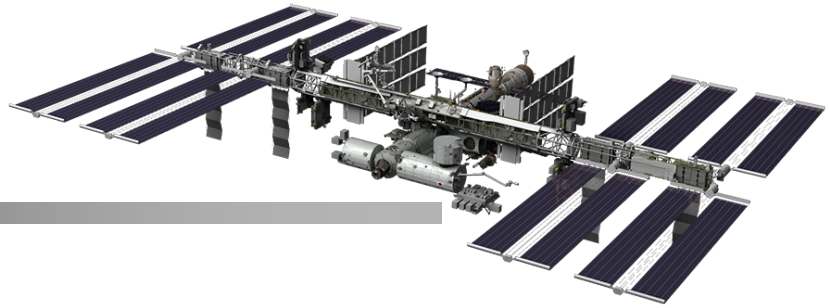
INTERNATIONAL SPACE STATION PROGRAM



International Space Station Status

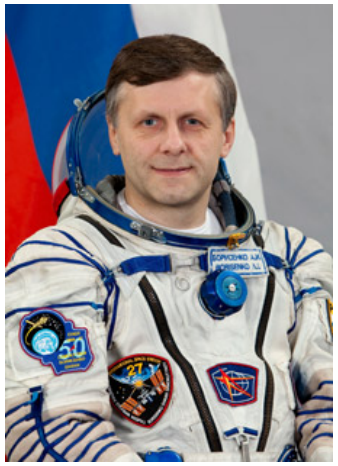
Robyn Gatens
Deputy Director, ISS
Human Exploration and Operations Mission Directorate
NASA Headquarters

March 2017

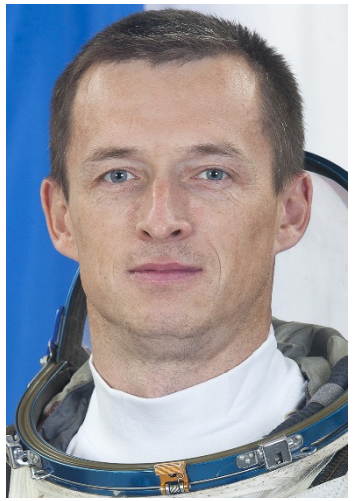
Increment 50 Overview: Crew

48S Dock 10/21/16
48S Undock 4/10/17

Shane Kimbrough
FE (US) – 48S
(*CDR Inc 50)*



Andrey Borisenko
FE (R) – 48S



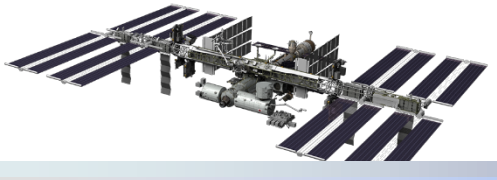
Sergey Ryzhikov
FE (R) – 48S
CDR – 48S

49S Dock 11/19/16
49S Undock 6/2/17

Peggy Whitson
FE (US) – 49S
(*CDR Inc 51)*

Thomas Pesquet
FE (US) – 49S

Oleg Novitski
FE (R) – 49S CDR



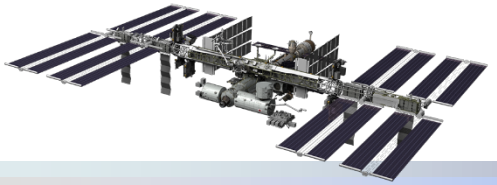
Near Term Flight Events

Launch and Landing Activities

- SpaceX CRS-10 Release and Splashdown – March 19, 2017 (Complete)
- Orbital ATK CRS-7 Launch – TBD
- Orbital ATK CRS-7 Capture and Berthing- TBD
- Soyuz 48S Undock and Landing – April 10, 2017
- Soyuz 50S Launch and Docking – April 20, 2017
- SpaceX CRS-11 Launch – May 2017

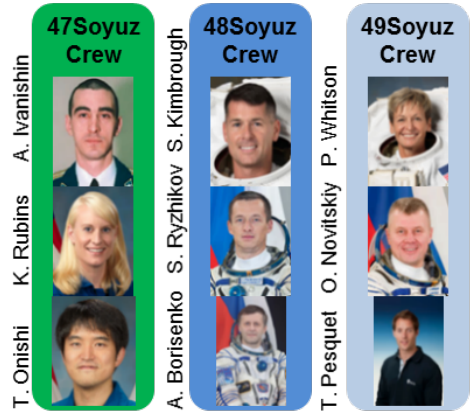
EVA Activities

- EVA – Enhanced Processor Integrated Communications (EPIC) MDM R&R/SPDM Lube – March 24, 2017
- EVA – EPIC Shields – March 30, 2017
- EVA – ELC Express Carrier Avionics (ExPCA) R&R – April 6, 2017 (TBC pending OA-7)



Increments 49 – 52

	Increment 49	Increment 50
Utilization	✓ Airway Monitoring (Airlock Session) ✓ Fluid Shifts ✓ SODI-DCMIX • Phase Change Heat Exchanger (PCHx) ✓ NRCSD #9 ✓ ELF Checkout	✓ OA-5 Post Unberth Activities: ✓ Saffire Operations ✓ External NRCSD Deployments ✓ JSSOD #5 and #6 • Fluid Shifts • SpX-10 External Payload xfr to ISS: STP-H5, SAGE III • SpX-10 External Payload xfr to SpX ULC: OPALS, RRM, MISSE-8 FSE • RR-4 (SpX-10) • Osteo Omics
EVA, Robotics, Systems, Software	✓ SSRMS LEE B Survey ✓ SSRMS LEE A Survey	✓ Robotic External Leak Locator (RELL) Checkout ✓ US EVA (Double): Ch 1A/3A Li-Ion Batt R&R during HTV-6 • N1 Galley Rack Activation and Checkout • Galley Rack Food Warmer Install and Checkout ✓ X2R15 Software Transition ✓ RELL – focused survey • US EVA: SPDM LEE Lube, EPIC MDM, Disconnect PMA3 • PMA3 Relocation • US EVA: EPIC MDM, Connect PMA3, N3 axial shields, PMA3 cummerbund/fwd shield install, ammonia imagery (TBC) • US EVA: ExPCA 4 R&R



IM - Todd Hellner (x31394) *IDM - Kevin Hames (x38592)*
IE - Julie Dunning (x34360) *IPE - David Bach (x46748)*
IE – Jarrett Quasny (x36903) *CTE - Jill Holm (x41106)*

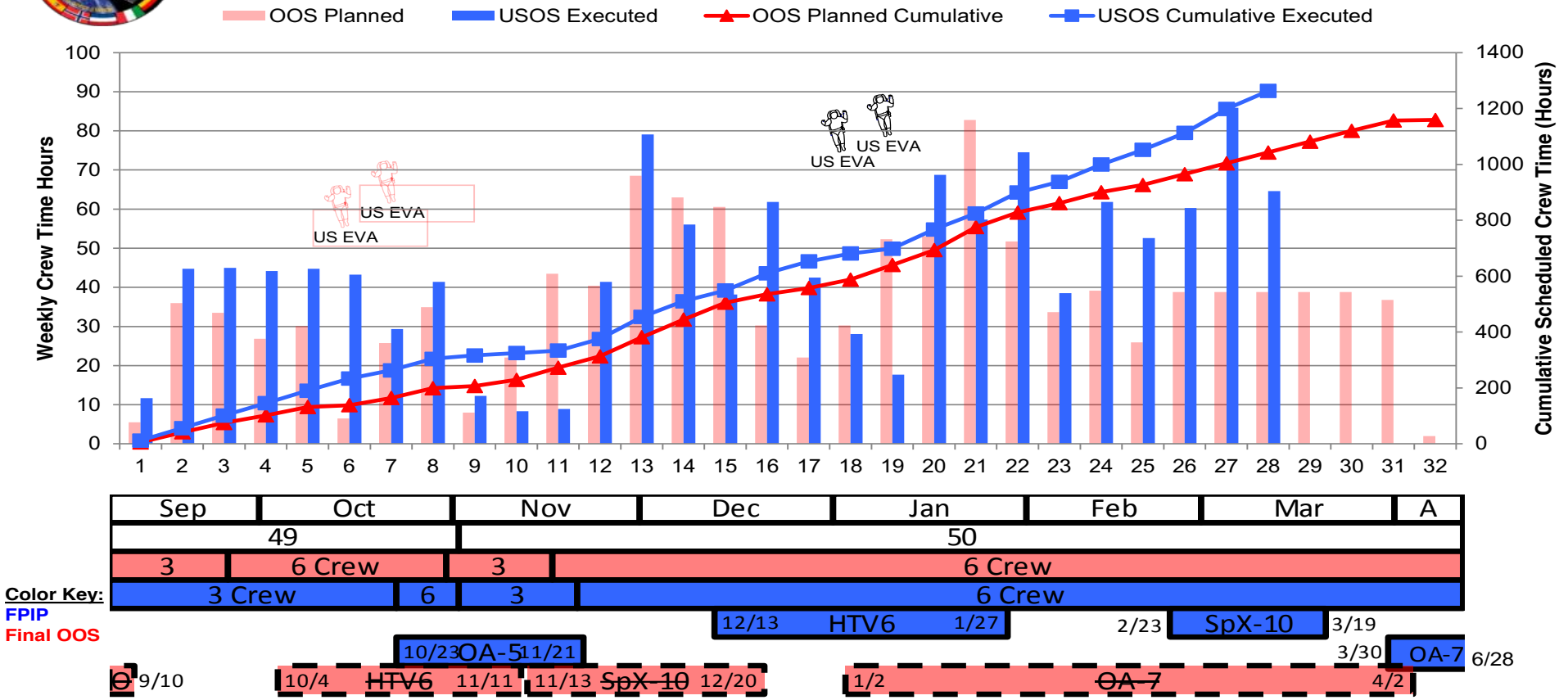
	Increment 51	Increment 52
Utilization	• BEAM • CASIS Protein Crystal Growth • DECLIC • Functional Immune • LDST • Human Research Program • Marrow • Meteor • Lighting Effects • SarcoLab-3	• MED-2 • Miniaturized Particle Telescope • SAGE-III • AMS-O2 • Energy • Radiation Environment Mon. • Biochem Profile • ExHAM • NRCSD
	• Fluid Shifts • Rodent Research-5 • ACE T6 & T9 • MUSES • NICER • Strata-1 • OsteoOmics • Magnetic 3D • Seedling Growth-3 • BRIC-Light Emitting Diode • Aquapad • In Situ • JEM Internal Ball Camera • ADCs in Microgravity • Lung Tissue • ROSA	• ELF • STP-HS • SERISM • Cold Atom Lab • RED-Data 2 • Haptics 2 / Interact • CREAM • Cardiac Stem Cells • J-SSOD • Veggie • Petri Plants • DOSIS 3D • BRIC-22 • SPHERES Zero Robotics • Mouse Epigenetics • Joint Rodent Research-1

