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# DISCOVERY PHASE A LAUNCH SERVICES

**Rex Engelhardt**

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# Launch Services Program Bottom Line



- **LSP—Assured access to space for civil spacecraft**
  - NSPD-40\*: NASA Administrator is responsible for assuring access to space for civil missions, the “launch agent” for the civil sector
- **Deeply technical, experienced, stable government civilian workforce**
  - 265 civilians, including matrixed support from KSC and other centers
  - Augmented by technical support from QinetiQ, approx 210 FTEs
  - Average government experience level in launch: 15 years
- **Providing insight/penetration for expendable launch mission assurance**
  - Current team has provided government go/no-go on every expendable launch vehicle NASA has launched since 1998
  - 98% mission success rate since 1998
- **Through purchasing commercial expendable launch services**
  - “Best value”, firm fixed price, full spectrum of launch performance

\* NSPD-40: U.S. Space Transportation Policy



# 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 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
    - » Big stick – no-go for launch
- **Interface with Safety and Mission Assurance**
  - **Safety**
  - **Quality**



# Available Vehicles

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- **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.**



# Launch Service Budget

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- **The launch service includes:**
  - **The launch vehicle, engineering, analysis, and minimum performance standards and services provided by the contract.**
  - **Launch Site 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.**
  - **Budget does not include launch delays.**



# Mission Integration Team Structure



## **Mission Integration Team (MIT)**

A multi-disciplined team that is tasked by the ELV Launch Services Program with the responsibility of managing all integration and vehicle engineering aspects of the assigned mission. This includes management of the corresponding budget for launch services, phasing for FY planning, and launch service contract modifications as required and directed by the NASA SOMD Flight Planning Board.

### **Mission Manager (MM)**

The primary customer interface for mission specific integration. This person has overall mission management responsibilities for technical, contract deliverables, budget and schedule.

### **Program Integration Manager (PIM)**

Provides program and business management for the launch services contract, including specialized support in procurement and DART management.

### **Launch Site Integration Manager (LSIM)**

The interface for spacecraft launch site processing and responsible for; advance planning for launch site processing, capturing and implementing spacecraft processing requirements, and acting as the spacecraft's consultant and advocate.

### **Integration Engineer (IE)**

Leads mission unique requirements definition, development and verification, and acts as the interface with the Vehicle Systems Branch for gaining insight into fleet status and assigned hardware production issues.

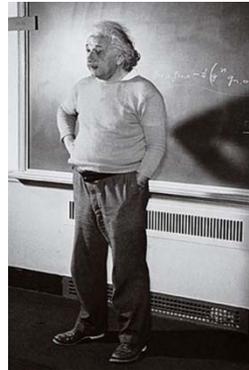


# The Big Picture

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**Commercial  
Launch Service  
Providers**



**YOU**

**Spacecraft  
Contractor**

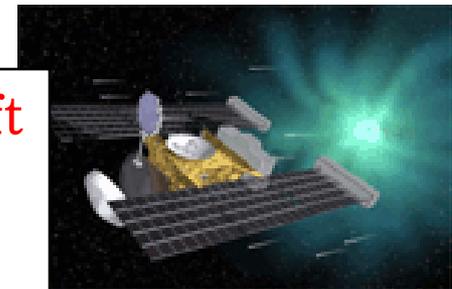
**Launch  
Services (NLS)  
Contract**

**S/C Contract**



**Launch  
Services  
Program**

**NASA Spacecraft**  
- GSFC  
- JPL  
- GRC  
- MSFC  
- APL, Etc.



**NASA  
Charter**

**NASA HQ  
SOMD**



# Early LSP Activities

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- **Provide budget estimates to Spacecraft Projects and Programs for Mission Launch Services**
- **Support early Spacecraft meetings:**
  - **Spacecraft Project Kick-Off**
  - **Mission SRR**
  - **Mission PDR (including SC Bus PDR)**
  - **Confirmation Review**
  - **Other reviews/meetings as requested**
- **Provide guidance on development of the IRD**
- **Updates on progress of NLS Follow-On to support planning**
- **Provide guidance on participation in LSTO process**
- **Support early spacecraft development**
  - **Facilitate LV early analyses (i.e. CLA, trajectory or other mission analysis)**
  - **LSP could perform some early analyses internally**
  - **Provide LV technical insight to S/C as requested**



