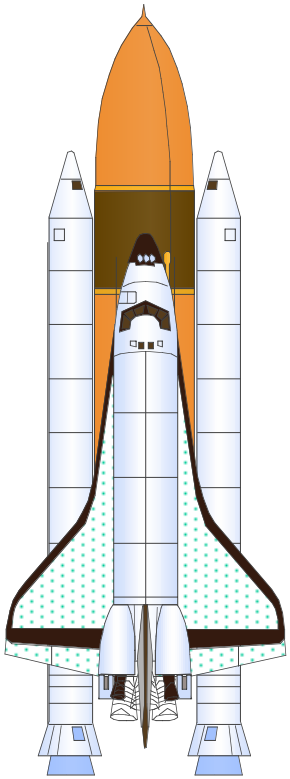
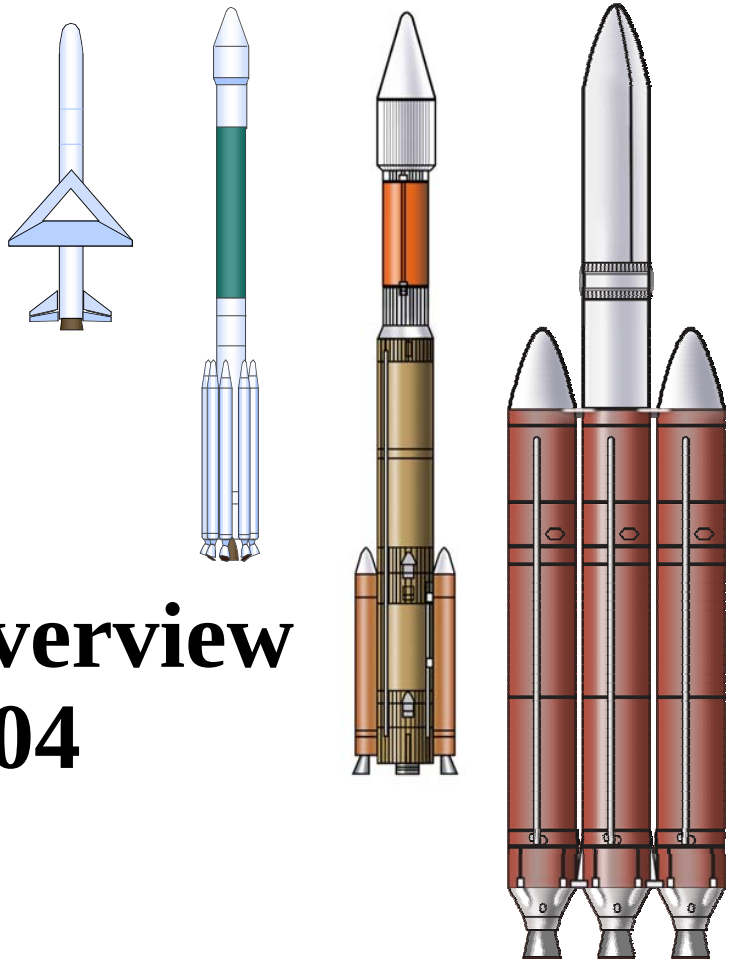




