



STS-135 / ULF7 MOD Flight Readiness Review

***JSC Mission Operations Directorate
Flight Director Office***

DA8/K. Alibaruho (STS Lead)

DA8/C. Edelen (ISS Lead)

DA8/R. Jones (Ascent)

DA8/T. Ceccacci (Entry)

DA8/E. Van Cise (Increment)

14 June 2011

Agenda



- **DA8 COFR Requirements/Endorsements**
 - COFR Requirements/Endorsements Summary
 - New Operations – A/E Topics, Shuttle, ISS, MCC
 - Safety Status Review
 - Flight Rules (Generic Volumes A, B, C, D, E; STS-135/ULF7 Annex)
 - FDF/ODF/SODF
 - Mission Staffing: Training/Certification/Work Guidelines Compliance
 - Non-Critical Processors/Applications (backup)
 - Emergency Mission Control Center (EMCC)/Backup Control Center (BCC) (backup)
 - Command Procedures (backup)
 - Contingency Shuttle Crew Support
 - Flight Techniques & Joint Operations Panels (backup)
 - Level II Actions/Shuttle IFAs
- **Standard Open Work (backup)**
- **Non-Standard Open Work**
- **Exceptions**
- **Items of Interest**
- **Flight Readiness Statement**



DA8 COFR Requirements/Endorsements



REQUIREMENT (SHUTTLE)	FD	PI	Safety	SPAN	SMG	Team 4
Non-Crit Processors/Applications	G				G	
EMCC	G				G	G
Certified Flight Controllers	G			G	G	G
Flight Rules	G					
FDF	G	G				
FTP - New Ops	G					
Flight Anomaly Resolution	G			G		
Anomaly - Procedure	G					
Exceptions/Action Items From Prior Readiness Reviews	G	G	G	G	G	G
CIL/Hazards	G		G			
No Constraints	G	G				
Level II (Program) Actions	G	G				
Mission Requirements	G					
Exception/Resolution	G	G				
Command Procedures	G					
Flt Prep Process Plan Requirements Met		G				
Contractor Process Insight		G				



Ready to Support Flight/Only Standard Open work



Non Standard Open work with expected resolution prior to flight.



Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.



N/A



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DA8 COFR Requirements/Endorsements



REQUIREMENT (STATION)	FD	PI	Safety	SPAN	Team 4
Non-Crit Processors/Applications	G				
BCC	G				G
Certified Flight Controllers	G			G	G
Flight Rules	G				
ODF/SODF	G	G			
JOP - New Ops	G				
Flight Anomaly Resolution	G			G	
Anomaly - Procedure	G				
Exceptions/Action Items From Prior Readiness Reviews	G	G	G	G	G
CIL/Hazards	G		G		
No Constraints	G	G			
Level II (Program) Actions	G	G			
Flight/Increment Planning (Mission Requirements)	G				
Exception/Resolution	G	G			
Command Procedures	G				
Contractor Process Insight		G			

G

Ready to Support Flight/Only Standard Open work

Y

Non Standard Open work with expected resolution prior to flight.

R

Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.



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Ascent/Entry Topics



Preliminary Launch Window Times for STS-135/ULF7

KSC Day Window Open	KSC Date	RNDZ Day	ET Photo Umbilical	ET Photo Handheld	Open (EDT)	Open (GMT)	In-Plane (GMT)	FD3 Close (GMT)	FD4 Close (GMT)
Friday	8-Jul	FD3/FD4	Daylight	Daylight	11:21:46	15:21:46	15:26:46	15:31:46	15:35:03
Saturday	9-Jul	FD3	Daylight	Daylight	10:59:14	14:59:14	15:04:14	15:09:14	
Sunday	10-Jul	FD3/FD4	Daylight	Daylight	10:33:30	14:33:30	14:38:30	14:43:30	14:46:44
Monday	11-Jul	FD3/FD4	Daylight	Daylight	10:10:57	14:10:57	14:15:57	14:20:57	14:24:16
Tuesday	12-Jul	FD3/FD4	Daylight	Daylight	9:50:26	13:50:26	13:50:16	13:55:16	13:58:26
Wednesday	13-Jul	FD3/FD4	Daylight	Daylight	9:22:42	13:22:42	13:27:42	13:32:42	13:35:56
Thursday	14-Jul	FD3/FD4	Daylight	Daylight	9:00:09	13:00:09	13:05:09	13:10:09	13:13:28
Friday	15-Jul	FD3/FD4	Daylight	Daylight	8:36:10	12:36:10	12:39:28	12:44:28	12:47:39
Saturday	16-Jul	FD3/FD4	Daylight	Daylight	8:11:54	12:11:54	12:16:54	12:21:54	12:25:09
Sunday	17-Jul	FD3	Daylight	Daylight	7:49:22	11:49:22	11:54:22	11:59:22	
Monday	18-Jul	FD3/FD4	Daylight	Daylight	7:23:39	11:23:39	11:28:39	11:33:39	11:36:51
Tuesday	19-Jul	FD3/FD4	Daylight	Daylight	7:01:06	11:01:06	11:06:06	11:11:06	11:14:21
Wednesday	20-Jul	FD3	Daylight	Daylight	6:38:34	10:38:34	10:43:34	10:48:34	