# NLS Launch Service Task Orders (LSTO)



- **LSTO Definition:**
  - **Competition between NLS contractors to select best LV provider for a particular mission**
- **Standard launch services:**
  - **Launch vehicle and operations**
  - **Readiness reviews, documentation**
  - **Program management**
  - **Base support services**
  - **Launch site range support**
  - **Mission integration**
  - **Make all arrangements with responsible authorities to perform all launch site activities**
- **Non-Standard Services, as ordered:**
  - **Alternate Vehicle Configurations (solid motors, fairings, adapters, upper stage hardware, access doors), payload processing facilities, advanced mission analysis and support, secondary payload launch service, public affairs support, support for developing data books for radioactive components**



# NLS Launch Service Task Orders (LSTO) cont.



- **Special studies in support of NASA payload mission planning**
- **Mission unique modifications as required by the payload**
- **LSTO process takes approximately 6 to 8 months to complete**
- **Launch Service Budget based on PPBE budget numbers presented annually to NASA HQ by LSP**



# LSP Mission Management Process

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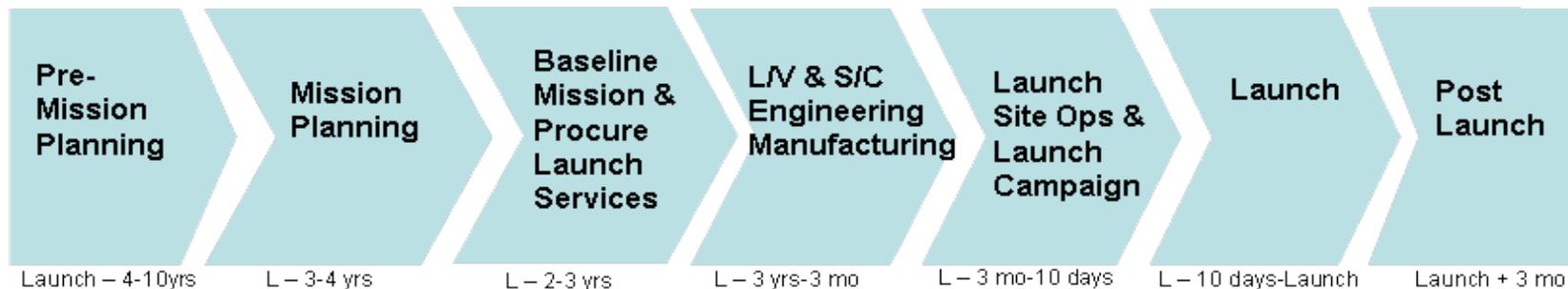


## Mission Life Cycle

Spacecraft

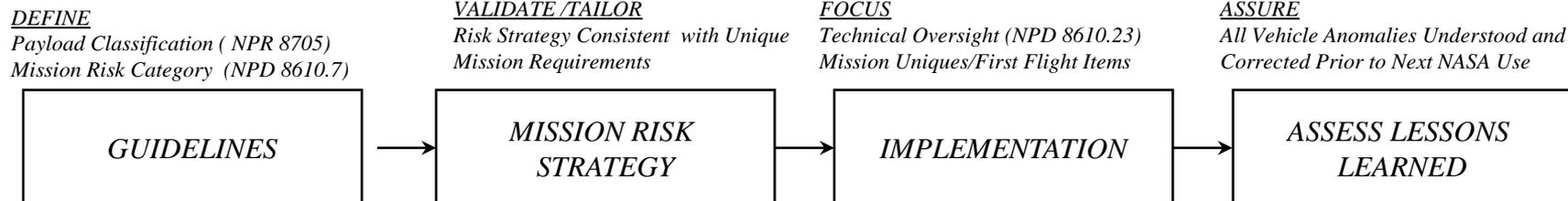


Launch Services



- *Early mission studies*
- *S/C AO support & eval*
- *S/C selection*
- *S/C manifested by FPB*
- *Assignment of LSP MIT*
- *S/C SRR, PDR, MCR*
- *Interface Requirements Document submitted by spacecraft*
- *Launch service competed & Selected through LSTO*
- *FPB ATP concurrence*
- *S/C CDR*
- *Requirements definition, implementation, verification (ICD & LSSP)*
- *S/C and LV hardware build*
- *S/C pre-ship review*
- *Pre-VOS or equivalent*
- *LVRR*
- *S/C MRR*
- *SMARR*
- *LSRR*
- *FRR/LRR*
- *Dress Rehearsal*
- *Launch*
- *Mission Success determination*
- *Post Flight Data Review*

