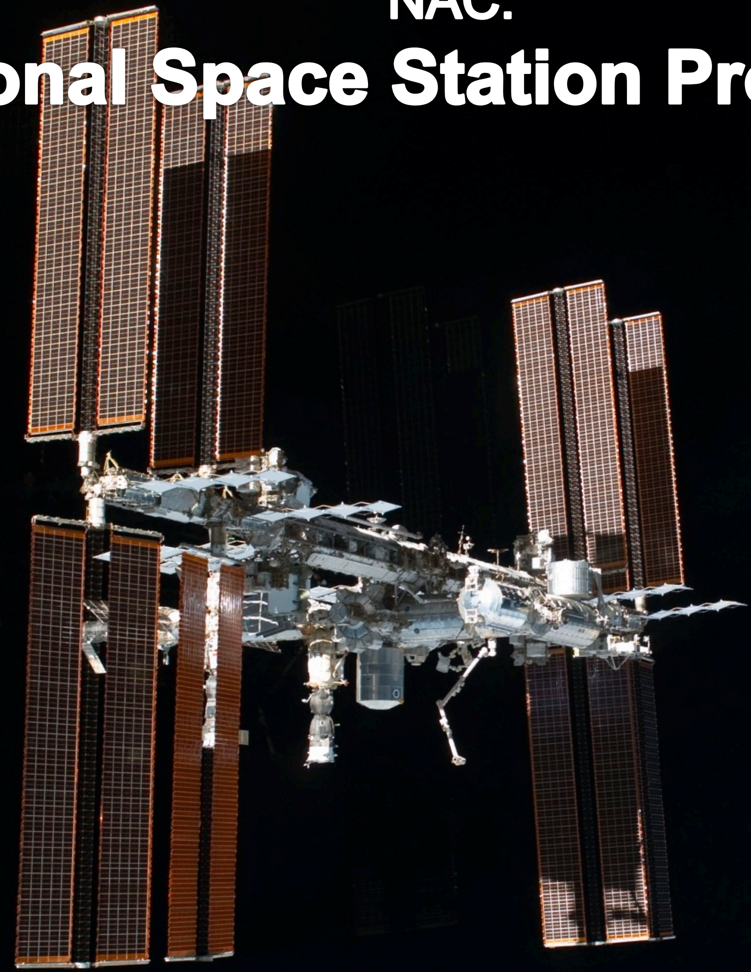
NAC:

International Space Station Program Status



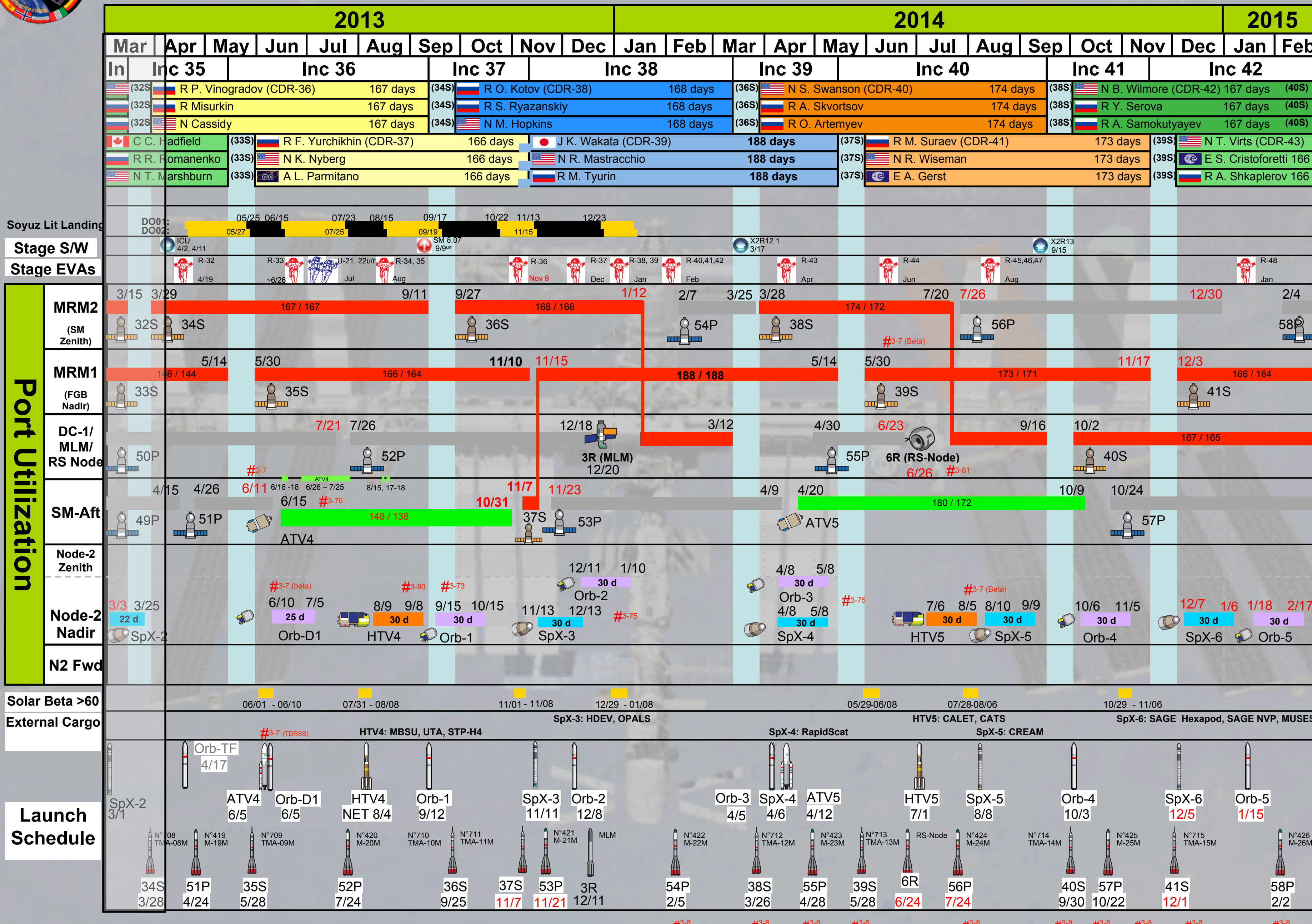
April 2013

Kirk Shireman
Deputy Manager, ISS Program

ISS Flight Plan

For current baseline refer to SSP 54100 Multi-Increment Planning Document (MIPD)

NASA: OC4/John Coggeshall
MAPI: OP/Scott Paul
Chart Updated: April 3rd, 2013
SSCN/CR: 13681A + Tact. Mods (In-Work)



