ISS Launch Schedule

February 17, 2015
Progress 58

March 27, 2015
Soyuz 42

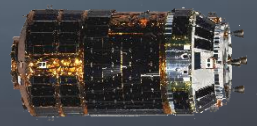
April 8, 2015
SpaceX CRS-6

April 8, 2015
Progress 59

June 13, 2015
SpaceX CRS-7

August 6, 2015
Progress 60

August 17, 2015
HTV-5, ISS Resupply



September 1, 2015
Soyuz 44

September 2, 2015
SpaceX CRS-8

October 15, 2015
Orb-4, ISS Resupply

October 22, 2015
Progress 61

September 1, 2015
Soyuz 45

December 5, 2015
SpaceX CRS-9

Manifesting and Scheduling- External

- Major Challenges
  - Demand for upmass exceeds current availability
    - All manifest requests subject to ISS Program Prioritization
    - Difficultly planning future missions when short-term allocation is unknown
    - Orbital ATK returning to flight will provide relief
  - Increased demand of JEM Airlock
    - Will take increased coordination between NanoRacks, JAXA, and NASA to maximize utilization
      - Various hardware requires different slide-table adaptors; up to 1 month to reconfigure airlock
  - Safety Requirements
    - Some requirements outdated/not clearly defined
      - Vibration testing

Manifesting and Scheduling- CubeSats

Generic CubeSat Developers Timeline	
Milestone	**Time from Launch (L+/-X Months)**
Contract Signing	L-11
Detailed Payload Info. Required	L-9
Phase 1 PSRP	L-8
Phase 2 PSRP	L-6
Flight Safety Verification Testing	L-3 to L-4
Phase 3 PSRP	L-2 to L-3
H/W Delivery to NanoRacks	L-1 to L-3
H/W Delivery to NASA	L-2
Launch	L-0
Deployment from ISS	L+1 to L+3

Lessons Learned

- Some COTS CubeSat components need to be altered to comply with ISS flight safety standards
  - 3 deployment switches
  - Battery Protection Circuits
- Early Coordination
  - PSRP needs significant time to review, particularly if hazards of payload are non-standard
    - Custom timelines for payloads with unique hazards (i.e., propulsion, biologicals, etc.)

Manifesting and Scheduling- Internal

- Major Challenges
  - Crew time
    - Availability of astronaut time to support experiments on orbit
  - Varying levels of technical capabilities
    - Helping all types of customers to get experiments to the ISS
  - Changing launch schedules
    - As well as predicting in advance who will be ready for what flight

Manifesting and Scheduling- Internal

Milestone	Time from Launch
Contract signing, experiment name and general payload information	L-8 months to NLT L-6.5 months
Submit initial manifest request	NLT L-6 months
Detailed information for Safety and Ops	NLT L-6 months
Phase 0/I/II SDP	L-5.5 months
Complete hardware testing	L-5.5 to L-4 months
Submit procedures inputs and payload requirements	L-5.5 to NLT 3.5 months
Phase III SDP submit	NLT L-3.5 months
Phase III Safety Review Close Out and Final Approval	L-2 months to L-2.5 weeks
Order labels	NLT L-3 months
Turn over to NR for final testing and prep	L-45 days to NLT L-32 hours
Turn over to NASA	L-30 days to NLT L-24 hours

Lessons Learned

- Early support for new customers
- Safety and ops involvement earlier in the timeline
- Understanding of crew time needs and use of streamlining strategies