



STS-117/13A MOD Flight Readiness Review



**JSC Mission Operations Directorate
Flight Director Office**

**DA8/K. Beck, C. Koerner, N. Knight
February 13, 2007**



**Mission Operations Directorate
Flight Director Office**

Agenda



- DA8 COFR Requirements/Endorsements
 - Flight Techniques & Joint Ops Panels/New Operations
 - Space Flight Meteorology Group (SMG)
 - Flight Rules (Volume A, B, C, D, STS-117/13A Annex)
 - Mission Staffing/Training/Certification/ Work Guidelines Compliance
 - Non-Critical Processors/Applications
 - Emergency Mission Control Center (EMCC)
 - Safety Status Review and OCAD
 - Command Procedures
 - Contingency Shuttle Crew Support/Rescue Flight (STS-318)
 - FCOH (SSP & ISS)
 - Level II Actions
- Standard Open Work
- Non-Standard Open Work
- Exceptions
- Flight Readiness Summary





DA8 COFR Requirements/Endorsements



Mission Operations Directorate
Flight Director Office

DA8 COFR Requirements/Endorsements



REQUIREMENT (SHUTTLE)	Flight Director	Program Integration	Ops Safety	SPAN	Space Flight Meteorology	Procedures	Team 4	MOD Console					
Non-Crit Processors/Applications	G				G	G			G	Ready to support the flight			
EMCC	G				G	G	G						
Training - MCC/POCC	G			Y	G		G	G					
Flight Rules	Y					G							
FTP - New Ops	G					G			Y	Non Standard Open work with expected resolution prior to flight.			
Flight Anomaly Resolution	G			G		G							
Anomaly - Procedures	G					G							
Exceptions/Action Items from prior reviews	G	G	G	G	G		G						
CIL/Hazards	G		G			G			R	Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.			
No Constraints	G	G											
Level II Actions	G	G											
Mission Requirements	G												
Exception/Resolution	G	G											
Command Procedures	G												
Flt Prep Process Plan Requirements Met		G								N/A			
Contractor Process Insight		G											



DA8 COFR Requirements/Endorsements



REQUIREMENT (STATION)	Flight Director	Program Integration	Ops Safety	SPAN	Procedures	Team 4						
Non-Crit Processors/Applications	G				G				G	Ready to support the flight		
BCC	G				G	G						
Training - MCC/POIC/POCC	G			G		G						
Flight Rules	Y				G							
JOP - New Ops	G				G			Y	Non Standard Open work with expected resolution prior to flight.			
Flight Anomaly Resolution	G			G	G							
Anomaly - Procedures	G				G							
Exceptions/Action Items from prior reviews	G	G	G	G		G						
CIL/Hazards	G		Y		G			R	Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.			
No Constraints	G	G										
Level II Actions	G	G										
Mission Requirements	G											
Exception/Resolution	G	G										
Command Procedures	G								N/A			





New Operations (FTP and JOP Summaries in Backup Charts)



Mission Operations Directorate
Flight Director Office

New Operations – ET Photography



- **Launch Period is March 15-26 (Closes for Progress undock on 4/6, can only use one extension day while docked for 3/26 launch)**
 - Dark Launch
 - ET Umbilical Photography - Daylight through March 18th
 - ET Handheld Photography - Daylight through March 22nd
 - » March 23rd – 25th: ET not in daylight for pitch maneuver but sunrise will occur ~4 minutes thereafter
- **Perform +X only when ET is in daylight**
 - Provides greater photo resolution for ET during handheld photography
 - New Flight Rule required for ET Pitch Maneuver with no +X maneuver
 - » AEFTP # 227 (Feb 16th) will disposition technique and Rule CR will be in Annex PCN-1
- **Perform ET hand-held imagery for all launch dates**
 - March 15-20 meets optimal lighting requirements
 - After March 20 obtain late hand-held imagery
 - » Sunrise moves later each day decreasing resolution
 - » For example, on March 25, best camera resolution is 4.5 inches at range of ~6000 feet



New Operations – SSME AHMS



- **STS-117 will fly with three AHMS controllers (no block II controllers)**
 - STS-116 Flight performance of SSME 2058 in monitor mode showed no issues
 - Single accelerometer disqualified during throttle bucket due to quiet pump (redline active with 2 accelerometers)
- **STS-117 is the first flight of active vibration redline on SSME 2057 (Right Engine) per PRCB direction (1/18/2007)**
 - Center and Left SSME will have redline inhibited
 - Active synchronous vibration redline mitigates HPOTP and HPFTP catastrophic events
 - MCC can monitor synchronous vibration data like other SSME redlines
 - Flight rules implemented in Volume A, PCN 7 (STS-116)
 - No updates to Crew procedures or LCC