4-Orbit Rendezvous

- **On March 28, the 34 Soyuz vehicle with the Expedition 35 Crew launched from Baikonur. Approximately 6 hours later the Crew docked to the ISS. This was the first crewed 4-orbit rendezvous to the ISS.**
- **From the USOS perspective, docking timeline is essentially identical for either rendezvous**
  - System configurations (powerdowns, array positioning, attitude control handover) occur at same time relative to docking and are identical to any other Soyuz
  - No changes to joint Flight Rules or USOS procedures for the 4-orbit rendezvous
- **U.S. and Russian flight control and engineering teams have performed standard analysis for both 4-orbit and 34-orbit dockings**
- **Soyuz generically retains enough propellant margin to support a re-rendezvous after an abort from any point in the trajectory**

4-Orbit Rendezvous

- **On February 21, 2013 the ISS Program conducting it Stage Operational Readiness Review and on March 6, NASA conducted the Flight Readiness Review**
  - Included detailed review of all aspects of 4 orbit Rendezvous
    - Vehicle configurations / timelines for 4 and 34 orbit
    - Crew fatigue and health management
      - US and RS doctors approved a sleep shifting profile to align with launch / docking activities.
      - Crew activities post ingress were limited to the Safety briefing.
    - Space Adaptation Syndrome – discussed with combined US / Russian medical team.
      - Mitigated with experience crew members, preflight testing of medications, and the availability of these medications to the crew on day of launch.
    - Confined space / spacesuit issues
      - crew was allowed to ingress the Orbital Compartment for hygiene and food / water access.
      - MAGs were approved and available to all crew members
      - Crew able to loosen straps on-orbit to allow stretching and mitigate join pain.
      -
- **The ISSP and then the FRR Board approved the 4 – orbit for 34S only.**
  - Plan is to conduct post flight lessons learned from vehicle, ops, crew, and medical teams to understand fully the risks and to determine if 4-orbit rendezvous should be approved in the future.

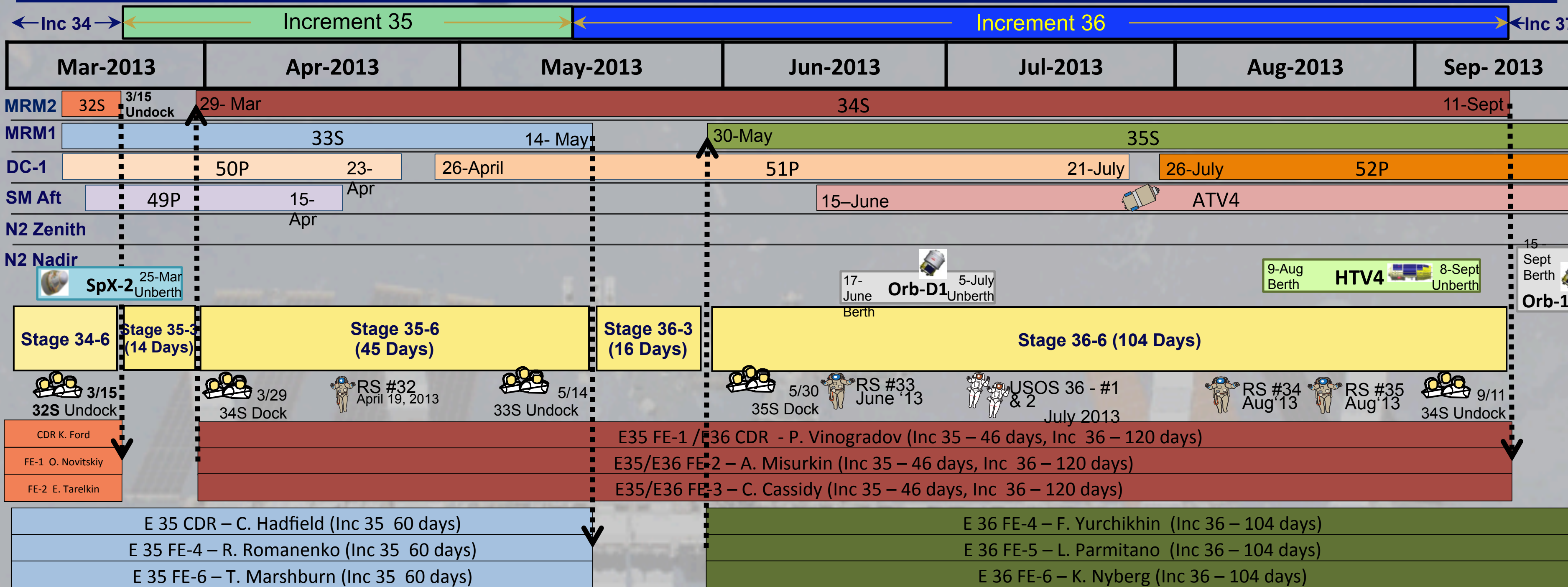
Expedition 35/36 Overview

Expedition 36
Pavel Vinogradov (CDR)
Alexander Misurkin
Chris Cassidy
(34S-Soyuz TMA-08M)

Expedition 35
Chris Hadfield (CDR)
Roman Romanenko
Tom Marshburn
(33S-Soyuz TMA-07M)

INCREMENTS 35_36

FPIP SSCNs 13706/13681A IDRD Rev A CR13583



	Stage 35-3	Stage 35-6	Stage 36-3	Stage 36-6
Utilization Inc Ave 35 hrs / wk	• More than 75 investigations during Stage 35-3 and 35-6 • **New Investigations:** BP Reg, Cartilage, FASES, ICE-GA, and UVP-2R		• More than 75 investigations during Stages 36-3 and 36-6 • **New Investigations:** Microbiome, ICE-GA, Diapason, STP-H4, RINGS, Ocular Health, Skin-B, Space PUP, and Asian Seed.	
EVA, Resupply & Outfitting		• RS EVA #32: Obstanovka exp. Setup, ATV reflector R&R • R&O: Install ICU, iPEHG, High Definition Cameras		• RS EVA #33: R&R FGB thermal regulator panel, photo external surfaces of the RS MLI, remove the Foton-Gamma from Molniya-Gamma experiment • USOS EVA #36-1: MLM Pwr cable, SGTRC-2 R&R, Grapple Bar, MISSE8 & ORMatE retrieval, Z1 Jumper (1 of 2) • USOS EVA #36-2: RGB V-Guides, MLM Ethernet cable, Z1 Jumper, R&R JEF Fwd Cam, FGB PDGF 1553 • RS EVA #34: Route power from FGB to MRM2, route Ethernet cable for MRM2 • RS EVA #35: Set up the portable workstation, the two-axial targeting platform, and the medium resolution camera (MRC) on the Plane IV portable workstation • R&O: Install HTV4 H/W: JEM LAN, JEM Environmental Monitor Equip, Utility Bonding Point, Cooler Box

