Space Operations Mission Directorate

FY 2011 Budget Briefing to AESB/SSB

March 8, 2010

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Space Operations Mission Directorate

SOMD Budget Priorities

03/08/2010

- **Safely fly the remaining Space Shuttle manifest and efficiently and responsibly retire the program**
- **Complete assembly and research outfitting of the International Space Station (ISS)**
- **Extend ISS operations to 2020 or beyond and enable full utilization**
- **Establish the 21st Century Space Launch Complex Program at Kennedy Space Center (KSC)**
- **Continue to provide launch services and space communications to our customers to meet scientific and communications needs**

Space Operations Mission Directorate
FY 2011 Budget Request

03/08/2010

RY $ in Millions	FY 2009*	FY 2010*	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
FY 2011 President's Budget Request*	**5,764.7**	**6,180.6**	**4,887.8**	**4,290.2**	**4,253.3**	**4,362.6**	**4,130.5**
Space Shuttle	2,979.5	3,139.4	989.1	86.1	0.0	0.0	0.0
International Space Station	2,060.2	2,317.0	2,779.8	2,983.6	3,129.4	3,221.9	3,182.8
Space and Flight Support	725.0	724.2	1,119.0	1,220.6	1,123.9	1,140.7	947.7
Space Communications and Navigation	582.9	485.3	452.9	478.0	479.5	488.4	489.6
21st Century Space Launch Complex	0.0	0.0	428.6	500.0	400.0	400.0	200.0
Launch Services	91.7	83.8	78.9	82.6	82.5	86.0	87.9
Rocket Propulsion Testing	41.8	44.3	44.3	44.2	44.2	48.2	49.2
Crew Health and Safety	8.6	8.6	0.0	0.0	0.0	0.0	0.0
Human Space Flight Operations	0.0	102.3	114.4	115.8	117.7	118.1	121.0

May be off due to rounding

**** FY 2011 President's Budget Request depicts the July 2009 Operating Plan including American Recovery and Reinvestment Act for the FY 2009 Actual column, and the Consolidated Appropriations Act, 2010 (P.L. 111-117) without the Administrative transfers for the FY 2010 enacted column***