NOTES:

- 1) Assumes 210.6 nm average altitude after all ATV reboosts are complete
- 2) Flight Day 3 launch window Open time may be constrained by small phase angle
- 2) ET Umbilical camera flash is available and +X maneuver will be performed on all days
- 3) FD3/FD4 are days where both a FD3 and a FD4 pane may be utilized to extend the launch window



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Ascent/Entry Topics – cont'd



- **TAL site TACAN & MSBLS Status**
 - Istres TACAN available for STS-135
 - Recertified by the FAA on April 7, 2011 after antenna R&R
 - Antenna bearing failure occurred just prior to STS-133 launch
 - Nimes TACAN not available for STS-135
 - Nimes is only flight-rule sanctioned backup for Istres TACAN
 - Decommissioning planned on June 1
 - NOTAMs currently reflect Nimes TACAN data not available
 - Moron and Zaragoza MSBLS certifications expire on 7/18 and 7/19, respectively
 - No issue if launch occurs on time
 - Contingency certification plans in place if launch slip possible



New Operations: ISS



- **PMM / MPLM Dual Ops**

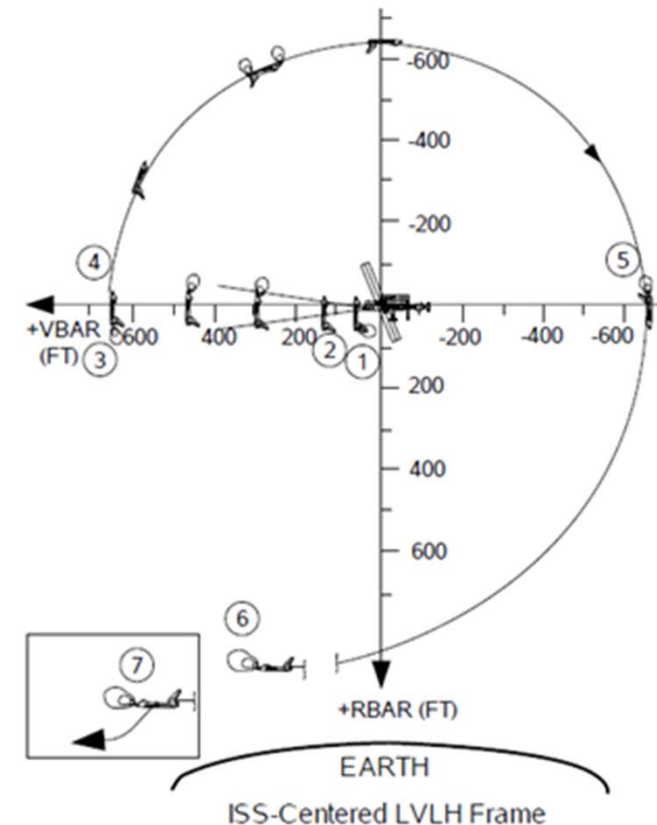
- ISS software has no accommodations for a second MPLM
- Telemetry / command will be maintained primarily w/ MPLM during joint mission.
- PMM will be activated each crew morning to support cargo ops (active PDU, MDM, lights, cabin fan, smoke detector, shell heaters). Crew will be prime for smoke detection.
- PMM will be deactivated each crew evening at completion of cargo ops (PDU, MDM, shell heaters overnight; hatch to remain open). Compliant w/ FR B17-202 “Actions for Cabin Smoke Detection (SD) Loss”
- Ground commanding to be performed twice daily to switch interface from MPLM to PMM to accomplish PMM reconfiguration. Swap back to MPLM when complete (i.e. no telemetry / command with PMM most of the joint mission).
- Ground procedures & PPLs verified in ORT 23 May 2011.
- Shuttle & ISS crew trained on plan



