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# NASA Advisory Council Space Operations Committee

NASA Headquarters  
February 8, 2011

Presented to the NASA Advisory Council on February 10, 2011

# Space Operations Committee

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## Meeting at NASA Headquarters, February 8, 2011

- Col. Eileen Collins (ret.), Chair
- Dr. Pat Condon, Vice Chair
  - Aerospace Consultant, former Commander of the Ogden Air Logistics Center, the Arnold Engineering Development Center, and the Air Force Armament Laboratory
- Mr. Tommy Holloway
  - Former Space Shuttle and International Space Station Program Manager
- Dr. John Grunsfeld
  - Former NASA Astronaut, Deputy Director, Space Telescope Science Institute
- Ms. JoAnn Morgan
  - Former Kennedy Space Center Associate Director, KSC Safety & Mission Assurance Director
- Mr. Bob Sieck
  - Former Space Shuttle Launch Director

## Not attending:

- *Dr. Leroy Chiao*
  - *Former NASA Astronaut and International Space Station Commander*
- Mr. Jacob Keaton, Executive Secretary, NASA

# Summary of Activities

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## Briefings:

- Space Shuttle
  - Bill Hill, Assistant Associate Administrator for Space Shuttle
- International Space Station and ISS Non-Profit Organization
  - Mark Uhran, Assistant Associate Administrator for ISS
- Heavy Lift/Space Launch System
  - Cristina Guidi, Exploration Systems Mission Directorate
- Commercial Crew Development (CCDev) – Ops Perspective
  - Phil McAlister, Exploration Systems Mission Directorate
- Ethics Briefing
  - Adam Greenstone, Office of the General Counsel

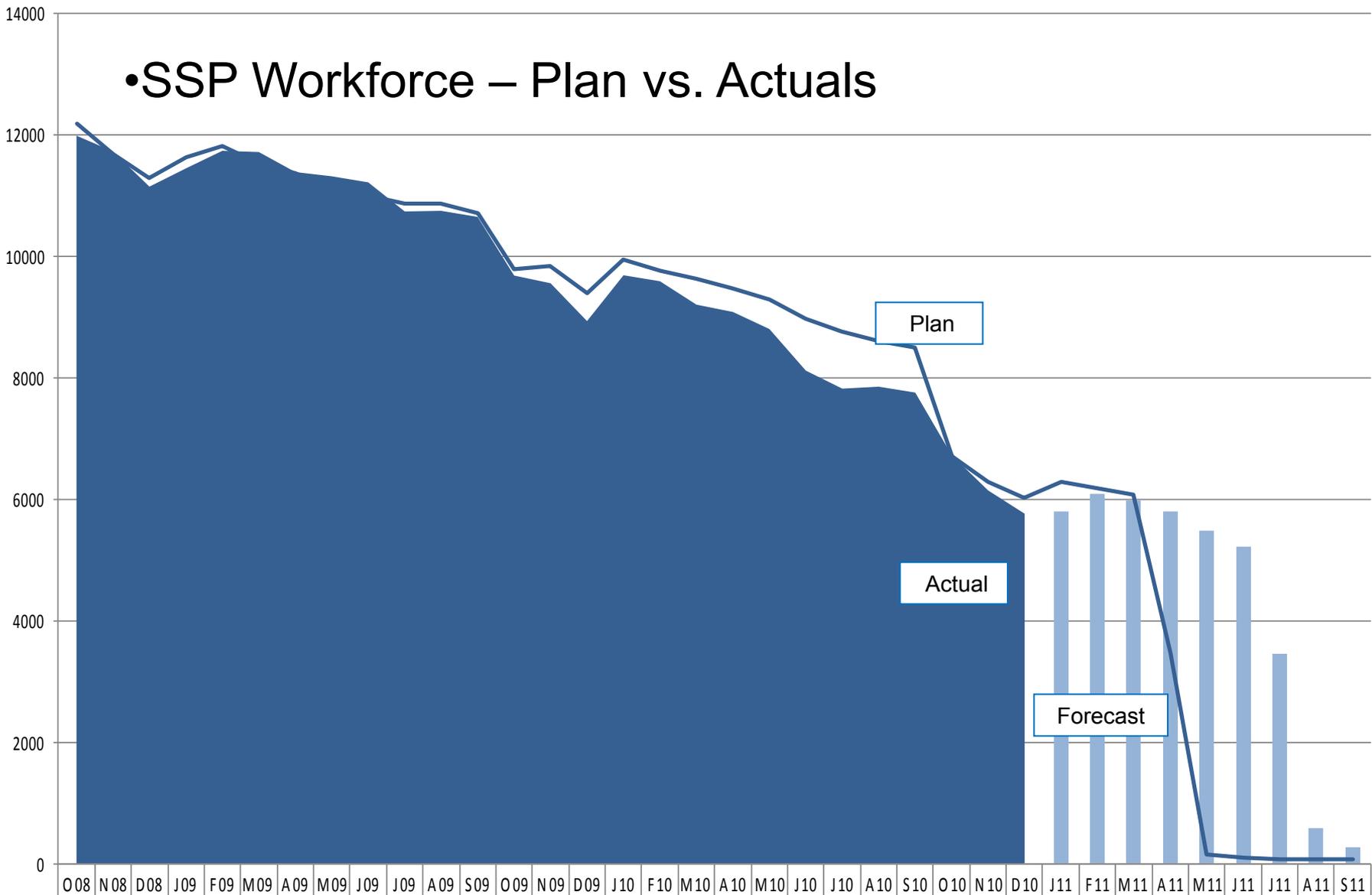
## Meetings with:

- Charlie Bolden, NASA Administrator
- Bill Gerstenmaier, Associate Administrator for Space Operations

CY2010				CY2011			
3	4	1	2	3	4		
FY2010		FY2011					
<h2>103</h2> <p>Discovery 131 (19A) 4/05/10 MPLM (P) LMC</p>				<h2>133 (ULF5)</h2> <p>Feb 24 (11+1) ~4:30 pm (Eastern) 2 EVAs (39) SPDU ELC4 ROEU 761 PMM ET-137</p>			
<h2>104</h2> <p>Atlantis 129 (ULF3) 11/16/09 ELC1 ELC2</p>		<h2>132 (ULF4)</h2> <p>5/14 ICC-VLD MRM1</p>				<h2>135 (ULF7)</h2> <p>June 28 (12+0) ~3:30 pm (Eastern) 1 EVA (33) MPLM (P) LMC ET-138</p>	
<h2>105</h2> <p>Endeavour 130 (20A) 2/08/10 Cupola Node3</p>				<h2>134 (ULF6)</h2> <p>April 19 (14+1) ~8:00 pm (Eastern) 4 EVAs (29) ELC3 AMS-2 ET-122</p>			

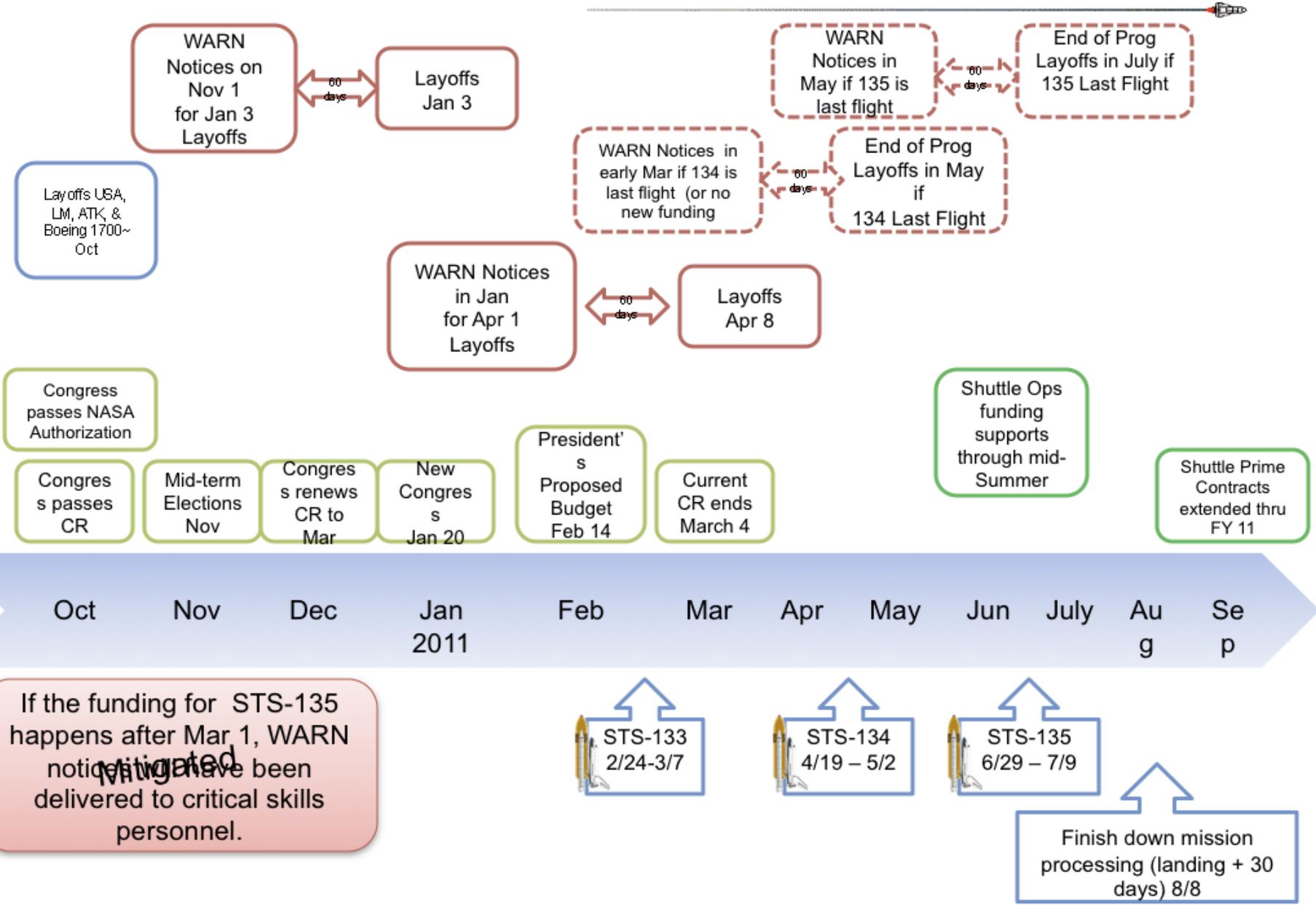
Flight Rate:	FY4/CY4				FY2/CY2														
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug			
<b>Launch Beta Angle Cutouts</b> <small>⊙ being above ±40 degrees (for 105mi Orbit) during Orbiter/ISS combined ascent operations (8 days)</small>	Beta Exceedance				1	β	1							31	β	20	31	β	15
