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# ***2007 Rideshare Workshop***

## ***Launch Services Program***

**John F. Kennedy Space Center**

**Garrett L Skrobot**

**Flight Projects Office**

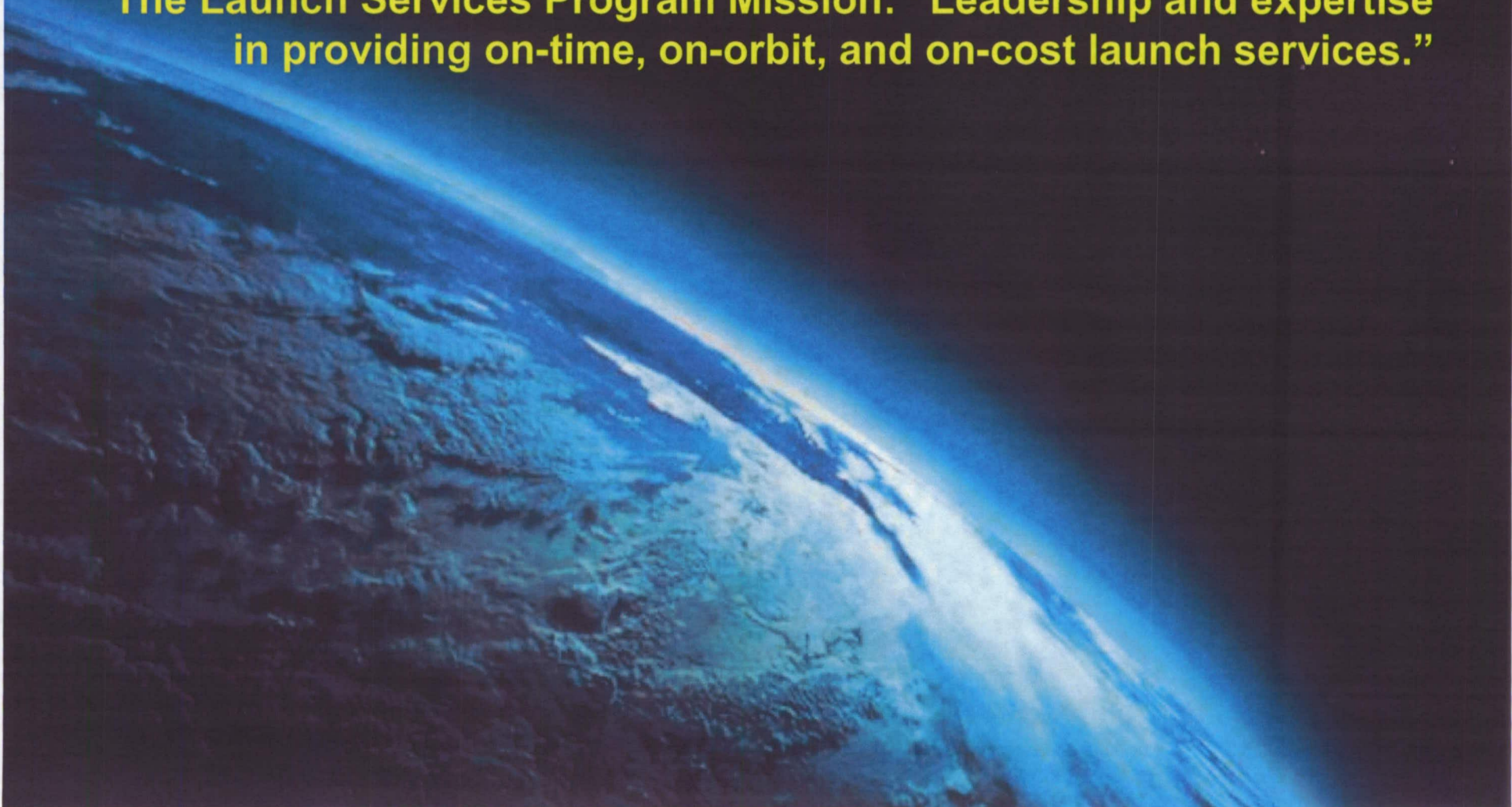


# *Mission Statement*

John F. Kennedy Space Center

LAUNCH SERVICES PROGRAM

**The Launch Services Program Mission: “Leadership and expertise in providing on-time, on-orbit, and on-cost launch services.”**