Launch Services Overview
August 26, 2004

Karen Poniatowski
OSF Assistant Associate Administrator
Launch Services

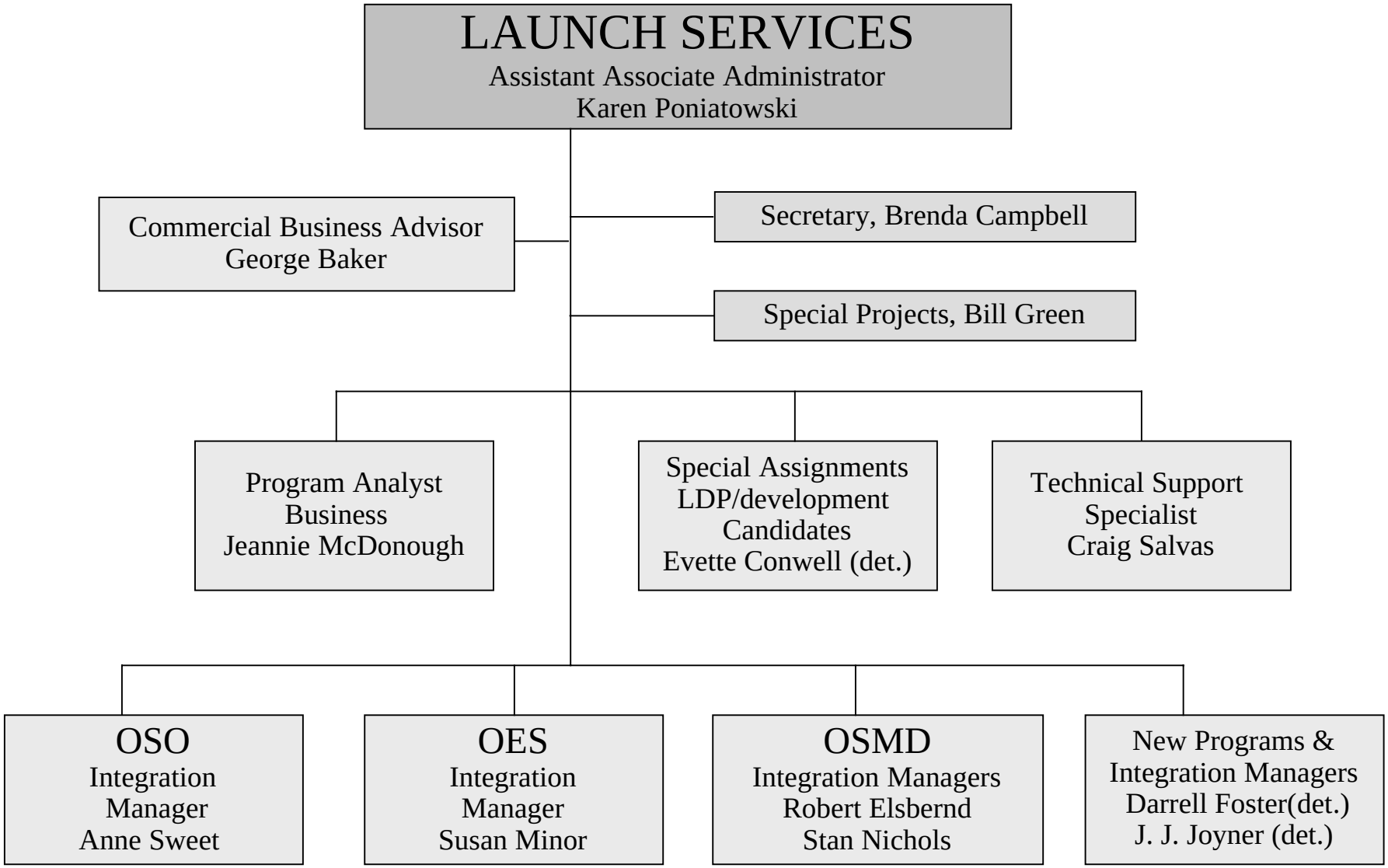
LAUNCH SERVICES PROGRAM

- The Launch Services Program (LSP) is Responsible for:
  - Assuring safe, reliable, on time, cost effective space access for NASA payloads on All Available Launch Systems, Including existing and emerging domestic launch services, Commercial, DOD Launch Vehicles and potential Foreign Vehicles
  - Achieving a sustained demonstrated success rate of 95% or better for NASA missions flown on U.S. ELV's managed by the LSP
  - Identifying and Aggregating Agency Launch Requirements and developing appropriate assured access to space launch strategy
  - Advanced planning and studies in support of new mission trade studies
  - Developing and negotiating requisite MOU's/commercial agreements
  - Closeout of the shuttle payload carriers program, including GAS, SEM and Hitchhiker capability
  - Coordinating with USAF EELV/STP and NRO Launch Programs to seek synergy in user requirements across the government user community
  - Assuring NASA assured access strategy consistency with National Space Transportation policy and law