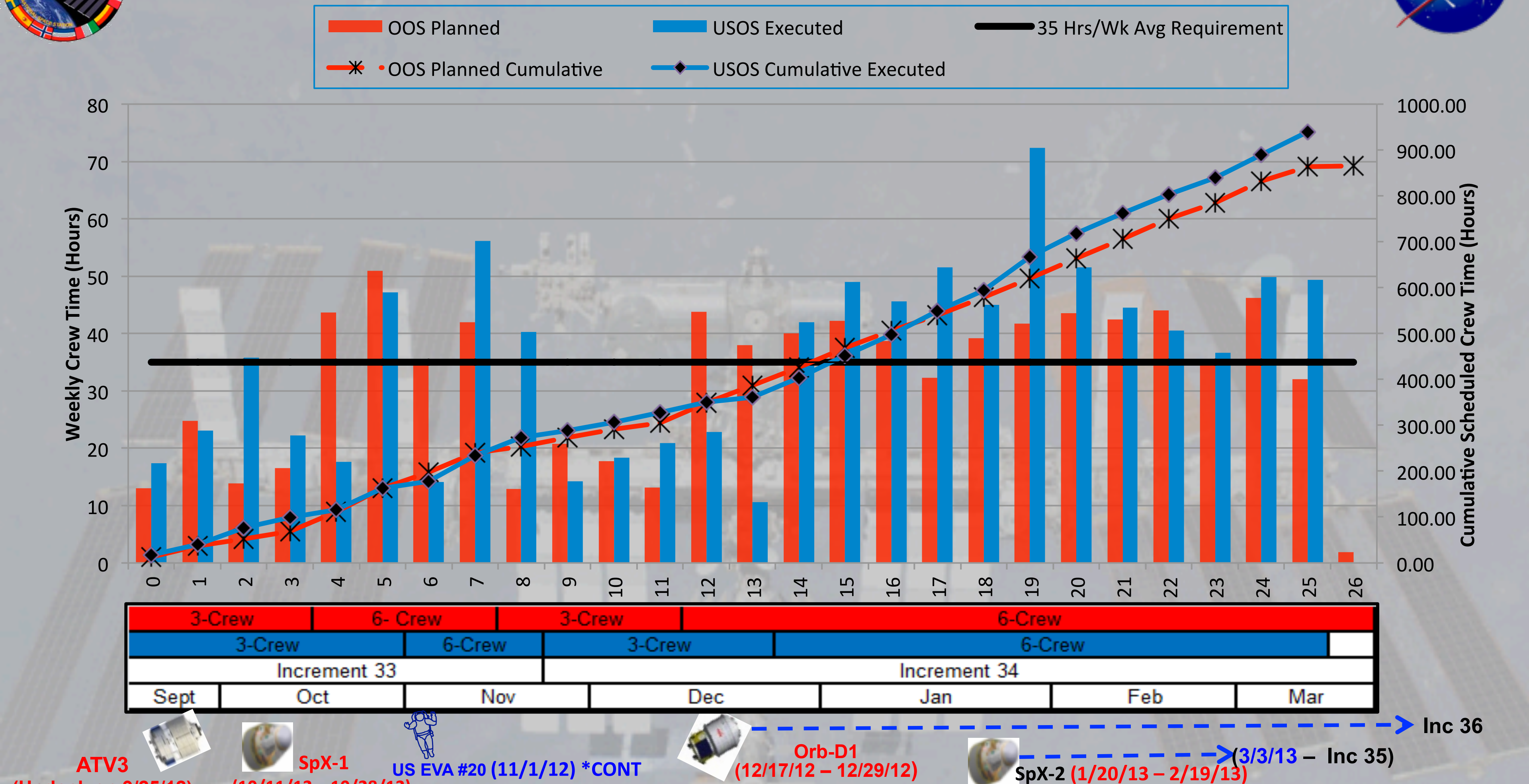
ISS Expedition 35 Mission Objectives
March 2013 – May 2013

- **Perform an average of 35 hrs/week for payload investigations**
  - FASES *Investigates the emulsion stability in relation to the physical-chemistry of droplet interfaces to obtain a modeling of emulsion dynamics to be transferred to industrial applications on Earth.*
  - BP Reg *Will test the efficacy of an in-flight manipulation of arterial blood pressure (BP) as an indicator of post-flight response to a brief stand test.*
  - Microbiome *This study will carry out a thorough evaluation of how long-term space travel impacts the human microbiome and ultimately human health, and it will form the basis for further studies towards the design of therapies to mitigate any microbiome changes or related health issues found as a result of this project.*
  - Ocular Health *Collect evidence to characterize the risk and define the visual changes and central nervous system (CNS) changes observed during a six month exposure to microgravity including postflight time course for recovery to baseline.*
  - Tritel *Characterizes the radiation environment within the Columbus module of the ISS with high accuracy. It uses a combination of three different detector types measuring the radiation amount, direction and history to determine absorbed dose and dose equivalent from solar and galactic radiation.*

- **Support visiting vehicle traffic including:**
  - SpaceX-2 unberthing, planned March 25th
  - 34 Soyuz docking, planned March 30th, first Soyuz to perform a 4-orbit rendezvous profile.
  - 49 Progress undocking, planned April 15th
  - RS EVA #32, planned April 19th
  - 50 Progress undocking, planned April 23rd
  - 51 Progress docking, planned April 26th
  - ATV-4 docking, planned May 1st
- **Installation of Ku Comm Unit**
  - Will increase hi rate Ku downlink from 150 Mbps to 300 Mbps, adds S/G3 and S/G4 (audio), adds two more channels of downlink video, reduces video bandwidth consumption (using new encoder algorithm), provides increased solid state recording of payload and video data.