EVA, Robotics, Systems, Software	• SSC "Habanero" Service Pack + Clients transition to ZBooks
	• JCP Software Update
	• iPHEG install into HRF1 and WORF Racks (HTV-6)
	• JAXA WAP R&R (SpX-11)
	• MPEP Modification on JEMAL Slide Table (SpX-11)
	• Node 2 IMV ducting for IDA Fwd
	• 2nd Galley Rack Food Warmer Installation (OA-7)
		• RS EVA 43
		  • Deploy test satellite [Vektor-T experiment]
		  • Deploy nanosatellite [Radioskaf experiment]
		• JSL Routers Upgrade (HTV-6)
		• MPCC Ku-Band Test
		• Pressure Management Device Install (SpX-12)
		• iPHEG install into Express Rack 3
		• Crew Personal Active Dosimeter (CPAD) Tech Demo (SpX-12)
		• Backup Drive System install for JEM SFA (SpX-12)

IM - Hubert Brasseaux (x48079)
IDM - Frank Acevedo (x32561)
IE - Jorge Salazar (x39663) Cindy Cranford (x47677)
IPE - David Cook (x46387)
CTE - Sam Longwell (x48230)

Inc 49–50 Utilization Crew Time

Inc 49 - 50 Utilization Crew Time

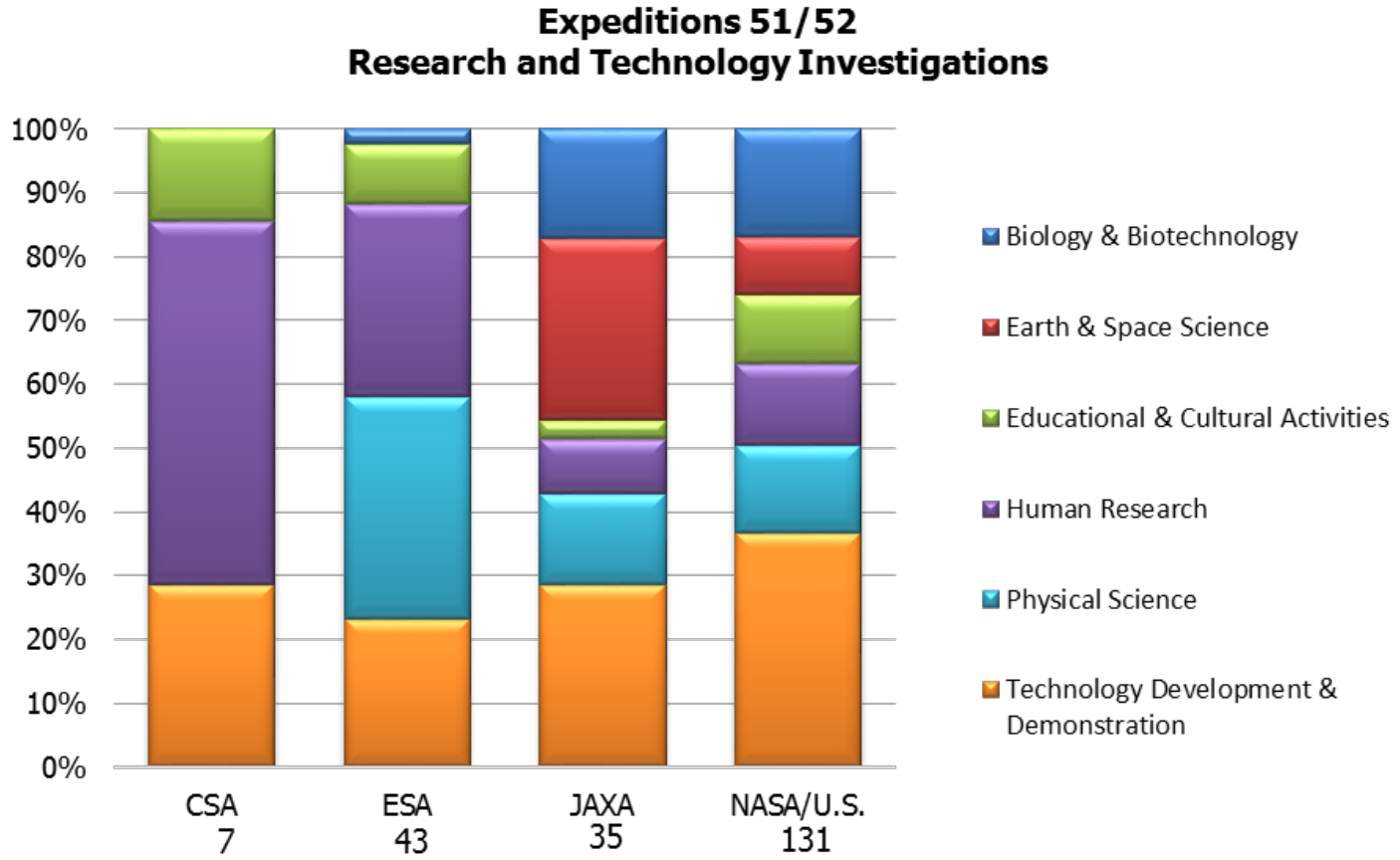


Executed through Increment Wk (WLP Week) 28 :	26.4	of 29.6 work weeks	(89.2% Complete)
USOS Actuals:	1262.92	hours -> 47.84 hours/week	
USOS IDRD Allocation:	1,159.00	hours-> 39.16 hours/week	(109.0% Complete)
OOS USOS Planned Total:	1,159.21	hours	(108.9% Complete)
Voluntary Science Totals to Date:	7.17	hours (not included in the above totals or graph)	
RSA/NASA Joint Utilization to Date:	178.00	hours (not included in the above totals or graph)	

ISS Research Statistics

- 131 NASA/U.S.- led investigations
- 85 International-led investigations
- 71 New investigations
  - 0 CSA
  - 5 ESA
  - 10 JAXA
  - 56 NASA/U.S.

