

# International Space Station Status



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NASA HQ  
HEO NAC  
November 2015



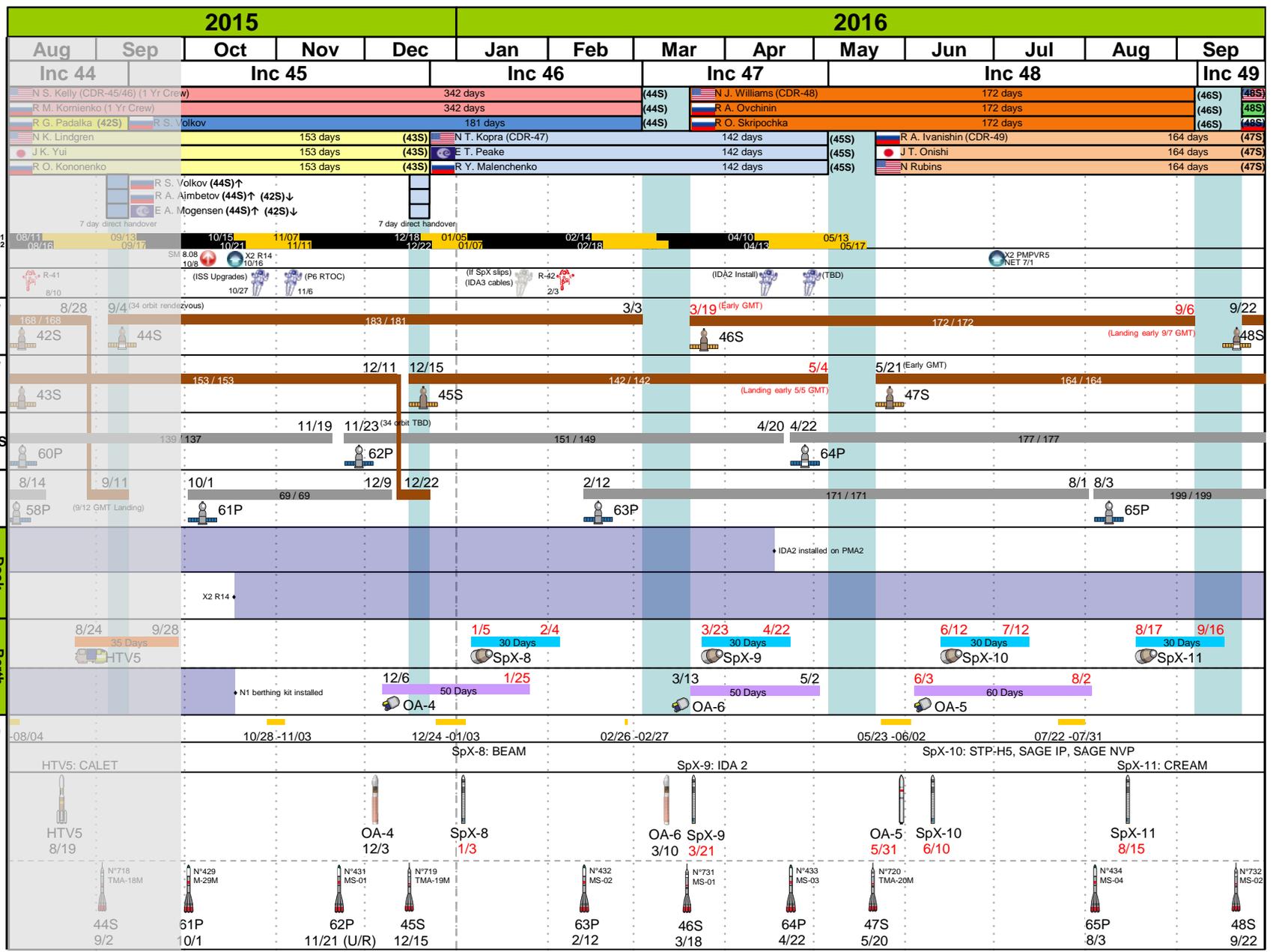
For current baseline refer to  
SSP 54100 Multi-Increment  
Planning Document (MIPD)

# ISS Flight Plan

## Flight Planning Integration Panel (FPIP)

(Pre-decisional, For Internal Use, For Reference Only)

NASA: OC4/John Coggeshall  
MAPI: OP/Randy Morgan  
Chart Updated: October 26, 2015



Crew Rotation

Soyuz Lit Landing  
Stage S/W  
Stage EVAs

Port Utilization

- MRM2 / SM Zenith
- MRM1 / FGB Nadir
- DC1 / MLM / RS Node
- SM Aft
- N2 Fwd / Dock
- N2 Zenith
- N2 Nadir / Berth
- N1 Nadir / Berth