Space Shuttle Program
FY 2010 & FY 2011 Plans

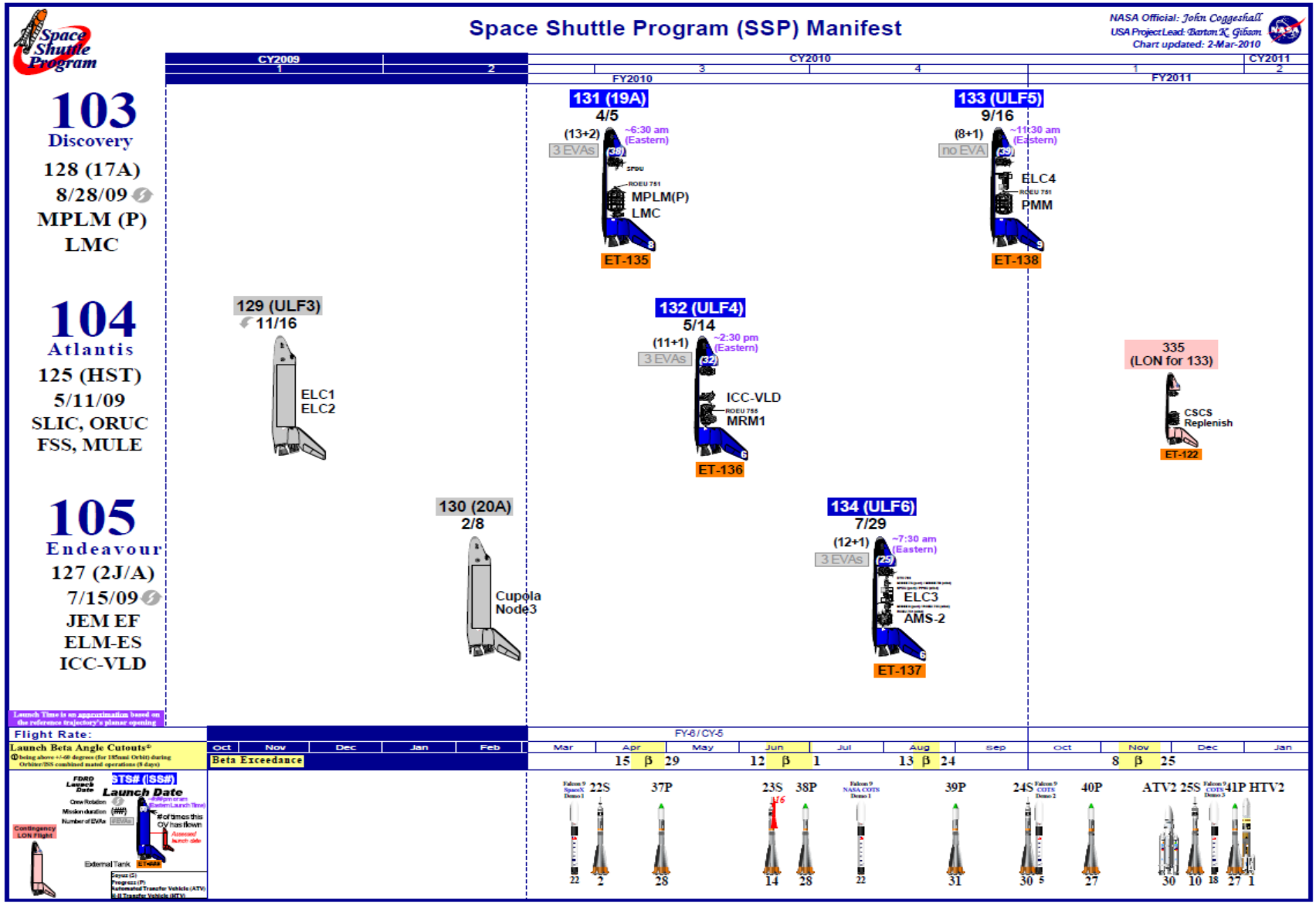
2/17/2010

- **FY 2010 Plans**
  - Conduct five ISS assembly missions and one additional flight to deliver and install the Alpha Magnetic Spectrometer (AMS) payload onto the ISS
    - Successfully completed STS-129 in November 2009 and STS-130 in February 2010
  - Conduct planned transition and retirement activities

- **FY 2011 Plans**
  - If safety, weather and/or technical challenges arise in FY 2010, the budget includes $600M to complete the final Space Shuttle flight(s) by the end of CY 2010
    - If the Space Shuttle completes the four remaining flights by September 2010, NASA will work with the Administration and Congress to determine the highest priority use of these funds
  - After last mission, ramp up transition and retirement activities