New Operations – ECO Sensor Instrumentation



- **New instrumentation downlisted for LH2 and LO2 Engine Cutoff Sensors**
 - Voltages output now provided for each sensor
 - Important because the “wet” discrete reading is also the failed low telemetry state
- **Engineering community working to determine how sensor voltages respond in a cryogenic environment**
- **MOD recommendation is an LCC and Flight Rule structured to define failed sensor values**
 - Flight Rule CR will be in placed in PCN-1 of STS-117/13A Flight Rules Annex
- **MOD actions for failed sensors (requires more than two failures):**
 - LH2/LO2 – 3 failed wet and less than 3 sigma confidence in FPR requires an extension of the OMS Assist or an Abort
- **PRCB on Feb 15th will disposition use of these sensors in powered flight for STS-117**



New Operations – SSME He Interconnect



- **First flight with new SSME He interconnect management protocol**
- **Adds MCC Booster procedure to maximize run time of a leaking SSME by using the helium margin from one of the non-leaking SSME's**
 - **Previously was only allowed when 2 SSME's operating if needed to close an abort gap**
- **Concerns for the “donor” SSME mitigated procedurally and by analysis**
 - **MCC will verify leak is stable prior to interconnecting**
 - **Boeing analysis confirms no pressure transient to the donor SSME**
- **AEFTP #227 (2/16) will provide final disposition of Boeing analysis and Annex Flight Rule**



New Ops – SSME LH2 Inlet Pressure Limit



- **SSME redlines do not provide adequate protection for the Block II SSME from low LH2 Net Positive Suction Pressure (NPSP), so manual action is required to prevent cavitation**
 - **SSME's manually throttled down or shutdown at NPSP of 3.5 psia on MCC call**
- **Action from AEFTP #220 to determine if minimum NPSP used for manual throttle and shutdown could be lowered to gain performance**
 - **Significant benefit by lowering the minimum NPSP to 3.0 psia**
- **SSME low LH2 NPSP hotfire testing at Stennis Space Center was performed and confirmed that a NPSP of 3.0 was safe for SSME operation**
- **New limit integrated into MCC Operational procedures for Main Propulsion System pressurization anomalies (ullage leak or two flow control valves failed closed)**
- **AEFTP #227 (2/16) will provide final disposition of new limit and Annex Flight Rule**



New Operations – GPS Ramp Up



- **3-String GPS Ramp Up Plan continues in preparation for STS-118 (June 2007), first 3-String GPS/ No TACAN flight on OV-105**
- **STS-121 successfully used GPS in BFS after high speed tracking evaluation**
- **STS-115 and STS-116 successfully used GPS in the PASS in OPS 3 prior to the deorbit burn and during entry after high speed tracking**
- **STS-117 will further expand ramp up objectives**
 - **Incorporate GPS into PASS and BFS in OPS 3 prior to deorbit burn**
 - **Incorporate GPS into PASS and BFS during entry after high speed tracking**