LV Risk Mitigation



**DEFINE**

*Payload Classification (NPR 8705)  
Mission Risk Category (NPD 8610.7)*

**VALIDATE /TAILOR**

*Risk Strategy Consistent with Unique Mission Requirements*

**FOCUS**

*Technical Oversight (NPD 8610.23)  
Mission Uniques/First Flight Items*

**ASSURE**

*All Vehicle Anomalies Understood and Corrected Prior to Next NASA Use*



# NLS II Contract



- The NLS II Contract(s) will continue to provide the agency with domestic launch services that are safe, successful, reliable, and affordable
- The Commercial Space Act of 1998 mandates commercial acquisition of space launch services
  - **Section 202 of P.L. 105-303 defines space transportation services as a “commercial item”**
- Launch services are provided for NASA-owned and NASA-sponsored payloads through multiple Indefinite Delivery Indefinite Quantity (IDIQ) Task Order Contracts with negotiated Not To Exceed (NTE) prices
- The launch services are provided on a Firm-Fixed-Price (FFP) basis, and incorporate best commercial practices to the maximum extent practical
- The maximum cumulative quantity is 70 launch services and the maximum potential IDIQ cumulative contract value is \$15 billion for launch services ordered under all NLS/NLS II contracts



# NLS II Launch Vehicles

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For detailed performance data see <http://elvperf.ksc.nasa.gov>



Launch Vehicle	Falcon 1	Pegasus	Athena I	Falcon 1e	Taurus XL	Athena II	Falcon 9 Blk1	Falcon 9 Blk2	Atlas V 401	Atlas V 551
<b>Offeror</b>	SpaceX	OSC	LMSSC	SpaceX	OSC	LMSSC	SpaceX	SpaceX	ULS	ULS
<b>Perf @ 600 km Sun Synch</b>	175 kg	240 kg	320 kg	505 kg	950 kg	1175 kg	6490 kg	7540 kg	6640 kg	14280 kg
<b>Certification Cat</b>	n/a	Cat 3	n/a	n/a	Cat 2	n/a	n/a	n/a	Cat 3	Cat 3
<b>Launch Sites</b>	RTS	CCAFS WFF RTS VAFB	CCAFS KLC WFF	RTS	CCAFS WFF VAFB	CCAFS KLC WFF	CCAFS RTS	CCAFS RTS	CCAFS VAFB	CCAFS VAFB



# Performance Key Points



- **NLS-II is now a signed contract**
  - New vehicles and minimum contractual performance commitments are now available
- **Expiration of NLS-I and transition to NLS-II enabled existing launch providers to re-baseline their contractual vehicle performance**
  - NLS-I provided no means to re-establish baseline vehicle performance
    - » Providers were obligated to meet minimum performance commitments over duration of contract
  - Providers afforded an opportunity via NLS-II negotiations to incorporate all changes from last 10 years at one time
    - » NLS-I covered a period in which EELVs evolved through development and brought into an operational state



# EELV Performance Status



- **Performance in NLS-II contract covers the next 10 years**
  - **General reduction in overall Atlas performance relative to NLS-I**
    - » **On the order of a few hundred kilograms of delivered mass-to-orbit**
  - **Differences relative to NLS-I data are highly dependent on configuration and orbit**
    - » **Vehicles with SRBs to LEO generally better**
    - » **Vehicles with no SRBs to high energy are worse**
- **LSP Flight Dynamics has insight into performance changes**
  - **ULA produced an itemized list of changes since NLS-I began**
  - **ULA reassessed the baseline performance capabilities of vehicle fleet as a result of these changes**
  - **ULA provided data for representative, generic mission profiles to demonstrate differences between NLS-I, Payload Planner's Guide and NLS-II**



# Effects Of Performance Changes



- **NLS-II performance data are based on generic ground rules and standard hardware configurations**
  - Intended to be used for planning purposes
  - Customized planning data can be provided to tailor the ground rules to more mission-specific requirements
  - Mission-specific performance will be finalized contractually during LSTO process
  - Vehicle trajectory design ground rules and mission-unique hardware will be customized based on detailed Interface Requirements Document (IRD)
  - Resulting commitments may be above the generic contractual data
- **Agency Announcements of Opportunity (AO's)**
  - LSP can work directly with and provide support to mission teams prior to AO
    - » Coordinated through the Flight Projects Office



# 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 through HQ to [Rex.A.Engelhardt@nasa.gov](mailto:Rex.A.Engelhardt@nasa.gov); LSP will gladly respond as quickly as possible.**