NASA Launch Services Program

Discovery AO
Pre-proposal Conference

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Feb 2, 2006

Agenda

- NASA Launch Services Program/Polices
- Launch Vehicle Certification
- Mission Management/Customer Interface
- Major Milestones/Launch Readiness Reviews
- Cost vs Performance

NASA Launch Services Program

- **Charter: Provide commercially available ELV launch services acquisition and management for NASA missions and customers.**

- **Objectives: to ensure ELV mission success, provide launch services on-time, and maximize customer satisfaction**

- **Primary Functions:**
  - **NASA Launch Services Contract acquisition/management**
  - **Budget development/execution**
  - **Mission Integration Management – "cradle-to-grave"**
  - **Core vehicle engineering, production, test, and operations insight**
  - **Mission Analysis & Design**
  - **Launch Site Integration Management**
  - **Communications/Telemetry**
  - **Advanced Missions Planning**
  - **Safety & Mission Assurance**

NASA ELV Policies

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- NASA KSC ELV work is governed/driven by the following Agency-level NASA Policy Directives (NPD):
  - NPD 8610.7, Launch Services Risk Mitigation Policy for NASA-Owned Or NASA-Sponsored Payloads
  - NPD 8610.23, Technical Oversight of Expendable Launch Vehicle (ELV) Launch Services
  - NPD 8610.24, Expendable Launch Vehicle (ELV) Launch Services Prelaunch Readiness Reviews

- These policies flow-down into Center-level documentation, which documents the “how-to”.

Launch Vehicle Certification

Launch Vehicle Certification

- Purpose: To outline NASA Headquarters requirements for expendable launch services risk mitigation and to discuss KSC's responses to requirements in terms of documentation and processes
- Key Documentation and Processes include:
- NPD 8610.7 "Launch Services Risk Mitigation Policy for NASA-Owned or NASA-Sponsored Payloads"
  - LSP-PLN-324.01 "Expendable Launch Vehicle Certification"
  - LSP-P-324.01 "Expendable Launch Vehicle Certification Process"

NASA Documentation (NPD, KPD) referenced here can be found at the following web address:

http://nodis.hq.nasa.gov/

A User Guide can be found at the following location;

http://nodis.hq.nasa.gov/Library/Directives/NASA-WIDE/MSWord_Docs/N_PG_1000_0002_.pdf

NASA KSC LSP Documentation (LSP) referenced here can be found at the following web address:

http://tdsearch.ksc.nasa.gov/search/general.html

NASA ELV Certification Status

- Pegasus XL – Cat 3 certification complete
- Taurus XL – Cat 2 certification preparation in work
- Delta II – Cat 3 certification complete
- Delta IV – No formal efforts yet in work
- Atlas V – Cat 3 final certification in process

Attachment D-4 NASA ELV Certification Requirements

	Risk Category 1	Risk Category 2	Risk Category 3		
Vehicle Maturity	No launch experience	Initial Launch	Production Launch Vehicles		
Management Systems	ISO 9001 Third Party Certification required	ISO 9001 Third Party Certification required	ISO 9001 Third Party Certification required		
Flight Experience (See Notes)	Plans in Place: Instrumentation Post Flight Operations/Anomaly Resolution Process Flight Margin Verification	Completed: 1 or more successful Instrumented Flight(s) Post Flight Ops/Anomaly Resolution Process Flight Margin Verification	Completed: Series of **3 or more consecutive successful** flights of a common vehicle configuration **from an evolved vehicle family produced by an LSP with demonstrated flight history** Flight Margin Verification	Completed: Series of **6 or more (minimum of 3 consecutive) successful** flights of a common vehicle configuration **from an evolved vehicle family produced by an LSP with demonstrated flight history** Flight Margin Verification	Completed: Series of 14 or more consecutive successful flights of a common vehicle configuration Flight Margin Verification
Design	95% predicted design reliability Space qualified H/W (for application) Documented ICD Process	**95% predicted design reliability**	**95% predicted design reliability**	**95% Predicted design reliability**	No additional qualification requirements for common vehicle
Manufacturing / Ops	NEQA-Type Audit	NEQA-Type Audit	NEQA-Type Audit		
System Safety	FMEA for all critical components Prelim/Final Hazard Analysis	Demonstrated safety system	Demonstrated safety system		
Test & Verification	Acceptance Test Plan in place. Ground Test, Qual & End-To-End Test Complete	Comprehensive acceptance test results	Comprehensive acceptance test results		
Quality Systems / Process	NEQA-Type Audit	NEQA-Type Audit	NEQA-Type Audit		
Flight Hardware and Software Qualification	None	**Series of NASA KSC ERB's on vehicle subsystems**	**Series of NASA KSC ERB's on vehicle subsystems**		
LV Analysis	None	**None**	**Prudent IV&V**		
Risk Assessment	None	**None**	**Full vehicle fishbone**		
LSP Risk Plan LSP Past Performance Management Design & Eng Processes	None	**None**	**NEQA-Type Audit**		
Launch Complex	None	NAS KSC ERB	NASA KSC ERB		