LAUNCH SERVICES PROGRAM

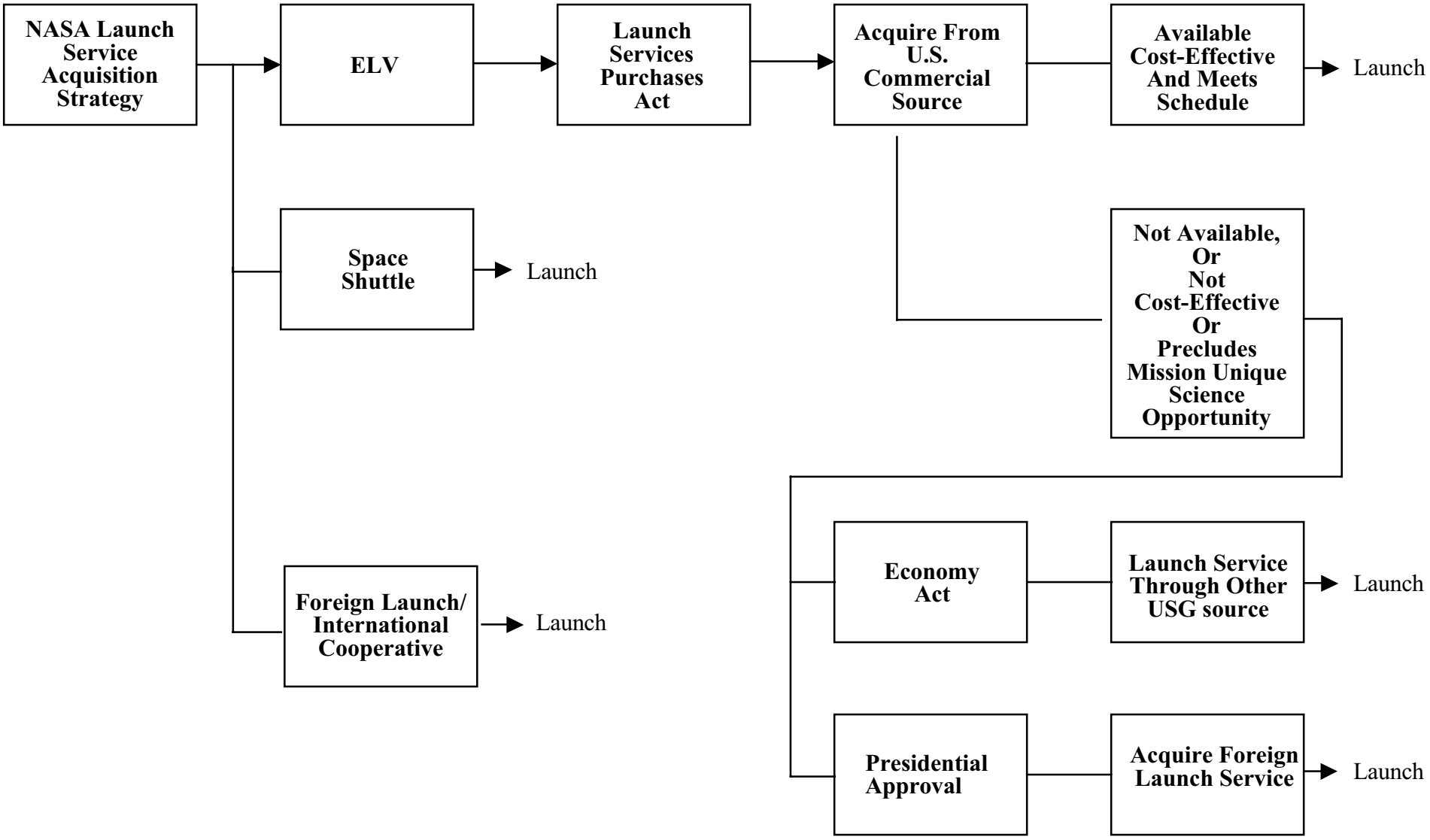
- Launch Services Management Approach
  - Provides a Single Interface for each Mission Directorate Customer
  - Space Access issues, vehicle assignments and manifest conflicts identified and resolved through the NASA Headquarters Flight Planning Board process
  - Clear lines of authority between OSO Assistant Associate Administrator, Launch Services and Launch Services Program Manager hosted at KSC
  - Launch Services Program is responsible for launch services acquisition and management for all Agency launch requirements from advanced planning through post flight assessment
  - Serves as the Agency Independent Technical Authority for launch services acquired from private sector suppliers and/or DOD
    - Structure and provide government technical oversight to maximize probability of mission success within defined resources
  - Acquire launch services under fixed price contracts with consistent level of technical oversight over full spectrum of launch capability
    - Heritage, emerging, evolved systems
    - Secondary and primary payloads on all classes of vehicle
  - Establish contractual mechanisms to enable access to fullest range of available launch services, including innovative bi-annual on ramps
  - Establish partnerships with NRO, USAF, and other agencies (DARPA) to retain and build on lessons learned from the Presidential Broad Area Review Into Launch Failures

