NASA Advisory Council Recommendation

Lowering the Cost of Expendable Launch Services
2011-02-06 (SC-01)

Recommendation:
We recommend that NASA work aggressively to lower the cost of expendable launch services through whatever means possible. This may include block buys or other innovative approaches in the NASA Launch Services II (NLS II) contract and pursuing alternate sources such as new commercial entries and international collaborations.

Major Reasons for the Recommendation:
The new NLS II contract greatly increases the cost of launch services, resulting in loss of the number of flight missions that the NASA Science Mission Directorate (SMD) can afford.

Consequences of No Action on the Recommendation:
The SMD launch rate will be reduced and there will be reductions in the science content of those missions that are launched.

NASA Response:
NASA concurs; however, the nature of the challenges that affects our ability to gain access to space differs across Expendable Launch Vehicle (ELV) size classes.

For the small launch vehicles that support the small payload class, the prices from the original NLS contract (AKA: NLS I) to the new NLS II contract have remained essentially the same. (See Attachment 1.) The larger concern for this payload class is the lack of robust launch demand. Several launch service providers have offered launch vehicles for this class (i.e., Orbital Sciences Corporation's (OSC) Pegasus and Taurus, SpaceX's Falcon 1/1e, and Lockheed/ATK's Athena 1c), but the market has not developed in a way to provide a manifest where multiple commercial flights can be manifested and flown each year. As evidence, NASA has averaged less than one small launch vehicle flight a year since 1998. (See Attachment 2.) In addition, the FAA's "2011 Commercial Space Transportation Forecasts" dated May 2011, predicts an average international demand in this launch vehicle class over the next ten years of 1.9 small launch vehicles for commercial payloads per year. Without multiple flights each year, it is difficult for industry to maintain a viable business case. This low launch rate becomes a concern for achieving robust launch reliability as evidenced by the last two OSC Taurus XL flights that ended in back-to-back launch failures for the Orbiting Climate Observatory (OCO) mission in February 2009 and for the Glory mission in March 2011.

For medium launch vehicles, the transition from NLS I to NLS II conveys some price increases. But the real issue here is the current lack of certified launch vehicles to support the medium payload class into the future. The current NLS II contract offers Falcon 9 and Athena IIc for the medium class. The Lockheed/ATK Athena IIc has not yet flown. The SpaceX Falcon 9 has had two successful demonstration flights; but this vehicle is still in development and has not completed the NASA certification process. Currently, the only certified medium launch vehicle

is the United Launch Alliance (ULA) Delta II. However, it is not currently available for procurement on the NLS II contract. NASA's last planned flight of Delta will be on the NPOESS Preparatory Project (NPP) satellite in October 2011. ULA has indicated to NASA that they plan to "on-ramp" Delta II during the summer and fall of 2011 so it can be offered as part of the NLS II. But there are only five vehicles left in inventory, and ULA has no plans to restart production. Other options to support the medium class include co-manifesting missions with other missions and users and seeking the ability to use the OSC Minotaur IV launch vehicle, based on excess Inter-Continental Ballistic Missile assets, on a limited basis as national policy will allow.

The area where price is the key issue is the large payload class. Large NASA payloads are supported by what the U.S. launch industry describes as "intermediate" launch vehicles. Currently, the only certified intermediate launch vehicle available on the NLS II contract is the ULA Atlas V. The Atlas V prices have increased substantially from the NLS I to the NLS II contract due primarily to the business case faced by the supplier, ULA. The U.S. Government is moving to provide a more stable demand expectation that will improve this business case. On March 10, 2011, NASA signed a Memorandum of Understanding with the U.S. Air Force and the National Reconnaissance Office that will allow NASA to take advantage of reduced Evolved Expendable Launch Vehicle (EELV) prices once the Air Force puts the new EELV block buy acquisition strategy in place. The Air Force's current plan is to have the new strategy in place for Fiscal Year 2013 through Fiscal Year 2017.