Space Shuttle Manifest - Baseline

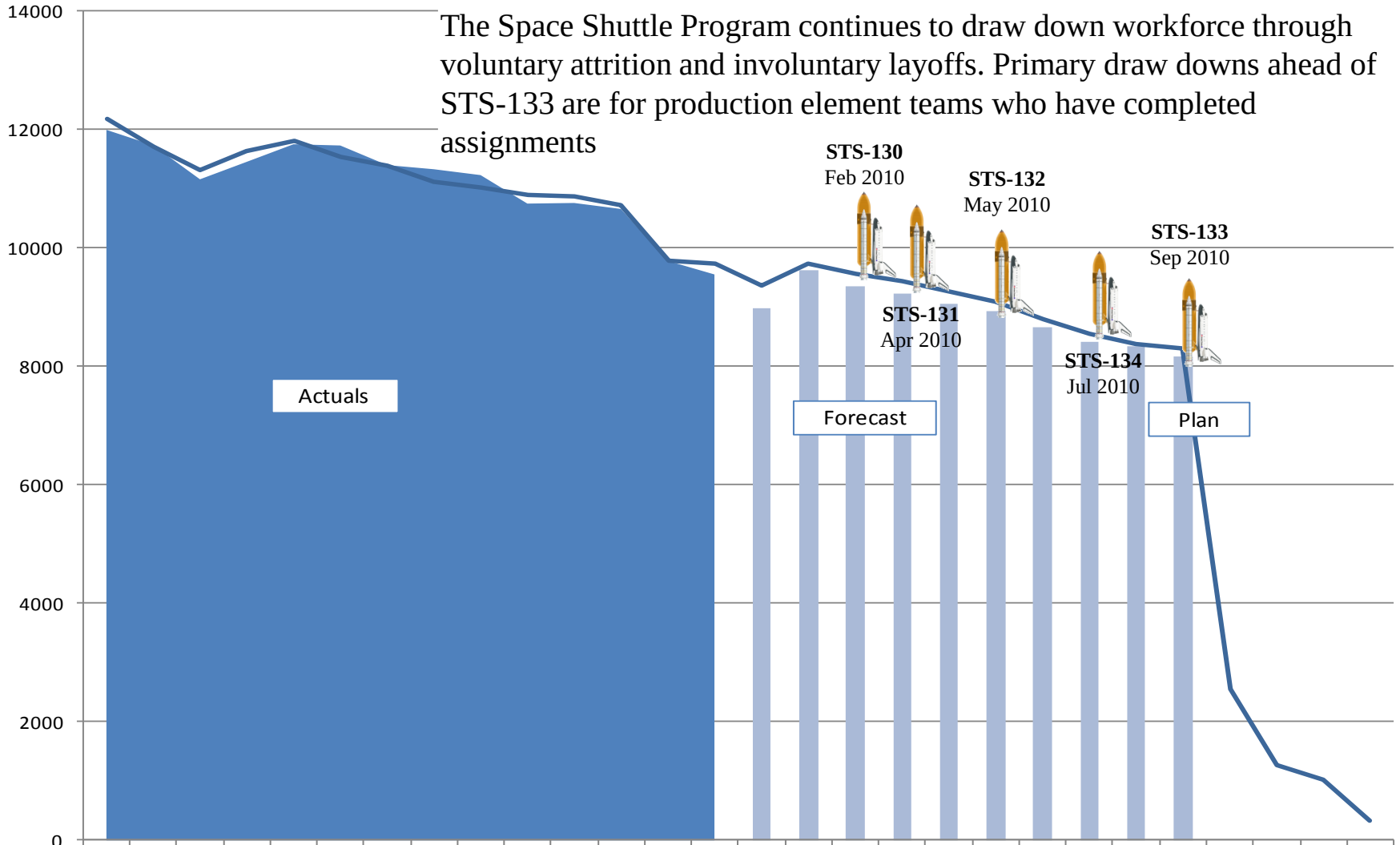
03/08/2010



Space Shuttle Workforce Plan

03/08/2010

The Space Shuttle Program continues to draw down workforce through voluntary attrition and involuntary layoffs. Primary draw downs ahead of STS-133 are for production element teams who have completed assignments



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SSP Actuals	12001	11741	11166	11461	11758	11737	11406	11336	11237	10756	10766	10665	9788	9559														
SSP Forecast															8990	9635	9364	9223	9058	8928	8668	8425	8348	8173				
SSP Plan	12183	11703	11308	11640	11816	11545	11387	11116	11008	10888	10875	10726	9786	9741	9371	9729	9559	9435	9267	9083	8803	8558	8382	8298	2551	1273	1025	332

Transition and Retirement

- The current plan is based on completing the manifest in September 2010
- Space Shuttle transition and retirement is funded through FY 2012 with an aggressive but achievable plan
- Orbiters to be safed and ready for transport from June 2011 to December 2011
- Requirements for transfer of real and personal property are based on Constellation Program and will be revisited
- Potential Historical Artifacts to be excessed are screened with museums and educational institutions for placement
- Current work plan does not require any waivers or deviations to U. S. Code or Federal Regulations

International Space Station
FY 2010 Plans

03/08/2010

- **Complete ISS Assembly**
  - Added first two ExPrESS Logistics Carriers (ELC), Russian Mini-Research Module (MRM) 2, and Node 3 with Cupola
  - Add MRM 1, two remaining ELCs, and Permanent Multipurpose Module (PMM)
- **Demonstrate commercial cargo transport systems**
  - SpaceX Demonstration (demo 1 orbital flight) – May 2010
- **Continue stable crew/cargo flight plan**
  - 4 Soyuz crew exchanges per year
  - 4-5 Progress cargo re-supply flights per year
- **Outfit laboratories with payload facilities**
  - Install 2 ELCs, each with 2 external experiment sites
  - Install AMS
  - Install remaining US research facilities: Window Observational Research Facility, Muscle Atrophy Research and Exercise System, additional ExPrESS Racks, and the third Minus Eighty Laboratory Freezer for ISS
- **Pre-position critical system spares**