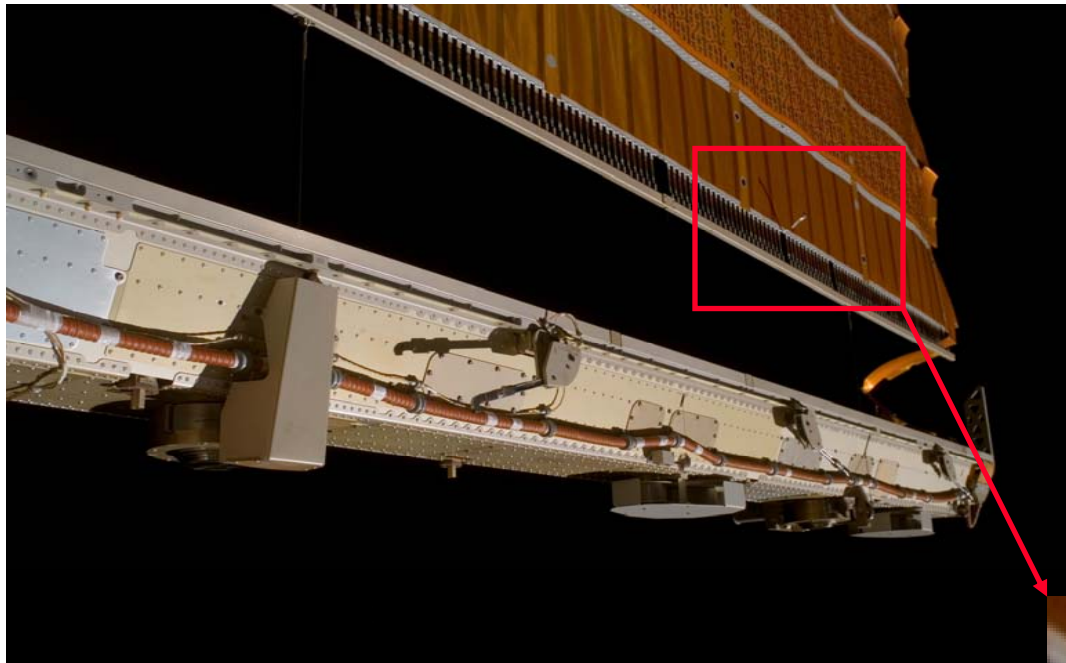
New Operations - 2B Retract



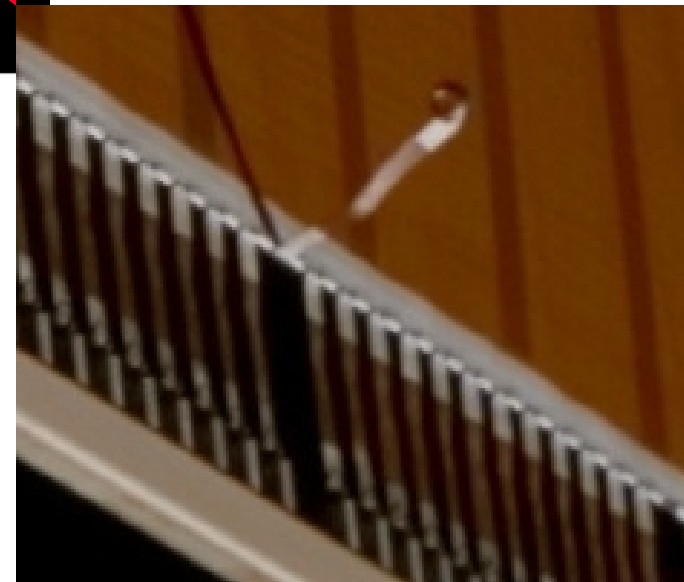
- **P6 4B Solar Array retraction anomalies required EVA assistance to fully retract array**
 - Backward folding blankets due to bent panel hinge
 - Guide wire hang up on grommets (both blankets)
 - Frayed guide wire (right inboard guide wire)
- **Similar problems are expected with P6 2B retract**
 - Similar techniques/tools for 2B retract as for 4B retract
 - Minor changes from 4B Retract incorporated into 2B Retract plan
 - » Detension blanket prior to retraction to increase probability panels will fold properly
 - » Incorporate Beta Gimbal Assembly sinusoidal motion proactively to reduce the probability that guide wires will hang on grommets
 - » EVA shaking of array not planned due to concerns with lifetime
- **Additional problems may need to be addressed during 2B retract**
 - 2B has the potential to be in worse condition than 4B due to the dynamic nature of the deploy (2B first array deployed on STS-97/4A)
 - 2B Retract surveys have identified additional problem with leader/spring detached from tension bar on right blanket box
 - Guide wire frays cannot be detected until EV crewmember in vicinity of fray



Right Blanket Box Detached Leader



ISS014E13310



**Mission Operations Directorate
Flight Director Office**

New Operations - 2B Retract



- **Overall IV and EV retract plan based on minimizing EVA time spent retracting 2B to increase the probability of completing all tasks critical to 13A.1 in three EVA's**
 - **Results in EVA assisted retract being split between EVA's 2 and 3**
 - **IV Retract during EVA 2 prep to determine whether panels will fold properly**
 - » **Use redeploy/retract sequence to attempt to clear backward folding**
 - **EVA2 to get 2B in a configuration to attempt IV retract**
 - » **Correct backward panel folding if required**
 - » **Clear guide wires/grommets that would preclude FD7 IV retract**
 - » **Address leader/spring detached from tension bar**
 - **FD7 IV retract**
 - » **Retract one bay, command Beta Gimbal Assembly sinusoidal motion**
 - » **Repeat until array retracted or guide wire snag comes within about 1 bay of the base of the blanket box**
 - **EVA 3 to complete retract and perform as many originally planned tasks as time allows**
 - » **Clearing guide wires/grommets and redistributing panels**
 - » **Containment inspection**



