



Space Operations Mission Directorate (SOMD)

Fiscal Year 2012 Budget Overview **April 2011**

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Agenda

04/06/2011

- **Overview**
- **Program Details**



04/06/2011

SOMD OVERVIEW



SOMD Budget Priorities

04/06/2011

- **Implement within budget and meet our external commitments**
 - Execution consistent with the NASA Authorization Act of 2010 in all areas possible,
 - Account for funding constraints and uncertainty under the current Continuing Resolution (CR) at the fiscal year (FY) 2010 enacted level
- **Safely fly the remaining Space Shuttle manifest, including STS-135 through FY 2011 if funding is made available, while continuing to efficiently and responsibly retire the Space Shuttle, and provide for the required pension liability for the Program's prime contractor**
- **Ensure safety and viability of astronauts on the International Space Station (ISS), which has been extended to 2020 and likely beyond,**
 - Provide for continued operations and support of full utilization for research and enhanced functionality
 - Support research, technology development, demonstration, as well as, enhancements to the ISS facility and operations
- **Support U.S. Commercial space industry to enable safe, reliable and cost effective access to low Earth orbit**



SOMD Budget Priorities (Cont.)

04/06/2011

- **The 21st Century Space Launch Complex Program at Kennedy Space Center (KSC), will benefit current and future NASA and commercial space launch activities and other complex users**
- **Continue to provide launch services, rocket propulsion test facilities and space communications to our customers**
- **Mission Operations Sustainment provides for essential human spaceflight activities by addressing outyear space operations requirements and risk**
- **Currently planning to merge SOMD and Exploration Systems Mission Directorate (ESMD), to create a new directorate which will implement human spaceflight program content, in alignment with the goals of the NASA Authorization Act of 2010**
 - This organization will manage all human spaceflight programs including ISS, Commercial Crew and Cargo, Space Launch System (SLS), Multi-Purpose Crew Vehicle (MPCV), and Exploration Research and Development



SOMD: Program Financial Plan Full Cost View

04/06/2011

Budget Authority (\$M)	FY 2010 Actual *	FY 2011 CR	FY 2011 Auth Act	FY 2012	FY 2013	Notional FY 2014	FY 2015	FY 2016
FY 2012 President's Budget Request	6,141.8	6,146.8	5,508.5	4,346.9	4,346.9	4,346.9	4,346.9	4,346.9
<u>Space Shuttle</u>	<u>3,101.4</u>	-	<u>1,609.7</u>	<u>664.9</u>	<u>79.7</u>	<u>0.8</u>	<u>0.8</u>	<u>0.9</u>
Pension Liability				547.9				
Program Integration	627.2			38.8	28.3			
Flight and Ground Operations	1,115.4			40.6	23.1			
Flight Hardware	1,358.8			37.6	28.3	0.8	0.8	0.9
<u>International Space Station</u>	<u>2,312.7</u>	-	<u>2,779.8</u>	<u>2,841.5</u>	<u>2,960.4</u>	<u>3,005.4</u>	<u>3,098.0</u>	<u>3,174.8</u>
ISS System Operations and Maintenance	1,555.2			1,434.6	1,576.1	1,538.1	1,665.3	1,782.8
ISS Research	129.5			221.1	210.7	213.2	221.1	223.5
ISS Crew and Cargo Transportation	628.0			1,185.7	1,173.6	1,254.1	1,211.6	1,168.5
<u>Space Flight Support</u>	<u>727.7</u>	-	<u>1,119.0</u>	<u>840.6</u>	<u>1,306.8</u>	<u>1,340.7</u>	<u>1,248.1</u>	<u>1,171.2</u>
21st Century Space Launch Complex				168.0	175.3	168.1	54.8	42.9
Space Communications and Navigation	482.3			436.0	477.5	484.5	483.6	481.9
<i>Space Communications Networks</i>	363.3			364.5	398.2	417.9	425.2	423.2
<i>Space Communications Support</i>	93.5			66.3	65.7	66.6	58.4	58.7
<i>TDRS Replenishment</i>	25.4			5.1	13.7			
Human Space Flight Operations	112.7			111.4	112.5	112.6	115.8	116.4
Mission Operations Sustainment					415.2	443.8	459.1	391.4
Launch Services	89.4			81.3	80.3	84.6	87.0	90.4
Rocket Propulsion Test	43.3			43.9	46.0	47.1	47.8	48.2