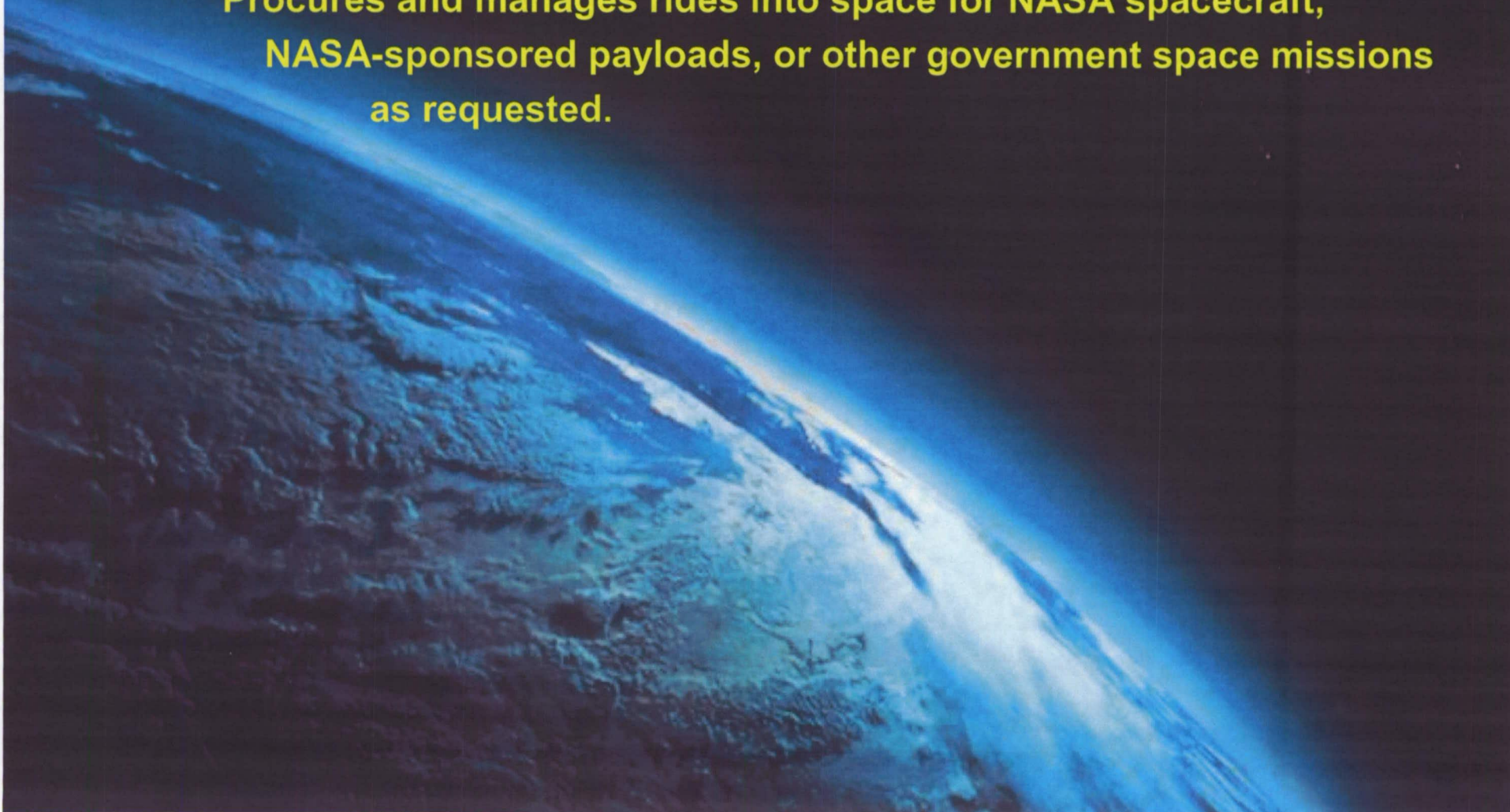


# *Launch Services Program*

John F. Kennedy Space Center

LAUNCH SERVICES PROGRAM

- **The NASA Launch Services Program (LSP)**  
Procures and manages rides into space for NASA spacecraft,  
NASA-sponsored payloads, or other government space missions  
as requested.