LAUNCH SERVICES ORGANIZATION



NASA LAUNCH ALTERNATIVES

LAUNCH SERVICES



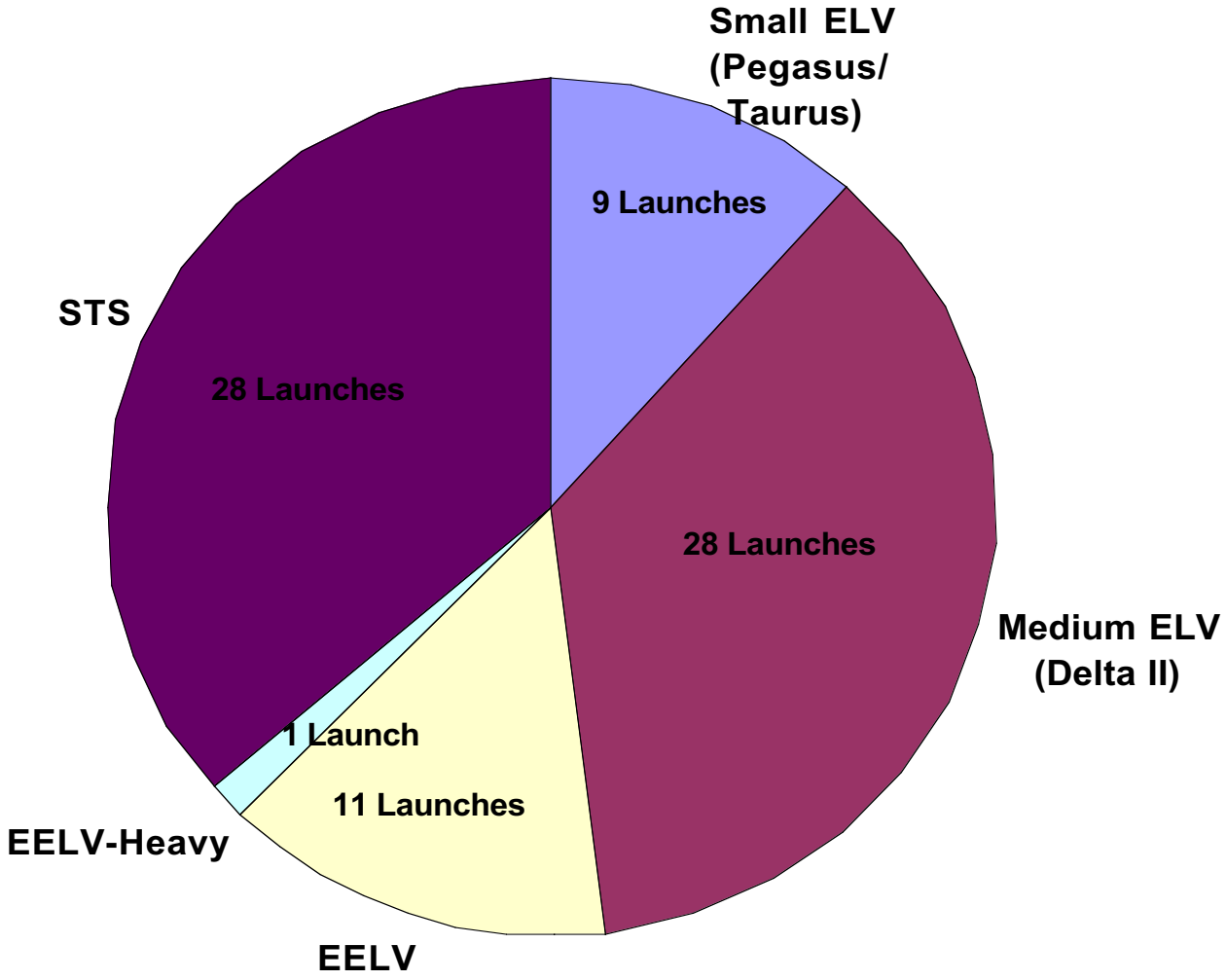
K. PONIATOWSKI
C. SALVAS P M 990804 BAR 8/4/99