* FY2010 Op Plan as of 2/10/2011



Space Shuttle Program (SSP)

(Including Transition & Retirement)



SSP: FY 2011 Plans

04/06/2011

- Under the current CR, budget assumes funding for the remaining Space Shuttle flights is available
- STS-133 launch of Discovery occurred on February 24, 2011
 - Flight will deliver and install the Permanent Multipurpose Module (PMM) - last pressurized element to be added to the U.S. Operating segment of the ISS
 - Flight will also deliver critical ISS hardware spares
- STS-134 target launch date target is April 29, 2011 and will deliver and install the Alpha Magnetic Spectrometer (AMS) payload onto the ISS
 - An additional mission, STS-135 has been authorized in the NASA Authorization Act of 2010. Mission preparations are currently underway, although it is yet to be funded
 - Currently preparing Space Shuttle *Atlantis*, to serve as STS-335 as the Launch on Need (LON) vehicle for STS-134
 - Target launch date is NET June 28, 2011



SSP: FY2012 Plans

04/06/2011

- **Ramp up transition and retirement activities**
- **Fund United Space Alliance (USA) Pension Liability**
 - USA notified NASA that it wished to terminate all defined pension benefit plans as of December 31, 2010
 - USA has consistently incorporated and billed the maximum allowable costs into their indirect rates, but the recent deterioration of the equities and credit markets has caused the plan to be underfunded by an estimated \$500M-600M
 - Space Program Operations Contract (SPOC) is a cost-type contract covered by the Cost Accounting Standards (CAS). In accordance with CAS 413.50(c) (12), any costs of terminating plans are a contractual obligation of the Government (if deemed allowable, allocable, and reasonable)
 - Almost all of USA business base (96%) is the NASA SPOC
 - Under an Advanced Agreement, USA deferred formal pension plan termination until after December 31, 2011 allowing NASA to use FY 2012 funding to cover this liability
 - USA has filed a notice of intent to terminate with the Pension Benefit Guaranty Corporation
 - Based on the latest actuarial estimates, the agency has budgeted \$547M for this liability
 - Agency is monitoring this liability and will update estimate based on final assumptions when the Space Shuttle manifest is complete
 - If funding remains after the pension plan termination, it will be used to defray Space Shuttle closeout costs that would otherwise require FY 2013 funding;
 - If there is a shortfall, it will reduce available Space Shuttle funds for closeout and some activity could move later



International Space Station (ISS)



ISS: FY 2011 and FY 2012 Plans

04/06/2011

- **Complete research outfitting, deliver hardware, and pre-position critical system spares**
 - Add two remaining ExPrESS Logistics Carriers (ELCs)
 - Add Permanent Multipurpose Module (PMM)
 - Install the Alpha Magnetic Spectrometer (AMS)
- **Maximize utilization of 6 crew to increase ISS research time availability and ramp up for full research operations**
 - Complete the transfer of research grants management to an independent non-profit organization
- **Demonstrate Commercial Cargo transport systems**
 - SpaceX Demo 2 (ISS flyby) – September 2011 (NET)
 - SpaceX Demo 3 (berthing to ISS) – January 2012 (NET) (Under Review)
 - OSC Demo – December 2011
- **Continue stable crew/cargo flight plan while moving toward domestic transportation capabilities for US responsibilities**
 - Roscosmos crew and cargo flights:
 - 4 Soyuz crew exchanges per year (6 Russian/6 non-Russian crew) and 4-5 Progress resupply flights per year (primarily Russian logistics)
 - Continue Japanese Aerospace Exploration Agency (JAXA) H-II Transfer Vehicle (HTV) and European Space Agency (ESA) Automated Transfer Vehicle (ATV) flights
 - Begin Space Exploration Technologies (SpaceX) and Orbital Sciences Corporation (OSC) Commercial Resupply Services (CRS) flights