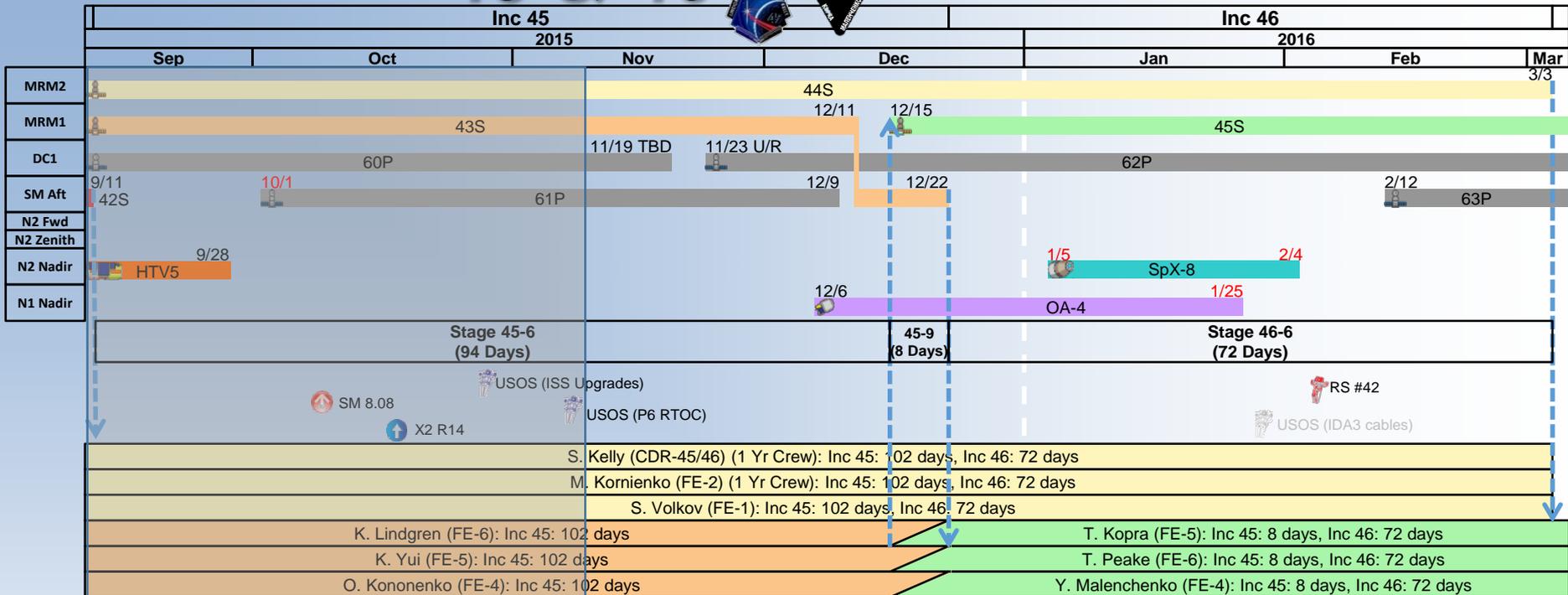
Solar Beta >60  
External Cargo

Launch Schedule

# INCREMENTS 45 & 46



Updated 10/29/2015: All Dates GMT  
SSCN/CR: 15088A, 15191 (in work)



	Increment 45	Increment 46
<b>Utilization</b>	<ul style="list-style-type: none"> <li>✓ STP-H4, SMILES, MCE disposal (HTV5)</li> <li>✓ JEM A/L: J-SSOD #4, NRCSD #6, ExHAM #2</li> <li>✓ RRM Phase 2 Science</li> </ul>	<ul style="list-style-type: none"> <li>• Complete 1 year crew science</li> <li>• Rodent Research-3 (SpX-8)</li> <li>• BEAM berth (SpX-8)</li> <li>• Airway Monitoring</li> <li>• JEM A/L: SIMPL, NRCSD #7</li> </ul>
<b>EVA, Robotics, Systems, Software</b>	<ul style="list-style-type: none"> <li>✓ SM 8.08</li> <li>✓ X2R14 Software Transition</li> <li>✓ USOS ISS Upgrades EVA</li> <li>✓ USOS P6 RTOC EVA</li> <li>✓ USOS Reconfig: N1 Nadir prep for VV</li> <li>• NORS AIK installation</li> <li>✓ Galley Rack transfer (HTV5)</li> <li>• RPCM P12B_A replacement</li> </ul>	<ul style="list-style-type: none"> <li>• USOS IDA3 Cables EVA (Below the line)</li> <li>• RS EVA #42</li> <li>• USOS Reconfig: Install C2V2 rack, comm units, perform C2V2 checkout</li> <li>• USOS Reconfig: Install IMVs, VAPs</li> </ul>

### 43Soyuz Crew



O. Kononenko, K. Yui, K. Lindgren

### 44Soyuz Crew



S. Volkov, M. Kornienko, S. Kelly

### 45Soyuz Crew



Y. Malenchenko, T. Peake, T. Kopra

IM - Ryan Lien (x47284)  
 IDM - Gaurang Patel (x30023)  
 IE - Karen Engelauf (x40860), Jorge Salazar (x39663)  
 IPE - David Cook (x46387)