New Operations: Joint Ops



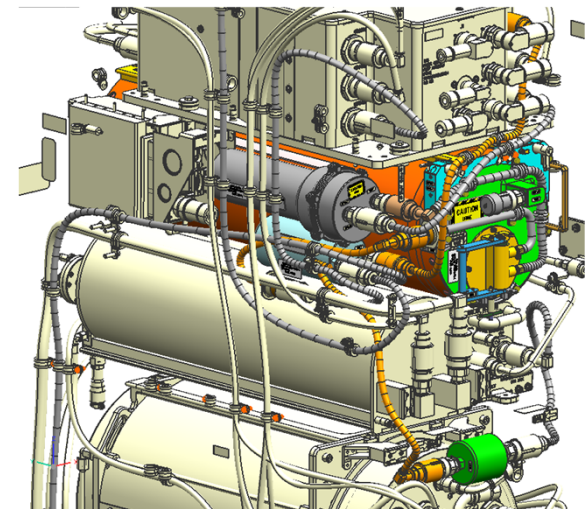
- **Modified Shuttle Flyaround**
 - ISS Program requirement to obtain engineering-quality photos of portions of ISS not normally seen ($\pm Y$ views)
 - YVV $\frac{1}{2}$ lap flyaround technique developed:
 - Shuttle undock & back away to 600 ft on +V bar
 - ISS perform 90 deg yaw maneuver
 - Shuttle initiate $\frac{1}{2}$ lap flyaround
 - Shuttle perform sep maneuver on -V bar
 - ISS maneuver back to stage TEA
 - Minimal changes to shuttle undock / flyaround procedures (RNDZ C/L)
 - Crew / ground procedures exercised in joint integrated sim Apr 25, 2011



New Operations: ISS Stage Ops



- **Enhanced Processor & Integrated Communications (EPIC) / X2R10**
 - EPIC processor cards flying up on 43P (23 June)
 - Crew installation in C&C and GNC MDMs in August
 - Software transition will be accomplished by card installation (no S/W uplinks)
 - CCS R10 is essentially CCS R9 rehost on EPIC cards; GNC R9 is essentially rehost of GNC R8 on EPIC card
- **Advanced Recycle Filter Tank Assembly (ARFTA) Mod Kit Installation**
 - ARFTAs are multiple use tanks that can be drained into EDV-U or Temporary Urine Brine Storage System (TUBSS) for disposal.
 - Reduces upmass requirements for urine processing at cost of increased crew time
 - 2 being delivered on STS-135
 - Mod kit includes filters and fluid lines for installation into WRS2 rack
 - Installation / demo planned for August



ISS: Items of Interest



- **EVA Preparation**
 - ISS crew will perform EVA, with shuttle crew providing IV, suit IV, & robotics support
 - Road-to plan includes EVA OBT for late changes to get-ahead tasks, EVA conf, & suit fit / dry run in addition to standard pre-mission EVA prep activities (total 67.5 hrs)
- **EMU CO2 Sensor Fail during STS-134/ULF7**
 - Affected EMU [3005]; recurrence of AR 3870. This EMU not planned for use on STS-135 / ULF7.
- **CWC-I Leakages**
 - Several CWC-I's found to be leaking during STS-134 / ULF6 (AR 5375)
 - Based on crew observations, large leaks' suspected cause is tube stub interference when CWC-I's placed in 3.0 CTB & stowed in PMM rack standoff area
 - For ULF7, CWC-I's will be stowed in JEM & PMM rack fronts w/ reduced number per CTB. Crew message will address best technique to avoid connector interference.
- **Cargo Stowage**
 - Resupply cargo will be placed in existing ISS racks & PMM rack fronts (dry cargo expected to cover 7-8 PMM rack fronts)