Number of Investigations for 51/52: 216



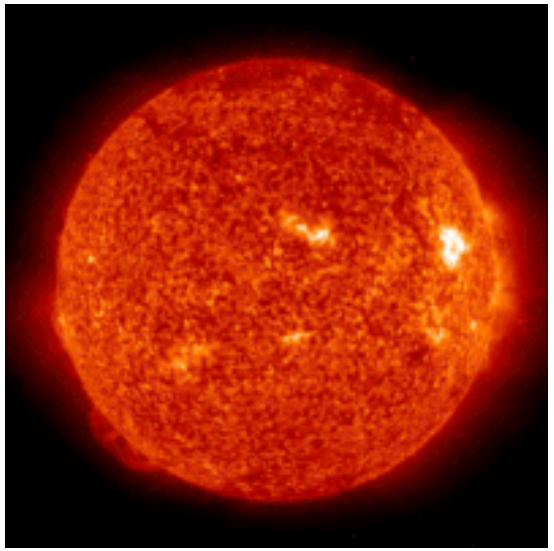
ISS Lifetime

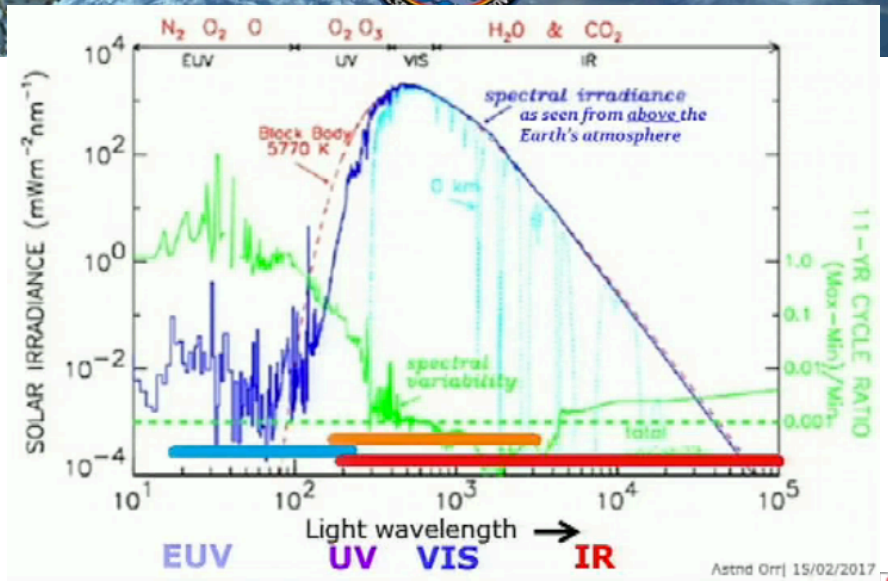
- Estimated Number of Investigations Expedition 0-50: 2310*
- Over 800 Investigators represented
- Over 1300 scientific results publications (Exp 0 – present)

Working data as of January 31, 2017
*Pending Post Increment Adjustments

Featured Investigation: SOLAR

- Launched with Columbus on STS-122/1E for what was supposed to only be a 1.5 year mission, SOLAR completed 110 observation periods before ending on 2/15
- Awareness of sun radiation level and spectrum is important to both Earth-based and space-borne systems as well as to advanced climate studies
- In 2012-2013, ISS demonstrated its capability to support solar research by changing its attitude (first time for science) to allow SOLAR observations for a full solar surface rotation without interruption
- SOLAR paved the way for the replacement NASA/NOAA Total Solar Irradiance Sensor (TSIS) going up on SpX-13 for a 5 year mission



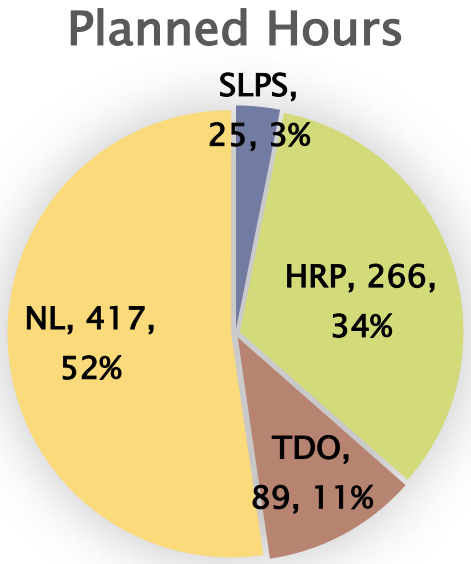


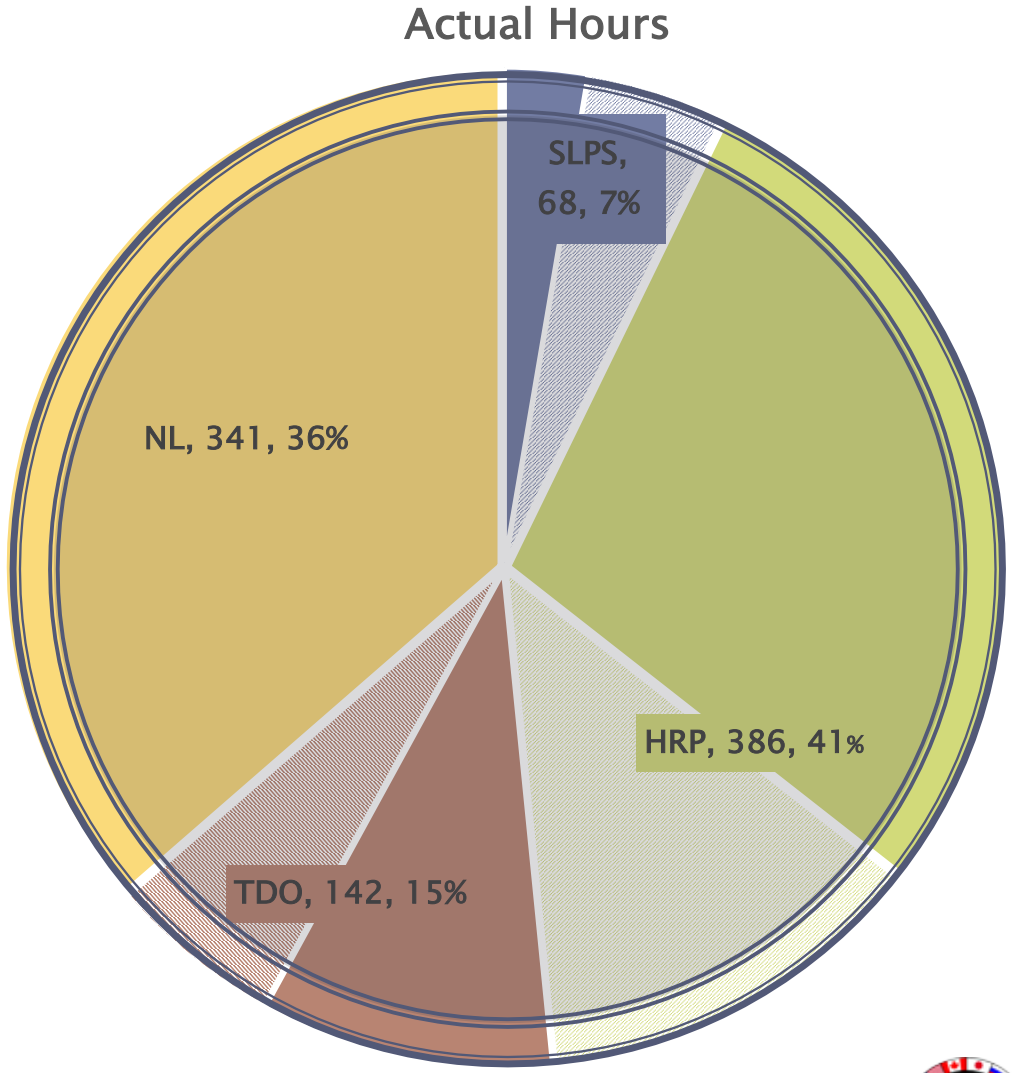
SOLAR data from ESA farewell event

Increment 47/48 Crew Time by Sponsor

- Enablers
  - Russian Crew time for:
    - Fluid shifts (HRP)
    - OASIS (SLPS/physical science)
    - EarthKAM/SPHERES Zero Robotics (NL)
- Delta Explanations
  - OA5 and SpX10 moving out of the increment delayed significant NL investigations (Rodent Research-4 approx. 200 hours)
  - Failure in SABL ACM prevented doing OsteoOMICS (approx. 40 hours (NL))
  - NL Reserve on orbit was insufficient to make up for the loss of the OA5 and SpX10 prime science

March '16 – Sept '16	Planned	Actual
USOS Research Hours	797	937
Total Crew Days (USOS)	352	349
Cargo Flights	OA6 Sx8 Sx9 OA5 Sx10	OA6 Sx8 Sx9
# EVAs	2	2
Russian Crew hours	0	154





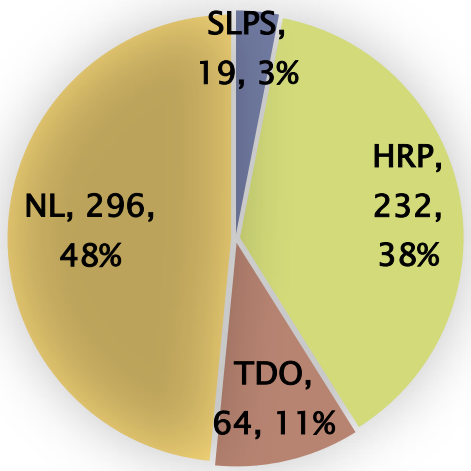
*Hatched wedges indicate increase from plan

