

# **ISS COMMERCIAL RESUPPLY SERVICES STATUS UPDATE**



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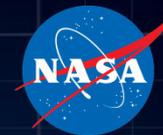
- **ISS Integration for Commercial Vehicles**
- **Orbital Status**
- **Space-X Status**
- **Consumables Forecast**
- **Flight Program Overview**
- **Summary**

# ISS Integration for Commercial Vehicles



- ISS integration of the commercial visiting vehicles ensures that visiting vehicles meet the required level of safety.
- ISS integration is performed by NASA:
  - Providing key safety related requirements to the visiting vehicle;
  - Evaluating the commercial providers compliance to the requirements through their design and production phases,
  - Evaluating final compliance to the requirements through final verification closures and safety assessment processes,
  - Conducting joint testing of key hardware and software interfaces,
  - Performing independent and integrated analysis of the visiting vehicle and the ISS.
  - Ensuring that there is a sound mission profile and overall joint operations plan.
- The key requirements document is SSP 50808 “ISS to Commercial Orbital Transportation (COTS) Interface Requirements Document (IRD)”
- The requirements are based on maintaining within the Approach Ellipsoid (4km x 2km x 2km with long axis aligned with V-Bar) around the ISS, a safety standard of:
  - Two fault tolerance to catastrophic hazards.
  - One fault tolerance to critical hazards.
  - FAA and Range Safety insure safety of the general public
- Mission Success is left to the visiting vehicle developers

# Orbital Demo ISS Integration Status



## Safety

### **Completed:**

- 32 Hazard Reports are being tracked.
- All Hazard Reports for Phase II have been approved.
- Phase III Hazard Report submittals are starting.

### **Upcoming:**

- Phase III SRP scheduled for October-November
- Integrated Hazard Report Phase III in November

## Mission Planning and Integration

### **Completed:**

- Expedition 30 Crew & MCC training.
- Multiple PROX TIMs
- Horizontal Integration Facility Construction complete

### **Upcoming:**

- FOR (Flight Operations Review) will be held in mid September.
- Launch Pad turnover for testing will occur at the end of Oct.
- Robotics Crew trials are schedule in October-November

## Software Integration

### **Completed:**

- Avionics Joint Tests 1&2 for checking communication interfaces completed

### **Upcoming:**

- Cygnus software Formal Qualifications Testing (FQT) scheduled in mid August.
- Avionics Joint Test 3 (Hardware Interface Checkout) scheduled in August will use the flight article interface to check workmanship.
- Avionics Joint Test 4/Stage Test (ISS + Cygnus SM) and Joint Test 5/End-to-End test (ISS + Cygnus SM + MCC-H + MCC-D + SSIPC-JAXA) in September-October at the Software Development and Integration Lab (SDIL).