NASA Design Certification Review prior to Flight Margin Verification (A two week review with 20 to 25 KSC personnel in attendance)

Notes: 1) Vehicle failures do not invalidate vehicle certification if NASA ERB concurs with cause and corrective action. Category 3 requires NASA participation in the LSP investigation. 2) Major vehicle upgrades may require additional NASA technical penetration. 3) Full engineering insight per NPD 8610.23 applied to all categories except for secondary payloads

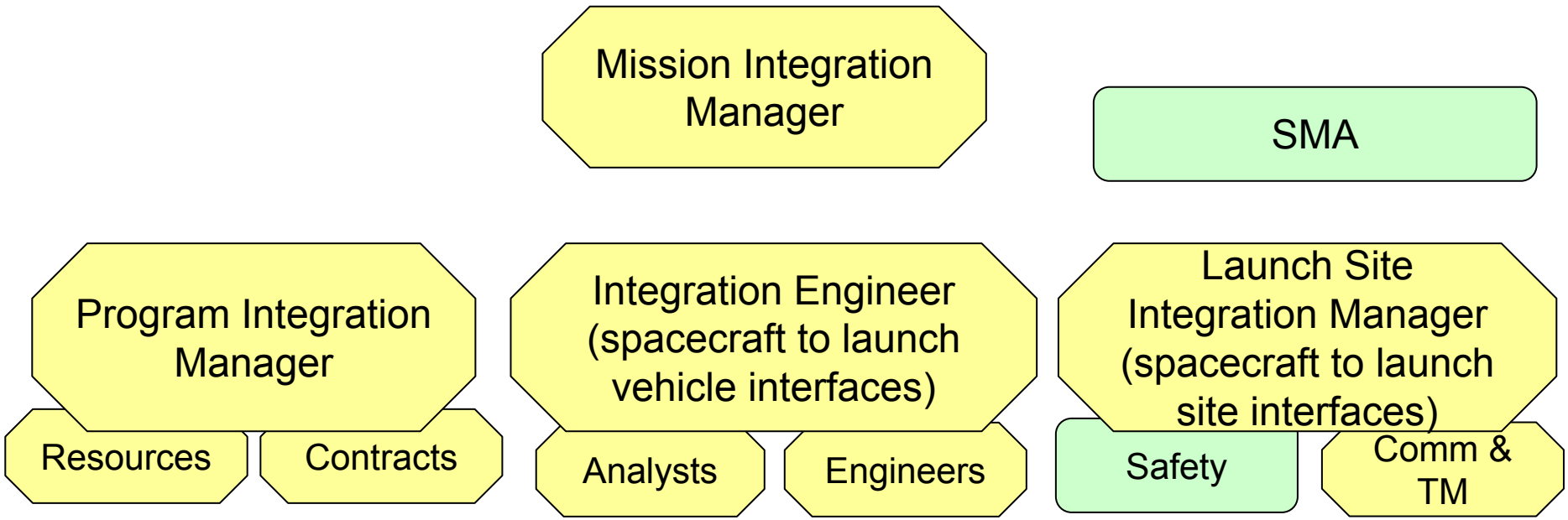
This column is identical to existing alternate method category 3 with revised flights, added fishbone, and deleted audits