JAXA HTV



Space Shuttle



Russian Progress

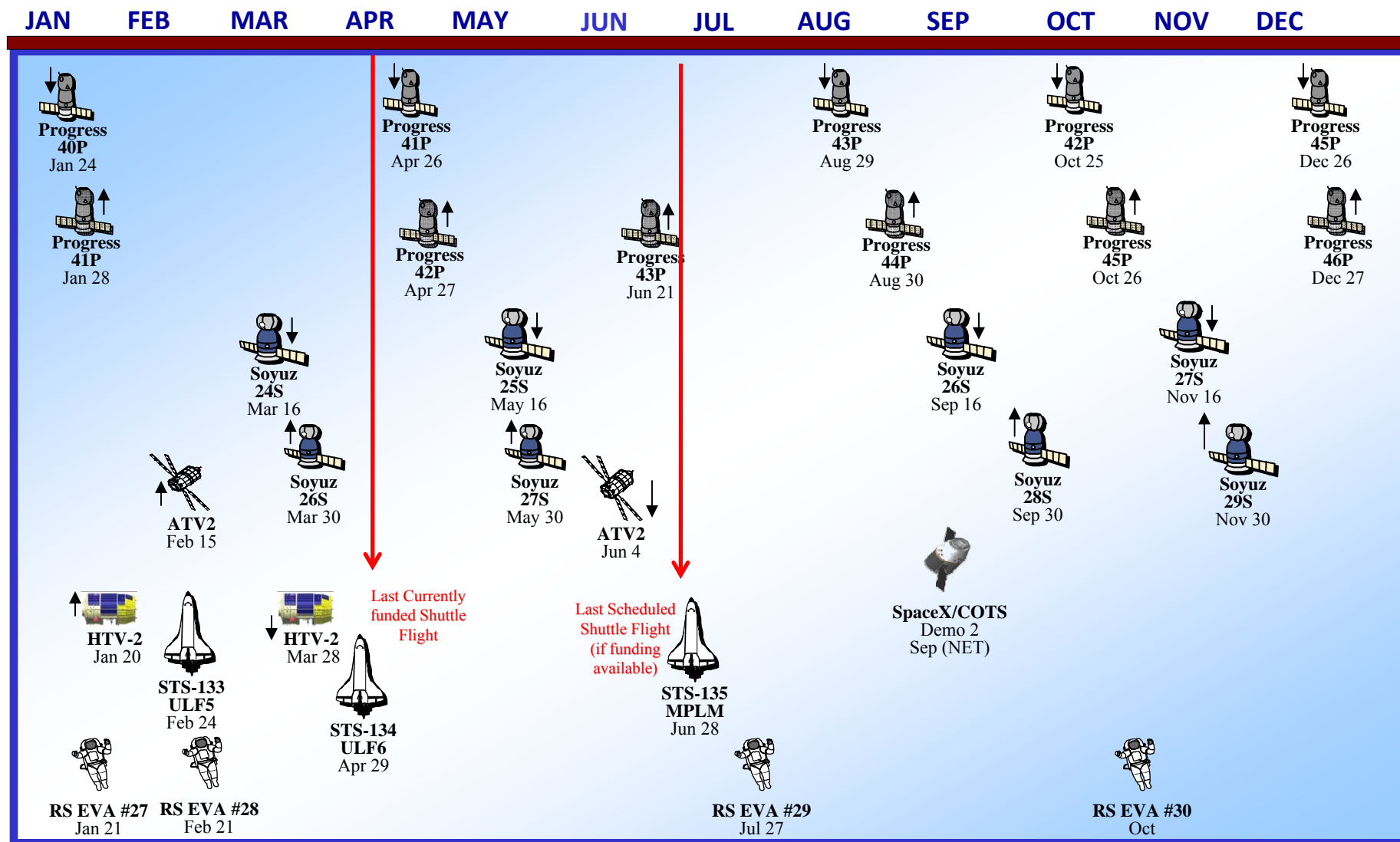


ESA ATV



ISS: CY 2011 Visiting Vehicle Plans*

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Launches: RS = 10 US = 3 JAXA = 1 ESA = 1 SpaceX = 1

* As of January 2011



ISS: Research

● ISS Research Statistics:

	ISS Expeditions 21/22 Oct 2009 - Mar 2010	ISS Expeditions 23/24 Mar 2010 - Sept 2010	ISS Expeditions 0-24 Dec 1998- Sept 2010
Total Investigations	218	195	1149
<i>New Investigations</i>	56	35	--
<i>Completed Investigations</i>	25	16	454
Scientists	496	385	1673
Countries	26	29	59

Investigations by Discipline	ISS Expeditions 21/22	ISS Expeditions 23/24	ISS Expeditions 0-24
Biology and Biotechnology	70	60	567
Earth and Space Science	21	19	39
Educational Activities	18	16	162
Human Research	39	30	146
Physical Sciences	42	43	126
Technology	28	27	109

● ISS Research Budget:

RY \$ in Millions*	<u>FY 11</u>	<u>FY12</u>	<u>FY13</u>	<u>FY14</u>	<u>FY15</u>	<u>FY16</u>
Biological & Physical Research (including NPO) **	65.0	66.5	67.0	66.3	66.8	67.2
Multi-User System Support (MUSS) (Including Enabling)***	156.1	154.6	143.8	146.9	154.2	156.2
Total ISS Research	221.1	221.1	210.7	213.2	221.1	223.5

* Budget in Full Cost (includes Labor)

** Includes \$15 million for the NPO

*** MUSS is the infrastructure required to support Research



ISS Research: National Laboratory Update

04/06/2011

● Existing work

- NASA currently has Memoranda of Understanding with five federal agencies and nine Space Act Agreements (SAAs) with companies and universities
- National Institutes of Health (NIH) issued 3-yr rolling Funding Opportunity Announcement for ISS-based investigations March 2009 to include two-phase awards up to \$2.5M per grant over 5 years
 - 1st three NIH grants awarded August 2010 to study how bones and the immune system weaken in space
 - Second set of NIH proposals received September 2010 and currently under review