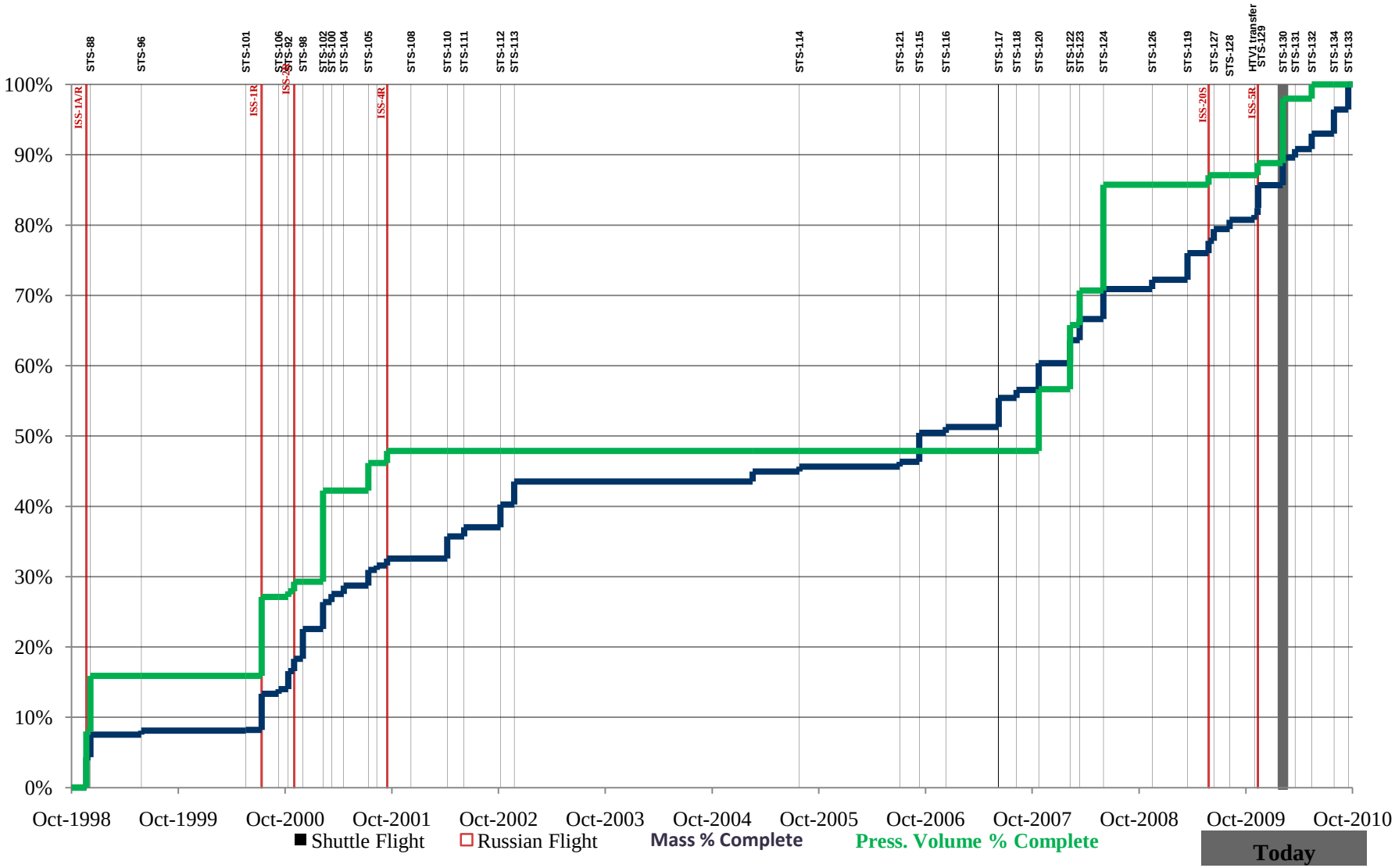
International Space Station
FY 2011 Plans

3/08/2010

- **Conduct ongoing utilization**
  - Maximize utilization of 6 crew to increase research time availability and ramp up for full research operations
  - Pursue exploration technology development payloads
  - Broaden ISS National Lab pathfinders research scope
- **Continue stable crew/cargo flight plan**
  - 4 Soyuz crew exchanges per year; 4-5 Progress cargo re-supply flights per year
  - Continue H-II Transfer Vehicle (HTV) and Automated Transfer Vehicle (ATV) flights
  - Begin SpaceX Commercial Resupply Services (CRS) flights
- **Demonstrate Commercial Cargo transport**
  - SpaceX Demo 2 (ISS flyby) – November 2010
  - SpaceX Demo 3 (berthing to ISS) – February 2011
  - OSC Demo – March 2011

