



NASA Expendable Launch Services Current Use of EELV

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Overview

- NASA's expendable launch vehicles are run by the Launch Services Program (LSP) consolidated at Kennedy Space Center in 1998
 - LSP provides acquisition, technical management, mission integration and launch management
- NASA utilizes a mixed fleet of vehicles (small, medium & intermediate) with varying levels of performance used to support a mix of mission sizes
 - Mainly for Science Mission Directorate payloads, but other NASA Directorates and other government agencies also use NASA launch services
 - Launches conducted from multiple ranges, including RTS, WFF, Kodiak
- Vehicles are selected from the NASA Launch Services Contract (NLS)
 - Through competition based on mass, orbit, class of payload, and best value
 - Current NLS contract expires in 2010, RFP released to extend the contract
- Most recent contract action purchased four intermediate class missions
 - TDRS – K & L, RBSP and MMS
- Important issues
 - Loss of Medium Class launch service provider, which has been 50% of NASA missions historically
 - Compressed manifest
 - Possibility that NASA incurs a portion of the intermediate class infrastructure costs post 2010



NASA Launch Services Manifest

FPB Approved 3/25/09 Release 6/03/09 Rev. 1	2009				2010				2011				2012				2013				2014				2015				2016							
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
Small Class (SC)																																				
Pegasus (P)																																				
Taurus (T)																																				
Falcon 1 (F)																																				
Medium Class (MC)																																				
Delta 732X Series (D3)																																				
Delta 742X Series (D4)																																				
Delta 792X Series (D)																																				
Delta 792X H (DH)																																				
Intermediate (IC) / Heavy Class (HC)																																				
Atlas V (AV)																																				
Delta IV (DIV)																																				
Delta IV Heavy (IVH)																																				
Falcon 9																																				
ADVISORY ROLE																																				
Vehicle Unassigned																																				

For NASA Planning Purposes Only

UR = UNDER REVIEW
 * = MISSION UNSUCCESSFUL
 A = ATP'd

△ = SCIENCE
 ○ = EXPLORATION SYSTEMS

□ = SPACE OPERATIONS
 ◇ = DOD REIMBURSABLE

V = VAFB LAUNCH W = WALLOPS LAUNCH
 K = KWAJALEIN

NASA-LSP Managed ELV Launch History (1998 – 2009)

ELV Performance Class	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CHART LEGEND												
Small Class												
Athena (AT)	SWAS (PXL) (WR) 12/6/98	WIRE (PXL) (WR) 3/4/99	HETE II (PHYB) (Kw) 10/6/00	KODIAK STAR (AT) (K) 9/29/01	HESI (PXL) (ER) 2/5/02	SORCE (PXL) (ER) 1/25/03		DART (PXL) (WR) 4/15/06	ST-4 (PXL) (WR) 3/22/06	AIM (PXL) (WR) 4/25/07	IBEX (PXL) (Kw) 10/19/08	
Pegasus XL (PXL)		TERRIERS/ MUSLCON (PXL) (WR) 5/17/99										
Pegasus Hybrid (PHYB)												
Taurus (T)												
Medium Class												
Delta II (DII)	DEEP SPACE-1/ SEDSAT (DI) (ER) 10/24/99	MARS LANDER 1 DEEP SPACE 2 (DI) (ER) 1/3/99	IMAGE (DI) (WR) 3/25/00	ODYSSEY (DI) (ER) 4/7/01		SCISAT (PXL) (WR) 5/12/03						
Delta II Heavy (DIIH)					AQUA (DI) (WR) 5/4/02							
Delta III (DIII)												
Intermediate / Heavy Class												
Atlas II (IIA)												
Atlas II with Solids (IIAS)	MARS ORBITER 1 (DI) (ER) 12/11/98	STARDUST (DI) (ER) 2/7/99	EO1/SAC-C MUNN (DI) (WR) 11/21/00	MAP (DI) (ER) 6/30/01	CONTOUR (DI) (ER) 7/3/02	ICESAT / CHIPSAT (DI) (WR) 1/12/03	GPB (DI) (WR) 4/20/04		STEREO (DI) (ER) 10/25/06	THEMIS (DI) (ER) 3/17/07	GLAST (DIH) (ER) 6/11/08	NOAA-N (DI) (WR) 2/6/09
Atlas V (AV)												
Delta IV (DIV)												
Titan II (TII)												
Launch Sites												
Eastern Range (ER)												
Western Range (WR)												
Kodiak (K)												
Kwajalein (Kw)												
Wallops (W)												
Launch Failure = *												
		FUSE (DI) (ER) 6/24/99	GOES-L (IA) (ER) 5/3/00	JASON / TIMED (DI) (ER) 12/7/01	TDRS-I (IA) (ER) 3/6/02	MER-A (DI) (ER) 6/19/03	MESSENGER (DIH) (ER) 8/3/04	NOAA-N (DI) (WR) 5/20/05	PLUTO - NEW HORIZON (AV-551) (ER) 1/19/06	PHOENIX (DI) (ER) 8/4/07	OSTM (DI) (WR) 6/20/08	KEPLER (DI) (ER) 3/6/09
			TDRS-H (IA) (ER) 6/30/00		NOAA-M (TI) DOD (WR) 6/24/02	SIRTF (DIH) (ER) 6/25/03			CALIPSO/ CLOUDSAT (DI) (WR) 4/23/06	DAWN (DIH) (ER) 9/27/07		
		TERRA (EOS-AM1) (IAS) (WR) 12/18/99										
			NOAA-L (TI) DOD (WR) 9/21/00	GOES-M (IA) (ER) 7/23/01	TDRS-J (IA) (ER) 12/4/02		SWIFT (DI) (ER) 11/20/04	MRO (AV-401) (ER) 8/12/05				STSS ATTR (DI) (WR) 5/5/09
		QUIKSCAT (TI) DOD (WR) 6/15/99				MER-B (DIH) (ER) 7/7/03						