- National Science Foundation funded a study using ISS as a platform for deploying CubeSats to study the upper atmosphere
- Continued progress at Astrogenetix on vaccine development project
- The Committee for the Decadal Survey on Biological and Physical Sciences in Space; National Research Council issued a report "*Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era*" on April 5, 2011. NASA is currently reviewing this report

● Management of future biological and physical research grants

- Making progress on implementing a non-profit organization (NPO) to stimulate, develop and manage the U.S. national uses of the ISS National Lab
 - Cooperative Agreement Notice (CAN) for soliciting proposals for an ISS National Lab Management Entity posted on February 14, 2011
 - Notices of intent were received March 4, 2011
 - Proposals were received April 1, 2011
 - Award planned for July 1, 2011



ISS Research: Management Structure

04/06/2011

- **During FY 2011, NASA will be awarding a cooperative agreement to an independent non-profit organization (NPO) with responsibility to further develop national uses of the ISS. This organization will:**
 - Act as a single entry point for non-NASA users to interface efficiently with the ISS;
 - Assist researchers in developing experiments, meeting safety and integration rules, and acting as an ombudsman on behalf of researchers;
 - Perform outreach to researchers and disseminate the results of ISS research activities; and
 - Provide easily accessed communication materials with details about laboratory facilities, available research hardware, resource constraints, and more
- **The NPO will oversee all research involving organizations other than NASA and transfer current NASA biological and physical research to the NPO in future years**
- **An independent assessment was performed to inform the structure and process of the NPO via reference model**