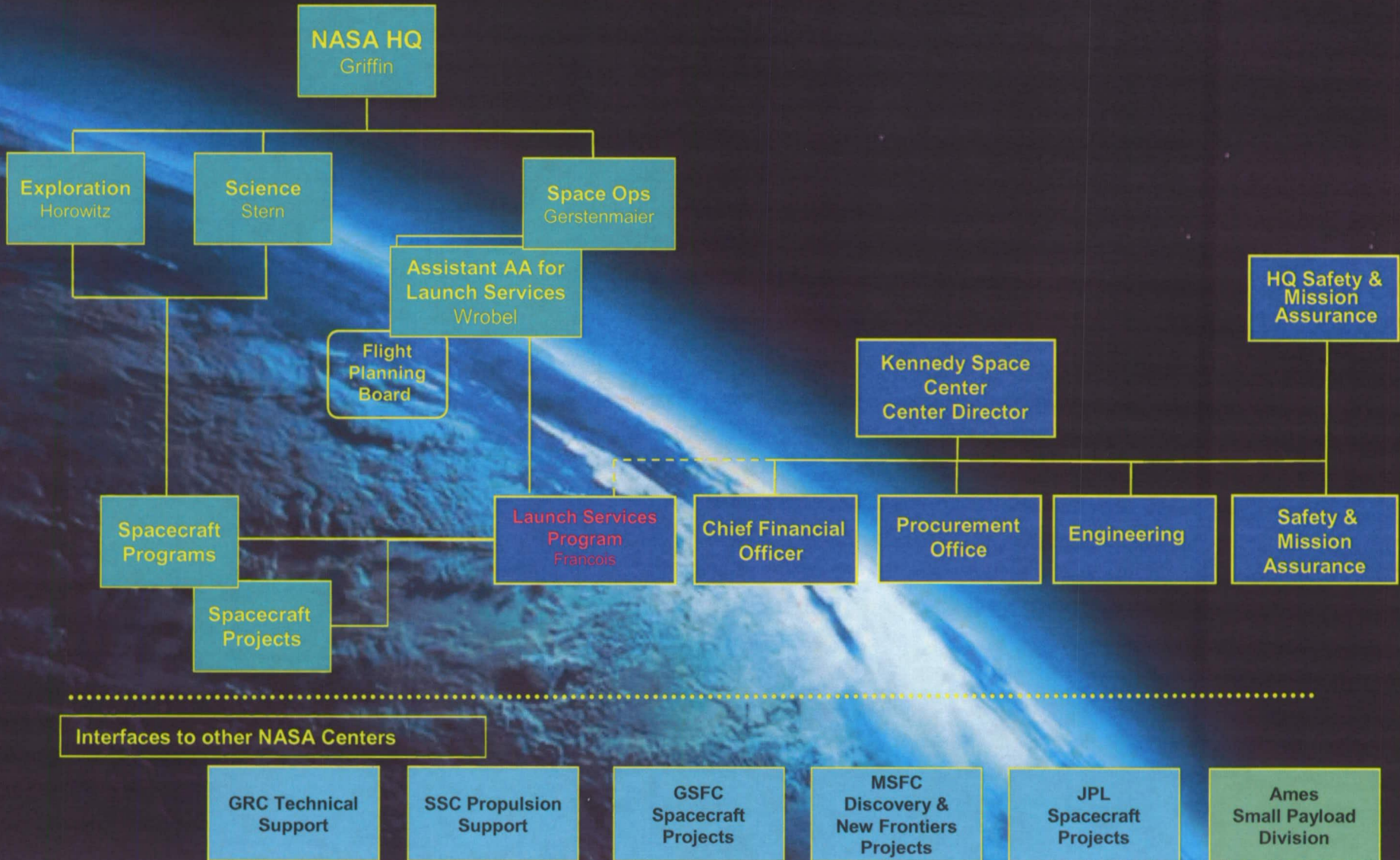




# Launch Services Program

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LAUNCH SERVICES PROGRAM





# Launch Services Program

John F. Kennedy Space Center

## LAUNCH SERVICES PROGRAM

VA

**LAUNCH SERVICES PROGRAM OFFICE**

6

MANAGER  
DEPUTY MANAGER  
SYSTEM INTEGRATION MANAGER

S. FRANCOIS  
R. LUGO  
D. BEDELL

3/19/2007

VA-1

**ADMINISTRATIVE OFFICE**

3

SENIOR LAUNCH DIR C. DOVALE

VA-2

**OFFICE OF LAUNCH DIRECTOR**

2

VA-A

**PROGRAM PLANNING OFFICE**

5.5

VA-B

**PROGRAM BUSINESS OFFICE**

17

CHIEF A. MITSKEVICH

G. SKROBOT

VA-C

**FLIGHT PROJECTS OFFICE**

16

VA-E

**INFRASTRUCTURE MANAGEMENT DIVISION**

2

VA-G