# Increment 45 Overview: Crew



42S Dock 3/28/15  
44S Dock 9/2/15  
44S Undock 3/3/16



Scott Kelly  
CDR (U) – 42S↑ / 44S↓



Mikhail Kornienko  
FE (R) – 42S↑ / 44S↓



Sergei Volkov  
FE (R) – 44S  
44S Undock 3/3/16



Oleg Kononenko  
FE (R) – 43S

43S Dock 7/23/15  
43S Undock 12/22/15



Kimiya Yui  
FE (J) – 43S



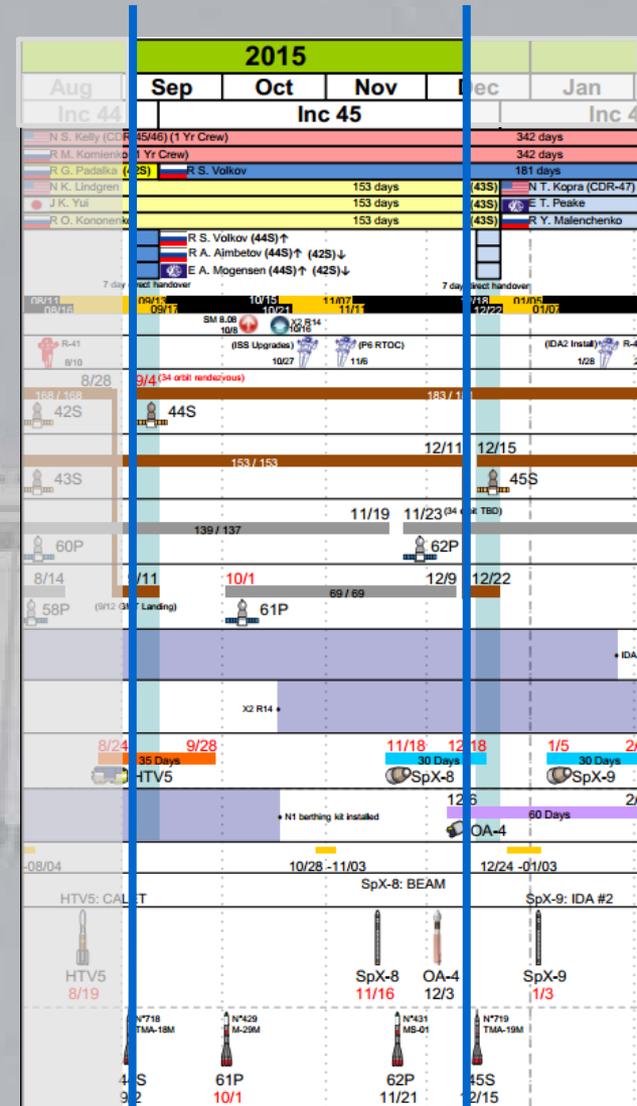
Kjell Lindgren  
FE (U) – 43S



# Increment 45 Overview: Major Stage Objectives (Based on Final OOS Assumptions)



- Increment 45:
  - Stage 45-6: 42S Undock to 45S Dock: 94 days
  - Stage 45-9: 45S Dock to 43S Undock: 8 days
  - EVAs
    - ISS Upgrades – October 28
    - P6 Return to Original Config – Nov 6
  - Cargo vehicles:
    - 61P Dock to SM Aft (10/1)
    - HTV-5 Unberth/Release (9/28)
    - SpX-8 (1/3 – U/R)
    - 60P Undock from DC1 (11/19)
    - 62P Dock to DC1 (11/21 U/R)
    - OA-4 Capture/Berth (12/6)
  - Science/Utilization:
    - Fluid Shifts FD150
    - RRM Phase II
  - Software
    - SM 8.08 (10/8) – successfully completed
    - X2R14 (10/16-10/21) – successfully completed
  - Stowage Ops
    - HTV left completely full
  - Maintenance/Outfitting
    - N1 Nadir Prep for USOS Cargo VV Berthing
    - NORS AIK Install in airlock





# ISS Reconfiguration Status



- Goal : Establish 2 docking ports and 2 berthing ports on ISS USOS to support crew and cargo vehicles
- Initial configuration : Berthing ports at Node 2 nadir, Node 2 zenith  
PMA 2 on Node 2 forward, PMA 3 on Node 3 port
- Final configuration : Berthing ports at Node 2 nadir, Node 1 nadir  
Docking ports at Node 2 forward (PMA 2 / IDA 2), Node 2 Zenith (PMA 3 / IDA 3)
- Move PMM from Node 1 nadir to Node 3 forward (*completed*)
- Configure Node 1 nadir to support berthing (*completed*)
- Move PMA-3 from Node 3 port to Node 2 zenith (*required EVA deferred with loss of IDA 1*)
- ~~Install IDA 1 on PMA 2 (Node 2 forward) – SpaceX-7 (IDA 1 lost)~~
- Install IDA 2 on PMA 2 (Node 2 forward) – SpaceX-9
- Install IDA 3 on PMA 3 (Node 2 zenith) – SpaceX-14 (*new IDA 3*)
- Install C2V2 antenna system on truss elements P3 and S3 (*completed*)
- Configure Node 3 aft to support BEAM (*completed*)
- Move ARED configuration in Node 3 (*completed*)

**ISS ready to receive IDA 2, EVA Oct 28 to route cables in support of PMA-3 relocate  
Node 1 nadir and Node 2 nadir ready to receive CRS vehicles**



# Increment 44/45 Overview: EVAs



No Time Critical Nature

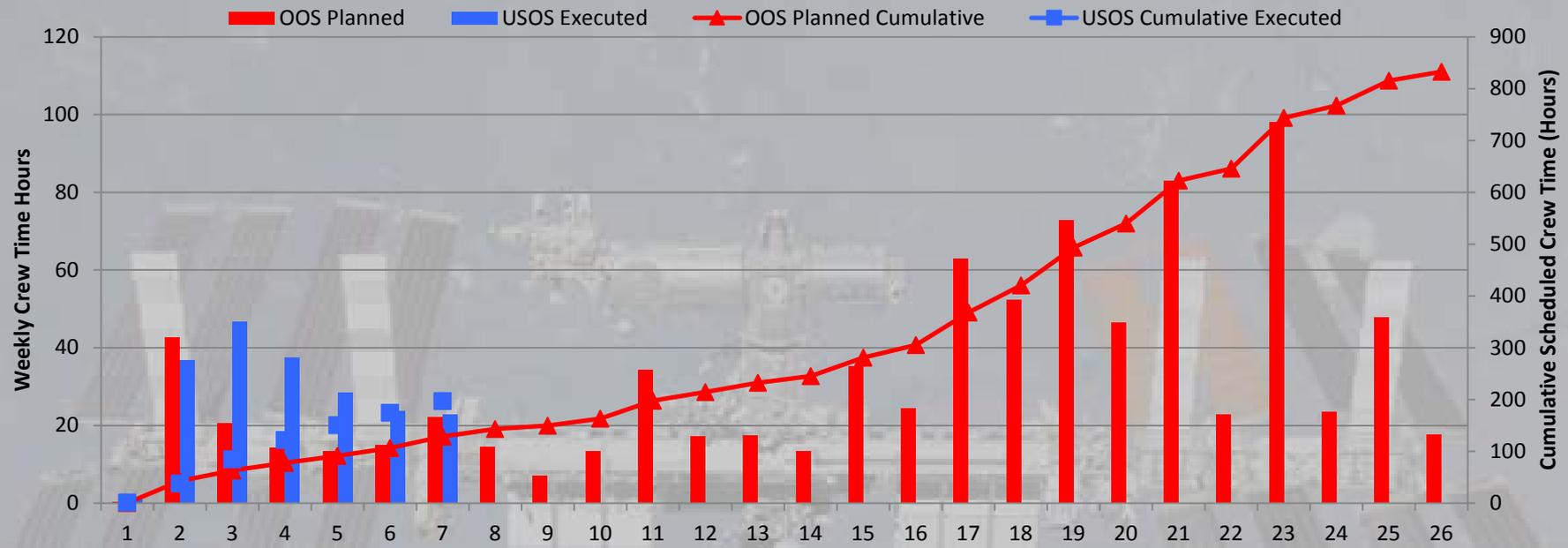
No Road to Items  
(Thomason, Wray)