FLIGHT PLANNING BOARD

- Membership:
  - OSO Assistant Associate Administrator, Launch Services (chair)
  - Deputy AA's (Exploration Systems, Science, Space Operations, Education)
  - Invited: Chief Engineer, Chief Safety & Mission Assurance Officer (others as appropriate)
- Purpose:
  - Established in1990 as mechanism to document Agency launch requirements and maintain HQ Level contractual launch dates and to enable long range acquisition planning
  - Forum for senior agency management of all NASA customers utilizing launch services to baseline and authorize launch services for new missions, authorize launch date changes, manifest conflict identification/resolution
  - Since 1997, FPB serves as the Agency forum launch vehicle assignment and approval of launch risk mitigation strategy for individual missions
- Process:
  - Quarterly meetings (more often as needed)
  - OSO documents FPB direction/actions
  - OSO provides direction to Launch Services Program Manager to implement FPB decisions
  - NASA FPB decisions reflected in national Current Launch Schedule Review Board (CLSRB) and National Mission Model

NASA LAUNCH FORECAST
FY 2005 PRESIDENTS BUDGET

77 Launches



* Assumes Shuttle retirement in 2010, no replacement missions added

NASA LAUNCH SERVICES MANIFEST

APPROVED FLIGHT PLANNING BOARD 6/24/04

	CY '04	CY '05	CY '06	CY '07	CY '08	CY '09	CY '10	CY '11
•SECONDARY (S) **•DELTA (D/S)** **•TAURUS (T/S)**					TBD △ SPACETECH 9 2Q/08			
•SMALL CLASS (SC) **•PEGASUS (P)** **•TAURUS (SH)**	P ✓ DART - 10/18		△ TBD SPACETECH 5 2/28 P ✓ AIM - 9/29	P ✓ SPACETECH 8 - 7/07 T ✓ Orbiting Carbon Observatory - 8/07 T ✓ GLORY - 12/07	✓ P SMEX-10 -2/08*	△ SC SMEX-11 - 2/09	T ✓ GEOSPACE ITM-9/10 T ✓ GEOSPACE RBM-9/10 SC ✓ SMEX-12 - 10/2010	
•MEDIUM CLASS (MC) **•DELTA 7325/7320 (D3)** **•DELTA 7425/7426 (D4)** **•DELTA 7920/7925 (D)** **•DELTA 7920 H (DH)** **•TITAN II (T-II) - VAFB**	✓ D GPB - 4/20 ✓ D AURA - 7/15 △ DH MESSENGER - 8/3 D3 △ SWIFT - NET 10/7 D △ DEEP IMPACT - 12/30	✓ D3 NOAA N - 2/11 ✓ D4 CLOUDSAT/CALIPSO NET 4/15	△ D STEREO - 2/11 △ DH DAWN - 6/17 UR D △ THEMIS (MIDEX-5) 10/19 D ✓ NPP - 10/31 D3 ✓ NOAA-N' - 10/31	△ DH GLAST - 2/28 D ⬠ STSS - 7/31 D △ PHOENIX - 8/3 (MARS SCOUT) D △ KEPLER - 10/07 D3 ✓ OCEAN SURFACE TOPOGRAPHY - 10/07	D4(T*) ✓ WISE (MIDEX-6) 6/08 D3 ✓ AQUARIUS - 9/08 D △ LUNAR ROBOTIC 1 10/15	△ D* DISCOVERY 11 6/09	D △ LUNAR ROBOTIC 2 10/2010	D4 * △ MIDEX-8 - 8/2011 MC △ DISCOVERY 12 8/2011 D4 * ✓ MIDEX-7 - 9/2011 MC △ MARS SCOUT 2 11/2011 DH △ MARS SCOUT 3 11/2011 D △ LUNAR ROBOTIC 3 10/2011
•INTERMEDIATE (IC) / HEAVY CLASS (HC) **•ATLAS (AIII&AV)** **•DELTA (DIII&IV)** **•DELTA IV HEAVY (IVH)**	DIV △ GOES-N - 12/1	DIV GOES-O - 12/05 AV △ MARS RECON ORBITER - 8/10	△ AV NEW HORIZONS 1/11 ○ IC X-37* - TBD (UR)	△ DIV GOES-P - 4/07	IC △ SDO - 4/15	IC △ MARS SCIENCE LAB - 10/27* IC △ MARS TELECOM* 10/09	△ HC SIM - 2/2010 △ IC NEW FRONTIERS 2 6/2010	IC △ MARS TESTBED LANDER - 11/2011