## Physical Integration

### **Completed:**

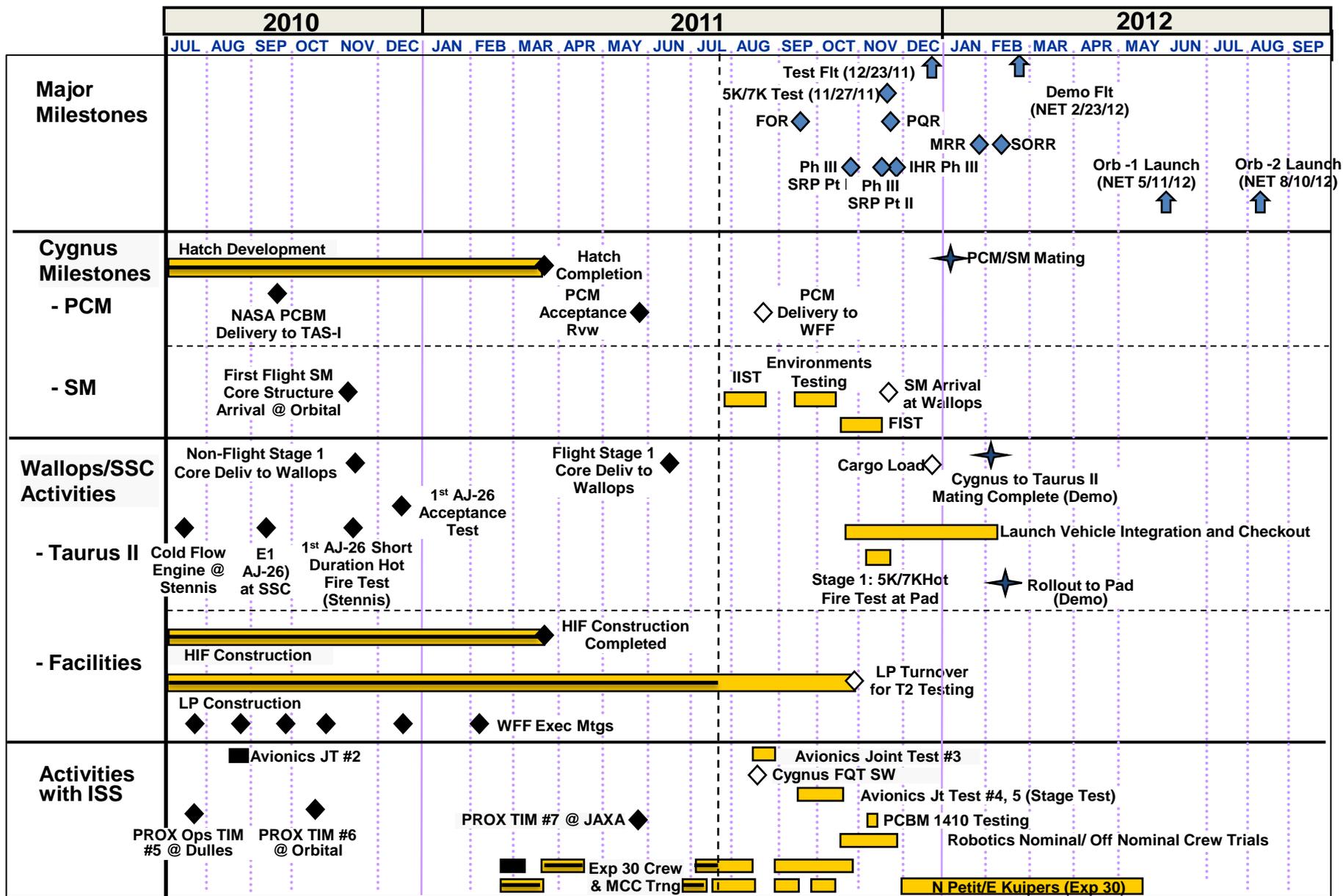
- Open Panel functional performance testing of Cygnus SM
- First flight SM Core Structure at Orbital
- NASA PCBM delivery to Alenia for integration with the Pressurized Cargo Module (PCM)
- PCM Acceptance Review

### **Upcoming:**

- Initial Integrated Systems (IIST) Test early August.
- PCM Delivery to WFF schedule for late August.
- Stage 5K/7K Hot Fire Test at Pad in November.
- Test Flight scheduled for December.
- PCM/Service Module (SM) Mating will occur in January at Wallops.
- Orbital Demo Launch – 02/23/12

# Orbital ISS Integration Schedule for Demo Flight

July 2011



# Orbital Status – Demo Cargo, Orb-1 and Orb-2



## Demo

- **Cargo**
  - Demo pressurized cargo manifest – 704 kg (allocation)

## Orb-1

- **Launch**
  - NET: 5/11/12
- **Cargo**
  - Plan for full pressurized cargo complement on Orb-1
- **Completed Milestones**
  - Authority To Proceed
  - Long Lead Order Placement
  - Vehicle Baseline Review
  - Mission Integration Review
  - Service Module Propulsion Sys Manufacturing Readiness Review
  - Completed flight structure
  - Completed avionics cards
- **Near Term Milestones**
  - Open Panel testing beginning in August for Orb-1
  - IIST (Initial Integrated Systems Test) scheduled to start in October

## Orb-2

- **Launch**
  - NET: 8/10/12
- **Cargo**
  - Plan for full pressurized cargo complement

### Completed Milestones

- Authority To Proceed
- Long Lead Order Placement
- Vehicle Baseline Review
- New radio passed CDR.
- New LIDAR systems procured.

### Near Term Milestones

- Mission Integration Review scheduled for mid August
- Preliminary Cargo Manifest delivery scheduled in September
- Open Panel testing is planned to start in November for Orb-2

# Orbital Hardware



**Taurus II Items in WFF HIF**



**PCM-0 (Demo Mission)**



# SpaceX Demo ISS Integration Status



## Safety

### **Completed:**

- 24 Hazard Reports are being tracked.
- All Hazard Reports for Phase II have been approved except 2.
- 3 Phase III Hazard Reports have been approved.