Space-X Dragon capsule approaching and berthed to the ISS

Increment 33_34 Utilization Crew Time

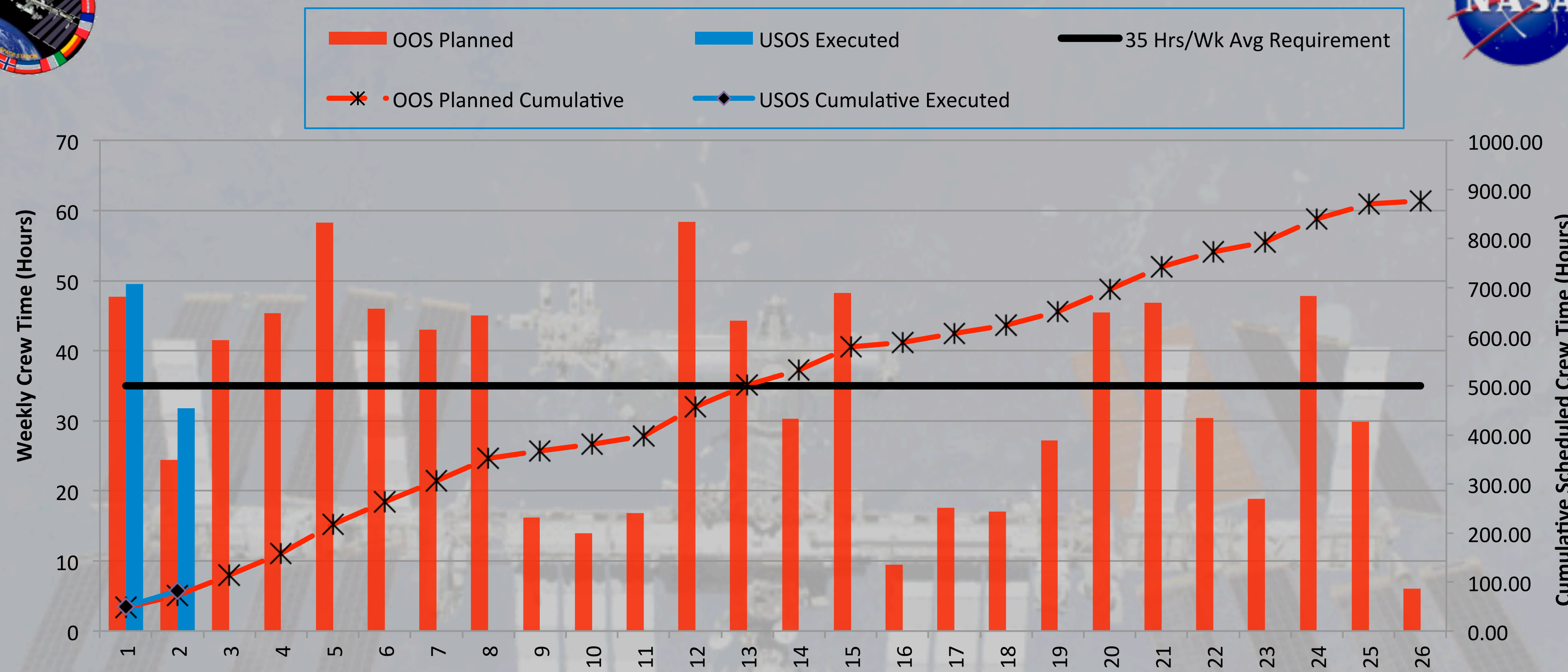


OC/OZ reconciliation is complete through Week 25 with the exception of ESA time.

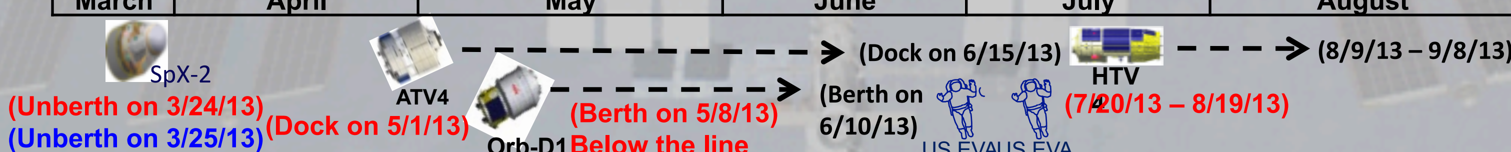
Date Color Key:
Completed
33-34 Final OOS
FPIP Plan

Executed through Increment Wk (WLP week) 25 =	25.0	of	24.8	work weeks
			100.81	% through the Increment
USOS IDRD & OOS Allocation:	868.0	hours		
Additional USOS Allocation for Stage 34-6:	928.0	hours	(Additional 60 hours)	
USOS Actuals:	938.73	hours		
	101.2	% through updated Stage 34-6 Allocation		
	108.1	% through IDRD and OOS Allocation		
Total USOS Average Per Work Week:	37.55	hours/work week		
Voluntary Science Totals to Date:	5.08	hours (Not included in the above totals or graph)		

Increment 35_36 Utilization Crew Time



3-Crew	6- Crew		3-Crew	6-Crew			
Increment 35			Increment 36				
March	April	May		June	July	August	Sept



Date Color Key:
Completed
35-36 Final OOS
FPIP Plan

OC/OZ reconciliation completed as of Week 2.

Executed through Increment Wk (WLP week) 2 =	2.0	of 24.4	work weeks
		8.20	% through the Increment
USOS IDRD Allocation:	875	hours	
OOS USOS Planned Total:	876.5	hours	
USOS Actuals:	81.41	hours	
	9.3	% through IDRD Allocation	
	9.3	% through OOS Planned Total	
Total USOS Average Per Work Week:	40.71	hours/work week	
Voluntary Science Totals to Date:	0.00	hours (Not included in the above totals or graph)	

ISS Research Statistics

as of Feb 28, 2013

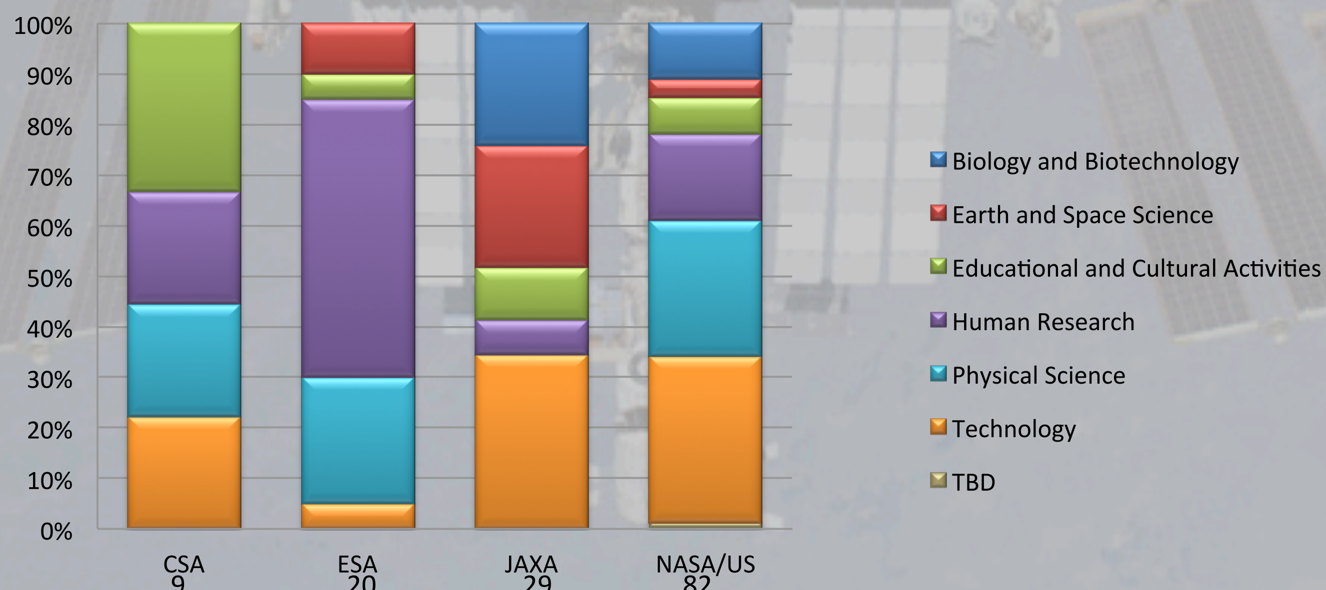
Number of USOS Investigations for 35/36 : 140

- 82 NASA/U.S.-led investigations
- 58 International-led investigations
- 30 new USOS investigations
  - 1 CSA
  - 4 ESA
  - 7 JAXA
  - 18 NASA/U.S.

