



NLS II Update

**Space Operations Mission Directorate
(SOMD)**

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NLS II Overview

- **NLS I contract expired June 30, 2010. Existing missions will remain in place. No new orders allowed.**

- **NLS II was awarded on September 23-24, 2010**
 - **Period of Performance is through June 2020**
 - **An IDIQ contract with negotiated Not To Exceed (NTE) prices**
 - **Launch services are provided on a Firm Fixed Price basis**
 - **Incorporate best commercial practices to the maximum extent possible**
 - **Competitive Launch Services Task Orders (LSTO) are performed for each mission to determine launch provider**



NLS II Launch Vehicles

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

NOTE: Delta II, Delta IV and Taurus II are not currently offered on NLS II



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
Offeror	SpaceX	OSC	LMSSC	SpaceX	OSC	LMSSC	SpaceX	SpaceX	ULS	ULS
Perf @ 600 km Sun Synch	175 kg	240 kg	320 kg	505 kg	950 kg	1175 kg	6490 kg	7540 kg	6640 kg	14280 kg
Certification Cat	n/a	Cat 3	n/a	n/a	Cat 2	n/a	n/a	n/a	Cat 3	Cat 3
Launch Sites	RTS	CCAFS WFF RTS VAFB	CCAFS KLC WFF	RTS	CCAFS WFF VAFB	CCAFS KLC WFF	CCAFS RTS	CCAFS RTS	CCAFS VAFB	CCAFS VAFB



NASA ELV Cost Comparison

Total Mission Cost Comparison

1999-2010 (NLS I)

Small \$30-75M

Medium \$50-80M

Intermediate \$100-125M

2010-2015 (NLS II)

Small \$32M - \$114M

Medium \$102M - \$136M

Intermediate \$102M - \$334M

NLS I costs based on historical actuals

NLS II costs are projected costs use contract NTEs

Price varies depending on performance/orbit/order year



NLS II Overview

- **Medium/Intermediate Class providers (Sweet spot for Planetary Science) are:**
 - **Falcon 9 Block 1 and Falcon 9 Block 2 offered by SpaceX Corporation**
 - **Atlas V fleet offered by United Launch Alliance (ULA)**
 - **Delta IV is not currently on contract expect ULA to on-ramp in August 2011**
- **Order year price is now determined using Launch Date minus 30 months**
- **Cumulative down payment of 10% is due at L-30; Payment is now required at Award. Amount will be determined during the LSTO. (Experience is 2-5% of LSTO value)**



NLS II Work Plan

- Work Plan from the NLS II RFP**

Payment Number	Program Event (Launch +/- months)		Accomplishment Criteria
1	L-"X" ² / L-30	ATP/Award/Mission Integration Start	Authority to Proceed received from the Contracting Officer. Long Lead Hardware Procurement Initiated as required. Launch slot reserved. Mission Integration Kickoff Meeting date proposed.
2	L-27	Mission Integration Kickoff Meeting Mission Specific Requirement Review (MSRR) ¹	Mission Integration Kickoff Meeting complete MSRR held;
3	L-24	Preliminary Interface Control Document (ICD) ¹ MSRR	Preliminary ICD submitted and CDRL C2-1.1 approved. Formal review documentation CDRL C1-1 approved for MSRR.
4	L-21	Preliminary Coupled Loads Analysis (CLA) Verification Matrix	Preliminary CLA complete and CDRL C4-7 has been submitted and approved by NASA. Verification Matrix CDRL C2-1.2 submitted
5	L-18	Mission Specific PDR (MSPDR)	Mission Specific Preliminary Design Review Complete and CDRL C1-1 has been submitted to NASA.
6	L-15	Interface Control Document (ICD)	Baseline ICD and Verification Matrix complete and under configuration control and CDRL C2-1.1 and C2-1.2 have been approved by NASA. Launch vehicle certification activities complete or on schedule, <i>if applicable</i> .
7	L-12	Mission Specific Critical Design Review (MSCDR)	Mission Specific Critical Design Review complete, CDRLs C1-1 and C4-1 have been submitted to NASA.
8	L-09	Matchmate PLF Hardware Acceptance Review	Contractor verification adapter and separation system are available to support structural matchmate. Detailed fabrication of subassemblies approximately 50% complete. Final assembly and checkout of the PLF are substantially complete and ready for PLF HAR or equivalent. Approval of PGAA (L-12M) CDRL C4-1



NLS II Work Plan

- Work Plan from the NLS II RFP (cont'd)**

9	L-05	Launch Vehicle Final Assembly and Test MSSAR Verification Coupled Dynamic Loads Cycle	Contractor statement that final assembly and test of the Launch Vehicle is substantially completed and on schedule for shipment to launch site. Mission Specific System Acceptance Review (MSSAR) or equivalent complete and CDRL C1-1 has been submitted to NASA. Verification loads cycle complete and CDRL C4-7 has been approved by NASA. Approval of PGAA (L-6M) CDRL C4-1
10	L-02	Launch Vehicle Systems Readiness Review	Obtain concurrence to erect L/V on pad, or to continue with L/V processing at the field site. Review includes mission overview, mission analysis, vehicle hardware and software, status on the factory buildup and launch site schedule. Mission Success Criteria & Determination and Methodology, CDRL C2-5 has been submitted and approved by NASA.
11	L	Launch	Launch event occurred and CDRL 4-12 has been delivered for review.
12	L+03	Mission Success Determination	Final Flight Report completed and CDRL C4-13 has been submitted to NASA.