International Space Station Mass/Volume % Complete Status

03/08/2010



International Space Station Life Extension

03/08/2010

- **Provides $2.5 billion in additional funding through FY 2015 to enable ISS extension until 2020 or beyond**
  - Although the budget supports operations through 2020, NASA will establish a process that will allow the U.S., its International Partners, and the broad stakeholder community to determine how long the ISS ultimately should operate
- **Funding will support the following activities:**
  - Work related to vehicle re-certification to extend ISS structures and mechanisms
  - Additional consumables and other necessary hardware to ensure full functionality
  - Upgrades to ISS aimed at reducing costs and increasing available research functionality
- **Life extension decision was critical for the following activities:**
  - Long term investment in National Laboratory by external entities
  - Planning with International Partners, including recertification of our partners' modules
  - Assuring CRS providers that there is a future cargo transportation market

International Space Station Functionality Increase

03/08/2010

- **Provides additional funding through FY 2015 to increase ISS functionality (included in ISS Extension budget)**
  - The ISS Functionality increase is an investment to improve the efficiency and effectiveness of the Space Station facility itself
  - This investment is intended to support ISS upgrade efforts while supporting and proving new space technologies
- **Projects to be funded from this line will be selected to satisfy one or more of the following objectives:**
  - Reducing demands on crew time
  - Lowering ground-based costs
  - Mitigating capabilities lost when the Shuttle retires
  - Improving ISS software capabilities
  - Improving ISS safety
- **Further details will be provided as specific projects are selected**

International Space Station Research

- **This budget provides $50M of funding annually within the ISS budget to support ISS research and Engineering Research and Technology Demonstrations (ERTD)**
- **Additional ISS technology demonstrations will be funded within ESMD and the newly established Space Technology Office**
- **NASA is planning to establish an external organization to manage and integrate both ISS research and ERTD**
  - Purpose is to facilitate requirements between ISS and the broad stakeholder community

International Space Station Enabling National Lab Activities

03/08/2010

- **U.S. payload operations have up to 50% unfunded idle functionality (estimated at 3 Metric Tons per year)**
- **Provides an additional $77M from 2011-2015 to integrate the payloads of new research partners at U.S. government agencies, private firms and other non-profit organizations**
- **Provides $492M from 2011-2015 to support the cargo transportation requirements for National Lab research payloads**
- **These investments will enable ISS to *support* additional research payloads up to its throughput functionality, but it does not actually fund the additional research needed to fully utilize ISS**

Space Communications and Navigation FY 2010 & FY 2011 Plans

03/08/2010

- **FY 2010 Plans**
  - Systems Level Critical Design Review (CDR) for Tracking and Data Relay Satellite (TDRS) K & L - February 2010
  - Communication Navigation and Networking Reconfigurable Testbed (CoNNeCT) Software-Mechanical-Avionics system CDR – March 2010
  - Award Space Network Ground Segment Sustainment (SGSS) contract – June 2010
  - CDR for the Lunar Laser Communications Demonstration (LLCD) – June 2010
- **FY 2011 Plans**
  - Award Contract of the first set of antennas to replace the Deep Space Network (DSN) 70m - October 2010
  - Launch of CoNNeCT on HTV-3 – June 2011
  - TDRS K: Begin Spacecraft Integration and Test; Pre-Environmental Review (PER) – March 2011
  - TDRS L: Complete Bus Module Design and Development – February 2011; Complete Bus Module Integration and Test – April 2011

Space Communications and Navigation
Deep Space Network 70m Replacement

03/08/2010

- **Replace all 70 meter antenna capability by arraying smaller 34 meter antennas by 2025**
  - Antennas are 40 plus years old and have many unique/custom subsystems that are obsolete and nearing end of life
  - 70m antennas can not accommodate new technology and the need to move to Ka band
- **NASA conducted an independent study to determine best value to replace 70m capability**
  - Study indicated an array of all 34 meter Beam Wave Guide (BWG) antennas as the most cost effective and lowest risk
- **Build first 34 meter BWG at Canberra Complex**
  - Nine (9) 34m BWG antennas – Three arrays to be connected with legacy equipment at the three Deep Space Network complexes
  - Six (6)100 Kilowatt (Kw) uplink command transmitters to provide 70m x-band capability

Space Communications and Navigation
Space Network Ground Segment Sustainment

- **The Space Network Ground Segment Sustainment (SGSS) project is intended to replace obsolete and unsustainable systems of the TDRSS Ground Segment**
  - The ground systems are based on late 1980 technology and have not fundamentally changed
  - Incorporates the TDRSS changes needed to meet evolving NASA and Customer requirements
- **SGSS will enable TDRSS to provide services for an additional ten to fifteen years of operation**
  - Request for Proposal (RFP) released September 2009
  - Proposals received December 2009
  - Contract Award is scheduled for June 2010