<b>STS# (ISS#)</b> <b>Launch Date</b> <small>FDRO Layer 8 Date</small> <small>Crew Rotation</small> <small>Mission duration (###)</small> <small>Number of EVAs</small> <small># of times this OV has flown</small> <small>Assessed launch date</small> <small>External Tank</small> <small>Booster</small> <small>Progress (P)</small> <small>Automated Transfer Vehicle (ATV)</small> <small>Orbiter Transfer Vehicle (OTV)</small>									HTV2	41P	ATV2	26S	42P	27S	43P			<small>Falcon 9</small> <small>COTS</small> <small>Delta 2</small>  15	
										20	28	15	30	27	30	21			

# •SSP Workforce – Plan vs. Actuals



	O08	N08	D08	J09	F09	M09	A09	M09	J09	J09	A09	S09	O09	N09	D09	J10	F10	M10	A10	M10	J10	J10	A10	S10	O10	N10	D10	J11	F11	M11	A11	M11	J11	J11	A11	S11	
SSP Actuals	1200	1174	1116	1146	1175	1173	1140	1133	1123	1075	1076	1066	9693	9566	8942	9698	9599	9213	9092	8811	8125	7828	7860	7763	6731	6148	5765										
SSP Forecast																												5788	6083	5984	5809	5483	5211	3449	592	276	
SSP Plan	1218	1170	1130	1164	1181	1154	1138	1111	1100	1088	1087	1072	9786	9851	9404	9938	9768	9643	9477	9297	8967	8771	8596	8512	6716	6285	6017	6294	6191	6067	3471	136	86	76	74	65	