Space Communications and Navigation (SCaN)



SCaN: FY 2011 and FY 2012 Plans

04/06/2011

● FY 2011 Plans

- Awarded Contract of the first set of antennas to replace the Deep Space Network (DSN) 70m - December 2010
- System Requirement Review for SGSS – 4th Quarter FY 2011
- Tracking and Data Relay Satellite (TDRS) K and L
 - Mission Operations Review - November 2010
 - TDRS K: Begin Spacecraft Integration and Test ; Pre-Environmental Review - June 2011
 - TDRS L: Complete Bus Module Design and Development – March 2011
- Turnover of Communications, Navigation, and Networking reConfigurable Test Bed (CoNNeCT) to JAXA – Summer 2011

● FY 2012 Plans

- Delivery of the TDRS-K spacecraft
 - Launch of TDRS-K in December 2012 (or possibly as early as June 2012) via Atlas V
- Implementation of infrastructure upgrades
 - Space Network Ground Segment Sustainment
 - Deep Space Network Canberra Deep Space Communications Complex 34 meter Beam Wave Guide
- Continued development of enabling capabilities and technology
 - Planned Launch of CoNNeCT on HTV-3
 - Integration and testing for Lunar Laser Communications Demonstration
- Completion of the integrated Network Architecture Review



21st Century Space Launch Complex (21CSLC)



21CSLC: FY 2011 and FY 2012 Plans

04/06/2011

- **21st Century Space Launch Complex will focus on upgrades to the Florida launch range, expanding capabilities to support SLS, MPCV, commercial cargo/launch services providers, and transforming KSC into a modern facility that benefits all range users, in line with the NASA Authorization Act of 2010**
- **SOMD has been working closely with KSC, the United States Air Force (USAF), the Federal Aviation Administration, and the space user community to refine requirements and develop a unified strategy**
- **Program has organized into five product lines to review requirements and select projects:**
 - Modernization Mission Focused Capabilities
 - Florida Launch Modernization and Infrastructure
 - Range Interface and Control Services
 - Environmental Remediation and Technologies Capability Development
 - Off-Line Manufacturing, Processing and Recovery Capabilities



Human Space Flight Operations (HSFO)



HSFO: FY 2011 and FY 2012 Plans

04/06/2011

● Space Flight Crew Operations (SFCO)

- SFCO supports the planned Space Shuttle manifest and U.S. crew rotations on the ISS
 - Provides trained crews for ISS
 - Provides crew expertise for future human space flight development
- SFCO aircraft inventory
 - Maintains 20 T-38 aircraft in order to provide astronauts with spaceflight readiness training
- NASA has enlisted the National Research Council to conduct an independent study of the activities funded within NASA's HSFO program
 - Study will focus on the role and size of the human spaceflight office after Space Shuttle retirement and Space Station assembly completion;
 - Crew-related training facilities, in addition to their aircraft and training requirements to support the Astronaut Corps for the requirements of NASA's new human spaceflight program, and the more cost-effective means of meeting these requirements.
 - The SFCO will also provide support and training for astronauts preparing for future flights to the ISS as well as provide technical and safety panel support to development of future human space systems
 - Study has commenced, with the goal of being completed in time to inform the FY 2013 budget process



HSFO: FY 2011 and FY 2012 Plans (Cont.)