*** FOR NASA PLANNING PURPOSES**
**** FAILURE**

△ = SCIENCE **□ = SPACE OPERATIONS** **✓ = VAFB LAUNCH**

○ = EXPLORATION SYSTEMS **⬠ = DOD REIMBURSABLE**

K. PONIATOWSKI
C.SALVAS MANI-11-LS FPB 6/24/04

INTERNAL USE ONLY

NASA ELV LONG RANGE PLANNING
POTENTIAL MISSION (CY 2012 - 2023)

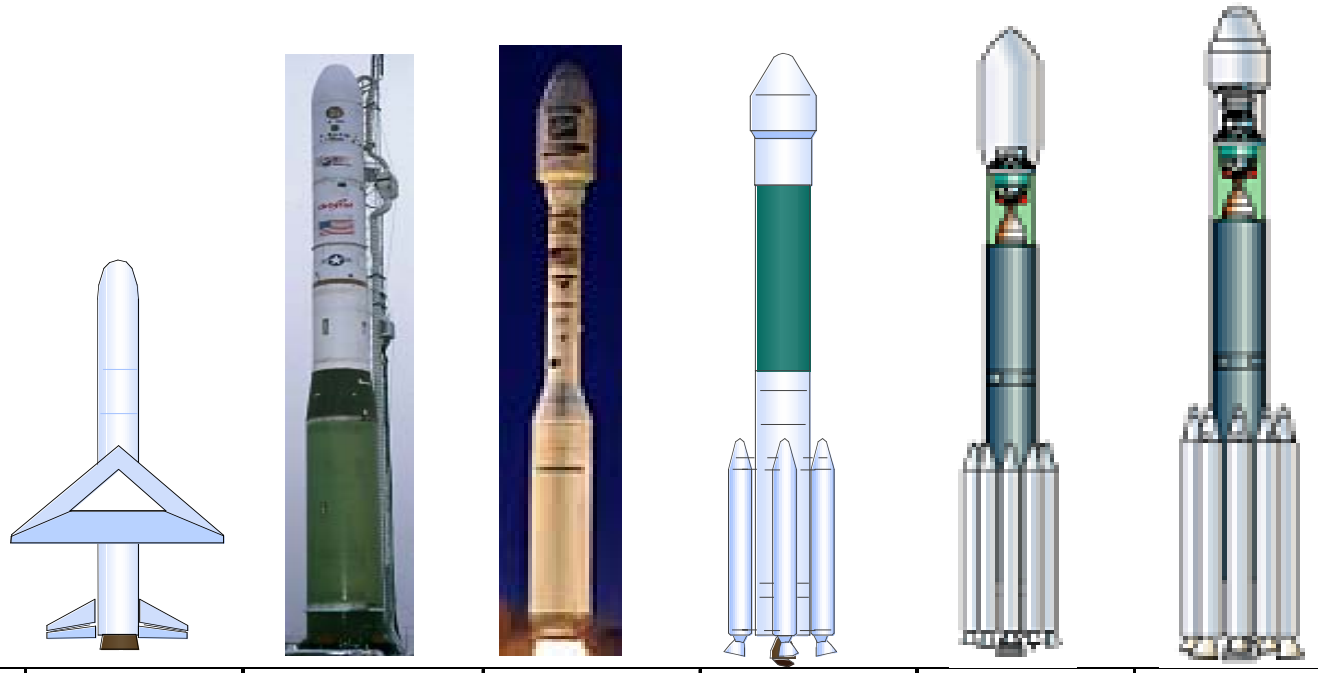
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
SMALL CLASS	GPMC	SMEX	SMEX		SMEX	SMEX		SMEX	SMEX		SMEX	SMEX
		NMP/EO										
	ESSP	(one every year) →										
MEDIUM CLASS	MIDEX	MIDEX		MIDEX	MIDEX		MIDEX	MIDEX		MIDEX	MIDEX	
		EOS		EOS		EOS		EOS		EOS		EOS
		OBPR	OBPR	OBPR	GEC							
	LRL	DISCOVERY		DISCOVERY	DISCOVERY		DISCOVERY	DISCOVERY		DISCOVERY	DISCOVERY	
	MARS SCOUT 2	MMS	MARS SCOUT 3	MC-MAGCON	MARS SCOUT 4		MARS SCOUT 5		MARS SCOUT 6		MARS SCOUT 7	
EELV CLASS	LISA		MARS AA	A & P	MARS BB	A & P	MARS CC	A & P	MARS DD		MARS EE	
		SEC		SEC		SEC		SEC		SEC		SEC
		CON X-1	CON X-2									
	TDRS-FO	TDRS-FO	TDRS-FO	TDRS-FO								
				JIMO*								
				TPF *								
		NEW FRONTIER			NEW FRONTIER			NEW FRONTIER			NEW FRONTIER	