21st Century Space Launch Complex

03/08/2010

- **$1.9 billion is requested over five years to establish a 21st Century Space Launch Complex at Kennedy Space Center**
- **This new initiative focuses on upgrades to the Florida launch range, expanding capabilities to support commercial cargo providers, and transforming KSC into a modern facility.**
  - Modernization activities to support safer and more efficient launch operations
  - Potential relocation of the KSC perimeter where appropriate and feasible, to enable certain existing private sector facilities to lie outside of the security perimeter
  - Environmental remediation as needed;
  - Payload processing capacity increases, improvement, and modernization
- **SOMD/KSC will be working closely with the United States Air Force, the Federal Aviation Administration, and the space user community in the coming weeks to develop a requirements plan**

Launch Services
FY 2010 & FY 2011 Plans

03/08/2010

- **FY 2010**
  - Support two NASA missions: Widefield Infrared Survey Explorer (WISE) (successfully launched 12/14/09); Solar Dynamics Observatory (SDO) (successfully launched 2/11/2010). Support one mission in advisory capacity: Geostationary Operational Environmental Satellite (GOES-P) (successfully launched 3/5/2010)
  - Award NASA Launch Services II Contract (ordering period of the current NLS contract expires in June 2010)
- **FY 2011**
  - Support six NASA missions: Glory; Aquarius; Juno; Nuclear Spectroscopic Telescope Array (NuSTAR); Gravity Recovery and Interior Laboratory (GRAIL); National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP)
  - Support two missions in advisory capacity: Space X/Commercial Resupply Services (CRS-1); Space X/Commercial Resupply Services (CRS-2)

Launch Services Challenges

- **NASA's costs for small, medium and large class missions continue to increase due to poor market conditions**
  - Downturn in commercial space activities in the 1990s
  - Government funding in some form continues to be needed to maintain certain launch capabilities
- **Uncertainty of medium class launch capability for science missions beyond CY 2011**
  - Once final Delta IIs are flown out, science payloads will assume use of EELVs until new medium class capabilities emerge
  - Leveraging investment in COTS/CRS for future science missions in the medium class
- **Evaluation of USAF infrastructure cost allocations could impact NASA costs**
  - National Space Policy Directive (NSPD-40) "U.S. Space Transportation Policy" requires the evaluation of requirements and responsibilities of the EELV system and infrastructure
  - This must include a recommendation on a proportionate shift in funding to reflect any change to the balance in usage by national security and civil missions

Rocket Propulsion Test Challenges

- **RPT has been actively using its level-funded maintenance budget to maintain required rocket propulsion test facilities while supporting infrastructure right sizing**
  - Continued cooperation with DoD through National Rocket Propulsion Test Alliance (NRPTA)
  - Had been matching maintenance, rehabilitation, and mothballing plans with Constellation program and commercial engine testing requirements

- **Will coordinate with ESMD to meet testing requirements of the new Heavy lift and foundational propulsion research and development program**

Human Space Flight Operations
FY 2010 & FY 2011 Plans

03/08/2010

FY 2010 Plans

- Established Human Space Flight Operations (HSFO) budget under the Space and Flight Support (SFS) Budget Theme
- Consolidated funding from Shuttle, ISS, and Constellation programs for the Flight Crew Operations Directorate (FCOD) and into one budget line called Space Flight Crew Operations (SFCO)
- SFCO budget supports the planned Space Shuttle manifest and U.S. crew rotations on the International Space Station

FY 2011 Plans

- Adds a consolidated Crew Health and Safety (CHS) budget to HSFO
- Complete reduction of the T-38 inventory to 20 aircraft

Human Space Flight Operations Challenges

- **Additional projects are under consideration for inclusion in HSFO as part of the FY 2012 budget planning process.**
- **NASA will enlist the National Research Council to conduct an independent study of the activities funded within NASA's Human Space Flight Operations program. The study will focus on the following:**
  - How should the role and size of the human spaceflight office change post Shuttle retirement and Space Station assembly?
  - What are the crew-related facility requirements after the Space Shuttle program ends?
  - Is the Astronaut Corps' fleet of T-38 supersonic training aircraft and other aircraft a cost-effective means of preparing astronauts for the requirements of NASA's new human spaceflight program?
  - Are there more cost-effective means of meeting these training requirements?
  - Goal is to have the study completed in time to inform the FY 2013 budget process