### **Upcoming:**

- Phase III scheduled in August.
- All Phase III Hazard Reports should be approved by late Sept.
- Boeing Integrated Hazard Report approval scheduled in October.

## Mission Planning and Integration

### **Completed:**

- Completed Demo mission departure simulation.
- Submitted UHF and S-Band National Telecommunication and Information Administration (NTIA) applications.
- Mission manifest was delivered to SpaceX.
- Three mission operations simulations - Joint Integrated Sims (JIS).

### **Upcoming:**

- Verification events for Post Qualification Review (PQR) scheduled to complete in August.
- The Flight Operations Review (FOR) starts August 1.
- Robotics crew trials begin in October.
- PQR is planned in September.

## Software Integration

### **Completed:**

- Dragon software development and testing near completion.

### **Upcoming:**

- Dragon Stage Formal Test will occur in September at SDIL. (Dragon + ISS)
- Dragon End-to-End test begins in September. (ISS + Dragon + MCC-H + MCC-X)

## Physical Integration

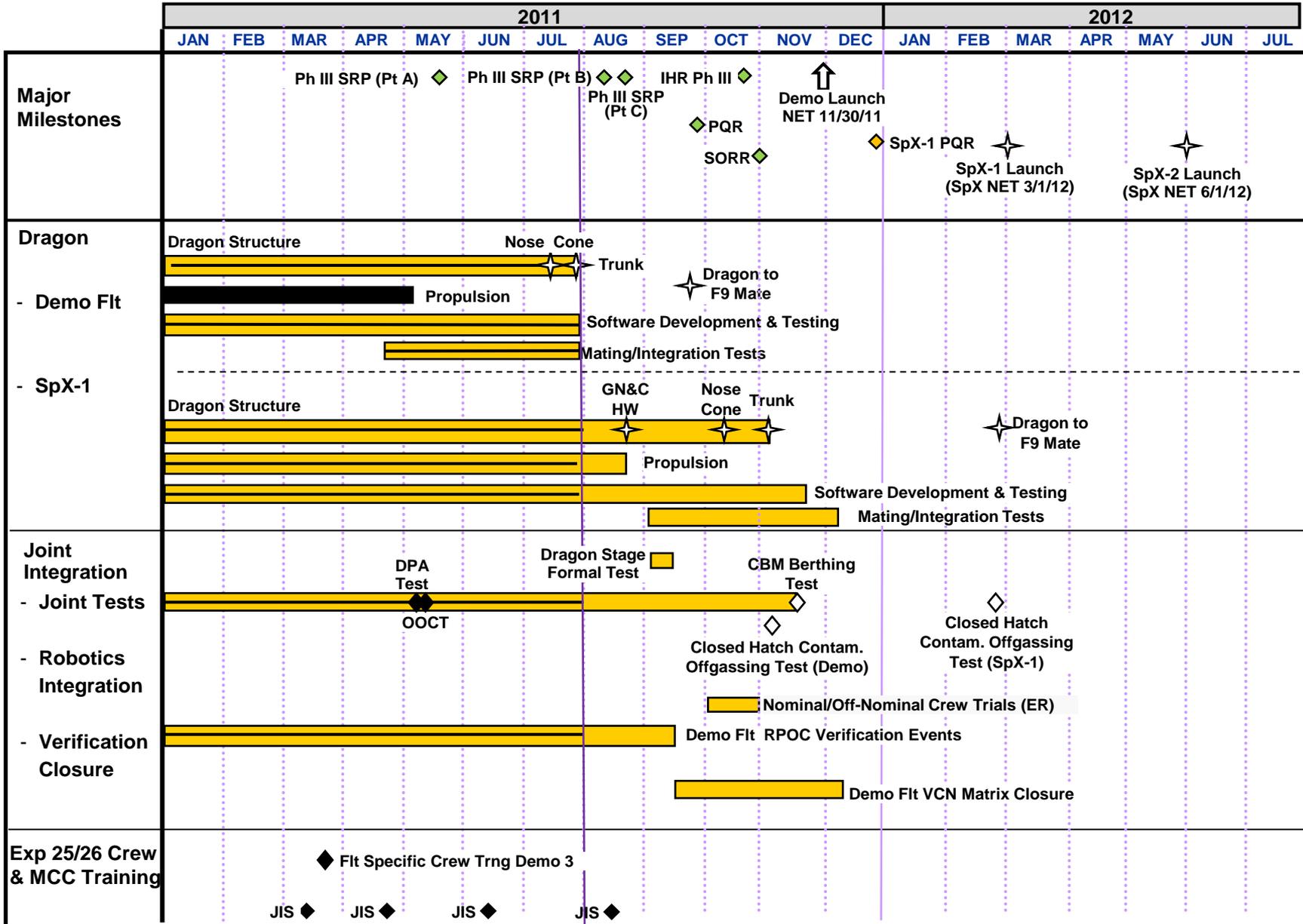
### **Completed:**

- Digital Pre-Assembly test was completed in May.