# Shuttle Workforce Timeline



# External Tank Stringer Crack Repair

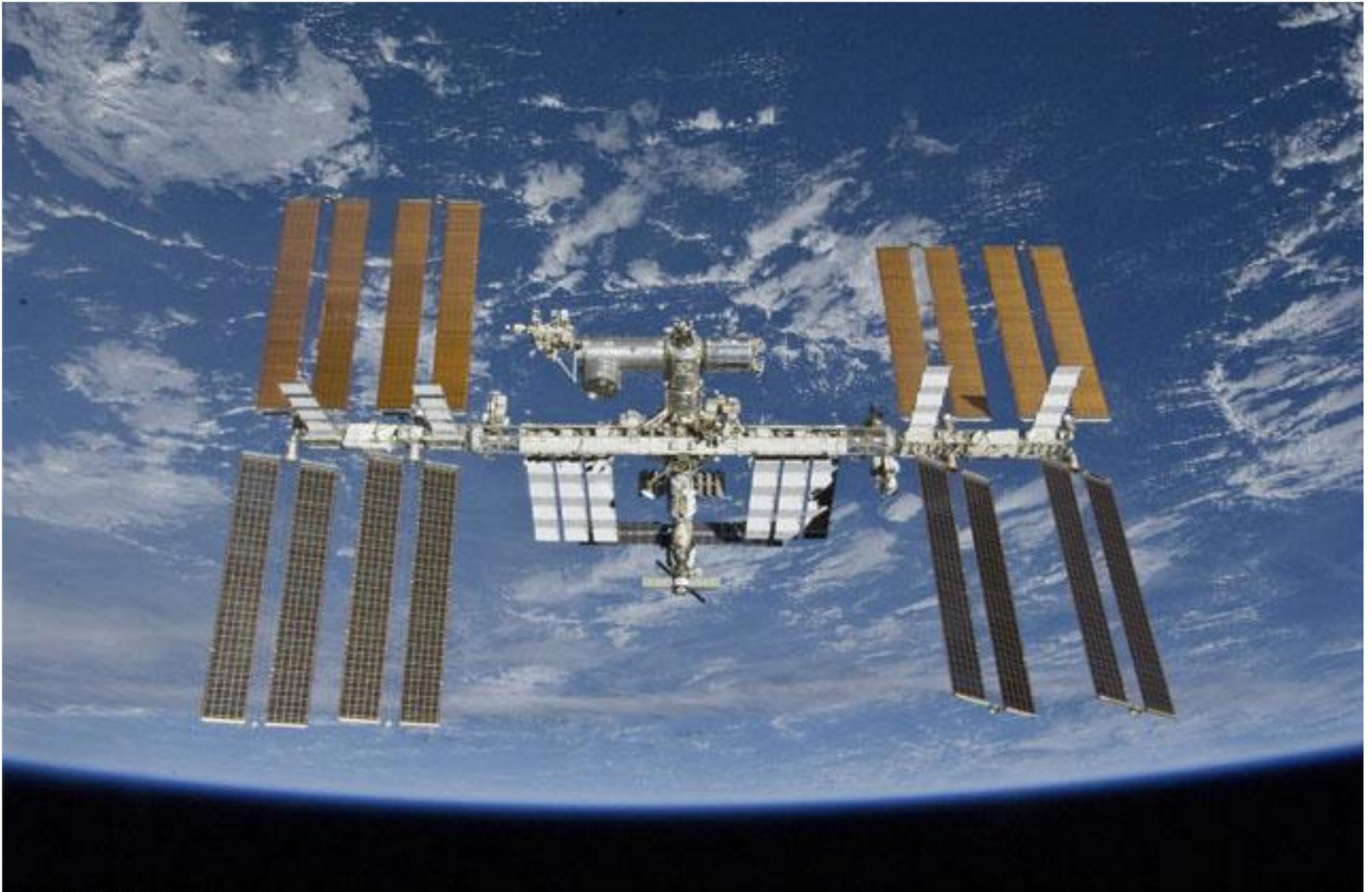
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S124E005013