ISS: Items of Interest



- **Lab MCA Failure**
 - GMT 157 Lab MCA mass spectrometer failed (AR 5381)
 - N3 MCA is not operational either (N3 electronics (ORU1) installed in Lab MCA)
 - R&R of Lab MCA ORU2 on road-to ULF7 plan
- **S-band String 1 RFG Failure**
 - GMT 160 S-band string 1 RFG transmitter failed to transition to ops state (AR 5397). Recovered on its own later that day
 - String 1 operational, but considered suspect.
 - Use of string 1 during STS-135 / ULF7 under review
 - If failure re-occurs: no impact to ULF7, loss of redundancy only



Shuttle: Items of Interest



- **TDRS-Z Corrupt Data Anomaly**
 - GDIS/IPE (Guam Data Interface System/Internet Protocol Equipment replaced prior to STS-133
 - GDIS/IPE systems perform data transmit/receive services at both Guam and White Sands
 - Multiple instances of corrupt data and voice observed during STS-133 and STS-134
 - IFA STS-133-G-003 Guam Data Interface System Replacement (GDIS-R) Return Service Anomaly documented issue
 - Issue limited only to Shuttle S-band and K-band services from TDRS-Z transmissions to Guam ground site-to-White Sands Complex
 - Workaround/Fail-over procedure put in place for STS-134 and successfully restored good data/voice when issue appeared
 - Troubleshooting to date has not isolated the root cause



Joint Items of Interest



- **Reduced Shuttle Crew Compliment (4 crew)**
 - Smallest STS crew size flown on ISS assembly or logistics mission
 - All normal FD 1 tasks completed
 - Keep crew up on-orbit later than normal – MET 0/08:30 (vice MET 0/06:30 on prev flts)
 - Wake crew up later pre-launch so total crew day compliant with Med Ops requirements
 - Waterfall effect allows completion of FD2 TPS inspection and FD3 Rndz
 - Joint Operations Panel assessments and crew training have revealed no issues with execution or apparent increase in risk
 - Slight changes to crew tasking and middeck comm config were only significant product deltas required to accommodate 4 crew for Ascent / Entry / Rendezvous
- **No “LON” Flight - CSCS scenario requires Shuttle crew return on Soyuz**
 - Conceptual return plan agreed to at program manager level.
 - Mixed ISS / shuttle crew return on 4 separate Soyuz vehicles (fly up two Soyuz w/ 1 empty seat; one w/ 2 empty seats)
 - Return last shuttle crewmember ~June 2012
 - Shuttle crew fitted for Sokol suits & Soyuz seat liners
 - Shuttle crew minimally trained for ISS exercise, ISS emergencies, routine ISS Ops, and Soyuz return



Joint Items of Interest (cont)



- **Cargo Transfer Plan**
 - Timeline accommodates all planned cargo transfer activities
 - Plan includes 25 hrs Russian crew cargo transfer time
 - ISSP reduction of MPLM cargo return target post-FOR was key enabler for getting timeline “in the box”
- **Change in MPLM disposition philosophy for contingencies**
 - Previously, if MPLM not loaded on-orbit to pre-flight certified config, leave MPLM on ISS
 - Shuttle undocks early due to orbiter or ISS contingency
 - Leave MPLM on ISS if MPLM mass outside pre-flight Verification Loads Analysis (VLA) limits
 - Next Shuttle could retrieve MPLM from ISS
 - For STS-135, MPLM will be removed from ISS prior to Shuttle departure
 - Stranded MPLM blocks ISS port required to support upcoming visiting vehicle traffic
 - No follow-on Shuttle available to retrieve stranded MPLM
 - MPLM loaded to Min Certified VLA limit (21,000 lbm) by about Flight Day 9
 - Every effort to be made to real-time “certify” MPLM for safe entry in Shuttle PLB
 - Shuttle unable to clear MPLM for entry following removal from ISS, jettison may be considered as final option



Flight Rules



- **All required generic volume A, B, C, D, and E flight rules have been developed, reviewed, and approved by the appropriate Flight Techniques Panels, Joint Operations Panels, and the Flight Rules Control Board**
- **The following generic publications are applicable for STS-135/ULF7**
 - Volume A (STS), Final, PCN-10 dated 5/21/09
 - Volume B (ISS), Final, PCN-1 dated 2/25/11
 - Volume C (Joint), Final, PCN-5 dated 5/18/09
 - Volume D (Soyuz/Progress), Final, PCN-6, dated 5/4/09
- **STS-135/ULF7 Flight Rules Annex**
 - Basic Rev-A dated 4/11/2011
 - Final, dated 6/10/2011
 - 14 flight rule CRs included
 - PCN-1, planned for JPRCB review on 6/23/11
 - 40 flight rule CRs (data updates, mission priorities, docked loads, etc)