Increment 49/50 Crew Time by Sponsor

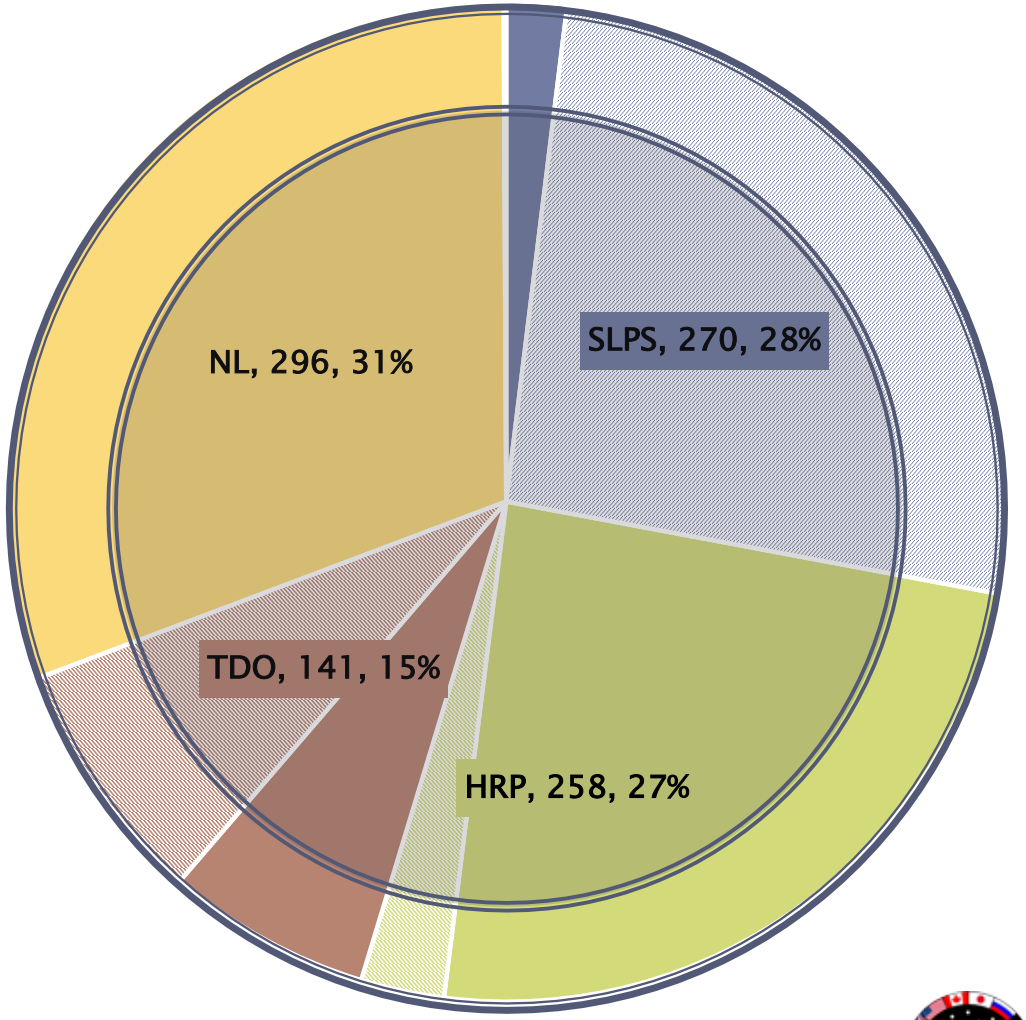
- Enablers
  - Crew is exceeding performance expectations on orbit
  - Russian Crew time MARES (HRP), SPHERES (NL), EarthKAM (NL), RR-5 (SLPS), FLEX (SLPS)
  - SLPS had prepositioned significant physical sciences in reserve and launched APEX-04 at risk
  - Tech Demo – Additional crew time was able to be used towards SPHERES (HALO and UDP), Robonaut Trouble shooting, BEAM modal testing
  - HRP – Extra Fluid Shifts session
- Delta Explanations
  - Increment crew time availability increase is resulting in smaller than anticipated percentage of NL utilization (hours stayed the same to plan)
  - Space X 10 hours, including Rodent Research-4, will shift these actuals

Sept '16 – March '17	Planned	Actual (To date)
USOS Research Hours	611	965
Total Crew Days (USOS)	317	386
Cargo Flights	OA-5 HTV6 SpX-10 OA-7 SpX-11	OA-5 HTV6 SpX-10
# EVAs	5	2
Russian Crew hours	169	TBD

Planned Hours



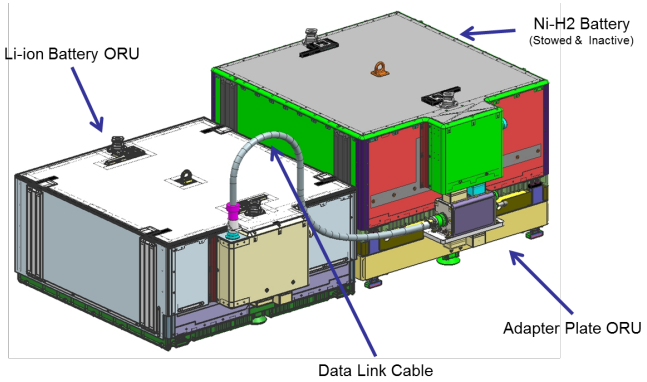
Actual Hours Through Week 25

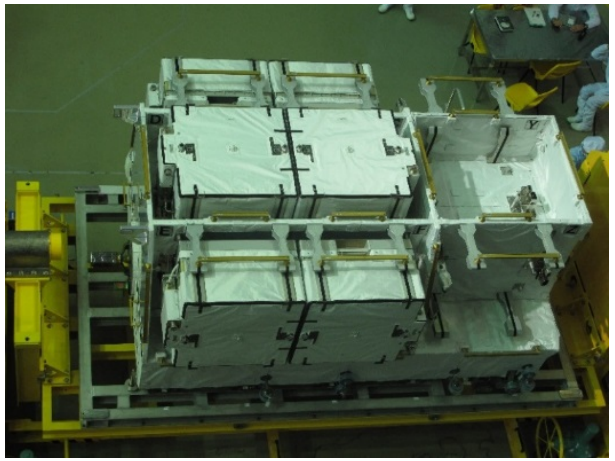


*Hatched wedges indicate increase from plan

Increment 50 EVA Execution

- 2 EVAs
  - EVA 1- 3A battery replace
  - EVA 2- 1A battery replace





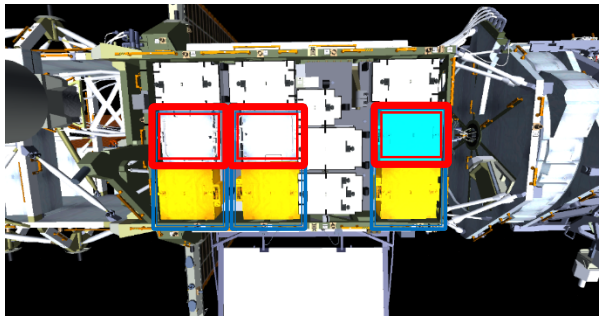
S4 Battery R&R – EVA 1 (1/6/17)

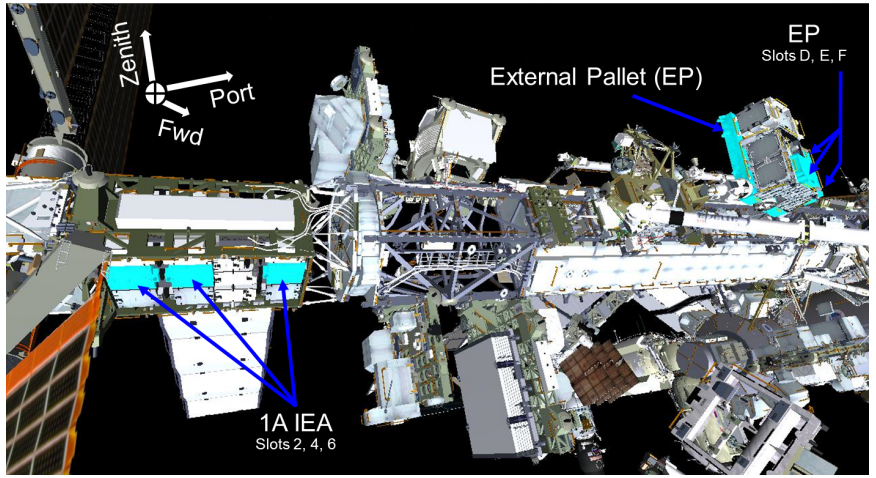
Color key: IEA Worksite | EP Worksite

PET	0:00	1:00	2:00	3:00	4:00	5:00	6:00	
EV1	[1] Egress (0:15)	Worksite Prep (0:55)	Retrieve AP A / AP B (0:35)	Install AP A (0:45)	Relocate Battery 4 (0:35)	Install AP B (0:20)	Relocate Battery 2 (0:45)	Retrieve/Install AP C (1:00)	1A Battery Prep/Cleanup (0:40)	Ingress (0:30)	[12]
EV2	[1] Egress (0:15)	Worksite Prep (0:55)	Retrieve AP A / AP B (0:35)	Install AP A (0:45)	Relocate Battery 4 (0:35)	Install AP B (0:20)	Relocate Battery 2 (0:45)	Retrieve/Install AP C (1:00)	1A Battery Prep/Cleanup (0:40)	Ingress (0:30)	[12]