* EELV HEAVY

WEST COAST LAUNCHES

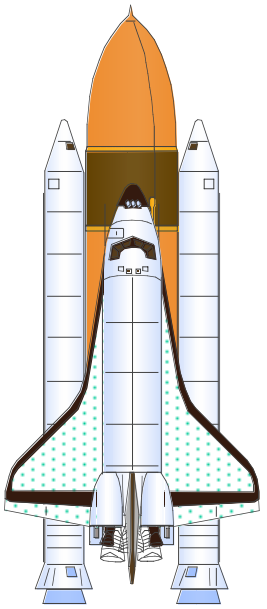
K. PONIATOWSKI
C. SALVAS MANI-13 LRPPM 6/21/04

CURRENT SMALL US LAUNCH CAPABILITY



Launch Vehicle	Pegasus	Minotaur	Taurus	Delta II 73XX	Delta II 79XX	Delta II 79XXH
Supplier	Orbital Sciences Corp.	Orbital Sciences Corp.	Orbital Sciences Corp.	Boeing	Boeing	Boeing
LEO (kg)	453	291	568	2,796	5,140	6,000
SSO (kg)	191	145	302	1,685	3,220	No WTR
ISS (kg)	350	N/A	455	2,435	4,440	5,200
GTO (kg)	N/A	N/A	N/A	1,000	1,870	2,100
High Energy C3=0	N/A	N/A	N/A	725	1,250	1,500
High Energy C3=10	N/A	N/A	N/A	600	1,000	1,300

CURRENT US LAUNCH CAPABILITY



Launch Vehicle	Delta IV 4040	Delta IV 4450	Atlas V 50X	Atlas V 55X
Launch Service	Boeing	Boeing	LM	LM
LEO (kg)	8,600	13,100	9,540	18,000
SSO (kg)	6,300	9,600	No WTR	No WTR
ISS (kg)	7,700	11,800	8,500	17,500
GTO (kg)	3,985	6,345	3,880	8,570
High Energy C3=0	2735	4,580	2680	6330
High Energy C3=10	2115	3,685	2150	5300

Delta IV Heavy	Atlas V Heavy
Boeing	LM
23,165	U/R
21,040	No WTR
23,900	25,500
12,650	12,200
9305	9000
7810	7500

Space Shuttle
NASA
22,600
N/A
16,800
2200*
N/A
N/A

* Assumes IUS Upper Stage

NASA LAUNCH VEHICLE RISK MITIGATION PROCESS

LAUNCH SERVICES

Mission Life Cycle

MISSION DEFINITION
(4-8 YRS BEFORE LAUNCH)

- Define science objective
- Initial vehicle trade analysis
- Assess vehicle alternatives within mission cost/schedule constraints
- Specify Launch Options in Spacecraft AO

DEFINE
Mission Risk Category (NPD 8610.7, dated Jan 1999)

GUIDELINES

MISSION ATP
(3 YRS BEFORE LAUNCH)

Launch Service ATP provided at Flight Planning Board

- Mission risk category
- Launch date
- Vehicle configuration
- Identify any additional technical oversight requirements

VALIDATE /TAILOR
Risk Strategy Consistent With Unique Mission Requirements

MISSION RISK STRATEGY

LAUNCH PHASE
(ATP TO LAUNCH)

- Implement technical oversight (NPD 8610.23)
- Document mission unique requirements
- Tailor technical oversight approach as warranted for mission
- Conduct nominal pre-launch reviews (NPD 8610.24)
- Support Mission IAR Reviews

FOCUS
Technical Oversight on Mission Uniques/First Flight Items

IMPLEMENTATION

MISSION OPERATIONS
(LAUNCH +)

- Review post-flight vehicle data
- Assess impact to future missions in flow
- Supports mission success payment to contractor