- Needed for IDA2
- Needed for PMM Relocate
- Needed for IDA3
- Needed for PMA3 Relocate
- ROBO MNVRs
- Get Aheads
- ISS Upgrades
- P6 Reconfig/ TTCR Stow
- LEE Lube
- AMS MLI



# Inc 45 - 46 Utilization Crew Time



Color Key:  
 Completed  
 Final OOS  
 FPIP Plan

**6-Crew Increment 45** (Sep - Oct)

- HTV5 Unberth 9/28/15
- US EVA (ISS Upgrades) 10/28/15
- US EVA

**9** (Nov - Dec)

- OA-4 Berth 12/6/15, Unberth 2/4/16, Unberth 1/25/16
- Soyuz relo 12/11/15

**6-Crew Increment 46** (Jan - Mar)

- SpX-8 Berth 01/3/16, Berth 1/5/16, Unberth 02/1/16, Unberth 02/4/16
- USOS (IDA3 cables)
- SpX-9 and SpX-10 were not planned in the Final OOS.

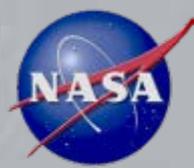
Executed through Increment Wk (WLP Week) 7 = 5.6 of 23.6 work weeks (23.73% through the Increment)

USOS IDR Allocation: 826.0 hours (35 hrs/wk)  
 OOS USOS Planned Total: 832.91 hours  
 USOS Actuals: 197.42 hours  
 23.90% through IDR Allocation  
 23.70% through OOS Planned Total

Total USOS Average Per Work Week: 35.25 hours/work week  
 Voluntary Science Totals to Date: 0.00 hours (Not included in the above totals or graph)  
 RSA/NASA Joint Utilization to Date: 4.50 Hours (not included in the above totals or graph)



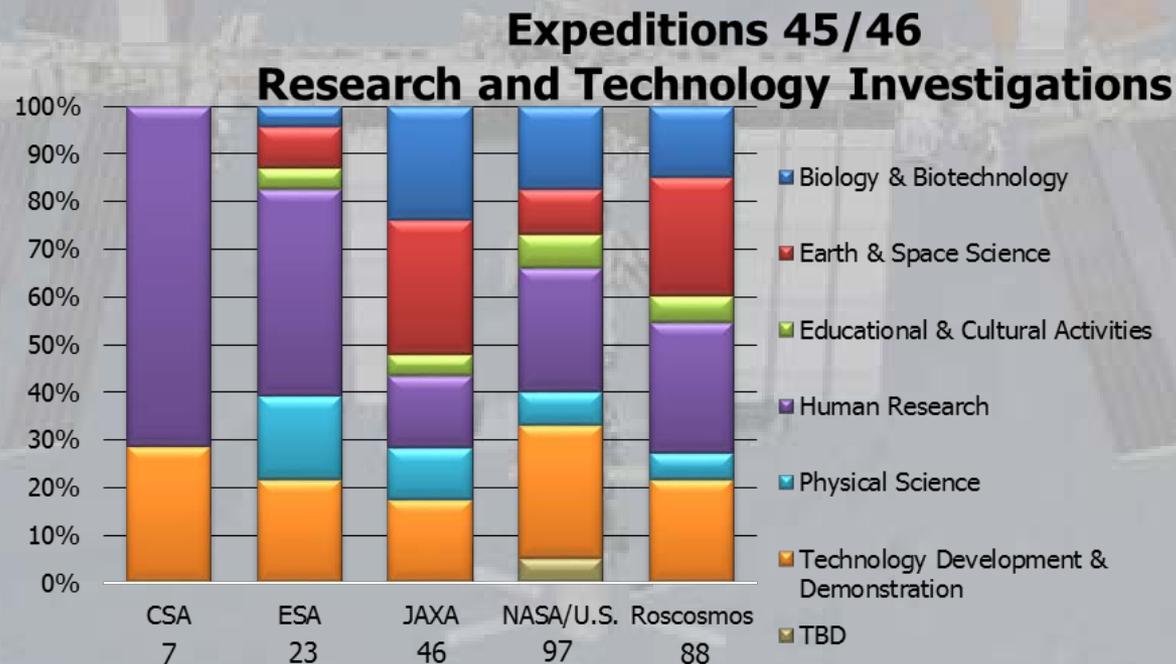
# ISS Research Statistics



## Number of Investigations for ISS Increments 45 & 46: 261

- 97 NASA/U.S.-led investigations
- 164 International-led investigations
- 49 New investigations
  - 3 CSA
  - 2 ESA
  - 7 JAXA
  - 35 NASA/U.S.
  - 2 Roscosmos (*prelim*)
- Over 800 Investigators represented
- Over 1200 scientific results publications (Exp 0 – present)

