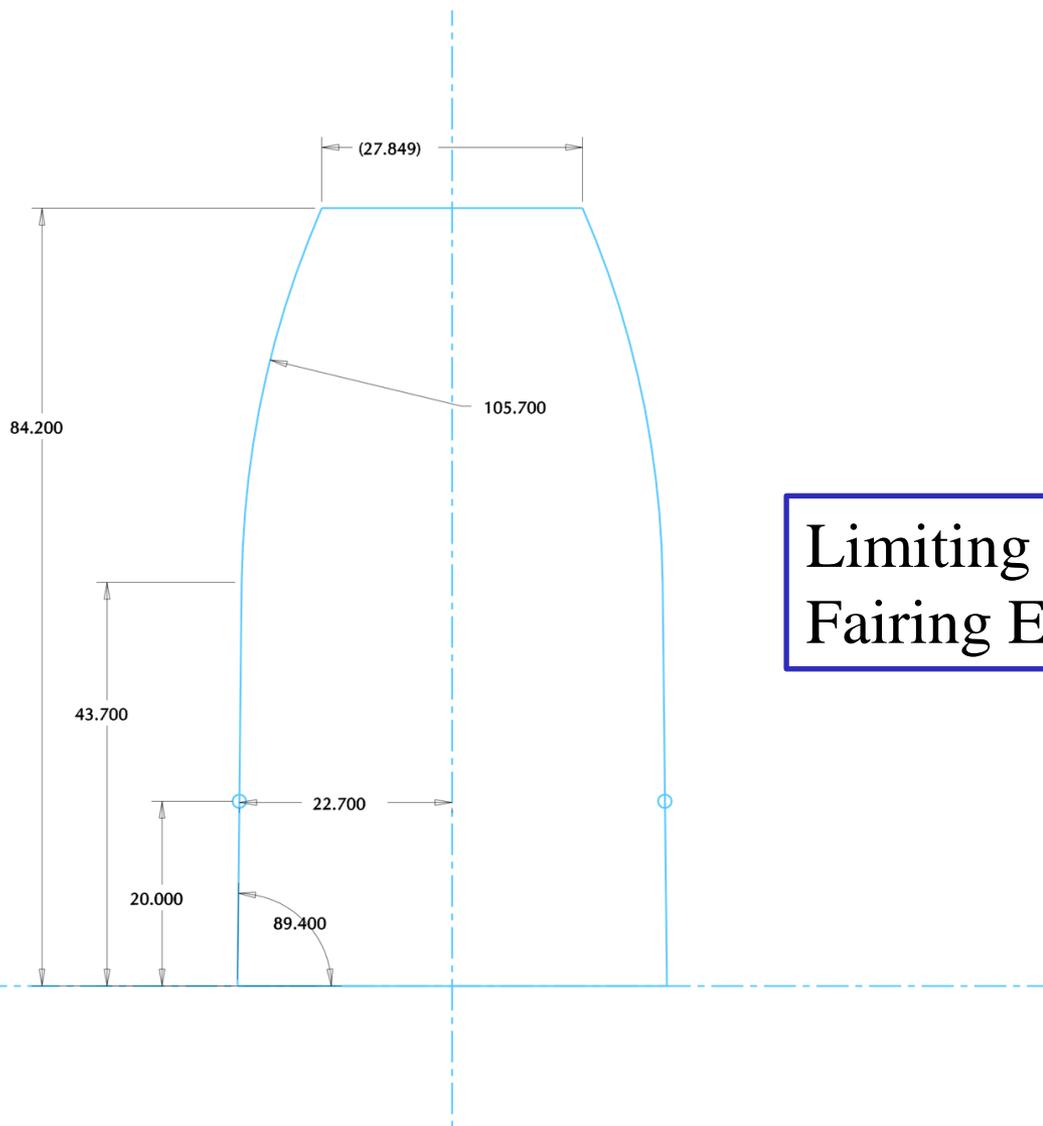
## Table 1 Launch Vehicle Maximum Performance vs. Launch Sites