**FLEET AND SYSTEMS MANAGEMENT DIVISION**

3

CHIEF J. LYONS

VA-H

**FLIGHT ANALYSIS DIVISION**

1

VA-E1

**GROUND SYSTEMS INTEGRATION BRANCH**

14

VA-E2

**LAUNCH SITE INTEGRATION BRANCH**

18

VA-G1

**FLEET SYSTEMS INTEGRATION BRANCH**

9

VA-G2

**MISSION INTEGRATION BRANCH**

11

VA-G3

**FLEET FIELD OFFICES**

6

VA-H1

**FLIGHT DYNAMICS BRANCH**

15

VA-H2

**FLIGHT STRUCTURES BRANCH**

9

VA-H3

**ENVIRONMENTS AND LAUNCH APPROVAL BRANCH**

10

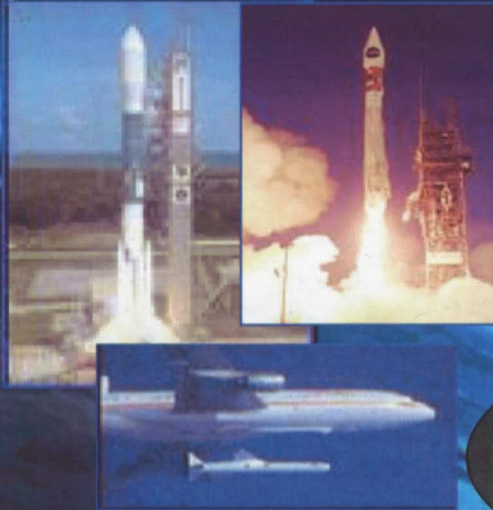


# Programmatic Acquisition and Management of Launch Services

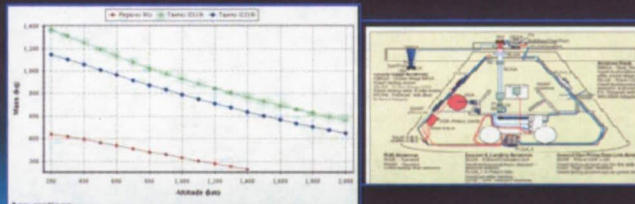
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Acquire commercial launch services