Estimated Number of Investigations  
Expedition 0-46: 2053\*





# Increments 45 & 46 Research Complement Snapshot



Biology & Biotechnology	Technology Development		Human Research		Physical Science
<b>Animal Biology</b> Rodent Research-3-Eli Lilly Micro-10 Embryo Cellad Mouse Epigenetics Space Pup <b>Cellular Biology</b> Cell Science-01 Heart Cells OsteoOmics NanoRacks SyNRGE Stem Cells SPHEROIDS <b>Macromolecular Crystal Growth</b> CASIS PCG 4 CASIS PCG 5 NanoRacks PCG PCG Crystal Hotel Validation JAXA PCG JAXA PCG Demo <b>Microbiology</b> (RJR) Microbial Sampling Microbial Observatory-1 Microbial Observatory-2 BRIC-NP Microbe-IV Myco (for 1YM) <b>Plant Biology</b> APEX-04 Auxin Transport Plant Rotation	<b>Air, Water &amp; Surface Monitoring</b> Personal CO2 Monitor <b>Avionics &amp; Software</b> SNFM Telescience Resource Kit <b>Characterizing Expt Hardware</b> POP 3D ESA-Haptics-1 MVIS Controller-1 <b>Communication &amp; Navigation</b> Maritime Awareness OPALS (Ext) SCAN Testbed (Ext) Vessel ID System (Ext) 3D VIT <b>Food &amp; Clothing Systems</b> Skinsuit <b>Imaging Technology</b> 3DA1 Camcorder HDEV (Ext) ExHAM-Array Mark (Ext) <b>Life Support Systems</b> UBNT (RJR) UPA LDST <b>TBD</b> NanoRacks MicroSat - K NanoRacks-Gumstix	<b>Repair/Fabrication Technologies</b> 3D Printing in Zero-G <b>Robotics</b> Robonaut (RJR) RRM-P2 (Ext) <b>SUPVIS-E</b> <b>Small Satellites Technologies</b> NanoRacks MicroSat Deployer NanoRacks-MicroSat-SIMPL NRCSD#6 NRCSD#7 <b>Space Structures</b> BEAM (Ext) <b>Spacecraft &amp; Orbital Envrnmtnts</b> ISS External Leak Locator STP-H4 (Ext) STP-H5 APS (Ext) <b>Spacecraft Materials</b> MISSE-8 FSE ExHAM-CFRP Mirror (Ext) ExHAM-MDM2 (Ext) ExHAM-PEEK (Ext) ExHAM-Solar Sail (Ext) <b>Radiation &amp; Shielding</b> Radiation Environment Monitor Area PADLES PS-TEPC Radi-N2	<b>Bone &amp; Muscle Physiology</b> Bisphosphonates Hip QCT (P) Intervertebral Disc Damage (P) Sprint <b>CARTILAGE (P)</b> <b>EDOS-2</b> <b>MUSCLE BIOPSY (P)</b> <b>Marrow</b> <b>Tbone (P)</b> <b>Cardiovascular &amp; Respiratory Systems</b> Cardio Ox IPVI IPVI for 1YM (P) <b>AIRWAY MONITORING</b> <b>BP Reg</b> <b>Vascular Echo</b> 61P, SpX-8 <b>Crew Healthcare Systems</b> <b>Skin-B</b> <b>Habitability and Human Factors</b> <b>Body Measures</b> Fine Motor Skills <b>Habitability</b> <b>Human Behavior &amp; Performance</b> Cognition Journals Reaction Self Test Sleep ISS-12 Synergy (P) <b>Circadian Rhythms</b>	<b>Human Microbiome</b> Microbiome <b>Immune System</b> Salivary Markers Multi-Omics HTV5, SpX-9 <b>IMMUNO-2</b> <b>Integrated Physiology &amp; Nutrition</b> Biochem Profile Dose Tracker Field Test (P) <b>Functional Task Test (P)</b> Repository Telomeres Twins Study Biological Rhythms 48hrs Biological Rhythms 48hrs for 1YM <b>Energy</b> <b>Nervous &amp; Vestibular Systems</b> NeuroMapping V-C REFLEX (P) <b>Straight Ahead in Microgravity (P)</b> <b>Space Headaches</b> <b>Vision</b> Fluid Shifts Ocular Health <b>TBD</b> Interactions-2 Pilot-T	<b>Combustion Science</b> FLEX-2J BASS-M SpX-8 ACME SpX-9 (↑), SpX-10 (↑) <b>ATOMIZATION</b> Group Combustion HTV5, Orb-4 <b>Complex Fluids</b> ACE-H2 SpX-8 ACE-T1 SpX-9 LMM Biophysics 1 SpX-10 (↑) LMM Biophysics 3 SpX-10 (↑) (RJR) OASIS SpX-8 (↓) <b>PK-4</b> <b>Fluid Physics</b> ARTE (Thermal Exchange) SpX-9 PBRE SpX-8 ZBOT SpX-10 Microchannel Diffusion SpX-8 (↓) Dynamic Surf Marangoni-UVP Two-Phase Flow SpX-9 (↑) <b>Fundamental Physics</b> DOSIS-3D 45S <b>Materials Science</b> MSL 2b - NASA SCA SpX-9 (↑↓) NanoRacks-LECN Maquette SpX-8 Interfacial Energy 1 Orb-4 JAXA ELF HTV5, Orb-4 <b>EML Batch 1</b> <b>MSL Batch 2b</b> SpX-10

Earth & Space Science	
<b>Astrobiology &amp; Astrophysics</b>	
AMS-02 (Ext)	
Meteor	Orb-4
CALET (Ext)	HTV5 (↑)
MAXI (Ext)	
MCE (Ext)	HTV5 (↓)
<b>Earth Remote Sensing</b>	
CATS (Ext)	
HREP-RAIDS (Ext)	
ISS RapidScat	
SAGE III-ISS (Ext)	SpX-10 (↑)
SMILES (Ext)	HTV5 (↓)
<b>Heliophysics</b>	
Solar-SOLACES	
Solar-SOLSPEC	
<b>Near-Earth Space Environment</b>	
SEDA-AP (Ext)	

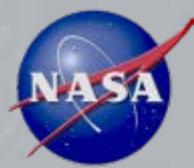
Education & Outreach	
<b>Commercial Demonstrations</b>	
JAXA-Commercial	HTV5
<b>Cultural Activities</b>	
NanoRacks Module-48	SpX-9 (↑↓)
<b>Educational Competitions</b>	
SPHERES-Zero-Robotics (RJR)	
NanoRacks Module-9	SpX-9 (↑↓), SpX-10 (↑↓)
<b>Educational Demonstrations</b>	
(RJR) Sally Ride EarthKAM	
ISS Ham Radio	
Story Time From Space Orb-4	
JAXA EPO	HTV5
Try Zero-G for Asia	
ESA-EPO-Peake	44S
<b>Student-Developed Investigations</b>	
Genes in Space-1	SpX-9 (↑↓)