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

ASSESS LESSONS LEARNED

K. PONIATOWSKI
C. SALVAS C/P/M 10/26/99

ADVANCED PLANNING

- Support to ISS
  - Providing definition of current launch capability to support ISS cargo requirements
  - Identifying options for supporting ISS cargo upon retirement of the shuttle
    - Mixed fleet assessments for cargo up and down mass
    - Plan to acquire domestic services to augment partner capability
- Support to Space Exploration
  - Providing definition of current launch capability to support robotic and human exploration missions
    - Supported trade studies for OSP and JIMO, provide basis for CEV follow on assessments
    - Updating earlier Shuttle evolution options to address Space Exploration needs
  - Identifying potential vehicle enhancements
    - Reliability and performance
    - Considerations for compliance with human rating
    - Keeping NRO/USAF apprised of issues/trade space - potential for areas of synergy
- Seek to integrate assured access to space strategy to meet both sets of emerging requirements
  - RFI soliciting U.S. industry interests/capabilities to meet full range of NASA space launch requirements targeted for release this month

INTERAGENCY COLLABORATION

- NASA/AF/NRO collaboration increasing due to shared launch systems
- Benefits resulted in decision to form group to oversee collaboration
- Launch Collaboration Steering Group (LCSG) established in Sep 03
  - Goal is to facilitate exchange of data, program status, methodologies between U.S. Government (USG) Agencies
  - Established by NASA AAA for Launch Services, NRO Director of Office of Space Launch, SMC EELV System Program Director
  - Agencies involved: NASA/LSP, NRO/OSL, SMC/CL, SMC/EV
  - Representation by all key division chiefs
  - Technical representation from Aerospace, Analex, L3Comm, Scitor
- Group tracks numerous launch collaboration efforts/forums
  - Mission Assurance Forums
  - IV&V working groups
  - Design Equivalency Reviews
  - Fleet-wide anomalies
  - Engineering Review Boards
  - Review Participation Comparison
  - Failure Study
  - Systems Engineering Comparison
  - Launch schedule/manifest issues
  - Procurement/legal actions
- Benefits to date range from cost avoidance and schedule risk mitigation by data sharing to enhanced mission success

Collaboration produces tangible results on key fronts: cost, schedule, personnel and most of all MISSION SUCCESS

SMALL PAYLOAD LAUNCH INITIATIVE

- President's FY 2005 Budget Request
  - Provides funding for demonstration flights of new launch systems
    - Seek to enable small payload access to space in tandem with retirement of shuttle secondary payload program
    - $10M in FY 2005 $10M in FY 2006
- NASA established small payload flight demonstration initiative
  - Facilitate acquisition of initial demonstration launches of new systems
  - Address low cost space access requirements for education, technology and science payloads displaced from Space Shuttle and/or unable to secure a cost effective ELV secondary launch opportunity
  - Candidate payloads can tolerate higher risk associated with early flight of new launch systems
- Implementation Strategy
  - On-ramp emerging small launch capability via the NLS contract
    - Requires at least one demonstrated flight prior to NASA consideration
  - Potential for accessing lower cost, higher risk services via USAF RSLP
    - Emerging secondary capability using ICBM assets (e.g., Minotaur or Peacekeeper) - will NOT be on-ramped under NLS
  - DARPA funding development under FALCON Program of new rapid response capability for longer term
    - NASA expanded partnership to enable award of additional commercial concepts to PDR
- Continue to monitor progress of new capabilities

SPACE LAUNCH CAPABILITY ROADMAP

- What is the current transportation capability ?
  - Characterization of current Agency requirements, industry capabilities and market trends
  - What are the growth paths, risks, costs, schedules, issues?
- What studies have been done to date and what have we learned?
  - Review myriad of NASA launch vehicle studies
- What changes on NASA requirements are emerging from new Vision?
  - Users clarify/define candidate mid and far term transportation requirements and user decision points/key milestones
  - How much? - How big? Up/down? How often? When?
  - What are the customer "riddles" for missions success?
    - Priority balance by user type: design reliability, cost, schedule
- Provide launch capability roadmap to strategic roadmap teams to assist in architecture development
  - Focus on defining assured access transportation requirements vs. single point vehicle design solutions and narrow waterfront on key niche markets
- Where is the Nation heading in assured access…..how do NASA emerging requirements affect the National Space Launch Requirements?
  - Integrate findings, identify data gaps, focus and prioritize next steps
  - Seek to identify any synergies with future national transportation requirements