Roscosmos data still in work

- Over 400 Investigators represented
- Over 500 scientific results publications (Exp 0 – present)

ISS Research Disciplines by Partner Agency
Increments 35/36



Number of Investigations Expedition 0-32: 1549*

**USOS + Roscosmos*

Total ISS Consumables Status: Total On-orbit Capability
28-March-13 51P SORR, 51P (Dock 26-Apr-13)

	T1: Current Capability with no resupply		T2: Current Capability with 51P	
Consumable – based on current, ISS system status	**Date to Reserve Level**	**Date to zero supplies**	**Date to Reserve Level**	**Date to zero supplies**
Food – 100% (1) (2)	September 28, 2013	November 13, 2013	October 18, 2013	December 10, 2013
KTO	June 11, 2014	July 26,2014	August 1, 2014	September 15, 2014
Filter Inserts	October 9, 2014	December 2, 2014 (2)	December 1, 2014	January 15, 2015
Toilet (ACY) Inserts (2)	April 15, 2014	June 6, 2014	May 11, 2014	July 1, 2014
EDV (UPA Operable) (2) (3) (4)	August 21, 2013	November 9, 2013	November 29, 2013	February 7, 2014
Consumable - based on system failure				
EDV (UPA Failed) (3)	July 16, 2013	August 30, 2013	September 10, 2013	October 31, 2013 **(2)**
Water, if no WPA (Ag & Iodinated) (2) (5)	August 24, 2013	October 16, 2013	October 12, 2013	December 4, 2013
O_2 if Elektron supporting 3 crew & no OGA (2) (6)	July 5, 2013	December 2, 2013	July 18, 2013	December 15, 2013
O_2 if neither Elektron or OGA (2) (6)	May 1, 2013	July 6, 2013	May 7, 2013	July 13, 2013
LiOH (7) (CDRAs and Vozdukh off)	~4 Days	~18 Days	~4 Days	~18 Days

(1) Includes food on Soyuz; after RS goes to zero, both sides share USOS food. **(2)** Reserve level to Zero is different than 45 days due to varying crew size. **(3)** Progress tanks included in assessment for urine dumping only. **(4)** A-RFTA operations as of 8/6/12. Assumes 74% recovery rate and no RS urine processing. **(5)** RS processes all condensate in event of WPA failure. **(6)** Includes metabolic O2 for 45 day/6-crew reserve and the O2 for greater of CHeCs or 4 contingency EVAs. **(7)** LiOH Canisters will be used for CO2 removal from the ISS if the CDRAs are inoperable. Total LiOH Reserve Level is 14 days for 6 crew. (Reserve Level for USOS LiOH is ~13.3 days for 3 crew (20 canisters), and for RS LiOH is 15 days for 3 crew (15 canisters).)

USOS System Challenges

- **Photovoltaic Thermal Control System (PVTCS) 2B Ammonia Leak - Monitoring**
  - In 2007 it was confirmed that the Channel 2B PVTCS exhibited a relatively constant leak rate of ~1.5 lbm/year that later accelerated to between 5.8 and 9.5 lbm/year by late 2012. USOS EVA 20 was performed on 11/1/12 to isolate the 2B Photovoltaic Radiator (PVR) and provide cooling via the Early External Active Thermal Control System (EEATCS) PVR via jumpers. Trending has confirmed that the isolated 2B PVR is not leaking. The new combined (hybrid) system is operating nominally. However, initial behavior suggests that the hybrid system is leaking and characterization of the rate is underway. Data to date indicates a rate in the range of ~5 lbm/yr, but many months are required to develop a reliable trend.

- **Sequential Shunt Unit (SSU) 1A Power on Reset (POR) - Monitoring**
  - On 1/10/13, SSU 1A started experiencing PORs during insolation passes, with this series of PORs ending on 1/13/13. Previously SSU 1A had experienced 3 other PORs. The impact from these PORs has been minimal. When the SSU performs a POR, the primary power channel momentarily goes to battery power (approx 1.5 seconds). Data gathering activities were developed that could assist the team in characterizing the issue if the PORs start re-occurring. The SSU will be operated as is while specialist continue their investigation through a similar solar beta period in March. Should the SSU have a hard failure, the Flight Control Team will perform the Seamless Power Channel Handover procedure to continue providing power to the loads on this channel.

- **Ku-Band Antenna Group 2 (AG2) Forward Link Anomaly – Troubleshooting**
  - On GMT 351, the Ku-band Group 2 failed to acquire TDRS. The Ku-band was configured to open loop pointing, with success in acquiring the return link, but not the forward link. Ku-band swapped to Antenna Group 1, acquiring TDRS nominally. Antenna Group 2 is currently powered off, with heaters enabled. Root cause identified a suspect failure in the Space to Ground Transmitter Receiver Controller (SGTRC). A spare SGTRC is available on-board. Removal and replacement is planned for US EVA #21 in June ‘13.

USOS System Challenges

- **Loss of Columbus Water Pump Assembly (WPA2) - Monitoring**
  - On 1/13, ESA was not successful in switching the active Internal Thermal Control System pump from WPA1 to WPA2. The switch over is a nominal activity in support of WOOV cycling conducted on a 3-month interval. Attempts to start WPA2 were unsuccessful, so the Columbus module is operating on WPA1 with no redundancy. Engineering evaluation of the fault is in-work, but the cause of the anomaly is not understood yet. A coolant top-off was performed on 2/14/13 to accommodate coolant sampling as well as margin for nominal leakage. There is no spare WPA on-board. A spare is scheduled to launch on ATV4.

- **Increased N3 Common Cabin Air Assemblies (CCAA) Indications - Workaround**
  - Water carryover events due to degraded heat exchanger (HX) in N3 CCAA. No spare CCAA HXs on orbit; one targeted for manifesting on HTV5.
  - FR Waiver in work to increase time prior to Carbon Dioxide Removal Assembly (CDRA) command to standby in the event of a continuous wet indication

USOS System Challenges

- **MERLIN2 Shutdown Due to False Fire Alert - Troubleshooting**
  - Event believed to be a result of a radiation hit on this system (Station at high latitude). MERLIN 2 used for galley food storage and has remained unpowered. Procedure in work to check the current system status after power up.