# International Space Station

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S132E012212

# International Space Station

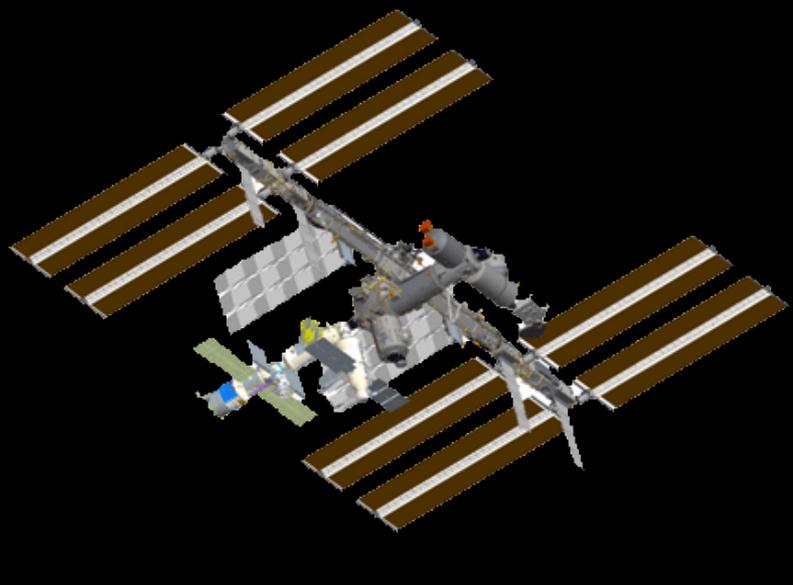
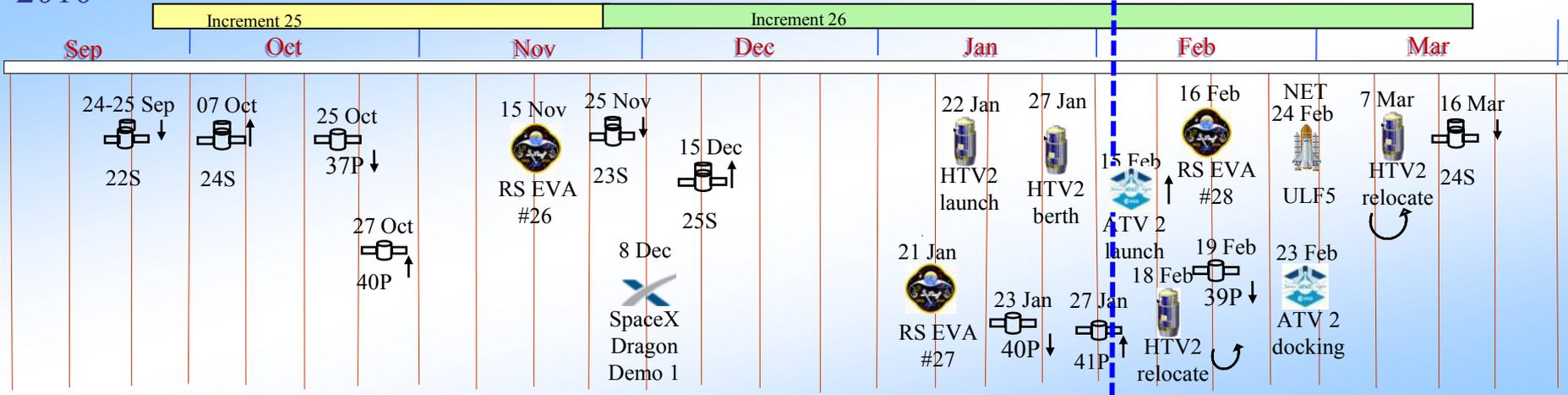
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S132E012232

# Increment 25-26 Summary

2010



23 Soyuz Crew	24 Soyuz Crew	25 Soyuz Crew
 Doug Wheelock Exp 25 CDR	 Alexander Kaleri Exp 25 / 26 FE1	 Dmitri Kondratyev Exp 26 FE4
 Fyodor Yurchikhin Exp 25 FE5	 Oleg Skripochka Exp 25 / 26 FE2	 Paolo Nespoli Exp 26 FE5
 Shannon Walker Exp 25 FE6	 Scott Kelly Exp 25 FE3 / Exp 26 CDR	 Catherine Coleman Exp 26 FE6

All dates are Eastern

# STS-133 / ISS-ULF5 Crew and Mission Summary



STS-133 Crew, from left to right:

- |  |                       |
|--|-----------------------|
|  Alvin Drew    | Mission Specialist #1 |
|  Nicole Stott  | Mission Specialist #4 |
|  Eric Boe      | Pilot                 |
|  Steve Lindsey | Commander             |
|  Mike Barratt  | Mission Specialist #3 |
|  Tim Kopra *   | Mission Specialist #2 |

\* Tim Kopra was injured and replaced by Steve Bowen



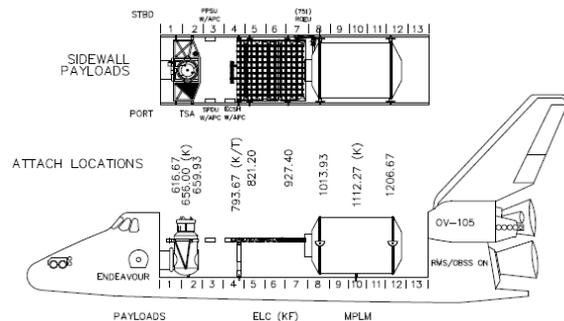
*Orbiter:* OV-103 (*Discovery*)