04/06/2011

- **Crew Health and Safety (CHS)**

- Implement the revised Lifetime Surveillance of Astronaut Health (LSAH)
- Responding to recommendation by the Institute of Medicine to convert to an occupational health model for tracking and mitigating the effects of spaceflight humans
 - Continue to examine the incidence of acute and chronic morbidity and mortality of astronauts, and define the risks of morbidity and mortality associated with the occupational exposures encountered by astronauts
 - All astronauts selected into the U.S. Space Program will be monitored
 - Goals were established:
 - Develop and Provide a Comprehensive Annual Medical Exam for each LSAH Participant
 - Conduct Occupational Surveillance
 - Improve Communication, Data Accessibility, Integrity and Storage
 - Support Operational and Health Care Analyses
 - Support NASA Research Objectives
 - Maintain the health of astronauts
 - Maintain skills retention/proficiency of space medicine specialists post Space Shuttle
 - Identifies and tracks threats to human health as a result of long duration space flight

- **SOMD is continuing to study other activities for inclusion in HSFO**



Launch Services Program (LSP)



LSP: FY 2011 – FY 2012 Plans

04/06/2011

- **NASA has assigned responsibility for understanding the full range of civil space launch needs to the Launch Services Program**
- **LSP's focus is to:**
 - Provide safe, reliable, cost effective and on-time launch services for NASA and NASA-sponsored payloads using expendable launch vehicles
 - Work with other government agencies and the launch industry to ensure launch opportunities are available on a range of launch systems
 - Work with launch service providers on emerging vehicles for future use
- **Provides for the core NASA government and contractor workforce supporting the upcoming NASA launches this fiscal year, along with conducting the engineering analysis and integration support for ~35 NASA missions in various phases of development**
- **Conduct nine planned launches of NASA payloads in FY 2011 and FY 2012:**
 - Glory – Taurus XL, Vandenberg AFB, CA: Unsuccessful launch on 3/4/2011; Mishap Investigation Board established
 - Aquarius – Delta II, Vandenberg AFB, CA : 6/2011
 - Juno – Atlas V, Cape Canaveral AFS, FL: 8/2011
 - Gravity Recovery and Interior Laboratory (GRAIL) – Delta II, Cape Canaveral AFS, FL 9/2011
 - National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) – Delta II, Vandenberg AFB, CA : 10/2011
 - Mars Science Laboratory (MSL) – Atlas V, Cape Canaveral AFS, FL: 11/2010
 - Nuclear Spectroscopic Telescope Array (NuSTAR) – Pegasus XL, Kwajalein Atoll: 2/2012
 - TDRS-K – Atlas V, Cape Canaveral AFS, FL: NET 6/2012
 - Radiation Belt Storm Probes (RBSP) – Atlas V, Cape Canaveral AFS, FL: 5/2012



LSP: FY 2011 – 2012 Plans (Cont.)

04/06/2011

- **Execute six Launch Services Task Orders (LSTOs) via NASA Launch Services (NLS)-II**

Contract:

- Mars Atmosphere and Volatile Evolution (MAVEN) – negotiations completed 10/21/2011
- Jason-3
- Soil Moisture Active-Passive (SMAP)
- Geostationary Operational Environmental Satellite (GOES-R and GOES-S)
- ExoMars
- Gravity and Extreme Magnetism Small Explorer Mission (GEMS)

- **Award Expendable Launch Vehicle Integrated Support (ELVIS) follow-on contract**

- Award planned for December 2011 / January 2012 timeframe; ~\$35M
- Provides critical engineering analysis and integration support to LSP