- ON-Orbit Constraints Test was completed in May.
- Utilities Mate/Fit check complete
- Power tests are complete.
- 1410 PCBM/ACBM testing is complete – fit check/leak test.

### **Upcoming:**

- Final integration for TVac test scheduled to complete beginning of August
- TVac testing is schedule to start mid August
- SpaceX Demo Launch – 11/30/11

# SpaceX ISS Integration Schedule for Flight Demo



# SpaceX Status – Demo cargo and SpX-1



## Demo

- **Cargo**
  - Pressurized only
  - Demo cargo manifest – 704 kg (allocation)

## SpX-1

- **Launch**
  - SpX-1 NET: 3/1/12
- **Cargo**
  - Current SpX -1 preliminary pressurized cargo manifest – 1268 kg (allocation)
- **Completed Milestones**
  - Authority to Proceed
  - Vehicle Baseline Review
  - Mission Integration Review
  - SpX -1 MRAD (Mission Requirements and Allocations Document) delivery
  - Updated pressurized cargo complement defined in July
- **Near Term Milestones**
  - Grapple fixture shipping in August
  - SpX -1 Cargo Integration Review planned for October

Niobium Mvac skirt mated to the MVac engine



Composite skirt for SpX-1



Engine section populated with propellant lines for SpX-1 (top)