Verify and validate mission engineering

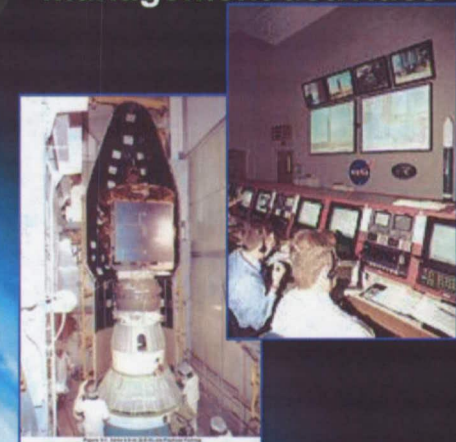


Insight and approval of production, integration, testing and processing



*Provide technical, operational, contractual, budget and business knowledge and expertise to future missions*

Perform NASA launch management activities



Certify launch systems for NASA use



Establish strategic partnerships and make investments to satisfy Agency Launch Service needs

Perform Spacecraft launch site operations



# Launch Locations

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Wallops

Kwajalein

Cape Canaveral

Vandenberg

Kodiak



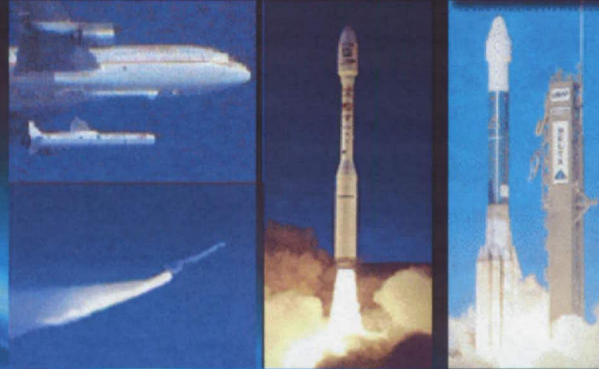


# Launch Vehicles

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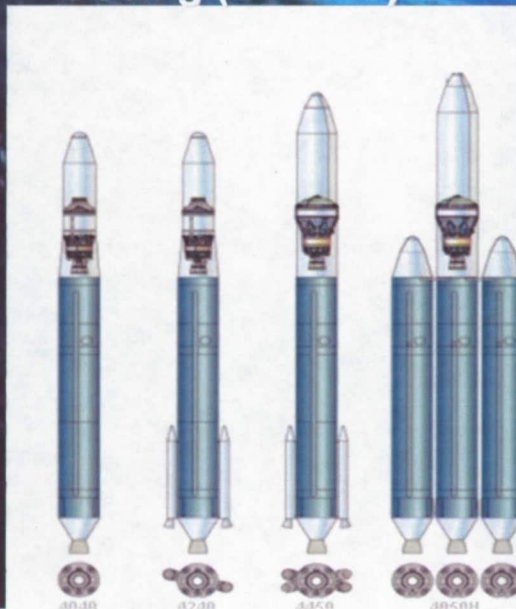
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## Heritage Vehicles



Pegasus Taurus Delta II

## Boeing (Delta IV)



## EELVs

Growth / Evolution

## Lockheed Martin (Atlas-V)



Growth / Evolution



# History

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***What is LSP's History with Small and Secondary Payloads?***