TBD Category	
CASIS Dev 11	SpX-10
NanoRacks-SMiLE	SpX-9
Payload Card Multilab-X	SpX-9
Payload Card-X	SpX-10
<b>Content</b>	

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



# Total ISS Consumables Status



Consumable – based on current, ISS system status	T1: Current Capability		T2: Current Capability + 62P + OA-4	
	Date to Reserve Level	Date to zero supplies	Date to Reserve Level	Date to zero supplies
<b>Food – 100%</b>	February 09, 2016	April 02, 2016	May 28, 2016	July 15, 2016
<b>KTO</b>	February 07, 2016	March 31, 2016	June 26, 2016	August 10, 2016
<b>Filter Inserts</b>	October 28, 2016	December 19, 2016	December 19, 2016	> December 31, 2016
<b>Toilet (ACY) Inserts</b>	May 28, 2016	July 12, 2016	June 22, 2016	August 06, 2016
<b>EDV + TUBSS (UPA Operable)</b>	June 28, 2016	October 07, 2016	September 30, 2016	> December 31, 2016
<b>Pre-Treat Tank</b>	March 23, 2016	May 11, 2016	August 14, 2016	October 06, 2016
<b>Water (Nominal Usage)</b>	June 02, 2016	September 11, 2016	July 20, 2016	November 07, 2016
<b>Consumable - based on system failure</b>				
<b>EDV + TUBSS (UPA Failed)</b>	March 13, 2016	May 02, 2016	May 04, 2016	June 27, 2016
<b>Water, if no WPA (Ag &amp; Iodinated)</b>	March 05, 2016	May 23, 2016	April 12, 2016	June 24, 2016
<b>O<sub>2</sub> if Elektron supporting 3 crew &amp; no OGA</b>	November 28, 2015	March 31, 2016	December 26, 2015	May 21, 2016
<b>O<sub>2</sub> if neither Elektron or OGA</b>	November 09, 2015	January 02, 2016	November 09, 2015	January 20, 2016
<b>LiOH (CDRAs and Vozdukh off)</b>	~0 Days	~14 Days	~0 Days	~14 Days



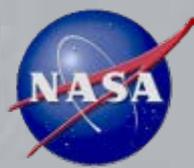
# USOS Consumables Status



Consumable – based on current, ISS system status	U1: Current Capability		U2: Current Capability + 62P + OA-4	
	Date to Reserve Level	Date to zero supplies	Date to Reserve Level	Date to zero supplies
<b>Food – 100%</b>	February 23, 2016	April 13, 2016	June 16, 2016	August 06, 2016
<b>KTO</b>	March 09, 2016	April 26, 2016	August 28, 2016	October 17, 2016
<b>Filter Inserts</b>	> December 31, 2016	> December 31, 2016	> December 31, 2016	> December 31, 2016
<b>Toilet (ACY) Inserts</b>	November 30, 2016	> December 31, 2016	November 30, 2016	> December 31, 2016
<b>EDV + TUBSS (UPA Operable)</b>	December 13, 2015	June 29, 2016	February 16, 2016	September 08, 2016
<b>Pre-Treat Tanks</b>	April 19, 2016	June 14, 2016	November 05, 2016	December 26, 2016
<b>Water (Nominal Usage)</b>	November 08, 2016	> December 31, 2016	November 08, 2016	> December 31, 2016
<b>Consumable - based on system failure</b>				
<b>EDV + TUBSS (UPA Failed)</b>	November 06, 2015	December 28, 2015	November 06, 2015	January 18, 2016
<b>Water, if no WPA (Ag &amp; Iodinated)</b>	December 23, 2015	February 16, 2016	December 23, 2015	February 16, 2016
<b>O<sub>2</sub> if neither Elektron or OGA</b>	November 11, 2015	January 15, 2016	November 11, 2015	January 30, 2016
<b>LiOH (CDRAs and Vozdukh off)</b>	~0 Days	~13.3 Days	~0 Days	~13.3 Days



# New Pertinent ISS Vehicle Issues



Issue	Impact to Stage Ops	Rationale
SSRMS LEE B Safing Event	No	<p>During HTV-5 release on GMT 271 (9/28/2015) the SSRMS LEE B experienced a safing event at the beginning of the Auto Release (start of derigidization). This resulted in a 1 orbit delay to HTV departure</p> <ul style="list-style-type: none"><li>• Second attempt was successful.</li><li>• Following HTV release, LEE-B completed a nominal grapple at MBS PDGF-1</li><li>• High Speed Data of the safing event was gathered and is currently under review by CSA</li><li>• Leading theory is that the LEE carriage experienced an over speed condition while trying to overcome initial tension</li><li>• LEE-B will be lubed in upcoming US EVAs</li></ul>
MELFI-2	No	<p>On GMT 250 (9/7/15), MELFI-2 (JEM) lost health and status with corresponding decrease in power draw and decrease in LTL out temp (in family with loss of Brayton motor)</p> <ul style="list-style-type: none"><li>• Science samples were relocated to MELFI-1 (Lab)</li><li>• Troubleshooting isolated failed ORU to the Rack Interface Unit (RIU)</li><li>• 1 RIU was replaces. Nominal ops returned</li></ul>



# Pertinent ISS Vehicle Issues



TOC Status	Yes	<p>The Total Organic Carbon (TOC) Status:</p> <ul style="list-style-type: none"><li>• High TOC indicates that the WPA MF Beds are saturated</li><li>• The R&amp;R of Ion Exchange Bed, Multifiltration Beds, and External Filter Assembly completed on Oct 2</li><li>• TOC readings now under detectable limits</li></ul> <p>TOC Readings</p> <ul style="list-style-type: none"><li>• July 15 – 2379 µg/L</li><li>• Aug 19 – 446 µg/L</li><li>• Sep 15 – 1943 µg/L</li></ul>
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# Pertinent ISS Vehicle Issues (cont)