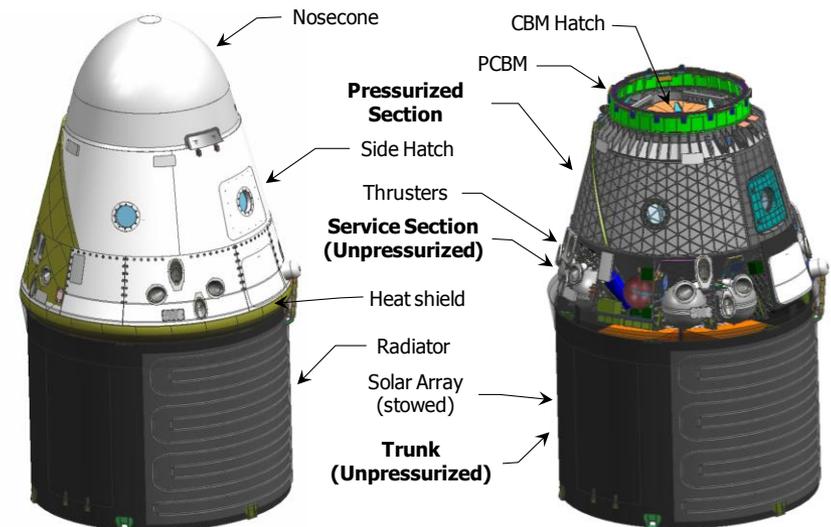
M9 engine #8 (bottom) for first stage



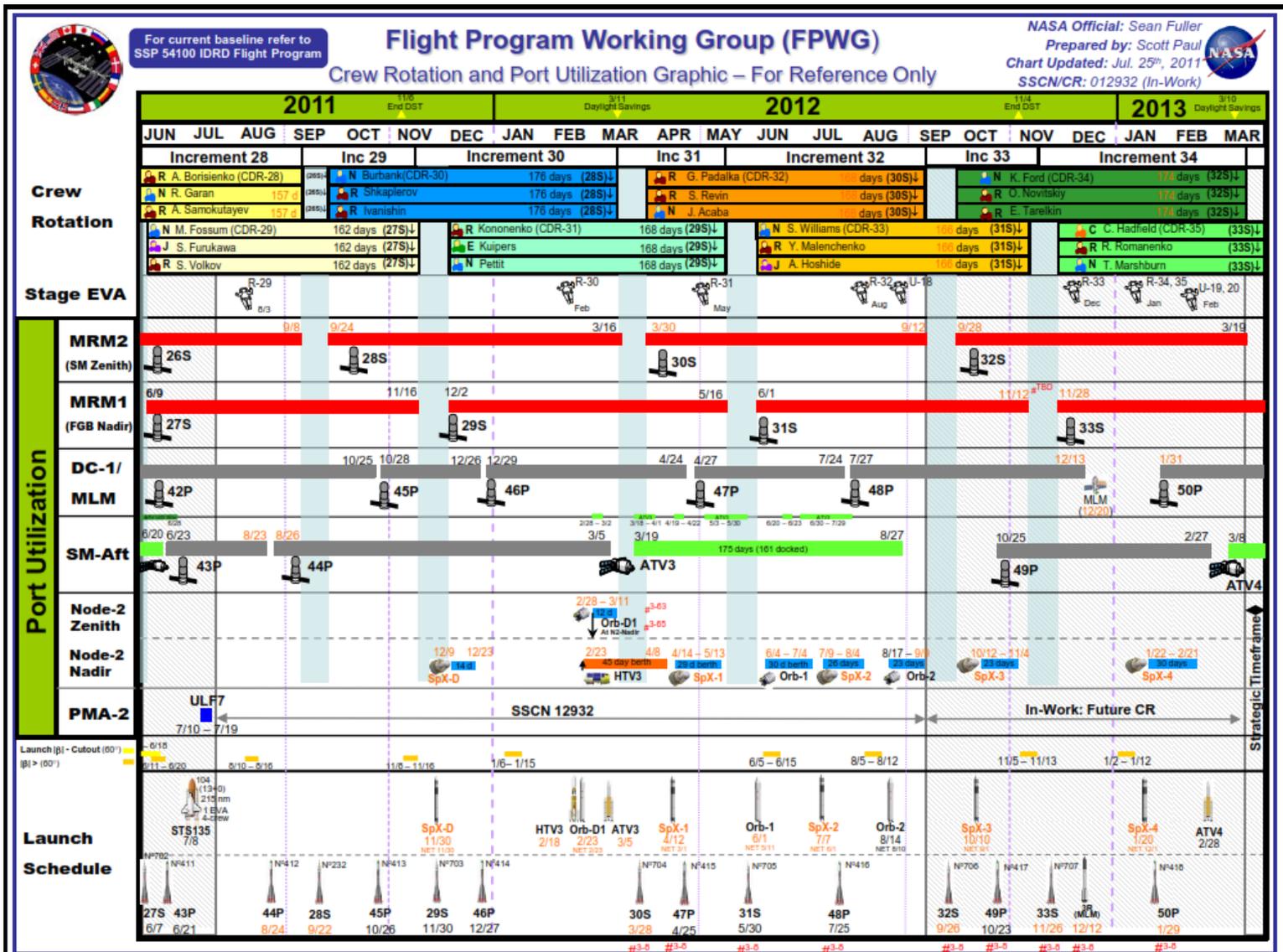
# SpaceX Status – SpX-2



- **Launch**
  - NET: 6/1/12
- **Cargo**
  - External cargo: 2 Grapple Bars/Bundle FSE to be installed to POA
  - Current preliminary pressurized cargo manifest – 1268 kg
  - Secondary Deployables - 4 PPODs/DOD small satellite (Cu-SAT)
- **Completed Milestones**
  - Authority To Proceed
  - Vehicle Baseline Review
  - Mission Integration Review
  - External Cargo Baseline
  - Phase II Safety Review – Ext Payload Review
  - Bundle Flight Support Equipment manufacture
  - Secondary Deployable Safety requirements was discussed in June with PSRP
  - External Integration Review/MRAD delivered in July
- **Near Term Milestones**
  - Crew training planned to start in November
  - Cargo Integration Review scheduled for December.