Shaded items are part of K-ELV-10.2 for the alternate method category 3

No changes to this column from existing 8610.7 category 3

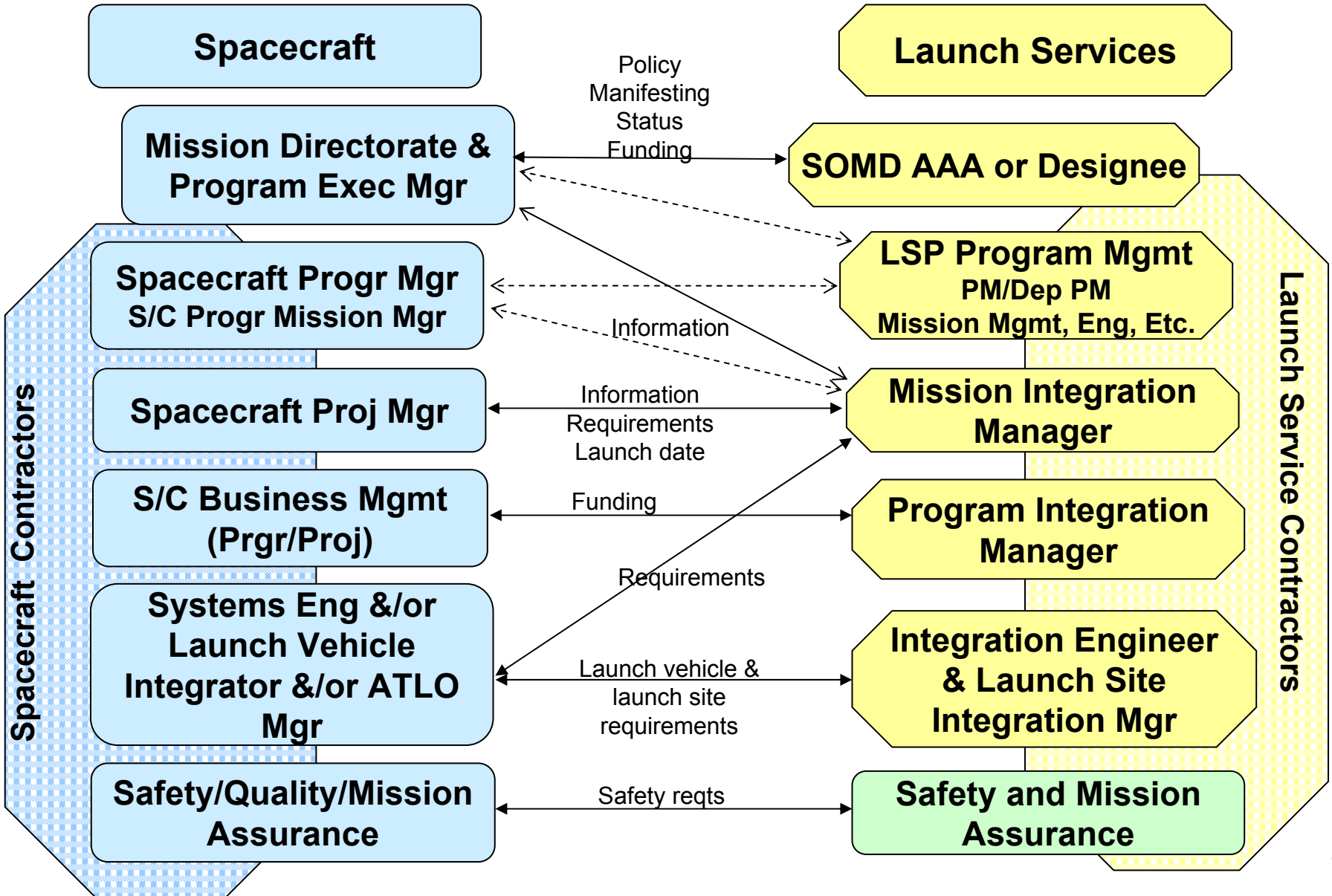
Mission Management

Typical LSP Mission Integration Team (MIT)