Issue	Impact to Stage Ops	Rationale
Node 3 CDRA Status	No	<p>Node 3 CDRA blower air leak</p> <ul style="list-style-type: none"><li>• Post the N3 CDRA blower R&amp;R (5/14/15) a leak was identified through troubleshooting at the V-Band Clamp (blower connection)</li><li>• The leak does impact to CO2 removal or Sabatier Operations</li><li>• N3 CDRA has no constraints to operate and is currently operational</li></ul>
Lab CDRA RPC Trip (LAD62B-A, RPC 12)	Yes	<p>RPCM LAD62B-A, RPC 12, provides power to the Lab CDRA selector valves, continued true overcurrent trips affects power to valves</p> <ul style="list-style-type: none"><li>• RPCM replaced on GMT 205 (7/24/15)</li><li>• First RPC trip occurrence on new RPCM on GMT 235 (8/23/15)</li><li>• Second RPC trip event on GMT 273 (9/30/15)</li><li>• Good ABIT following trip and re-closure of RPC</li><li>• Troubleshooting cable to be developed and flown</li></ul>



# Pertinent ISS Vehicle Issues (cont)



Issue	Impact to Stage Ops	Rationale
SPDM Arm 2 joint position issue	Yes	<p>On GMT 281 (10/8/15), during Special Purpose Dexterous Manipulator (SPDM) Arm 2 power up, the shoulder yaw measured 0.0 degrees when the last known position was +3.9 degrees.</p> <ul style="list-style-type: none"><li>• Robotics Refueling Mission (RRM) operations were completed with Arm 1, Multi-Function Tool was stowed with joint unpowered and brakes applied.</li><li>• A quick turnaround diagnostic patch was uplinked on Wed 10/14/15 to gather additional data on SPDM Arm 2. Preliminary investigation indicated issue with Joint Electronics Unit ability to read motor/joint resolver data.</li><li>• SPDM Arm 2 ok for unloaded operations using Degraded Joint Ops.</li><li>• Contact ops require analysis to verify no break slippage or joint loads violations.</li><li>• Next MART scheduled for 11/5/2015.</li><li>• Next potential SPDM Operation is the RPCM P12B_A R&amp;R in early December.</li></ul>



# HTV5 Mission Status



## ➤ Mission Planning

- Stage Operations Readiness Review (SORR) completed on 7/27/15
- Successful launch on 8/19/15 and berthing on 8/24/15
- No major issues tracked during mission
- Successful departure on 9/28/15

## ➤ Cargo

- Pressurized cargo included Node 1 galley rack, MSPR-2 (JAXA rack), 30 Contingency Water Container – Iodine (CWC-I), and additional soft-stow cargo
- MPSR 2 was removed from HTV and installed in JEM in Aug
- Late load shipments #1 and #2 arrives at TNSC on 7/27/15 and 7/30/15 (NASA 992)
- Outstanding coordination post SpaceX-7 failure to adjust and add capability (MPSR front rack)
- Late load #1 and #2 completed on 8/13/15
- Vehicle launched ~ 8000 lbs pressurized, 1450 lbs external
- Trash Removed : 4,350 pounds

## ➤ External Cargo

- CALorimetric Electron Telescope (CALET) which will investigate the high energy universe was removed from the HTV5 Exposed Pallet (EP) and installed to ISS
- MCE, SMILES and STP-H4 experiments were installed on EP for disposal; EP was returned to HTV5 on 9/15/15



HTV5 berthed on 8/24/15



# OA-4 (Orb-4) Mission Status



## ➤ Mission Planning

- Orbital has contracted with United Launch Alliance (ULA) for an Atlas V launch of Cygnus
- First use of Atlas V401 with the Cygnus spacecraft
- Cargo Integration Review (CIR) was conducted on 7/29/15
- Safety Review Panel (SRP) TIMs on 8/5/15 and 9/15/15
- Chief Engineer Readiness Review was completed on 9/1/15
- SRP Phase 3 is planned for completion on 10/13/15

## ➤ Pressurized Cargo complement

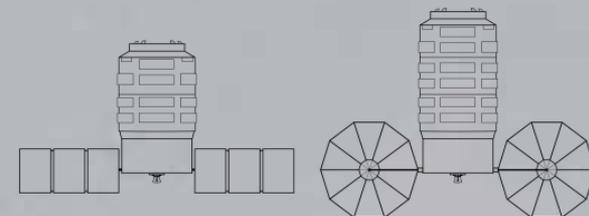
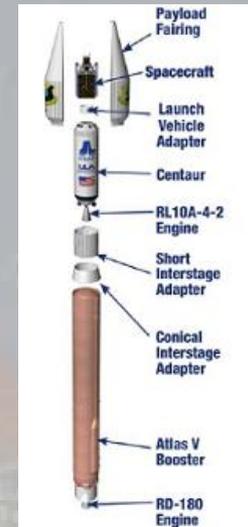
- NASA delivered ISS cargo manifest in June
- Planned Upmass : 7,730 pounds

## ➤ Cygnus Status

- First enhanced Cygnus with a longer Pressurized Cargo Module (PCM) and lightweight solar arrays
- Service Module (SM) will accommodate changes to the TriDAR/LIDAR configuration
- PCM completed FE1410 testing at the Cape on 8/20/15
- SM completed Final Integrated Systems Test (FIST) and scheduled to arrive at the Cape on 10/15/15
- Initial cargo arrival is planned for 10/16/15

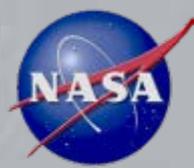
## ➤ Atlas V 401

- Payload Adapter has been manufactured and is ready for integration
- Booster ship to CCAFS is planned for 10/30/15