NASA LSP LV Launch Success Rate: 59 Attempts / 58 Successes = 98.3%
Refer to success/failure guidelines in Metric 0773 within the LSP BOA.

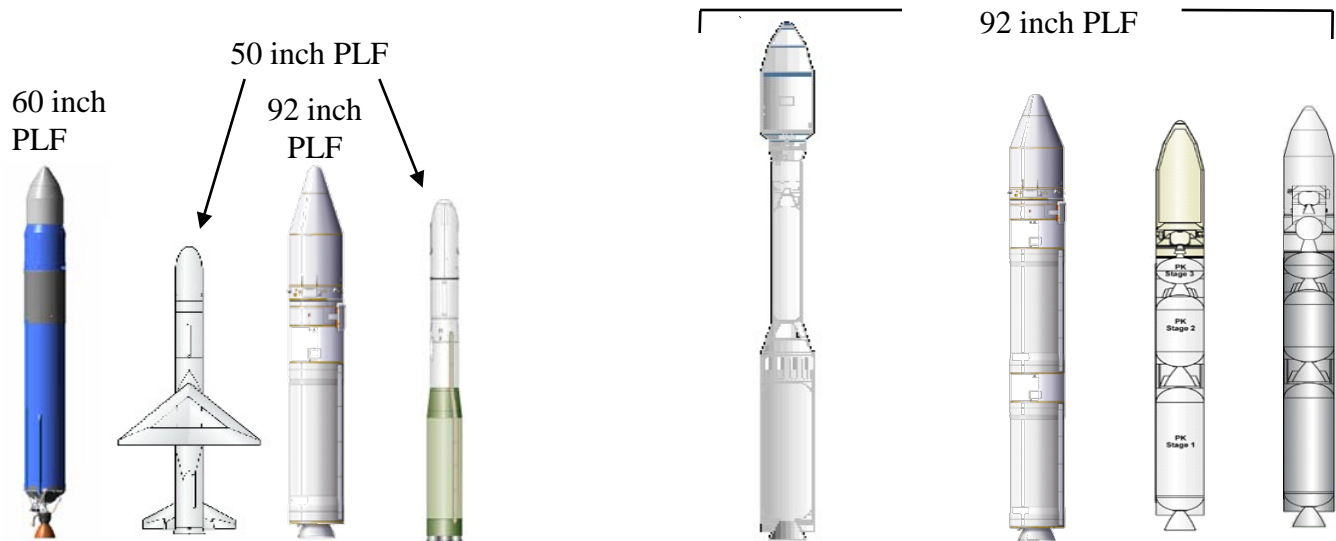
Tiffany Nail / KSC
5/6/09



Small Launch Vehicle Performance Range (Kg)