*Launch Window Opens:*  
February 24, 2011

*Mission Duration:*  
11 days nominal + 1 extension + 2 contingency

*Mission Highlights:*

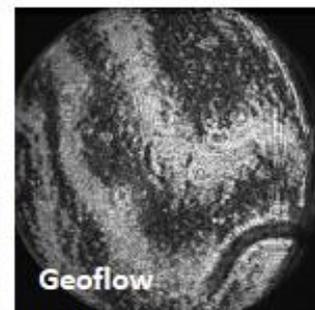
- Last scheduled flight of the Space Shuttle *Discovery* (its 39<sup>th</sup> and 12<sup>th</sup> to the ISS)
- Install the Italian-built Permanent Multipurpose Module (PMM), full of cargo, on the earth-facing port of the Node 1 “Unity” module
  - Derived from the Multipurpose Logistics Module (MPLM) “Leonardo”, the PMM provides much needed pressurized stowage and space to perform science and other activities
  - PMM is the last pressurized element to be added to the U.S. operating segment of the ISS
  - Install the ExPRESS Logistics Carrier (ELC) 4 at the lower inboard attachment site on the starboard truss (ExPRESS = Expedite the Processing of Experiments to the ISS)
  - This is the third of four ELCs to be delivered to the ISS (the last will be on STS-134)
  - ELC4 carries a spare Heat Rejection System Radiator and provides five additional attachment sites for external payloads and spares
- Conduct two EVAs (Extravehicular Activity)
  - Relocate the failed ammonia Pump Module to an external stowage platform and vent
  - Retrieve the Lightweight Adapter Plate Assembly (LWAPA) from the Columbus external payload facility for return in the shuttle payload bay
  - Install camera equipment on the Special Purpose Dexterous Manipulator (SPDM), also known as “Dextre”
  - Install / reconfigure a variety of external equipment
  - Transfer critical hardware, payloads and logistics resupply
  - Perform science payload activities
  - Launch Robonaut 2, a highly dexterous, humanlike robot, inside the PMM



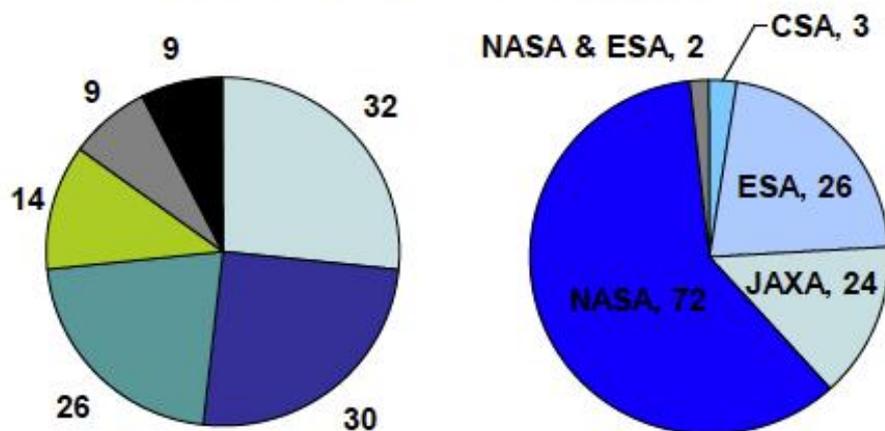
# ISS Research Accomplishments

(data as of 12/10/10)

- Expeditions 25/26
  - 121 U.S.O.S.-integrated investigations
    - 49 new investigations
    - 44 International Partner investigations
    - 25 National Lab investigations
  - > 360 scientists



Number of Investigations, Expeditions 25/26



## Scientific Disciplines

- Human Research
- Physical and Materials Sciences
- Earth and Space Science
- Technology
- Biology and Biotechnology
- Education

# Exploration Systems Update

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- Space Ops Committee was briefed on:
  - Space Launch System (SLS) Reference Design Vehicle
  - Multi-Purpose Crew Vehicle (MPCV)
  - SLS Study Contracts (Broad Agency Announcement)
- Space Ops Committee was represented at the NAC Exploration Committee meeting on January 11, 2011