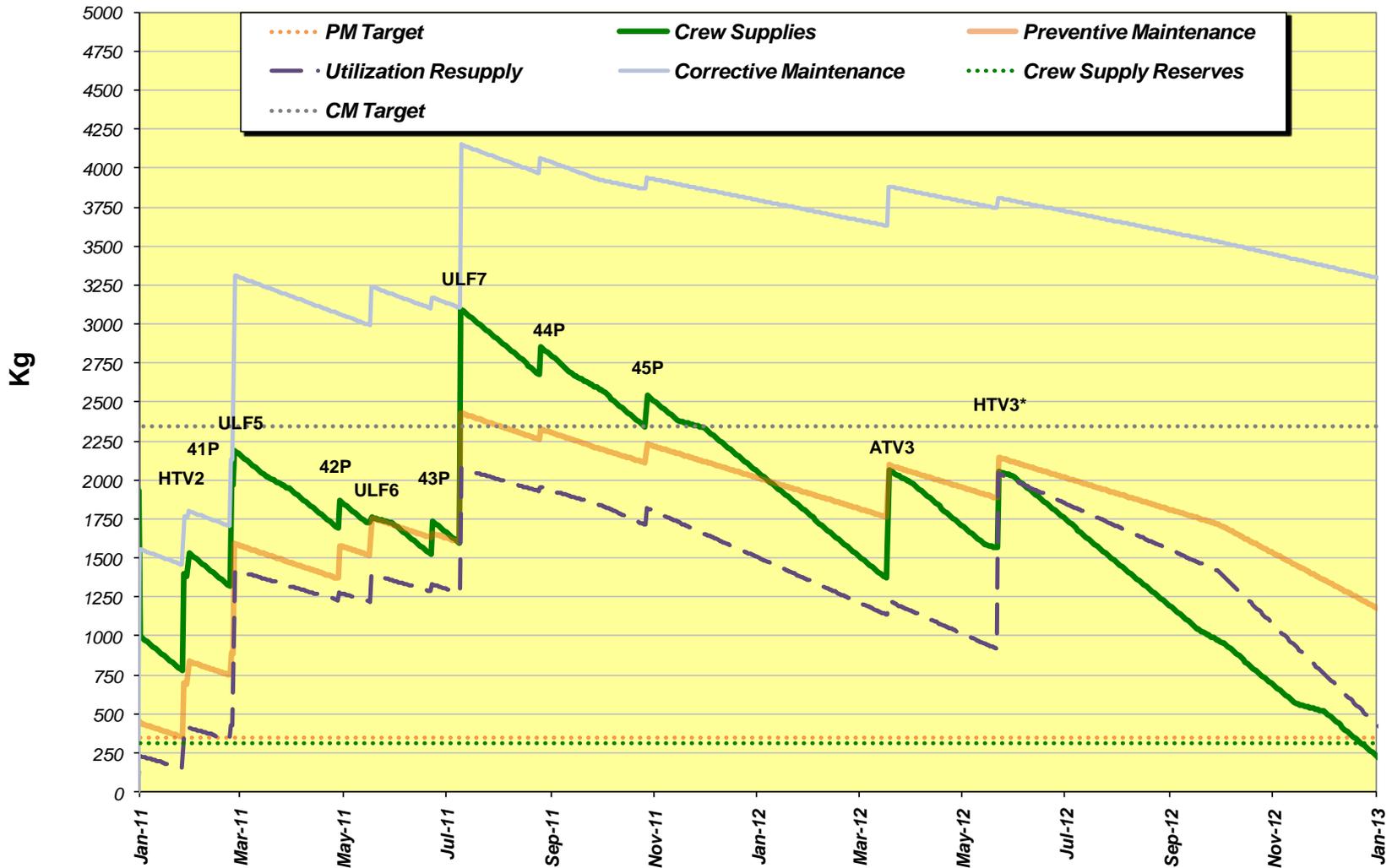
# Flight Program Overview



# ISS Consumables to 2013 (Assumes no CRS)



## 2011-2012 Pressurized Demand vs. Capability



\* Assumes 1100 kg of Utilization is available for HTV3



- ISS Integration for Demo Missions & Commercial Resupply Missions continues.
  - Two commercial providers are progressing in their development programs as expected
    - Expect existing schedules to move to the right.
  - STS-135 brought consumables sufficient to provide considerable margin
- Preparations for Commercial Crew
  - Clarifying, updating and revising CCT -1130 ISS Services Requirements Document based on Commercial partner inputs at industry day.
  - Incorporating requirements into SSP 50808 ISS Interface requirements Document to accommodate a crewed vehicle.
    - Updating document to define NASA Docking System interfaces and requirements along with common communications interfaces.
  - Defining ISS Integration activities to support commercial partners PDR and Mission Concept Reviews.
  - Holding Technical Interchange Meetings (TIMs) with commercial partners to discuss ISS requirements and docking interfaces