EV1:
[1] Post Depress (0:05)
[12] Pre Repress (0:05)

EV2:
[1] Post Depress (0:05)
[12] Pre Repress (0:05)





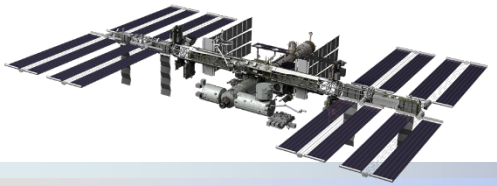
S4 Battery R&R – EVA 2 (1/13/17)

Color key: IEA Worksite | EP Worksite

PET	0:00	1:00	2:00	3:00	4:00	5:00	6:00	
EV1	[1] Egress (0:15)	Worksite Prep (0:55)	Retrieve AP E / AP F (0:35)	Install AP F (0:45)	Relocate Battery 4 (0:35)	Install AP E (0:20)	Retrieve/Install AP D (1:00)	Cleanup (0:40)	Get Ahead (0:45)	Ingress (0:30)	[12]
EV2	[1] Egress (0:15)	Worksite Prep (0:55)	Retrieve AP E / AP F (0:35)	Install AP F (0:45)	Relocate Battery 4 (0:35)	Install AP E (0:20)	Retrieve/Install AP D (1:00)	Cleanup (0:40)	Get Ahead (0:45)	Ingress (0:30)	[12]

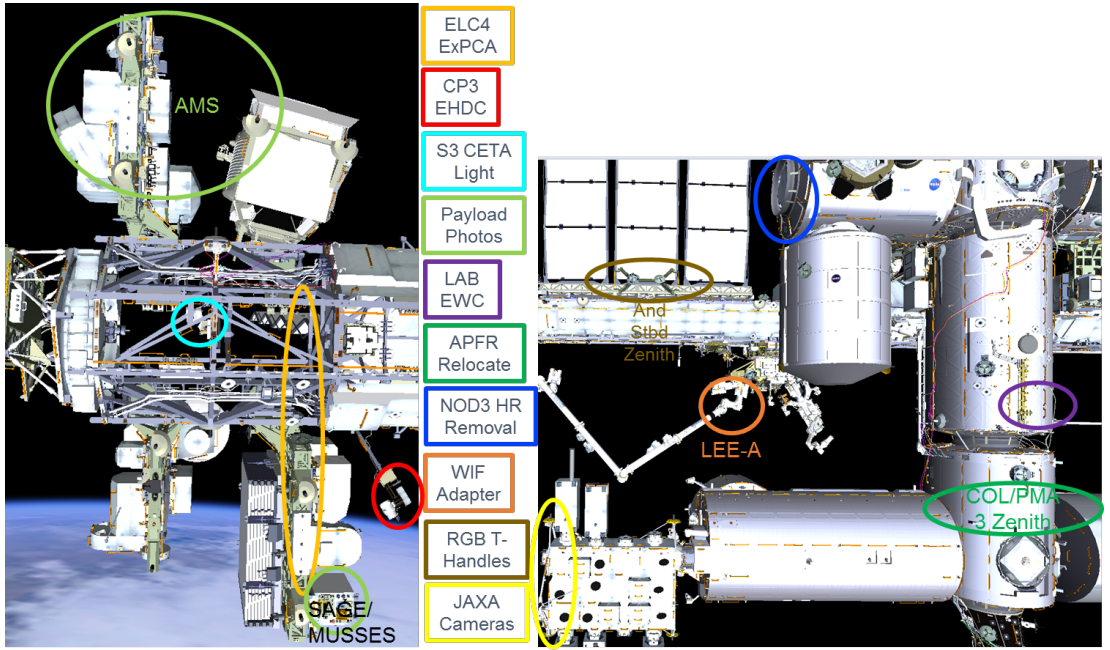
EV1:
[1] Post Depress (0:05)
[12] Pre Repress (0:05)

EV2:
[1] Post Depress (0:05)
[12] Pre Repress (0:05)



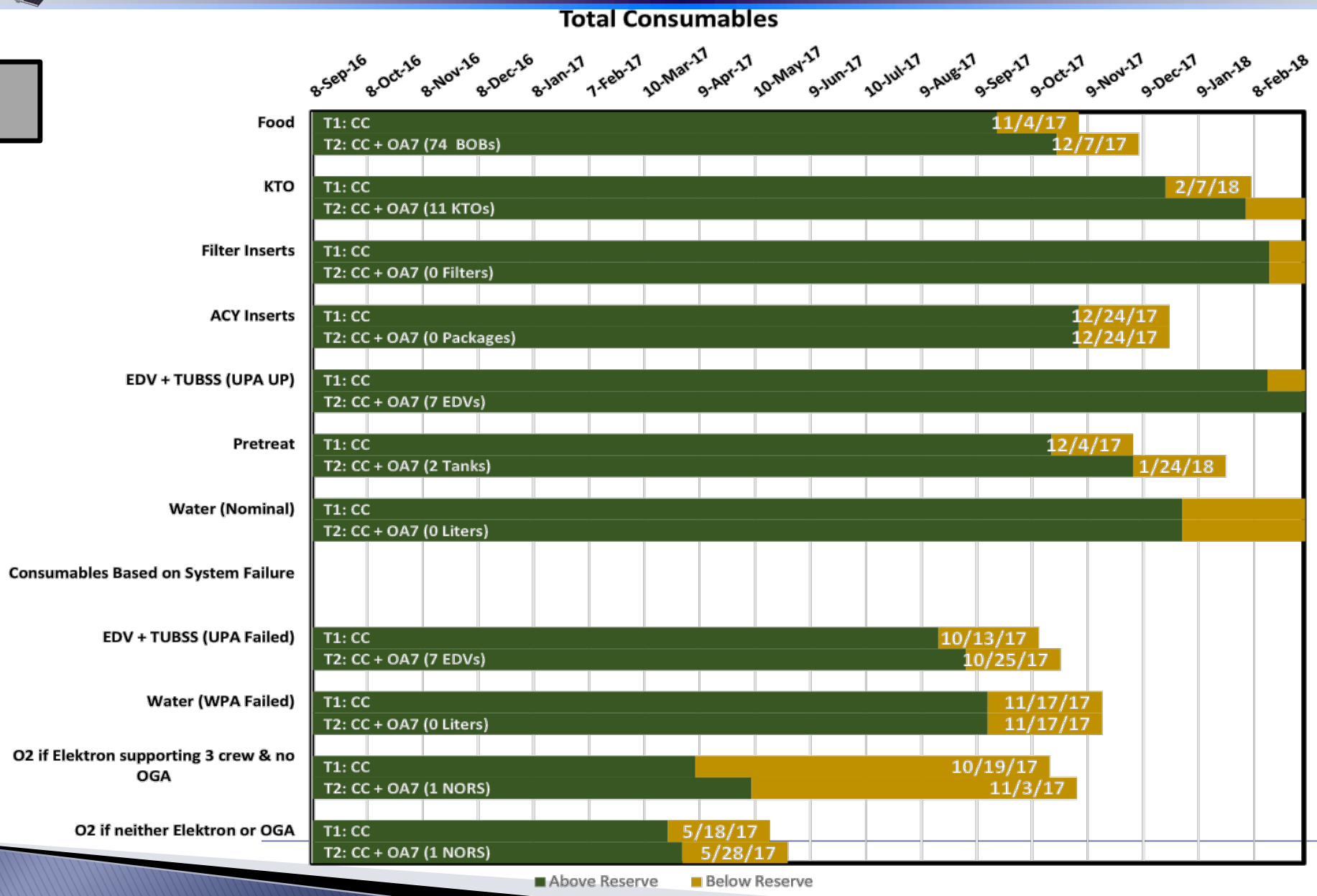
Upcoming EVA Plan

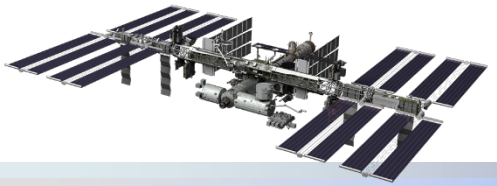
- EXT EPIC/SPDM LEE Lube EVA (Completed 3/24)
  - R&R EXT-1 MDM with new EXT EPIC
  - Disconnect PMA3 to enable PMA relocation
  - Lube SPDM LEE (requires SSRMS support to manipulate the SPDM)
  - R&R JEM RWS Wrist Vision Equipment (WVE) (replacing both lights)
  - R&R JEF Fwd Camera (replacing one light)
  - R&R S1-1 CETA Light
- EXT EPIC/Shields EVA
  - R&R EXT-2 MDM with new EXT EPIC
  - Reconnect PMA3 post relocation
  - Install MMOD shields on Node3 Port
  - Remove PMA3 MLI (to allow IDA installation)
  - Install MMOD shields on PMA3 (as available)
  - Get Ahead time on both crewmembers following shield installations
- ExPCA Install EVA
  - R&R ExPCA (requires SSRMS support to access the ExPCA worksite)
  - AMS Terminator Cap install
  - CP3 HD Camera Install
  - R&R JEF Aft Camera (replacing one light)
  - Install LAB Nadir EWC antenna