- **Space Acceleration Measurement System II Remote Triaxial Sensor/Drawer 2 (SAMS-RTS/D2) Loss of Health and Status – Troubleshooting**
  - On 2/11, SAMS-RTS/D2 lost health and status. Log files show no communication between SAMS and ICU. Troubleshooting isolated issue to either ER4 PEHB or JAXA LEHX. MART identified additional troubleshooting steps to be performed on 3/26 to isolate to one of these two systems.

- **MBSU 2 RBI 5 Trip (feeds Russian Segment Service Module [CHT] 21 & 22) – Troubleshooting**
  - Noise from the [CHT]s is believed to have caused MBSU2 RBI5 to trip off on GMT 206. Team developing procedures to use on-orbit oscilloscope to test the input side of the [CHT]s in the April/May timeframe.

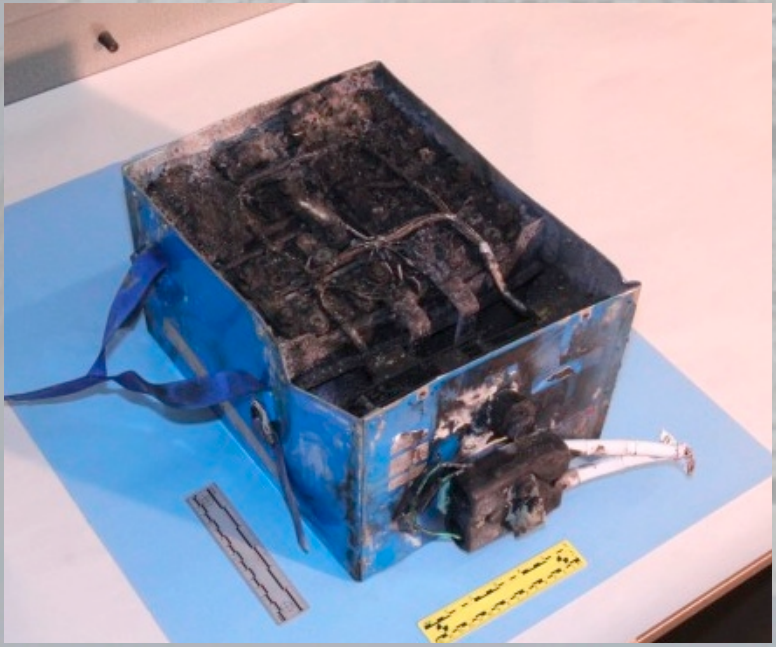
USOS System Challenges

- **Dragon Draco Thruster Check Valve**
  - During the SpX-2 mission, 3 of 4 propulsion manifolds were not properly pressurized following second stage separation. The issue was overcome real-time and SpaceX has identified root cause due to failure of in-line check valves. SpaceX is working design modification for follow-on missions
  - During approach and release/departure, 3 of 4 quads are required to complete operations. An abort to protect ISS requires 2 of 4 thruster quads to be operational. Analysis has shown that Dragon will safely drift away from ISS in the event that all four quads failed
  - Although check valves operated nominally upon entry into ISS ellipsoid, sufficient blowdown was available should an abort be required
  - Check valve operated nominally for departure and re-entry

- **HTV3 Abort**
  - The HTV3 abort was caused by an interaction between the grapple fixture cam arms on the vehicle and the initial motion of the SSRMS during back away due to the relative positions of the HTV and the ISS. This interaction created rates on the HTV vehicle that, when checked on board the HTV, indicated the HTV would leave its designed departure corridor and thus it initiated an abort per joint safety requirements.
  - No damage was done to the ISS. NASA has assessed a number of options to eliminate this interaction to mitigate risk of an abort on future vehicles and is implementing a modified SSRMS release approach to incorporate a delay in the start of initial SSRMS back away. Implementation is on schedule and includes refining visual cues for the crew to monitor the release as well as potentially adjusting SSRMS configuration parameters to provide a smooth separation between the SSRMS and the vehicle.
  - NASA has assessed other free flyer vehicles (Dragon and Cygnus) and has implemented a corresponding approach to mitigate the concern.

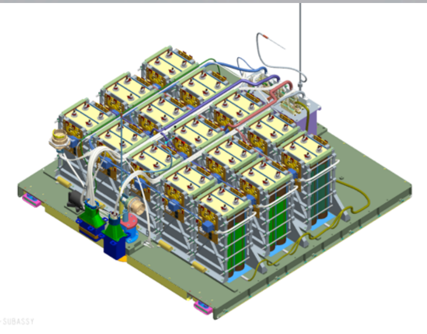
Comparing Boeing 787 Li-Ion Battery to ISS Li-Ion

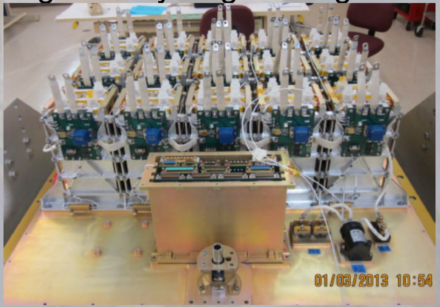
- **January 7, Boston – post-landing, battery fire, see photos below**
- **January 16, Japan – emergency landing, pilots reported smoke odor, error battery messages**
    - No fire, electrolyte leakage, battery case swollen
- **January 17, all 787s grounded pending investigation**
    - Boeing (Satellite Systems), GS Yuasa, NTSB, FAA
    - Boeing (Houston) in communication with team and with NASA to understand the incidents
- **787 battery is manufactured by Thales, using 8 GS Yuasa 65 Ah Li-ion cells**
- **ISS battery is manufactured by PWR, using 30 GS Yuasa 134 Ah Li-ion cells**



ISS Li-Ion Truss Batteries

- **ISS Li-Ion Battery Design**
  - 1 Li-Ion ORU will replace 2 series connected Ni-H2 ORUs
  - 10-year design life (58,000 charge/discharge cycles)
  - 134-Amp-hr (Ah) nameplate capacity, 15 kW-hours power
  - Multiple layers of redundant controls and safeguards
    - Hardware and software / inside and outside the battery ORU
    - Photovoltaic Control Application (PVCA)
    - Battery Charge Discharge Unit (BCDU)
    - Battery Interface Unit (BIU)
- **Cell Selection Process**
  - 2010 Risk Mitigation Study
    - Evaluate candidate cells to meet ISS mission requirements
    - Assessed for uniformity, design features, and manufacturing quality
    - 7 Li-Ion cell designs were tested
    - 2 remained viable candidates
  - 2012 Cell selection Consideration
    - Supplier performance (lead time, current production, established baseline)
    - Management (preparation, participation, timeliness & accuracy)
    - Technical (ability to maintain baseline material, meet specified requirements)
    - Cost (total cost of product)
    - GS Yuasa Lithium Power of Rosewell GA selected to provide cells
      - Each individual cell must pass rigorous acceptance testing before if can be used in an ISS battery