FDF/ODF/SODF



- **DA8 has participated in FDF/ODF/SODF processes and procedure reviews as required**
- **FDF/ODF will be ready to support STS-135/ULF7**
- **New procedures are primarily for:**
 - GNC (DAP table mods for Draper loads analysis)
 - EVA and Robotics activities
 - Assembly Ops (TRIDAR, payload activities)



Flight Director Mission Staffing



- **STS-135/ULF7 Flight Directors are certified per Flight Director Certification Guide (DA8-00010), Final, dated May 22, 2009**
- **Additional certified Flight Directors are available to support mission staffing, Team 4, and EMCC as required**
- **MOD Work Guidelines are met**
- **Flight-specific certifications are expected to be complete by June 24, 2011**

Shuttle Flight Directors		ISS Flight Directors	
Kwatsi Alibaruho	Lead/Orbit 1	Jerry Jason	Orbit 1
Richard LaBrode	Orbit 2	Chris Edelen	Lead/Orbit 2
Paul Dye	Planning	Courtenay McMillan	Orbit 3
Richard Jones	Ascent		
Tony Ceccacci	Entry	Edward Van Cise	Increment Lead



Spaceflight Meteorology Group



- All forecasters required to support STS-135 meet requirements listed in SMG Training & Certification plan.
- Moron Wx Team not able to dial in upper air balloons or surface observations
 - Problem occurred for launch attempts for STS-133 and STS-134
 - E-mail workaround in place
- Zaragoza radar down for maintenance since June 6
 - Radar service expected prior to STS-135 launch (specific ETRO date is TBD)
 - If ZZA radar remains unavailable, TALCOM and ground observer reports sufficient for weather assessments, but no flight rule 'rain shower exception' allowed



Level II Actions and Exceptions



- **Level II Actions:** **None**
- **Exceptions:** **None**



Non-Standard Open Work



- None



Flight Readiness Statement



- **Pending completion of all standard and non-standard open work, the Flight Director Office and Space Flight Meteorology Group are ready to support the STS-135/ULF7 mission and ULF7 stage**
- **All standard/non-standard open work will be closed out or have a closure plan prior to SSP FRR (6/21/11) with no exceptions**
- **ISSP SORR will be conducted on 6/22/11; closeout for non-standard open work will be reported to ISSP prior to SOMD Level 1 FRR (6/28/11)**





BACKUP



OPEN NASA OCADs

(as of 6/8/11)



OSO (5 Flight OCADs, rest stage)

- ARFTA
- IVA/EVA inhibits
- OGA Water & Pump ORU IFM
- New QDMA Preventative Maintenance

EVA Task and Systems (7 Flight OCADs, rest stage)

- LMC FRAM CPK
- Wobble Socket OCAD update
- RRM
- Long Duration Tie-down constraints
- New QDMA
- ECLSS (all stage OCADs)
 - ARFTA OCADs
 - Fire Cartridge
- ROBO (1 Flight OCAD, rest stage)
 - Clearance constraints for MPLM reberth into PLB
 - RRM
- BME (stage OCAD)
 - ARFTA
- ACO (4 Flight OCADs)
 - RRM
 - CCAA HX to FSE to RSP in MPLM
- PHALCON (3 Flight OCADs)
 - IVA/EVA inhibits

Expect completion by L – 2 Weeks



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OCADS TO BE SUBMITTED*

(as of 6/8/11)



Operational Controls to be Submitted				
HR Number	HR Title	Owner	POC	Number of OCADs
ISS-FRAM-MCH-0109-ULF7	Inability to Gain/Maintain Structural Integrity Using the Active Flight Releasable Mechanism (AFRAM) Mechanisms of the FRAM	Boeing	Mari Crowe	3-5 OCADs for EVA Task and Robo
ISS-COL-1002-ULF7	ISS Collision	Boeing	Darryl Perrilloux	1 OCAD for EVA Task
New QDMA HRs	Quick Don Mask Assembly Risk Assessment Executive Summary Report	GFE	Nick Meyer	3 OCADs for EVA Systems (with BME as a co-signer on one)

* Other operational controls may continue to be submitted until L-2 weeks, such as potential APAS no touch constraints. Past L-2 weeks, they will be submitted via the real-time process.