Total Consumables

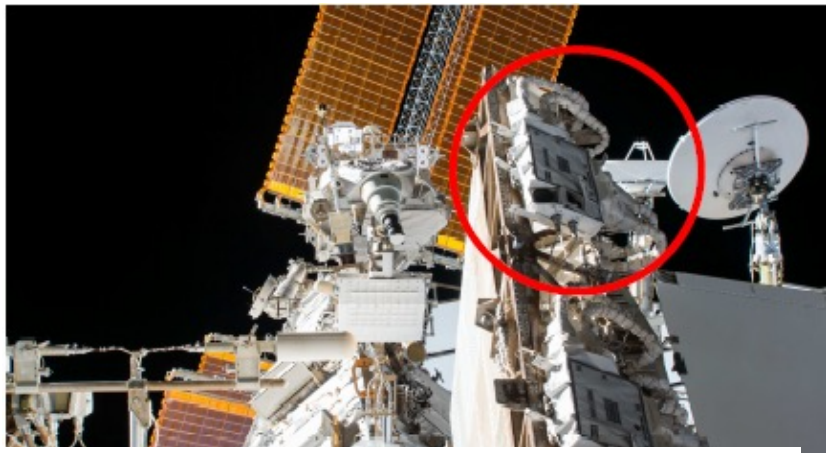
Analysis Date
08 Mar 2017

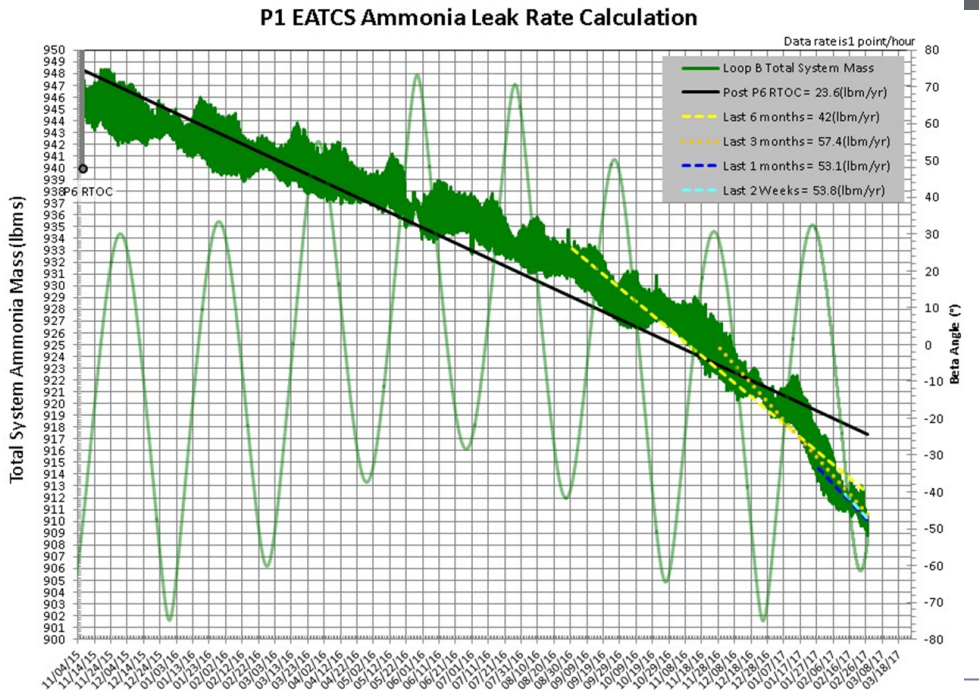


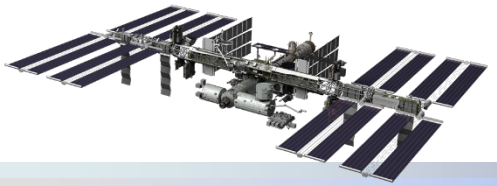


EATCS Loop B Leak

- External Active Thermal Control System (EATCS) Loop B has had a trending leak since ~2013
- Current leak rate is in the range of 42 – 57 lbs/year NH3,
  - While current rate is still small, the rate has been accelerating *(particularly in last 3 months)*
  - Similar leak profile of PVTCS P6 2B loop accelerated, then opened up in May 2013 requiring contingency EVA for ORU replacement
- Radiator flex line region around RBVM P1-3-2 hardware appear to have ammonia leakage.
  - Robotic External Leak Locator (RELL) operations in November 2016 indicated elevated ppNH3 in vicinity of P1-3-2 and February 2017 operations indicated elevated ppNH3 in vicinity of radiator jumpers from P1-3-2 RBVM.
  - Imagery of RBVM P1-3-2 performed in February by the crew from the Cupola currently under review.
  - Tasks in planning during the Inc 50 EPIC SPDM Lube EVA to perform close up inspections of the suspect RBVM hardware in this area for evidence of ammonia.
    - Includes manipulation of the MLI surrounding suspect hardware (RBVM and Junction Box QD, flex hoses, system rigid lines) in the area and additional close in imagery.
  - Looking at options to isolate or fix
    - Team assessing impact for further increased rate
    - There are two spare ATAs onboard and two spare ATAs on the ground.

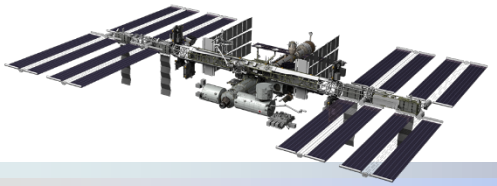






SpaceX-10 Mission

- Mission Planning
  - Launch occurred on 2/19/17
  - Unberth occurred on 3/19/17
- Pressurized Cargo – 1533 kg; 1738 kg return
  - Launch: 2 Animal Transporter, 1 Polar, 1 Glacier
  - Return: 3 Polars, 1 Glacier
- Unpressurized Cargo – 1157 kg upmass; 817 kg disposal
  - Stratospheric Aerosol and Gas Experiment (SAGE) Instrument Payload (IP), SAGE Nadir Viewing Platform (NVP), and Space Test Program – Houston 5 (STP-H5) were the external payloads delivered to ISS
  - Optical Payload for Lasercomm Science (OPALS), Robotic Refueling Mission (RRM), and Materials on ISS Experiment (MISSE)-8 removed for disposal; first ISS disposal payloads



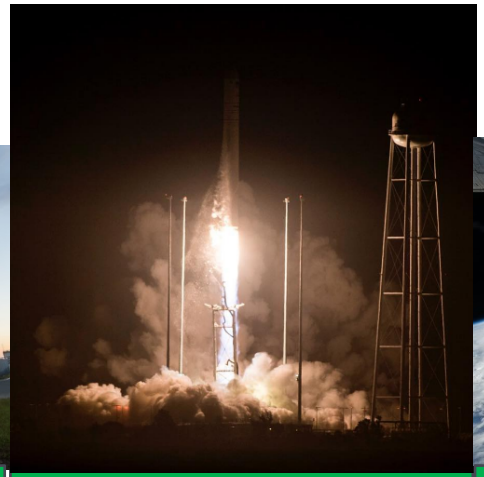
SpaceX-11 Mission Status

- Mission Planning
  - Post Qualification Review (PQR) is planned for 4/6/17
  - Stage Operations Readiness Review (SORR) is planned for 4/20/17
- Pressurized Cargo – 1600 kg planned; 1900 kg return estimated
  - Launch: 2 Animal transporters, 2 Polars
  - Return: 1 Animal transporter, 4 Polars
- Unpressurized Cargo – 1179 kg upmass
  - Neutron star Interior Composition ExploreR (NICER), Multiple User System for Earth Sensing (MUSES) and Rolled Out Solar Array (ROSA)
- Dragon Status
  - Dragon 6 is first re-use of a Dragon capsule and select components (D6 flew on SpaceX-4)
  - Trunk and Capsule are planned to ship to the Cape in March
  - SpaceX is working actions as a result of the SpX-10 rendezvous abort; SpaceX will brief NASA prior to the SpX-11 SORR
- Falcon 9 Status
  - SpaceX is determining which launch vehicle to assign for this mission

OA-5 Antares Return to Flight Mission Success

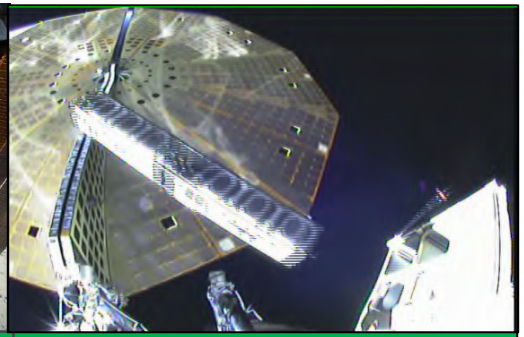
- Unberth occurred on 11/21/16
  - Pressurized Cargo – 2342 kg
  - Unpressurized Cargo –Disposal – 1258 kg
- Post-departure science objectives – 83 kg
  - Saffire and Cubesat deployments were successfully completed
- Re-entry occurred on 11/27/16