Launch Site	Assumed Inclinations	Altitude Range	Max Performance
CCAFS	28.5° - 51.6°	200 km - 2000 km	450 kg
RTS	0° - 60°	200 km - 2000 km	465 kg
VAFB	70° - 90° Sun-synch	200 km - 1200 km	375 kg
WFF	38° - 51.6°	200 km - 1300 km	435 kg

- This performance does not include the effects of orbital debris compliance, which must be evaluated on a mission-specific basis. This could result in a significant performance impact for missions in which launch vehicle hardware remains in Earth orbit
- Guidance reserves account for 3-sigma flight performance
- Performance is for baseline configuration; non-standard, mission-unique hardware will require additional assessment
- 38-inch (0.96-meter) separation system
- Mass of entire separation system is book-kept on the launch vehicle side
- Listed performance is for separated spacecraft mass



# Static Envelope



Limiting Case  
Fairing Envelope



# 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:

**Bruce E. Reid**  
**Mission Manager**  
**NASA Launch Services Program**  
**Code VA-C**  
**Kennedy Space Center, FL 32899**  
**Phone: 321-861-8119**  
**Email: [Bruce.E.Reid@nasa.gov](mailto:Bruce.E.Reid@nasa.gov)**

**LSP is ready to respond to your mission specific questions**



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# Back Up



# Evaluation



• **Launch Service Technical Evaluation:**

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

• **LV Performance: Area of concern (Yes or No)**

- Proposed LV configuration: \_\_\_\_\_
- 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): \_\_\_\_\_ : \_\_\_\_\_ .



# Evaluation



## • LV Performance: Area of concern (cont)

- Orbit requirements: Apogee: \_\_\_\_\_ km Perigee: \_\_\_\_\_ km  
Inclination: \_\_\_\_\_ deg.
- High Energy requirements: C<sup>3</sup>: \_\_\_\_\_ km<sup>2</sup>/sec<sup>2</sup> DLA: \_\_\_\_\_ deg  
RLA: \_\_\_\_\_ deg
- Proposed LV Performance: \_\_\_\_\_
- 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:



# Evaluation



- **Launch Service Cost Assessment: Area of concern (Yes or No)**
  - Is there additional funding for any mission unique modifications/services? (Yes or No)
- **LV Integration: Area of concern (Yes or No)**
  - Does the proposer have experience in LV integration? (Yes or No)
- **LV to Spacecraft Interface: Area of concern (Yes or No)**
  - Proposed Payload Fairing (PLF) \_\_\_\_\_
  - Spacecraft (S/C) Dimensions: Radial: \_\_\_\_\_ m Height \_\_\_\_\_ m
  - Any intrusions outside of the PLF usable Static volume? (Yes or No)
  - **Mechanical Interface:**
  - Standard Adapter: \_\_\_\_\_ Custom Adaptor: \_\_\_\_\_
  - **Electrical Interface:**
  - Standard \_\_\_\_\_ Pin(s) Connector(s): (Yes or No)



# Evaluation



- **LV to Spacecraft Interface: Area of concern (Yes or No)**
- **Mission Unique requirements:**
  - Instrument T-0 GN<sup>2</sup> 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: \_\_\_\_\_
  - **Unique Facility Requirements: (Yes or No)**
    - » Pad: \_\_\_\_\_
    - » S/C Processing Facility: \_\_\_\_\_
  - **S/C Environmental Test Plans**
    - » Environmental Test Plan/Flow described: (Yes or No)
    - » Test Levels provided: (Yes or No)
    - » Test Schedule provided: (Yes or No)
    - » Comments/issues/concerns: \_\_\_\_\_



# Evaluation



- **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)**
  - **Delivery of Verified S/C Model: (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 concern (Yes or No)**
  - **List the Radiological Sources:**  

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  - **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)**



# LSP Organizational Structure

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LAUNCH SERVICES PROGRAM