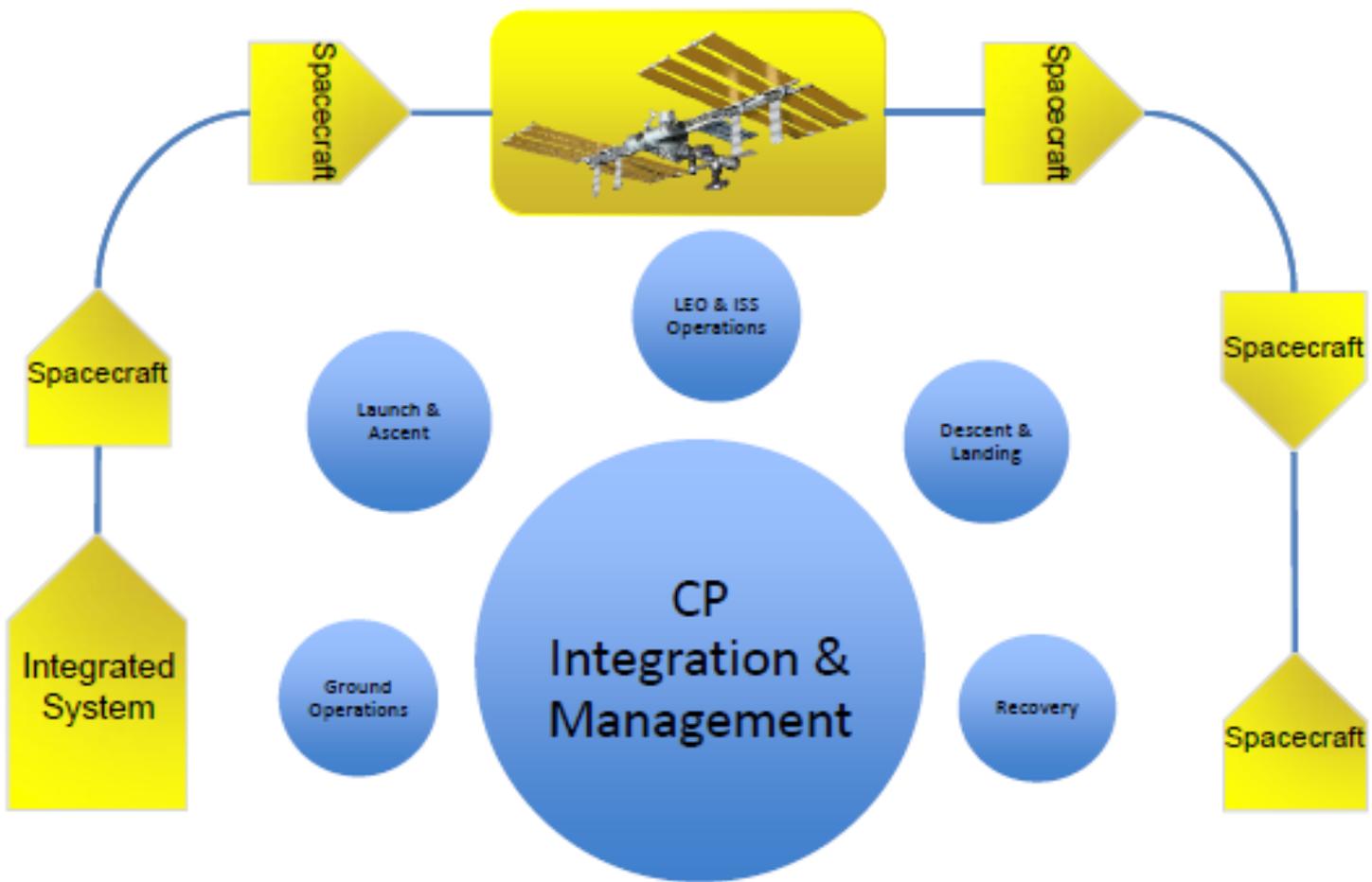
# Commercial Launch

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- Commercial Orbital Transportation (COTS) Status
  - SpaceX and Orbital Status
- Commercial Crew Development (CCDev) Status
  - On February 1, 2010 five CCDev1 partners were announced and received funding:
    - Blue Origin
    - Boeing
    - Paragon
    - Sierra Nevada Corporation
    - United Launch Alliance (ULA)
  - CCDev2 awards are planned to coincide with the FY11 appropriation (estimated for March) which will determine the exact amount available.
- Ops Perspective

# Commercial Spaceflight Initiatives

- Concept of Operations:
  - Commercial Partners provide end-to-end integration, including production, processing, launch operations, mission planning, flight operations, crew training, vehicle and crew recovery, vehicle safing, and disposal.



# NASA's Commercial Crew Requirements Status

- In May 2010, NASA released to industry the first version of our commercial human rating requirements in a document titled, *Commercial Human Rating Plan (CHRP)*.
- NASA received extensive input from industry on the CHRP.
- NASA developed a concept known as “crew transportation system certification”, as opposed to “human rating”.
- On December 9, NASA baselined and released the *Commercial Crew Transportation System Certification Requirements for NASA Low Earth Orbit Missions* document (see right).