Performance From Payload Planner's Guides or Company Estimates

120 inch PLF



Small Class

Medium

Vehicle	Falcon 1	Pegasus XL	Athena I	Minotaur I	SIGNIFICANT GAP	Taurus XL	GAP	Athena II	Minotaur IV	Minotaur V	GAP	Delta 7320
Orbit												
600 km 90 deg	200 (a)	250	~300	375		900		~1150	~1200	NA		1650
675 km SS		225		325		750-800			1100	NA		1550
C3=0	NA	NA	NA	NA		~280(kg)		~425(b)	NA	~390		7425=750(b)
Perf risk	Low-Med	Low	Med	Low		Low		Med	Low	Low		Low
Avail for Science Msn (c)	Now	Now -	~Late CY 2014	Now		Now		~Late CY 2014	~3 rd qtr 2011	~3 rd qtr 2011		N/A -

(a): Falcon 1e concept with higher performance (~400kg) exists, but is in early development stage

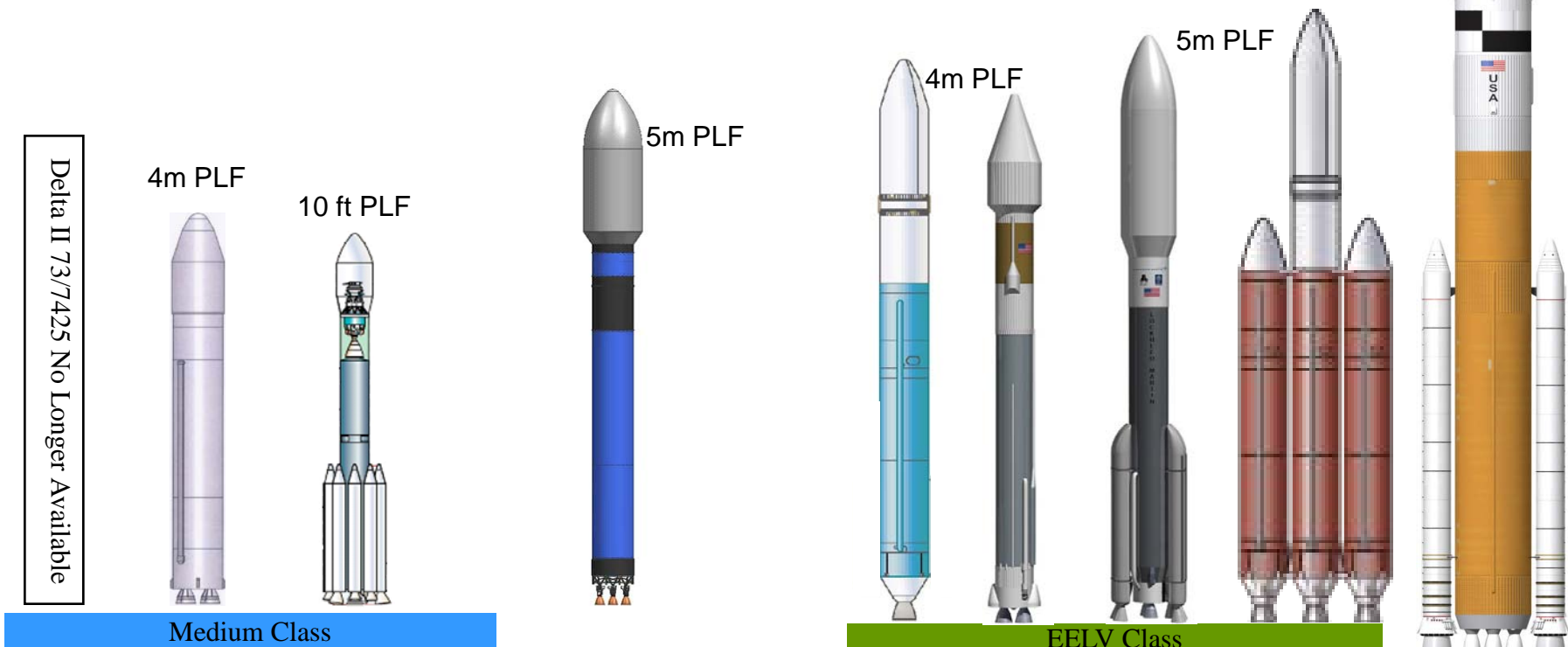
(b): Requires additional LV provided stage for high energy missions

(c): Significant schedule risk exists for first flight date of any new launch vehicle configuration, therefore actual availability is likely 6 to 18 months after dates noted above.