NASA also supports the addition and use of new entrants in all classes of launch vehicles in order to continue to facilitate and encourage competition, which will be the true motivator for reduced launch service prices over the long term. Through Commercial Orbital Transportation Services (COTS), Commercial Resupply Services (CRS) and Commercial Crew Development (CCDev), NASA is providing development dollars and facilitating development and operational flights of multiple vendors in order to promote competition and provide the ability to achieve significant flight rates. Additionally, a key change was made to the NLS I contract and carried forward into the new NLS II contract that allows a provider to become a supplier on the NASA launch services contract even if they have not yet flown, as long as they are able to meet the terms and information requirements of the contract.

NASA actively pursues international partnerships on many of its science missions and, within the limits imposed by national policy, adopts arrangements involving a partner-provided launch vehicle. These occur in both strategic missions planned and implemented by NASA and in competed missions in which a Principal Investigator proposes a mission involving a foreign partner. However, the purchase of a non-U.S. launch vehicle for a NASA science mission is not permitted, regardless of domestic availability issues, unless NASA is exempted by the National Security Council and the Office of Science and Technology Policy, subject to interagency coordination, from the National Space Policy's requirement to launch U.S. Government payloads on space launch vehicles manufactured in the U.S.

In every ELV class, NASA is aggressively pursuing all available options. We will keep the NAC and its committees informed of our progress.

NASA ELV Cost Comparison

Total Mission Cost Comparison

1999-2010 (NLS I)		2010-2015 (NLS II)	
Small	**$30-75M**	**Small**	**$32M - $114M**
Medium	**$50-80M**	**Medium**	**$102M - $136M**
Intermediate	**$100-125M**	**Intermediate**	**$102M - $334M**