ORU Design



High fidelity Engineering Model

LSE 134 Cell

USOS System Enhancements

- **Carbon Dioxide Removal Assembly (CDRA) "-4" Desiccant/Adsorbent Beds-Monitoring**
  - Two new CDRA beds will be launched on SpX-2
  - New features include a redesigned heater core with significantly thicker Kapton insulation to reduce risk of short, and completely re-engineered attachment points to the wiring harness to reduce strain at the wiring interface
  - New beds have been manufactured under clean-room conditions to reduce chance for built-in FOD
  - Sheets for the heater core have been re-engineered to reduce sharp edges and weld points which were potential FOD sources from welding slag
  - Beds incorporate new temperature sensors which have been changed from a thin-film sandwich type to a completely new helical wire-wound construction, significantly improving sensor survivability under repeated thermal cycles (similar to commercial applications in aircraft brakes)
  - Shape of the desiccant and absorbent materials were changed to allow for more efficient packing on the ground and to potentially reduce dusting due to material abrasion when exposed to long term thermal/vacuum cycles on-orbit
  - Housing of the bed was updated to accommodate the addition of captive fasteners and other features to allow the crew to partially disassemble the adsorbent bed on-orbit to remove the dust that accumulates from operation of the CDRA without having to return the beds to the ground for refurbishment

USOS System Enhancements

- **Continue replacement of legacy ISS avionics with Obsolescence Driven Avionics Replacement (ODAR) components**
  - Integrated Communications Unit (ICU) ready for activation in early April - doubling the downlink data rate (300 Mbps) and an eight-fold increase in the uplink data rate (25 Mbps)
  - improved Payload Ethernet Hub Gateway (iPEHG) ready for activation in late May – tenfold increase in medium rate onboard data communications (100 Mbps)
  - 2 flight ICUs and 4 iPEHGs are on-orbit; 3rd flight ICU planned for launch on ATV4
  - Installation is planned for April 2013

USOS System Enhancements

- **The ELC Wireless system provides a COTS solution for external high data rate 802.11n wireless capability to payloads on the Express Logistic Carrier (ELC)**
- **The system consists of two separate segments**
  - US Lab
    - COTS Wireless Access Points (WAP) placed inside the lab with external antennas to provide the core wireless capability
  - Payloads/Users
    - Characterization of a wireless solution for the payloads/users to integrate and provide piece parts to the developers
- **External Wireless users can connect using two methods:**
  - Use an IEEE 802.11n Network Interface Card in their device
    - The NIC can be integrated directly into the Payload. (e.g. a PCI card)
    - NASA can provide a USB NIC to a user that can be integrated into the Payload.
  - Provide an IEEE 802.3 wired Ethernet interface and connect to Wireless Media Converter
    - NASA is investigating providing a hardware (circuit card with wired Ethernet port and antenna out port) solution that will allow a Payload to use a standard wired Ethernet port and this hardware perform the wired to wireless conversion
    - This hardware will be “smart” and require some configuration by the Payload in order to access the network
    - Radiation testing on candidate hardware is being performed January 16 – 18

USOS System Enhancements

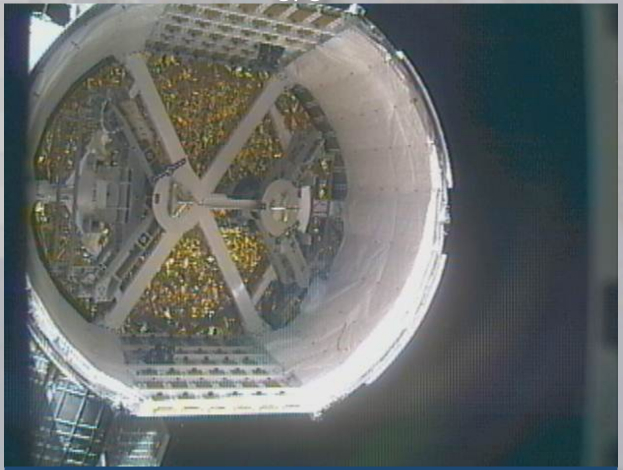
- In an effort to increase the utilization of Commercial off the Shelf (COTS) hardware with limited or no modifications to support on-orbit operations, the ISS Program worked with commercial industry to develop a power inverter which converts the DC power generated from the ISS solar arrays to AC power just as you would find in your home.
- The provision of AC power allows ISS systems and payload developers to simplify and reduce the schedule and cost for the development, integration and delivery hardware into the ISS.
- The ISS power inverter (pictured below) comes in two models: 120Vdc-to120Vac and 28Vdc-to-120Vac respectively to support the primary power input voltages provided throughout the ISS (USOS and Russian Segments) and payload power interfaces.
- The 120Vdc-to120Vac power inverter provides power AC power provides: four (4) standard three prong AC power outlets and is capable of providing a total of 750W @ 60hz.
- The 28Vdc-to120Vac power inverter provides power AC power provides: four (4) standard three prong AC power outlets and is capable of providing a total of 400W @ 60hz.

International Space Station
SpaceX-2

SpX-2

- **Cargo**
  - 577 kg of pressurized launch cargo included the following:
    - 95 kg of crew supplies and computer and EVA hardware
    - 347 kg of utilization hardware including 2 GLACIERs and 5 double cold bags
    - 135 kg of vehicle hardware including 2 Carbon Dioxide Removal Assembly (CDRA) desiccant absorbent beds
  - 221 kg of unpressurized external cargo (first SpaceX flight with external cargo to ISS) included the following:
    - Two (2) Heat Rejection Subsystem Grapple Fixtures (HRSGF) (Grapple Bars)
  - 1235 kg of pressurized return cargo plan included the following:
    - 197 kg of crew supplies and computer and EVA hardware
    - 576 kg of utilization hardware including 1 GLACIER and 5 double cold bags
    - 462 kg of vehicle hardware
- **Status**
  - Successfully launched on 3/1 and berthed to ISS on 3/3
  - Grapple bars were successfully extracted on 3/6
  - Dragon unberthing/re-entry occurred on 3/26 with early destow cargo arrival at Long Beach on 3/27 and nominal return cargo arrival at McGregor scheduled for 4/2
  - Post-flight briefing to NASA occurred on 4/16

Dragon 4 (SpX-2) berthed to ISS on 3/3



Grapple bars in Dragon trunk ready for extraction

Photo Credits: NASA

Orbital Status

- **7K Hot Fire Test successfully completed on 2/22**
  - Post-test flame trench inspection yielded positive results; no rework prior to Test Flight
  - On-pad inspections and cleaning of Engines 2 & 3 completed
  - Pad modifications on track for addition of a helium heat exchanger
    - Will improve the Liquid Nitrogen (LN2) subcooler's ability to chill down helium entering the vehicle to meet launch vehicle requirements
- **Test Flight status**
  - Payload simulator mated on 2/20
  - Launch planned for NET 4/20
- **Demo Launch status**
  - Pressurized Cargo Module (PCM) Initial Cargo Load occurred on 3/22
  - PCM-to-SM mate occurred on 4/1 – 4/2
  - Final Flight Software regression testing conducted on 3/19 and Joint Test 4 Software Stage Verification conducted on 4/2 – 4/5
  - Joint Multi-Segment Training (JMST) #10 (long rendezvous) simulation was successfully conducted on 3/21
  - NASA's Vehicle Assessment Review (VAR) is planned on 5/2
  - Cargo upmass allocation is 704 kg
    - Ascent manifest consists of crew provisions, food, laptops, and other non-critical hardware (no utilization)