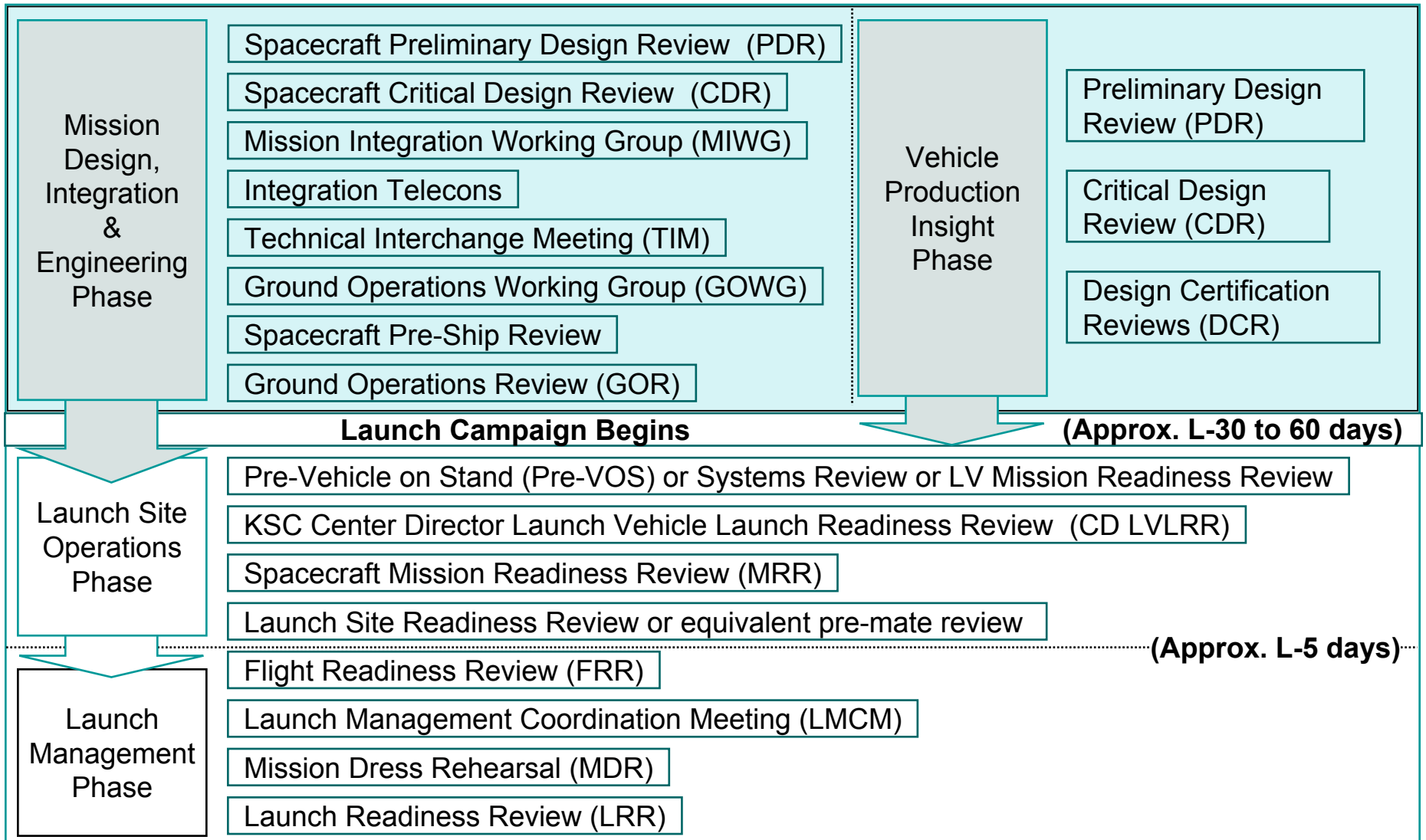
- **Matrixed team of disciplines from across LSP**
- **SMA also provides key functions– independent reporting**
- **Sub-teams support each primary MIT element**