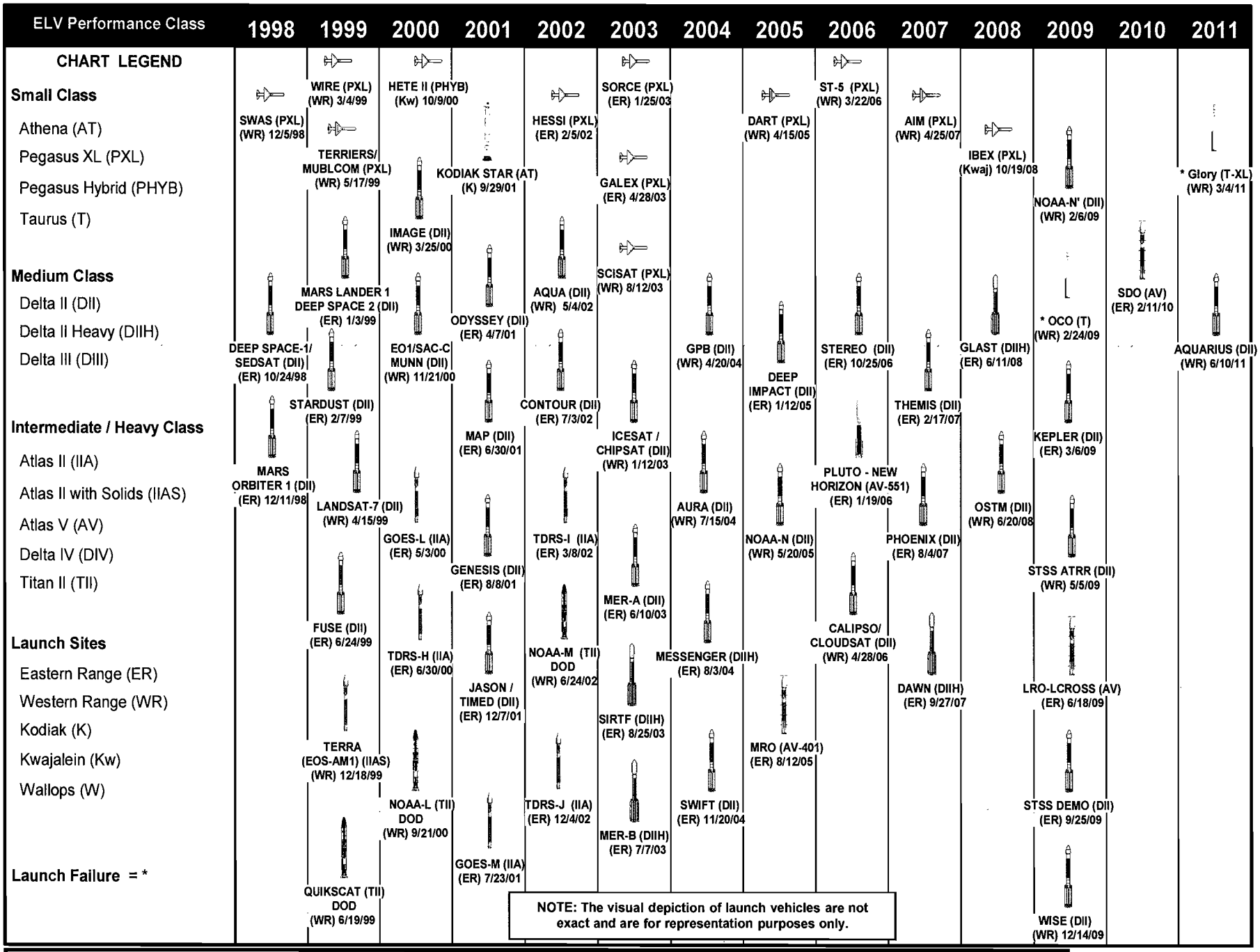
NLS I costs based on historical actuals

NLS II costs are projected costs using pre-negotiated contract Not-To-Exceed (NTE) values. Actual launch service price may be lower than NTE pending results of head-to-head competition or mission negotiation

Price will also vary depending on required performance/orbit/order year

Attachment 1

NASA Launch Services Program (LSP) Launch History (1998 – 2011)



NASA LSP LV Launch Success Rate: 65 Attempts / 63 Successes = 96.9% (Refer to success/failure guidelines in Metric 0773 within the LSP Basic Ordering Agreement (BOA).)

Tiffany Nail / KSC
6/15/11
Attachment 2 (Page 1/3)

LSP Launch History (1998 - 2011)