NLS II Challenges

- **There are 4 major challenges facing the Planetary Science Community, some of these risks can be mitigated others will require collaboration**
 - **Performance ranges offered by Atlas V are less than expected**
 - **Prices for NLS II Atlas V launch services have increased**
 - **Cost risk for EELV Launch Capability (ELC) remains**
 - **Schedule/cost risk to secure manifest slots**



NLS II Challenges (cont.)

- **Performance offered by ULA for Atlas V is less than NLS contract**
 - **Decrease is due to vehicle hardware configuration changes and modeling updates over the past decade**
 - **During the life of NLS I, existing margins were adequate to accommodate fluctuations in performance for most Atlas missions**
 - **For missions with narrow performance margins (i.e. JUNO, MSL), ULA has implemented performance improvements to meet contractual requirements**
 - **Expiration of NLS I and transition to NLS II enabled existing launch providers to re-baseline their contractual vehicle performance**
 - **General reduction in overall NLS II Atlas performance is on the order of a few hundred kilograms of delivered mass-to-orbit relative to NLS I**
 - **NLS II performance data is intended to be used for planning purposes**
- **Customized planning data can be provided by LSP based upon tailored ground rules to more mission-specific requirements**
- **Mission-specific performance will be finalized contractually during LSTO process**



NLS II Challenges (cont.)

- **NLS II Prices for Atlas V have increased; factors identified for increase:**
 - **Eroded Industrial Base:** Business base has eroded by 50% to 75% over the last few years, resulting in higher fixed cost per vehicle, driving costs higher by as much as 100% to 800%
 - **Project manifest:** Current prices are based on 5 launches per year versus assumptions in 2000 of 10 to 12 launches per year
 - **Production Rate:** Lower launch rate than was previously estimated requires operating expenses to spread over less number of vehicles
 - **Lot Buy Size:** ULA anticipates smaller lot sizes from suppliers which will lead to higher unit costs
 - **Inventory:** There is no excess inventory beyond current commitments
 - **Escalation:** NLS I prices were heavily discounted and did not take into account normal escalation rates



NLS II Challenges (cont.)

- **NLS II Price Effects on Planetary Science**
 - **MAVEN first planetary mission awarded under NLS II LSTO – total launch service cost is \$187M for an Atlas V**
 - **MAVEN utilized one of the last of the remaining EELV lot buys resulting in significant discount. Price falls in between NLS I and NLS II**
 - **A similar sized vehicle with a Launch date of 2016 would be 17% more than MAVEN; a 2018 launch date would be 34% more than MAVEN**



NLS II Challenges (cont.)

- **Falcon 9 – new and emerging Launch Service similar performance to Delta II, significantly less than Atlas V for planetary**
 - **Cost is 43% less than Atlas V**
 - **LSP developing plans to certify Falcon 9 Block 1 Cat 2 performance**
 - **Partnering with other Government Agencies to accelerate certification schedule**



NLS II Challenges (cont.)

- **Impacts associated with the ELC cost risk are being addressed**
 - **An agreement between NASA/NRO/USAF is in work to define each parties role in the ELC**
 - **Anticipate NLS II contract will be updated once agreement is finalized; until then ELC NTE prices bound impact**
- **Cost risk for additional enhanced launch capability continues to be worked.**
 - **MSL launch delay brought this to light due to the close proximity of Juno's launch date on the CY 2011 manifest**
 - **Expect this type of cost risk to be an exception rather than the rule for every mission**
 - **To be addressed in the ELC agreement**



Summary

- **Strong partnerships with DoD to work together to resolve ELC risks and to understand their acquisition strategy**
- **LSP will continue to work closely with SMD's Planetary Science Division in an effort to mitigate cost risks and react to changes as they occur**
- **LSP is committed to partnering with our customers to provide effective budget solutions**
- **LSP is committed to mission success**



Back up Charts



NASA ELV Cost Comparison

Percent increase NLS I to NLS II (2010 order year)

Small negligible¹

Medium ~20%²

Intermediate³ – Falcon 9 ~0%⁴

– Atlas V ~50%⁵

¹ Based on NLS I vehicles in small class

² As compared to later Delta II 19-pack missions (but excluding GRAIL)

³ Depending on performance/orbit requirements

⁴ Does not include non-recurring costs associated with certification/first use

⁵ Does not include EELV Launch Capability threat of ~\$100-150M additional per flight nor Enhanced Launch Capability threat of ~\$20M to secure a slot on the manifest



Atlas V Performance Degradation