OA-5 rollout on 10/13/16



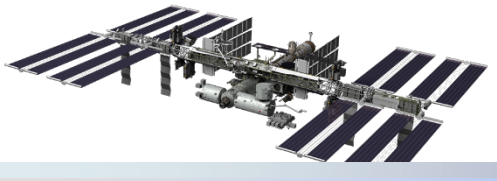
OA-5 launch on 10/17/16

OA-5 berth on 10/23/16



OA-5 Cubesat deploy 11/27/16

Photo Credit: Orbital



OA-7 Mission Status

- Mission Planning
  - Mission Readiness Review (MRR) was completed on 1/12/17
  - Joint Multi Segment Training (JMST) #2 was completed on 2/3/17
  - Post Qualification Review (PQR) was completed on 2/9/17
  - Flight Readiness Certification Review (FRCR) was completed on 2/14/17
  - Stage Operations Readiness Review (SORR) was completed on 2/22/17
- Pressurized Cargo – 3371 kg planned; 1802 kg disposal estimated
  - Saffire #3 payload installation was completed on 2/3/17
  - RED-Data 2 experiment and 4 Polars are planned for this mission
  - Initial cargo load was completed on 2/11/17
  - Late cargo load was completed on 3/4/17
  - Final cargo load was completed on 3/6/17
- Unpressurized Cargo
  - NanoRacks CubeSat Deploy (NRCSD) for deploy above post unberth; installation was completed on 2/28/17
- Cygnus Status
  - Cygnus is fueled. Fairing encapsulation completed
- Atlas Status
  - Investigating anomaly in booster hydraulic system discovered 3/22

HTV6 Mission Success

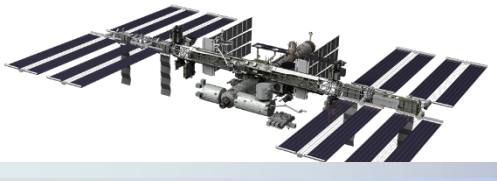
- Unberth occurred on 1/27/17
  - Pressurized Cargo Delivered – 2566kg; Cargo Disposed – 1500 kg
  - Unpressurized Cargo – disposal 1600 kg
    - Li-Ion batteries delivered by HTV were installed on power channels 1A/3A and are operating nominally
    - Disposed of nine NiH_2 batteries removed from channels 1A/3A
    - First insertion of Exposed Pallet via ground control (saved 2hr 40min crew time)
- Post-departure JAXA experiment objectives
  - Kounotori Integrated Tether Experiments (KITE) external experiment was attempted after unberth; the tethered end mass was not able to be released
  - Successful Field Emission Cathode Controller (FECC) experiment
- Re-entry occurred on 2/5/17

Launch on 12/9

SSRMS ready to grapple HTV

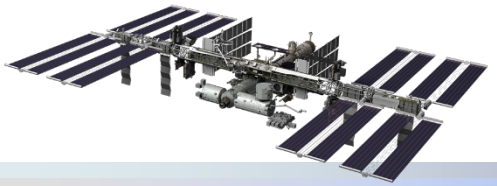
SSRMS removing Exposed Pallet

Insertion of Exposed Pallet (EP) into HTV (loaded with NiH2 batteries for disposal)



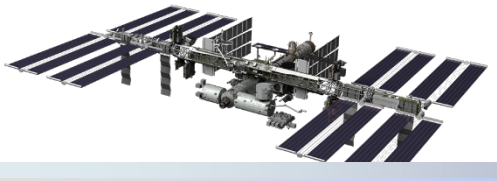
Commercial Resupply Services CRS-2 Status

- CRS-2 Contract award was announced on January 14, 2016
  - Awardees are Orbital-ATK Inc. (OA), Sierra Nevada Corporation (SNC) and SpaceX (SpX)
  - ISS Integration work has been ordered for each provider as of 6/3/16; there are seven integration milestones required to be completed prior to first vehicle launch
  - A minimum of six missions will be ordered from each provider
- ISS Integration Milestones – #1 Kickoff and #2 System Requirements Review for all three contracts were successfully completed
- ISS Integration Milestone – #3 Preliminary Design level review
  - OA IR #3 was conducted on 10/26/16
  - SpX IR #3 was conducted on 11/15/16
  - SNC IR #3 was conducted on 2/27/17 – 3/1/17
- ISS Integration Milestone – #4 Critical Design level reviews are scheduled to begin in the Fall 2017
- CRS-2 missions are planned for launch beginning in 2019



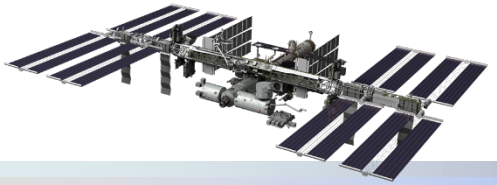
ISS Integration Status of Crew Vehicles

- Mission Planning
  - Baselined the Boeing ISS Hardware Interface Control Document (ICD) and Ground Segment ICD
  - Successfully conducted the Boeing Post Certification Mission 1 (PCM-1) Vehicle Baseline Review (VBR) milestone
  - Successfully conducted the SpaceX PCM-1 Mission Integration Review (MIR) milestone
  - Identifying requirement variances with both providers and working through paperwork approvals
- ISS On-Orbit Readiness
  - Conducted Boeing CST-100 Phase 2 Safety review
  - SpaceX delivered the Phase 2 Safety review packages and their integrated ISS hazard review was performed
- Joint Integration Activities (10 joint tests; 6 joint analyses; and 2 joint inspections)
  - SpaceX Crew Dragon – Joint Test (JT) 2 (Data Handling I/O) planned to be completed by 3/16/17 and JT7 (Power Quality/EMI) is planned for late Mar
  - Boeing CST-100 – Conducted Joint Test (JT) 7 (Power Quality and Electromagnetic Compatibility Test); Conducted risk mitigation test for JT9A (Joint RF Compatibility Tests); JT2 (CCTS Data Handling I/O Test) is planned for late Mar
- Coordinating data exchanges with International Partners



LEO Commercialization Update

- Assessing next steps in Port RFI
- Evaluating the REMIS responses from industry; expect to award in early summer
  - Research, Engineering, Mission Integration Services
- NASA has initiated a study activity to define long term research and utilization requirements in LEO
  - Across NASA including SMD, STMD and HEOMD with input from CASIS
- CASIS and AAS are making very good progress in finalizing the plans for the ISS Research and Development Conference
  - July 17-20 at the Omni Shoreham at Woodley Park in DC



Back Up

Increment 50 Extension, Increment 51/52 Research Complement Snapshot

Biology & Biotechnology

Prime = 380 hrs
Reserve = 100 hrs

Animal Biology
- Joint Rodent Research-1
- Fruit Fly Lab -02 (FFL-02)
- Rodent Research-5 (RR-5)
- Multi Omics-Mouse/Mouse Epigenetics-2
- Space Pup

Cellular Biology
- CORM
- MYOGRAVITY
- NANOROS
- SERISM
- ADCs in Microgravity
- Cardiac Myocytes
- Lung Tissue
- Magnetic 3D cell culturing
- SABL
- Synthetic Bone
- Stem Cells

Macromolecular Crystal Growth
- CASIS PCG 6
- CASIS PCG 7
- JAXA Medium Temp PCG
- JAXA PCG

Microbiology
- Microbial Tracking-2
- APEX-02-2
- EXTREMOPHILES

Plant Biology
- Asian Herb
- BRIC-22
- BRIC-Light Emitting Diode (LED)
- Payload Card-X
- Petri Plants-2
- Seedling Growth-3

Facilities
- EMCS
- Plant Habitat
- STaARS-1
- Veggie

Earth & Space Science

Prime = 11 hrs
Reserve = 16 hrs

Astrobiology & Astrophysics
- CREAM (Ext)
- NICER (Ext)
- AMS-02 (Ext)
- Meteor
- CALET (Ext)
- MAXI (Ext)

Earth Remote Sensing
- CATS (Ext)
- CEO
- ISS RapidScat (Ext)
- SAGE III-ISS (Ext)
- STP-H5 FPS (Ext)
- STP-H5 LIS (Ext)
- NREP Inserts (Ext)

Near-Earth Space Environment
- SEDA-AP (Ext)

Facilities
- WORF

Education & Outreach

Prime = 32 hrs
Reserve = 79 hrs

Cultural Activities
- NanoRacks Module-48
- Music and Space

Educational Competitions
- NanoRacks Module-9
- NanoRacks Module-52, 54, 55, 56
- NanoRacks Module-66, 67, 70
- SPHERES-Zero-Robotics

Educational Demonstrations
- ISS Ham Radio
- Sally Ride EarthKAM
- Story Time From Space
- Tomatosphere-US
- JAXA EPO TBD
- AstroPi
- EPO Nespoli
- EPO Pesquet
- ESA-EPO-TASK-LIST