Year	Date	Payload	LV Config	Success/ Failure	Launch Site	LV Mgmt Center
2011	6/7/2011	Aquarius	Delta II	S	WR	KSC
	3/4/2011	Glory	Taurus XL	F	WR	KSC
2010	2/11/2010	SDO	Atlas V	S	ER	KSC
2009	12/14/2009	WISE	Delta II	S	WR	KSC
	9/25/2009	STSS DEMO	Delta II	S	ER	KSC
	6/18/2009	LRO-LCROSS	Atlas V	S	ER	KSC
	5/5/2009	STSS ATRR	Delta II	S	WR	KSC
	3/6/2009	KEPLER	Delta II	S	ER	KSC
	2/24/2009	OCO	Taurus	F	WR	KSC
	2/6/2009	NOAA-N Prime	Delta II	S	WR	KSC
2008	10/19/2008	IBEX	Pegasus XL	S	Kwaj	KSC
	6/20/2008	OSTM	Delta II	S	WR	KSC
	6/11/2008	GLAST	Delta H	S	ER	KSC
2007	9/27/2007	Dawn	Delta II	S	ER	KSC
	8/4/2007	Phoenix / Mars Scouts	Delta II	S	ER	KSC
	4/25/2007	AIM (SMEX-9)	Pegasus XL	S	WR	KSC
	2/17/2007	THEMIS (MIDEX-5)	Delta II	S	ER	KSC
2006	10/25/2006	STEREO	Delta II	S	ER	KSC
	4/28/2006	Calipso / Cloudsat	Delta II	S	WR	KSC
	3/22/2006	SPACETECH 5	Pegasus	S	WR	KSC
	1/19/2006	Pluto New Horizons	Atlas V	S	ER	KSC
2005	8/12/2005	Mars Recon Orbiter (MRO)	Atlas V	S	ER	KSC
	5/20/2005	NOAA-N	Delta II	S	WR	KSC
	4/15/2005	DART	Pegasus XL	S	WR	KSC
	1/12/2005	DEEP IMPACT	Delta II	S	ER	KSC
2004	11/2/2004	SWIFT	Delta II	S	ER	KSC
	8/3/2004	MESSENGER	Delta II	S	ER	KSC
	7/15/2004	AURA	Delta II	S	WR	KSC
	4/20/2004	GPB	Delta II	S	WR	KSC
2003	8/25/2003	SIRTF	Delta II	S	ER	KSC
	8/12/2003	SCISat	Pegasus XL	S	WR	KSC
	7/7/2003	MER-B	Delta II	S	ER	KSC
	6/10/2003	MER-A	Delta II	S	ER	KSC
	4/28/2003	GALEX	Pegasus XL	S	ER	KSC
	1/25/2003	SORCE	Pegasus XL	S	ER	KSC
	1/12/2003	ICESat/CHIPsat	Delta II	S	WR	KSC

LSP Launch History (1998 - 2011)

Year	Date	Payload	LV Config	Success/ Failure	Launch Site	LV Mgmt Center
2002	12/4/2002	TDRS-J	Atlas IIA	S	ER	KSC
	7/3/2002	Contour	Delta II	S	ER	KSC
	6/24/2002	NOAA-M	Titan II	S	WR	KSC
	5/4/2002	AQUA	Delta II	S	WR	KSC
	3/8/2002	TDRS-I	Atlas IIA	S	ER	KSC
	2/6/2002	Hessi	Pegasus XL	S	ER	KSC
2001	12/7/2001	Jason-Timed	Delta II	S	WR	KSC
	9/29/2001	Kodiak Star	Athena	S	Kodiak	KSC
	8/8/2001	Genisis	Delta II	S	ER	KSC
	7/23/2001	GOES-M	Atlas	S	ER	KSC
	6/30/2001	MAP	Delta II	S	ER	KSC
	4/7/2001	MARS Odyssey	Delta II	S	ER	KSC
2000	11/21/2000	EO1, SAC-C, MUN	Delta II	S	WR	KSC
	10/9/2000	Hete-2	Pegasus	S	Kwaj	KSC
	9/21/2000	NOAA-L (16)	Titan II	S	WR	KSC
	6/30/2000	TDRS-H	Atlas IIA	S	ER	KSC
	5/5/2000	GOES-L (11)	Atlas	S	ER	KSC
	3/25/2000	IMAGE	Delta II	S	WR	KSC
1999	12/18/1999	EOS-Terra	Atlas	S	WR	KSC
	6/24/1999	FUSE	Delta II	S	ER	KSC
	6/20/1999	QUIKSCAT	Titan II	S	WR	KSC
	5/18/1999	TERRIERS, MUBLCOM	Pegasus-XL/HAPS	S	WR	KSC
	4/15/1999	LANDSAT-7	Delta II	S	WR	KSC
	3/4/1999	WIRE	Pegasus-XL	S	WR	KSC
	2/7/1999	STARDUST	Delta II	S	ER	KSC
	1/3/1999	Mars Polar Lander	Delta II	S	ER	KSC
1998	12/11/1998	Mars Climate Orbiter	Delta II	S	ER	KSC
	12/6/1998	SWAS	Pegasus-XL	S	WR	KSC
	10/24/1998	Deepspace 1 (SEDSAT)	Delta II	S	ER	KSC