- **LSP also providing support to:**

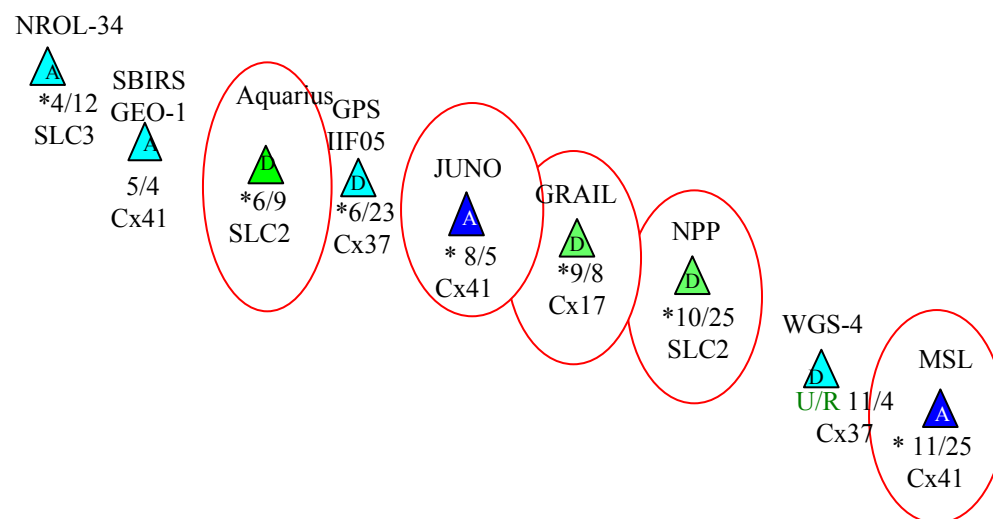
- ISS CRS Program in an advisory capacity in FY 2011 and FY 2012,
- Other Commercial/Department of Defense (DoD) launches



2011 Launch Manifest

-NASA LSP Planning Only-

04/06/2011



Other

ER Ops:

- STS-134 4/29
- STS-135 6/28

WR Ops:

- MDA: , 11/15
- MM: , *6/22, *7/27, *9/21
- Range Maint. Dec-Feb 2012
- Other: *5/5(KLC) *8/10,

- NASA/LSP Taurus
- NASA/LSP Atlas
- NASA/LSP Delta II
- USAF/DoD/NRO
- Commercial
- Other
- M Minotaur

- LSP primary missions
- LSP advisory missions

Standard Setback Guidelines:

10 days in between missions for LSP

15 days in between DII ER to WR for ULA

60 days off of SLC-2 for ULA

60 days AV on ER for ULA

* RANGE DATE
U/R Under Review
NET No Earlier Than

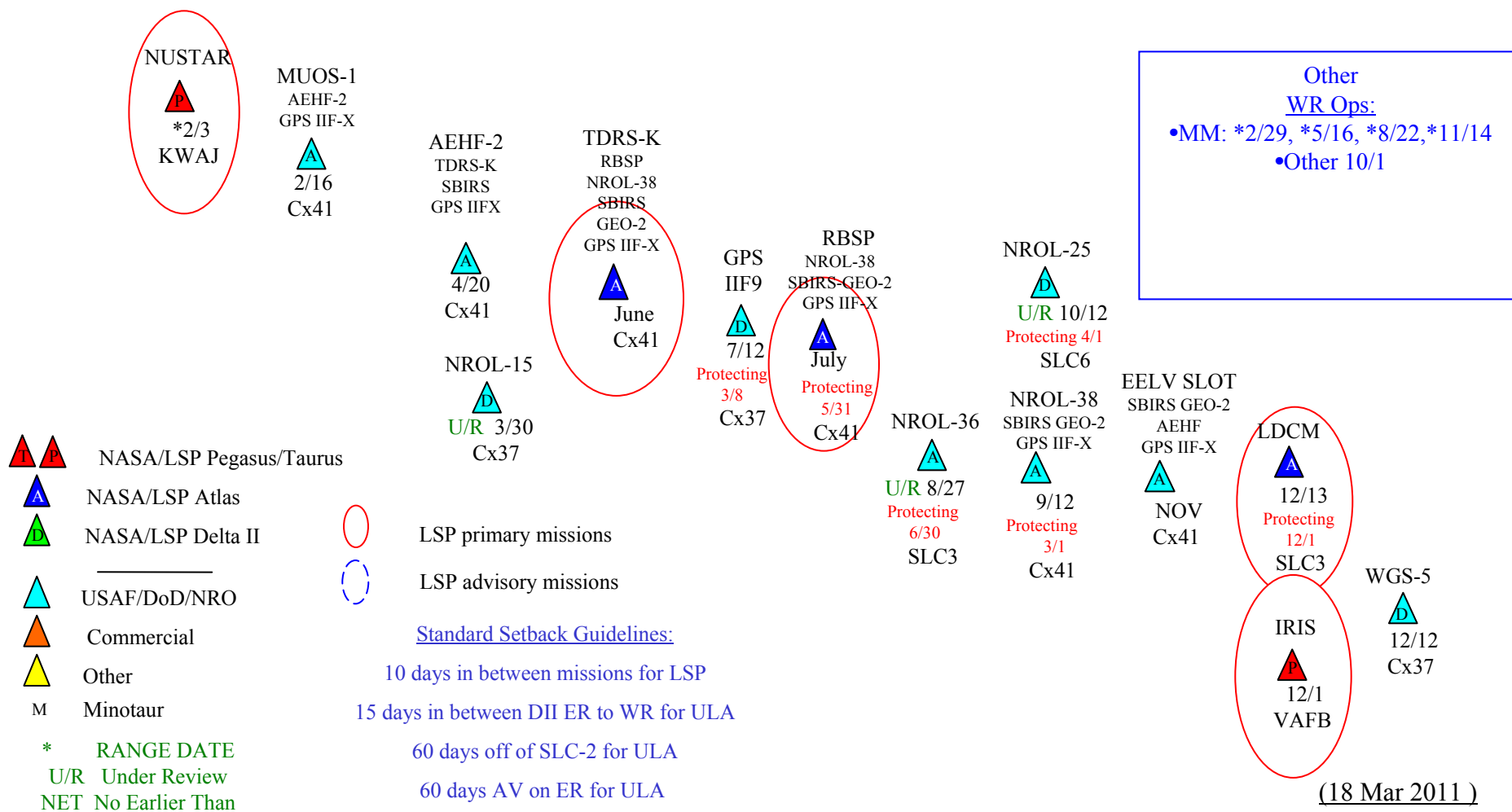
(13 Mar 2011)