Student-Developed
- Genes in Space-2
- Genes in Space-3

Physical Science

Prime = 107 hrs
Reserve = 161 hrs

Combustion Science
- ACME
- BASS-II
- Cool Flames Investigation
- ATOMIZATION
- Group Combustion

Complex Fluids
- ACE-T-8
- ACE-T-9
- ACE-T-6
- PK-4

Fluid Physics
- DECLIC HTI-R
- Slosh Coating
- ZBOT
- Eli Lilly-Lypholization
- Two-Phase Flow
- FLUIDICS
- Geoflow-2C

Fundamental Physics
- Cold Atom Lab (CAL)
- DOSIS-3D
- MAGVECTOR

Materials Science
- DECLIC DSI-R
- Strata-1
- SUBSA Furnace & Inserts
- Advanced Nano Step
- ELF Investigation
- Transparent Alloys (↑)
- EML Batch 1 & 2
- MSL SCA-Batch 2b-ESA

Technology Development

Prime = 81 hrs
Reserve = 63 hrs

Air, Water & Surface Monitoring
- Water Monitoring Suite

Avionics & Software
- ARAMIS (↑)
- Spaceborne Computer
- STP-H5 CSP (Ext)
- STP-H5 Space Cube - Mini (Ext)
- Honeywell-Morehead-DM-7
- NanoRacks Module-63
- SG100 Cloud Computer

Characterizing Expt Hardware
- IN SITU
- ROSA (Ext)
- MVIS Controller-1
- ECHO

Commercial Demonstrations
- Made In Space Fiber Optics

Communication & Navigation
- Maritime Awareness
- SCAN Testbed (Ext)
- Vessel ID System (Ext)
- MOBIPV

Fire Suppression and Detection
- Saffire-III

Food & Clothing Systems
- Skinsuit
- EVERYWEAR

Imaging Technology
- HDEV (Ext)
- NanoRacks-CID
- NanoRacks-Cavalier Space Processor
- NanoRacks-KEIIM
- 360 Camera

Life Support Systems
- Capillary Structures
- LDST
- MED-2
- UBNT
- Aquapad

Microbial Populations in Spacecraft
- MATISS

Microgravity Measurement
- STP-H5 SHM (Ext)

Radiation & Shielding
- Miniaturized Particle Telescope
- Radiation Environment Monitor
- STP-H5 RHEME (Ext)
- Area PADLES
- PS-TEPC
- Radi-N2

Robotics
- Gecko Gripper
- Robonaut
- STP-H5 Raven (Ext)
- JEM Internal Ball Camera
- HAPTICS-2/INTERACT
- SUPVIS-JUSTIN

Small Satellites Technologies
- NRCSD #10, 11, 12, 13
- NanoRacks-extCygnus-NRCSD

Space Structures
- BEAM (Ext)
- RED-Data2

Spacecraft & Orbital Environmts
- RFID Logistics Awareness
- STP-H5 APS (Ext)
- STP-H5 GROUP-C (Ext)
- STP-H5 iMESA-R (Ext)
- STP-H5 LITES (Ext)

Spacecraft Materials
- STP-H5 ICE (Ext)

Thermal Management Systems
- Passive Thermal Flight Experiment
- Phase Change HX
- STP-H5 EHD (Ext)

Other
- NanoRacks Black Box
- NanoRacks-Formaldehyde Gas Monitor Assembly

Prime = 297 hrs
Reserve = 64 hrs

Human Research

Bone & Muscle Physiology
- Intervertebral Disc Damage (P)
- Sprint
- Brain-DTI (P)
- EDOS-2
- MUSCLE BIOPSY (P)
- SARCOLAB-3
- Marrow

Cardiovascular & Respiratory Systems
- Cardio Ox
- IPVI
- Vascular Echo

Crew Healthcare Systems
- Medical Consumables Tracking
- Portable PFS

Habitability and Human Factors
- Body Measures
- Fine Motor Skills
- Habitability

Human Behavior & Performance
- Lighting Effects
- Circadian Rhythms
- At Home in Space

Immune System
- Functional Immune
- Multi-Omics
- Probiotics
- Immuno-2

Integrated Physiology & Nutrition
- Biochem Profile
- Dose Tracker
- Repository
- Telomeres (P)
- Energy

Nervous & Vestibular Systems
- Field Test (P)
- NeuroMapping
- GRASP
- GRIP
- Space Headaches
- Straight Ahead in Microgravity (P)

Radiation Impacts on Humans
- ESA-Active-Dosimeters

Vision
- Fluid Shifts

Prime = 125 hrs
Reserve = 35 hrs

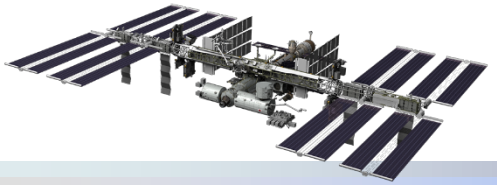
Facilities/Multipurpose

- Coldbag, Polar
- GLACIER, MELFI, MERLIN
- HRF-1, 2
- LMM
- Mass Measurement Device
- SAMS-II
- MUSES
- NanoRacks Platforms
- NanoRacks STEP (↑)
- TangoLab
- EFU Adapter
- ExHAM#1, #2
- J-SSOD#7
- MSPR
- Ryutai
- Saibo
- MiniECCO

Key

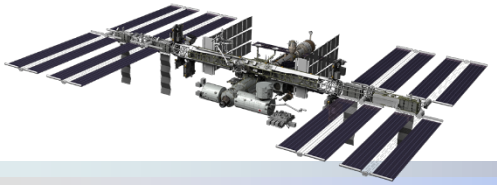
NASA	(P) = Pre/Post BDC only
National Lab	(Ext) = External
JAXA	(RJR) = Russian Joint Research
ESA	(↑) = Launch only
CSA	(↓) = Return only
RSA	

As of 17 February 2017



ISS Vehicle Health

System	Status Update	On-going Issues / Investigations
C&DH/ OpsLAN	No Change	Primary C&C MDM Transition C&W Message Re-annunciation (IFI 22806)
C&T	No Change	ICU – Unexpected Ku Fwr Packet Hits (IFI 20639). C2V2 Radiation during Transmitter Built-In Test (IFI 22550) . External High Def Camera (EHDC) fails to auto recover after Ku-Band AOS (IFI 22872)
CHeCS	No Change	TOCA N_2 flow sensor drifting high. (IFI 22961)
FCS	No Change	Elevated Fungal Levels in Node 1 (IFI 8837). MWA Utility Strip Damage (IFI 22684).
ECLSS	No Change	UPA – Operational, but with High Conductivity (IFI 22681) WPA – Nominal. OGA – Partially mated QD (IFI 22959), H_2 ORU sensing line reflowed solder joints ((IFI 22958, PRACA 22726)) CDRA - CDRA ASV Slow transition/Failures (IFI 7973). Node 3 CDRA RPC trip (AR 7890) THC – Node 2 CCAA Inlet ORU Fault (IFI 22658). This fault is currently not being observed and fan is operating at nominal RPM. WHC – Pump Sep did not deactivate following UR R&R (IFI 22900). PTU leak at UVB location (AR 7863) TCCS – Node 3 MCA ORU 2 calibration Misc - NORS AIK Install N2 Outlet Hose 1 Gamah Seal Leakage Issue (IFI 20641), Sabatier Reactor Degradation, hot zone moving (IFI 22863), Sabatier Faulted to low separator dP. (IFI 22929)
EVA	No Change	Nominal
EVR	No Change	MBS Mast Camera Hazy Image (IFI 8178). SSRMS LEE Latching Degradation (IFI 8910). LEE Snare Cable Degradation (IFI 20615). Loss of video from SSRMS tip elbow camera (IFI 22986)



ISS Vehicle Health

System	Status Update	On-going Issues / Investigations
PROP	No Change	Nominal
GN&C	No Change	GPS R/P 1 Y-axis RLG Failure (IFI 22758). SIGI accelerometer data cut-off. (IFI 22942)
S&M	No Change	P4 EWIS Triggers (IFI 8691)
EPS	No Change	SM CHT Noise (IFI 8103). SSU 3B PORs (AR 4963). *External Lighting*:. CETA S1-1 light failed (IFI 7853), CETA Light S3-1 (IFI 22595) . *Overcurrent Trip Investigation*: Lab CDRA RPC trip (IFI 8859), Node 3 CDRA RPC trip (AR 7890), LA2B-A RPC 4 (IFI 22586). *Open RPCs due to FCH Issues*: N21A4A_A RPC 6 (GLA NOD2SD2 – IFI 9250).
ATCS	No Change	ER2 RFCA Overcurrent (RPCM LA2B-A RPC 4) (IFI 22586) External white flakes observed in P1LOOB HD camera video – Possibly ammonia leak. Under investigation
PTCS	No Change	Airlock Secondary Htr Zone 3 failure (IFI 22473) – RPC Trip - Under investigation.
Payload Facilities	No Change	EXPRESS Rack -4 flow sensor failure (PAR ER4-FLD-006).