Typical Mission Communication Paths



REVIEW FLOW DURING MISSION CYCLE

The following table provides an overview of the meetings and reviews and their flow during mission cycle



Cost vs Performance

Cost Table Notes

- All costs are estimated in real-year dollars (order year=L-27 mo.) based on current NLS contract information. Phasing reflects 30 months integration cycle standard for EELV class.
- The funding profiles provide for the launch service, nominal allocation for mission unique launch vehicle modifications/services, mission integration, launch site payload processing, range safety, and telemetry/communications
- Budget does not include launch delays.
- The launch service prices are estimates and are not to be considered commitments from the Launch Service Program and are subject to change
- Performance ranges from 1397 to 5190 Kg are an estimate. There is no guarantee that launch services in this range will be available to support these launch dates.
- Delta II missions with a launch date of CY10 or beyond, will be assessed additional Delta II "Fly-out" costs related to post-production and pad maintenance. These are significant costs that could be up to $30M per year.
- Prices based on POP ‘05 pricing assumptions using current NASA contract mechanisms

2011 Launch

ELV Launch Service Class (non-nuclear)

Discovery 12 SMD Pricing Exercise Summary - FY 2011 Launch								
Performance Range (Kg) See Notes 500Km	C3 = 0	**Launch Date**	**Launch Site**	**FY08**	**FY09**	**FY10**	**FY11**	**Total**
0 to 1396	NA	FY 2011	CCAFS	$1	$24	$26	$23	$74
1397 to 4365	0 to 1235	FY 2011	CCAFS	$1	$34	$37	$34	$106
4366 to 5190	1236 to 1425	FY 2011	CCAFS	$1	$39	$42	$38	$120
5191 to 9445	1426 to 3500	FY 2011	CCAFS	$1	$48	$52	$47	$148

Nuclear Costs	FY08	FY09	FY10	FY11	Total
	$3	$7	$5	$4	$19

2012 Launch

Discovery 12 SMD Pricing Exercise Summary - FY 2012 Launch								
Performance Range (Kg) See Notes 500Km	C3 = 0	**Launch Date**	**Launch Site**	**FY09**	**FY10**	**FY11**	**FY12**	**Total**
0 to 1396	NA	FY 2012	CCAFS	$1	$25	$27	$24	$77
1397 to 4365	0 to 1235	FY 2012	CCAFS	$1	$35	$38	$35	$109
4366 to 5190	1236 to 1425	FY 2012	CCAFS	$1	$39	$43	$39	$122
5191 to 9445	1426 to 3500	FY 2012	CCAFS	$1	$49	$53	$48	$151

Nuclear Costs	FY09	FY10	FY11	FY12	Total
	$3	$7	$5	$4	$19

2013 Launch

Discovery 12 SMD Pricing Exercise Summary - FY 2013 Launch								
Performance Range (Kg) See Notes 500Km	C3 = 0	**Launch Date**	**Launch Site**	**FY10**	**FY11**	**FY12**	**FY13**	**Total**
0 to 1396	NA	FY 2013	CCAFS	$1	$27	$29	$25	$82
1397 to 4365	0 to 1235	FY 2013	CCAFS	$1	$36	$40	$36	$113
4366 to 5190	1236 to 1425	FY 2013	CCAFS	$1	$41	$45	$41	$128
5191 to 9445	1426 to 3500	FY 2013	CCAFS	$1	$51	$55	$50	$157

Nuclear Costs	FY10	FY11	FY12	FY13	Total
	$3	$7	$5	$4	$19

ELV Advance Mission Planning Support

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