2012 Launch Manifest

-NASA LSP Planning Only-

04/06/2011





LSP: Alpha Magnetic Spectrometer (AMS) FY 2011 Plan

04/06/2011

- **AMS is a Department of Energy (DOE) - sponsored, 16-nation international cosmic-ray particle physics experiment planned for the ISS that will search for dark matter, anti-matter, and strange matter**
- **AMS was delivered to KSC in August 2010**
- **AMS is currently in flight-ready configuration awaiting a launch to the ISS via the Shuttle flight STS-134 currently planned for April 2011**
- **AMS will be installed on the exterior of the ISS to begin a 10 year or more science mission**
- **After initial AMS operations controlled from Johnson Space Center (JSC) for ~ 2 months, AMS science operations control will be transferred to the European Organization for Nuclear Research (CERN), Switzerland for the remainder of the AMS science mission on ISS**
- **NASA will continue to provide low-level AMS housekeeping flight operations support to the DOE/International-funded AMS science operations at CERN**



Rocket Propulsion Test (RPT) Program



RPT: FY 2011 & FY 2012 Plans

04/06/2011

- **Maximize use of Rocket Propulsion Test Program (RPT) resources by implementing, and keeping current the RPT Master Plan to merge current and future requirements, existing budget horizon, and capabilities to assure proper Agency propulsion test portfolio is maintained**
 - FY 2011 - 2012 plan is to transition from 29 active test positions across 19 test stands to 25 active test positions across 15 test stands (33 test positions across 22 test stands total inventory)
 - Implementation of White Sands Test Facility (WSTF) Right-Sizing Study rocket propulsion testing recommendations
 - Further right-sizing plans will closely follow development of future Agency plans to allow further right-sizing plans based on final decisions
- **Continue to support commercial rocket propulsion testing through utilization of NASA test facilities**
 - Continued testing of AJ-26 engine at SSC for Orbital Taurus II
 - Continued testing of RS-68 engine at SSC for Pratt & Whitney Rocketdyne & USAF