Successful 7K Hot Fire Test

Test Flight Fairing and Payload Simulator

Photo Credits: OSC

International Space Station
ATV4

ATV4: ***Albert Einstein***

- **Launch**
  - The launch date for ATV4 was moved out due to a connector inside of the pressurized module requiring a repair as well as a Digital Signal Processing Unit (DSPU) being removed and replaced
- **Cargo**
  - Nominal cargo load is complete
  - Late load is planned at L-3 weeks
  - Manifest (in kg): ~2200 prop for ISS use, 860 prop for transfer, 100 (air and O2), 570 water, and ~2700 packed dry cargo
- **Status**
  - ATV target on Service Module has contamination which has caused pitch/yaw noise on all ATVs. Noise has been worsening on each flight. ESA management has decided to have RSCE swap out target during 4/19 Russian EVA
  - ATV2 and ATV3 cabin fan failure investigations largely complete with no clear identification of root cause. Spare fan on board ISS will be installed if ATV4 fan should fail. Most ATV operations may continue without operational ATV cabin fan (covered by a Flight Rule)
  - Stage Operations Readiness Review is planned for 5/13

Pressurized module for *Albert Einstein* (ATV4) on production line

Photo Credits: ESA

International Space Station
HTV4

HTV4

- **Cargo –** (Manifest Requests (MRs) pending)
  - ~3144 kg currently manifested for ISS
    - 2257 kg of pressurized cargo, including crew supplies and computer resources (582 kg), water bags and flight support equipment (571 kg), vehicle hardware (676 kg), utilization hardware (357 kg), EVA supplies (71 kg), and
    - 887 kg of unpressurized cargo
  - External cargo includes:
    - Space Test Program – Houston 4 (STP-H4)
    - Main Bus Switching Unit (MBSU)
    - Utility Transfer Assembly (UTA)
    - For disposal: STP-H3
- **Status**
  - Launch date moved due to a potential Earth Sensor Assembly(ESA) issue found during acceptance test on an HTV7 unit.
  - STP-H4, UTA, and MBSU have been integrated onto the Exposed Pallet. For MBSU/UTA IAs, this was the first time JAXA performed all physical integration at TNSC without NASA touch labor (observers only); STP-H4 personnel performed offline testing and checkouts prior to turnover to JAXA;
  - Processing of water and filling of the Contingency Water Containers – Iodine (CWCI) began in early March; leak subsequently discovered on one bag and replacement bags have been shipped. NASA is flying 24 CWCIs

HTV launch from Tanegashima Space Center

HTV on approach to ISS

Photo Credits: JAXA/NASA

ISS Top Program Risk Matrix
Post April 10, 2013 PRAB

Risks (L x C) *continued*

Score: 2 x 4
▲ 6368 - Development of ISS On-Orbit Nitrogen and Oxygen Recharge Capability - (OG) - (C,S,T,Sa)

Score: 3 x 2
▲ 6393 - Channel 2B PVTCS Ammonia Leak Increasing - (OB) - (C,S,T,Sa)

Score: 2 x 2
▲ 6347 - Temporary Urine and Brine Stowage System Catastrophic leak of a Tox-2 Fluid - (OB) - (C,S,T,Sa)
▲ 6032 - On-Orbit Stowage Short-Fall (Pressurized Volume) - (OC) - (T,Sa)

LIKELIHOOD					
5				2	1
4			2	3	
3		1	3	1	3
2		2		1	
1					
	1	2	3	4	5

CONSEQUENCE

Low	Medium	High

C – Cost	S – Schedule	T – Technical	Sa – Safety

▲ – Top Program Risk (TPR)

Removed: 6198 - ODAR/ICU, 6234 - Institutional Gaps, and 6407 - SpX Engine Anomaly

Corrective/Preventative Actions

None

Watch Items

None

Continual Improvement

None

Risks (L x C)

Score: 5 x 5
▲ 6352 - Overlap in Commercial Crew & Soyuz Launch Services - (OH) - (C,S,T,Sa)

Score: 5 x 4
▲ 6370 - ISS Pension Harmonization - (OH) - (C)
▲ 6344 - ISS Operations Budget Reduction - (OH) - (C)

Score: 4 x 4
▲ 6399 - ISS Budget and Schedule - (OH) - (C,S,T)
▲ 6372 - Full ISS Utilization - (OZ) - (S)
▲ 6169 - Visual Impairment / Intracranial Pressure - (SA) - (C,S,T,Sa)

Score: 3 x 5
▲ 6420 - NDS and IDA Qualification Schedule - (OG) - (C,S,T,Sa)
▲ 5688 - ISS Solar Array Management Operations Controls and Constraints - (OM) - (C,S,T,Sa)
▲ 2810 - Russian Segment (RS) capability to provide adequate MM/OD protection - (OM) - (C,S,T,Sa)

Score: 3 x 4
▲ 6408 - FGB Sustaining Contract and FGB spares plan post 2016 undefined - (OB) - (C,S,T,Sa)

Score: 4 x 3
▲ 6413 - ELC ExPCA Low Voltage Power Supply (LVPS) Board Design Flaw - (OB) - (C,S,T,Sa)
▲ 5269 - The Big 13 Contingency EVA's - (OB) - (S,T,Sa)

Score: 3 x 3
▲ 6402 - SpaceX Dragon splash down - water intrusion / power outage - (ON) - (S,T)
▲ 6277 - Loss of utilization flexibility based on CRS capabilities - (OZ) - (C,T)
▲ 5184 - USOS Cargo Resupply Services (CRS) Upmass Shortfall - 2010 through 2016 - (ON) - (C,S,T,Sa)

ISS Program Focus

Tactical

- Maintain/increase crew time & resources for utilization
- Continue preparations for 1 year Increment
- FY13 budget posture
- Execute SpaceX-3 mission & complete Orbital test and demonstration missions
- ATV 4 launch
- HTV 4 launch
- Better utilize on-orbit stowage to improve crew time efficiency
- Commercial Crew Integration

Strategic

- Maximum utilization of ISS as a National Lab
- Technology development and demonstration
- Test bed for Exploration and extension of ISS capabilities for use in deep space
- Crew transportation plan
- Technical analysis & planning of ISS life exten**sion**
- Budget formulation to address challenges over the budget horizon