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STANDARD OPEN WORK



- **INDEPENDENT SAFETY VERIFICATION REVIEW**
 - ISS ISVR REPORT (ECD: L-2 wk)



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ISS OPEN HAZARD REPORTS & NCRs



Open HRs/NCRs:

HR ISS-FRAM-MCH-0109-ULF7, *Inability to Gain/Maintain Structural Integrity Using the Active Flight Releasable Mechanism (AFRAM) Mechanisms of the FRAM & related NCR* (ECD 6/17/11)

HR ISS-COL-1002-ULF7, *ISS Collision* (ECD 6/16/11)

HR ISS-EVA-0302-ULF7, *EVA Crewmember Exposure to Sharp Edges/Corners, Pinch Points and Entanglement/Entrapment* (ECD 6/17/11)

New Quick Don Mask Assembly (QDMA) Risk Assessment Executive Summary Report (RAESR) Hazard Reports (ECD 6/17/11)

Fire Cartridge RAESR Hazard Reports (ECD 6/13/11)

Expiring NCR:

NCR-ISS-STO-N1N2N3-001, Rev. A (Expires ULF7 Stage, 8/29/11; ECD 8/1/11)



PAYLOAD OPEN HAZARD REPORTS & NCR



- **STS**
 - None
- **ISS**
 - JAXA EPO7-01: Leakage of the THL 1 Items
 - UV goggles incorrectly used to provide eye protection for THL 1 materials
 - Hazard Report and JAXA crew procedure update in work
 - ECD 06/22/11
 - RRM
 - Three open hazard reports (F002, F006 and F007)
 - 16 open OCADs
 - ECD 06/27/11



Non-Critical Processors/Applications



- No changes to Flight Director MCC software applications for STS-135/ ULF7



EMCC/BCC



- **No changes to EMCC procedures from STS-134/ULF6 plan**
 - Personnel are identified to support EMCC, if required
- **Backup Control Center (BCC)**
 - BCC-HOSC is prime for BCC/BAT.
 - Facilities and personnel are readying to support.
 - March 30-31, 2010, BCC-HOSC checkout successful and included HOSC, POIC, JAXA, ESA and MCC-M
 - 2011 checkout scheduled for week of 5/23/11
 - June 7, 2010, BAT hotel checkout successful
 - 2011 checkout scheduled for week of 5/30/11



Command Procedures



- **Personnel are prepared and ready to execute the command procedures as documented per MOD Command Policy/Flight Rules**



Remaining STS-135/ULF7 Integrated Sims



- **Ascent/Entry**
 - Entry #2 (6/15/11)
 - ET Tanking Test for ET-138 (6/15/11)
 - Asc #3 (6/16/11)
 - FDO/BSE (6/20/11)
 - TCDT (6/23/11)
 - Entry #3 (6/27/11)
 - Asc #4 (7/1/11)
- **Orbit**
 - Dual Long Rendezvous (6/17/11)
- **ISS**
 - None



Standard Open Work



- **STS-135/ULF7 Flight Rules Annex**
 - PCN-1: JPRCB on 6/23/11
- **FDF/SODF**
 - Generic Final cut-off - 5/3/11
 - FS Final cut-off – 6/3/11
 - Final crew review – 6/24/11
 - Final errata – 6/26/11
- **Training**
 - Complete STS-135 Ascent/Entry simulations (L-7 days)
 - Complete Flight Director flight specific certifications (ECD 6/24/11)
- **Independent Safety Verification Review**
 - ISS ISVR Report (ECD: L-2 wk)



Standard Open Work



- **Water transfer plan and Pressure profile**
 - Complete coordination with MCC-M (ECD L- 8 days)
- **Finalize solar array constraints and power profile plan for docked mission**
 - SACM (L-2 weeks)
 - Power Analysis (ECD L-2 weeks)
 - Longeron Shadowing Response
 - Plasma environment for EVA PCU failure response
- **Complete “Road To” Items and Prepack**