Medium, Intermediate and Heavy Launch Vehicle Performance Range (Kg)

Performance From Payload Planner's Guides or Company Estimates



Vehicle Orbit	Delta II 7320/5	Taurus 2 WFF	Delta II 7920/5 H	Falcon 9 Block 1 (b)	SIGNIFICANT GAP	Delta 4040	Atlas V 401	Atlas V 551	Delta IV Heavy	Ares V (c)
C3=0	750 (a)	1150 (a)	1400 (a)	2000		2750	3450	6300	9305	62.8 mT(to TLI)
C3=10	650 (a)	950 (a)	1200 (a)	1350		2100	2850	5300	7010	
675 km sun sync	1550	Not achievable from WFF	Not achievable from CCAS	~6500		6800	7250	13600	20250	~187.7 mT (to 29 deg incl, 130 nm)
GTO	N/A	TBS	900	3495		3985	4765	8570	12980	
Perf risk	Low	High	Low	Med		Low	Low	Low	Low	Med
Available for Science Msn	N/A	~1 st qtr 2014 (d)	Now	(d)		Now	Now	Now	Now	2 nd half CY2019 (d)

(a) Requires additional LV supplied upper stage for high energy missions (b) Falcon 9 Block 2 upgrade planned (higher performing) – available ~4th qtr 2013 (c) On hold until conclusion of Augustine Commission (d) Significant schedule risk exists for first flight of any new LV configuration, therefore actual availability is likely 6 -18 mo after dates noted above.



EELV Considerations

- Cost
- Infrastructure
- Industrial base
- Multiple users risk approaches
- Schedule



Back up slides



EELV Launch History



LOCKHEED MARTIN

Eutelsat Hotbird 6
Atlas V (401)
21 Aug 02



BOEING

Eutelsat W5
Delta IV (4,2)
20 Nov 02



BOEING

DSCS A3
Delta IV (4,0)
10 Mar 03



LOCKHEED MARTIN

Hellas Sat
Atlas V (401)
13 May 03



LOCKHEED MARTIN

Rainbow 1
Atlas V (521)
17 Jul 03



BOEING

DSCS B6
Delta IV (4,0)
29 Aug 03



LOCKHEED MARTIN

AMC-16
Atlas V (521)
17 Dec 04



BOEING

HLV-Demo
Delta IV (HLV)
21 Dec 04



LOCKHEED MARTIN

Inmarsat I-4
Atlas V (431)
11 Mar 05



LOCKHEED MARTIN

Mars Recon Orbiter
Atlas V (401)
12 Aug 05



LOCKHEED MARTIN

Pluto New Horizons
Atlas V (551)
19 Jan 06



LOCKHEED MARTIN

Astra 1KR
Atlas V (411)
20 Apr 06



EELV Launch History - continued



BOEING
GOES-N
 Delta IV (4,2)
 24 May 06



BOEING
NROL-22 vb
 Delta IV (4,2)
 28 Jun 06



BOEING
DMSF-17 vb
 Delta IV (4,0)
 4 Nov 06



ULA
 United Launch Alliance
STP-1
 Atlas V (401)
 9 Mar 07



ULA
 United Launch Alliance
NROL-30
 Atlas V (401)
 15 Jun 07



ULA
 United Launch Alliance
WGS SV-1
 Atlas V (421)
 11 Oct 07



ULA
 United Launch Alliance
DSP-23
 Delta IV HLV
 11 Nov 07



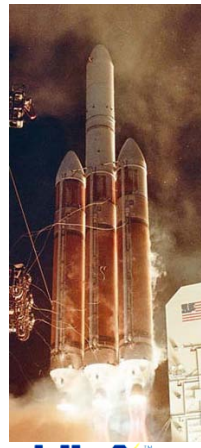
ULA
 United Launch Alliance
NROL-24
 Atlas V (401)
 10 Dec 07



ULA
 United Launch Alliance
NROL-28 vb
 Atlas V (411)
 13 Mar 08



ULA
 United Launch Alliance
ICO-G1
 Atlas V (421)
 14 Apr 08



ULA
 United Launch Alliance
NROL-26
 Delta IV HLV
 18 Jan 09



ULA
 United Launch Alliance
WGS SV-2
 Atlas V (421)
 4 Apr 09