***What has been some of the challenges with Secondary payloads?***

***What work has LSP provided in looking at getting Secondaries on Launch Vehicles?***

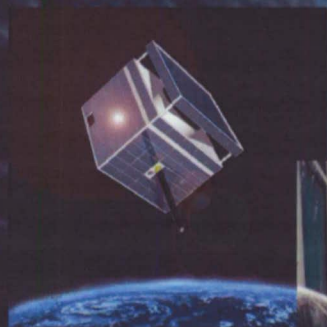


# Recent History of NASA's Small Satellite Missions

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Secondary Payload	Approx. Mass	Date	Vehicle	Primary (Customer/Payload)	Type
DUVE	102 kg	07/92	Delta II/6925	NASA/GEOTail	2 Non Separating
SEDS-1	45 kg	03/93	Delta II/7925	USAF/NAVSTAR II-19	Tether
PMG	55 kg	06/93	Delta II/7925	USAF/NAVSTAR II-21	Tether + Diagnostics
SEDS-2	50 kg	03/94	Delta II/7925	USAF/NAVSTAR II-21	Tether
SURFSAT	35 kg	11/95	Delta II/7920	CSA/RADARSAT	2 Non Separating
SEDSAT	40 kg	10/98	Delta II/7326	NASA/DeepSpace-1	Separating
Orsted	61 kg	02/99	Delta II/7920	USAF/P-91	Separating
Sunsat	63 kg	02/99	Delta II/7920	USAF/P-91	Separating
ACRIM	120 kg	10/99	Taurus (T-4)	Commercial/KOMPSAT	APC/Separating
Munin	6 kg	11/00	Delta II/7320	NASA/EO-1&SAC-C	Separating
Starshine 3	100 kg	09/01	Athena I	USAF/PICOSAT/PCSat/SAPPHIRE	Separating
QuikTOMS	375 kg	10/01	Taurus (T-6)	Commercial/OrbView-4	APC/Separating
CHIPS	~85kg	01/03	Delta II/7320	NASA/ICESat	Mini-DPAF/Sep
ST-5	~120kg	03/06	Pegasus	NASA	Separating





# Secondary Challenges

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**Secondaries being ready and on time to fly on the day of launch**

**Understanding of what is required from the secondary for inputs into testing and reports**

**Knowing that they are the secondary and not a primary**

**Funding, there are cost associated with integrating a secondary to the launch vehicle.**

**Interface requirement, the secondary initially indicates that all is required is a separation circuit and later asking for a quick disconnect purge system in a Class 10K clean room**



# *Past Studies and Agreements*

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**February 1992 – Memorandum of Agreement between Space System Division Delta II Systems Program Office and NASA Orbital Launch Services Project for Secondary Mission on Delta II was signed**

**August 1992 – First Copy of the Secondary Payload Planner's Guide on Delta II was provided**

**February 2002 – Feasibility Study was performed to integrate P-Pods and BioNanoSat as a s Secondary on Pegasus**

**April 2003 – Secondary Payload Capability Studied conducted for both Atlas V and Delta IV**

**2005 – LSP provides funding for Wallops to develop the Multi Payload Adapter to support possible DARPA launch opportunities**

**January 2006 - Request for Launch Services Proposal (RLSP) for the Lunar Reconnaissance Orbiter (LRO) mission included requirements for accommodating at least one secondary payload mission, with options to accommodate multiple payloads up to a total capability of 1000 kgs**



# Present Studies

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**LSP Management has given direction to go forward and investigate how we can fly the PPOD system on ELV's**

***So, How are we going to do this?***

**March 2007 – Submitted Statement of Work to ULA Atlas to develop a method to integrate PPod on the Atlas V**

**This study kicked off on April 23 with the first out brief at the end of June. Current plan is to complete the Atlas V development and integration, then start the Delta IV effort.**

**April 2007 - Started working with Orbital Science Corporation in developing a method to integrating PPods on the Taurus XL**

**Statement of Work has been sent to Orbital Science requesting a proposal to integrate PPODs on Taurus**

***If we implement the PPod system on this ELV's, are there opportunities to fly this system?***



# NASA Launch Services Manifest

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FPB Approved 01/18/07 Release 05/01/07	2007				2008				2009				2010				2011				2012				2013				2014							
	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				
<b>Secondary (S)</b> Delta (D/S) Taurus (T/S)																																				
<b>Small Class (SC)</b> Pegasus (P) Taurus (T)																																				
<b>Medium Class (MC)</b> Delta 732X Series (D3) Delta 742X Series (D4) Delta 792X Series (D) Delta 792X H (DH)																																				
<b>Intermediate (IC) / Heavy Class (HC)</b> Atlas V (AV) Delta IV (DIV) Delta IV Heavy (IVH)																																				