# OA-6 (Orb-5) Mission Status



## ➤ **Mission Planning**

- ULA/Orbital ATK customer kickoff meeting was held on 8/21/15
- Ground Operations Readiness Review (GORR) is planned for mid Oct
- Cargo Integration Review (CIR) is planned for Nov

## ➤ **Pressurized Cargo complement**

- Final ISS cargo manifest planned for delivery in Oct to support CIR
- Spacecraft Fire Experiment (Saffire) #1 payload will be integrated into Cygnus
- Planned Upmass : 7,730 pounds

## ➤ **Cygnus Status**

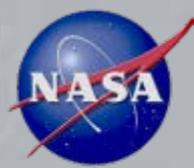
- Schedule rework is in progress to support an Service Module (SM) flight on an Atlas launch vehicle
- SM has been in storage and will undergo Return to Flight (RTF) regression testing in Dec after TAS-E radio delivery
- Pressurized Cargo Module (PCM) is planned for delivery to KSC in Jan 2016

## ➤ **Atlas V 401**

- Payload Adapter planned for manufacturing



# OA-5 (Orb-6) Mission Status



## ➤ **Mission Planning**

- First enhanced Cygnus on the upgraded Antares Launch Vehicle launched from WFF Pad 0A

## ➤ **Pressurized Cargo complement**

- ISS cargo manifest planned in support of Cargo Integration Review (CIR)
- Spacecraft Fire Experiment (Saffire) #2 payload will be integrated into Cygnus
- Planned Upmass : 7,050 Pounds

## ➤ **Cygnus Status**

- Service Module (SM) in storage having completed integrated testing
- SM plan for post-storage testing is approximately 3 months before launch

## ➤ **Antares Status**

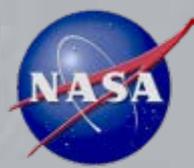
- Hardware Acceptance Review (HAR) for the RD-181 engines was conducted from 7/7/15 – 7/9/15 with delivery to WFF on 7/20/15
- Antares 230 Stage 1 Core delta Critical Design Review (CDR) was conducted from 7/15/15 – 7/17/15
- WFF range/FAA Antares 230 status briefing was conducted on 7/23/15
- Engines 2A and 3A were attached to the Stage Test Article (STA) for fit check
- RD-181 Certification Test Review was conducted from 9/2/15 – 9/4/15
- Core is at WFF; modifications to support Antares 230 configuration are nearly complete
- Engines are being prepared for hot fire test

## ➤ **Launch Pad Status**

- Pad 0A rebuild completion and re-certification planed for Oct.



# SpaceX-8 Mission Status



## ➤ Mission Planning

- Cargo Integration Review (CIR) Part 1 completed on 5/28/15 with Part 2 planned for Oct
- Safety Review Panel (SRP) Phase 3 review is planned to be complete by 10/7/15
- Post Qualification Review (PQR) is planned for Nov
- Stage Operations Readiness Review (SORR) is planned for Dec

## ➤ Pressurized Cargo

- 1 Animal Enclosure Module-Transporter (AEM-T), 3 Polars (2 powered), and a NORS O2 Tank
- Planned Upmass : 3,810 pounds. Planned Return : 4,100 pounds

## ➤ External Cargo

- Bigelow Expandable Activity Module (BEAM) arrived at KSC on 7/23/15 and is dwelling in the SSPF until SpX is ready to integrate

## ➤ Dragon Status

- Capsule and trunk stacking for integrated checkouts at Hawthorne was completed on 7/27/15
- Final hatch blowdown and Acceptance Test Procedure (ATP) was completed on 8/25/15
- Vehicle in the Loop (VITL) and polarity testing was completed on 8/31/15
- Trunk and capsule are planned to be shipped by 10/9/15

## ➤ Falcon 9 Status

- SpX-8 will be first CRS Falcon flight with full thrust capability (2<sup>nd</sup> or 3<sup>rd</sup> Falcon flight with full thrust)
- Interstage in final assembly preparing for Stage 1 mate
- M1D qualification completion is planned for Oct with MVac qualification planned for Nov
- Stage 1 and 2 are planned to ship to TX by Nov for ATP



# SpaceX-9 Mission Status



## ➤ Mission Planning

- Cargo Integration Review (CIR) is planned for L-4 mo., Dec. 2015

## ➤ Pressurized Cargo

- 1 JAXA Rodent Module (first flight – including live mice return), 1 Bioculture, 3 Polar, Short Extravehicular Mobility Unit (SEMU), and 2 NORS Tanks
- Planned Upmass : 4,620 pounds Planned Return : 4,100 pounds

## ➤ External Cargo

- International Docking Adapter (IDA) #2

## ➤ Dragon Status

- Capsule pressure and service section integration mate was completed on 7/15/15
- All tank welds were completed in Sep
- Prop tank installation is currently underway
- Capsule and trunk stacking at Hawthorne for integrated checkouts is planned for 11/3/15

## ➤ Falcon 9 Status

- Engine Octaweb currently in final assembly
- Production for other elements is planned to begin in Oct; engines to begin production and ATP in Oct



# 62P Progress-MS



- 62P is the first Progress MS vehicle
  - A number of updates to the Progress included in this version of the vehicle
    - MMOD shielding modified on the Orbital compartment (matches Soyuz vehicle updates)
    - Utilizes Kurs-NA rendezvous system instead of Kurs-A
    - GLONASS/GPS satellite navigation system added and previous orbital navigation hardware
    - Kvant radio replaced with S-band satellite communication system
- First Progress flight on Soyuz 2.1A booster since 59P accident
  - Russian specialists conducted coupled loads analysis with the Progress updates and the Soyuz 2.1A Booster
  - NASA has requested Russian specialist to present special topic from this analysis at upcoming reviews
  - NASA has requested a special topic on this at the Vehicle Assessment Review, SORR and FRR.
- Next Steps
  - 62P Vehicle Assessment Review – 10-15-15
  - 62P SORR – under review
  - 62P FRR – under review