National Aeronautics and Space Administration			
CCTS Certification Requirements	Document No: ESMD-CCTSCR-12.10		
	Revision: Basic	Effective Date: December 8, 2010	

**Commercial Crew Transportation System  
Certification Requirements  
for  
NASA Low Earth Orbit Missions**

ESMD-CCTSCR-12.10  
Revision-Basic

  
Douglas R. Cooke  
Associate Administrator  
Exploration Systems Mission  
Directorate

12/9/10  
Date

# Benefits of a Successful Commercial Crew Program

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- After the Shuttle is retired later this year, only Russia and China will have the capability of getting people off the planet.
- As the primary means for the U.S. to launch crew to low-Earth orbit, the Commercial Crew Program will:
  - End the gap in U.S. human access to space
  - Give us assured access to the International Space Station
  - Strengthen America's leadership in space
  - Allow NASA to focus on exploration, enabling us to go further, faster
  - Contribute to the national economy
- Success of this initiative is essential to enable NASA to conduct future deep space exploration

# Recommendation

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- **Short Title of the Proposed Recommendation:**
  - Communicating the Human Spaceflight Vision
- **Short Description of the Proposed Recommendation:**
  - The Space Operations Committee has observed that there is a disconnect between the human spaceflight vision at the top levels of the Agency and the perception that is prevalent throughout the NASA civil servant and contractor workforce. The success of commercial launch to low Earth orbit is imperative to the success of the NASA exploration beyond low Earth orbit, including the capability for multiple destinations, with the ultimate goal being Mars. We recommend that a clear vision of the overall NASA direction of its human spaceflight program be communicated to the workforce and the public, to include the commercial and deep space exploration components. NASA should publish specific goals and objectives, and communication should include an enrollment plan, town hall meetings, the NASA website, social media, and other forums. Follow-up will be required to ensure that the message is received, and that actions are underway commensurate with the vision.
- **Major Reasons for Proposing the Recommendation:**
  - Motivate the workforce behind the vision. A more informed workforce is more productive. Improve NASA's image with the public. Tie in with STEM education and inspiration. Eliminate the perception of competition between LEO and deep space programs.
- **Consequences of No Action on the Proposed Recommendation:**
  - Potential lack of workforce commitment and motivation. A potentially deteriorating NASA image, both internally and externally.

# 2011 Space Operations Committee Work Plan

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## 1. International Space Station Operations:

- a) Transition from assembly phase to research phase of operations
- b) National Laboratory activities, as well as the independent, nonprofit research management organization which is being set up to develop and manage the U.S. portion of the station
- c) Unique operational issues associated with visiting vehicles, robotics, EVA, efficiencies in conducting science, and other issues facing long-duration astronauts
- d) Examine what kind of technologies and operations might be developed and tested on ISS that could be enabling with respect to human exploration beyond LEO

## 2. Space Shuttle Operations:

- a) Transition of shuttle to future launch systems (ground ops, training, in-flight mission operations)
- b) Workforce and infrastructure issues concerning shuttle program termination

# 2011 Space Operations Committee Work Plan

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## **4. Future NASA Human Launch Systems (with Exploration committee):**

- a) Study development and proposals for next heavy-lift human deep-space launch system with emphasis on operational impacts to ground and flight crews

## **5. Commercial Launch Systems (with Commercial Committee):**

- a) Cargo to ISS and LEO
- b) Crew launch (including NASA astronauts) to ISS
- c) Review commercial crew certification requirements

## **6. KSC Spaceport Modernization:**

- a) Workforce
- b) Mission accomplishment

## **7. Human Flight Operations, Present and Future:**

- a) Extravehicular activity
- b) Rendezvous & docking
- c) Displays and controls
- d) Micro-meteorite protection
- e) Radiation protection

# Next Meeting

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- Kennedy Space Center, May 2-3, 2011 (planned)
  - Fact-finding:
    - Operations & Checkout Building: Orion Processing
    - Launch Complex 40 (SpaceX): Electronic Processing System
    - Heavy Lift Development Ground Facilities
    - Space Station Processing Facility Capabilities
    - Shuttle Landing Facility: Horizontal Launch Capability
  - Briefings:
    - FY2011 Budget
    - 21<sup>st</sup> Century Launch Complex Planning
    - SpaceX Demo 2 and 3 Flight Status Update
    - Orbiter Processing Facility Commercial Development
    - ISS Plan for Mars Mission Simulation
    - FACA Training

# Summary of Activities

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- Space Shuttle
- International Space Station and ISS Non-Profit Organization
- Heavy Lift/Space Launch System
- Commercial Crew Development (CCDev) – Ops Perspective
- Recommendation
- 2011 Work Plan
- Future Activities