△  
ST-9  
9/2010

▲  
IBEX (P)  
6/15/08

▲  
ST-8 (SC)  
2/28/09

▲  
AIM (P)  
4/25/07

▲  
OCO (T)  
9/15/08

▲  
GLORY (T)  
12/15/08

▲  
THEMIS (D)  
2/17/07

▲  
OSTM (D3)  
6/15/08

○  
TBD (DH)  
10/15/08

▲  
KEPLER (D)  
11/1/08

▲  
DAWN (DH)  
6/30/07

▲  
NOAA-N' (D3)  
2/1/09

▲  
PHOENIX (D)  
8/3/07

▲  
STSS B2010 RR (D)  
NET 11/08/07

▲  
STSS (D)  
11/25/07

▲  
GLAST (DH)  
NET 12/14/07

▲  
NPP (D)  
4/30/09

▲  
AQUARIUS (D3)  
7/14/09

▲  
WISE (D3)  
11/1/09

▲  
LDCM (MC)  
7/2011

△  
Discovery 11 (MC) \*  
9/2011

○  
LUNAR ORBITER - 2 (MC)  
10/2011

△  
MARS SCOUT 2 (MC)  
11/2011 \*

△  
DISCOVERY - 12 (MC) \*  
11/2012

▲  
MIDEX - 7 (MC) \*  
11/2013

△  
GOES-O (DIV)  
4/2008

△  
GOES-P (DIV)  
4/2009

▲  
SDO (AV)  
8/1/08

▲  
MARS SCIENCE LAB (AV)  
NET 9/15/09

○  
LRO/LCROSS (AV)  
10/31/08

△  
Juno (IC/HC)  
8/11/2011

△  
RBSP (IC) \*  
8/2011

○  
LUNAR ROBOTICS LANDER (IC)  
10/2011

▲  
MMS (IC) \*  
10/2013



# Potential Secondary Opportunities

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## Potential Secondary Opportunities

Page 1 of 1

	2007		2008												2009														
	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D			
ATLAS V LC-41	▲	ICO NOV-07 AV-4XX (C)	▲	GPS II-F02 MAR-08 AV-401 (AF)				▲	SDO AUG-08 AV-401 (N)	▲	LRO OCT-08 AV-401 (N)					▲	GPS II-F03 APR-09 AV-401 (AF)										▲	(GPS II-F04) 4Q-2009 AV-401 (AF)	
DELTA IV LC-37B																▲	(GPS II-F05) OCT-09 LIKELY SLIP TO 2010 D IV M+4.2 (AF)											▲	
DELTA II SLC-17A & 17B																													
ATLAS V SLC-3E																													
DELTA IV SLC-6																													
DELTA II SLC-2W																													
TAURUS																													

▲ Delta IV East Coast  
▲ Atlas East Coast

▼ Delta West Coast  
▼ Atlas West Coast

▲ Delta II East  
▲ Taurus

▼ Delta II West





# Future Work

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## ***So, where does LSP go from here with Secondaries?***

***Identify the possible need by the Agency/Government to fly  
Pico/Nano spacecraft and how we will do this.***

***Develop a manifesting policy for PPODs/Cubesats***

***Continue to work with ULA Atlas and OSC in the implementation  
of the PPod system on both the Atlas V and Taurus XL to support  
a possible first flight in 2008***

***Start discussion with US Air Force in the development an  
agreement to fly PPODs on Air Force mission with available  
margin.***

***Study any new launch vehicle entering the market as a potential  
carrier for small/secondary spacecraft.***



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*Question?*