New Operations - TPS Inspection Plan



- **Planned Ascent Debris and MMOD Inspections will use updated TPS Inspection Procedures**
 - **First significant change since Return to Flight (STS-114)**
 - **Eliminates clearance concerns**
 - **Automates maneuvers between scans**
 - **Improves overall coverage**
 - » **Integrates crew cabin survey into wing scans**
 - » **Fixes LDRI inspection gaps**
 - » **Includes carrier panel**
 - » **Provides concurrent IDC imagery opportunities**
 - **Potential overall time savings of up to 2 hours on FD2**
- **Late Inspection performed same day as undock (EOM-2)**
 - **Close hatches and depress vestibule night before undock**
 - **If focused inspection was not required**
 - » **Undock, flyaround, unberth OBSS, late inspection, OBSS berth**
 - **If focused inspection required**
 - » **OBSS will be on SRMS at undock**
 - » **No flyaround due to lack of certification for OBSS on SRMS**



New Operations - Focused Inspection Plan



- **Focused Inspection if required replaces 2B retract on FD7**
 - Both 2B retract and focused inspection will not fit on FD7
 - SSRMS walkoff, OBSS unberth/handoff and inspection on FD7
 - Maintain EVA3 on FD8
 - » Add IV 2B retract attempt during EVA 3 prep
 - » EVA assisted retract during EVA3 (more EV time expected with no FD7 IV)
 - Option exists to perform FI on FD6 if number of areas of interest or severity of damage warrants earlier inspection
 - » Results in back to back Eva's if still trying to preserve 13 day, 4 EVA timeline
 - » FD6 operationally preferred over FD5 to avoid SSRMS walkoff and MT translate back to WS2 required for SAW deploy
- **FD7 provides sufficient time to protect repair/CSCS options**



New Operations – Focused Inspection Plan



- **FD7 – Focused Inspection**
- **FD8 – EVA 3**
- **FD9 – Repair Decision, Modified Group C Powerdown**
- **FD10 – IV Day**
- **FD11 – EVA 4 (TPS Repair)**
- **FD12 – IV Day**
- **FD13 – Undock (assuming repair deemed acceptable)**
- **FD14 – Entry Prep**
- **FD15 – Landing**
- **FD 16 – +1 Day to be used as needed**
 - Additional time for analysis
 - Deorbit wave off day



Spaceflight Meteorology Group (SMG)



- All NWS/SMG software used to create mission critical products or required for mission support is ready for STS-117/13A.
- All SMG forecasters required to support STS-117/13A meet currency requirements listed in SMG Training & Certification plan.
 - CONUS and TAL forecasters certifications are current.
 - Two other lead forecasters required for mission support need to be re-certified by March 7th. No problems anticipated in meeting the deadline.
- No non-standard open work or exceptions
- Standard open work to reduce TAL support problems
 - Moron Handar undergoing testing and maintenance at KSC
 - Will be reinstalled prior to launch

The undersigned certifies that the Spaceflight Meteorology Group is ready to support the STS-117/13A flight.

/s/ Frank C. Brody

Frank C. Brody

Chief, Spaceflight Meteorology Group



Mission Operations Directorate
Flight Director Office

Flight Rules



- All required Volume A, B, C, and D Flight Rules have been developed, reviewed, and approved by the appropriate Flight Techniques, JOP, and FRCB forums
- The following publications will be utilized for STS-117:
 - Volume A, Final 2002, PCN-7 dated 11/16/06
 - Volume B, Final dated 3/6/07E
 - Volume C, Final PCN-2, dated 11/20/06
 - Volume D, Final, PCN-1, dated 1/16/07
- STS-117/13A Flight Rule Annex
 - Final to be approved at 2/22/07 JPRCB (date under review)
 - PCN-1 to be presented at future JPRCB (3/5/07 target)
 - All required rules to support the STS-117/13A mission have been worked through the appropriate Flight Techniques, GJOP, and 117/13A JOP forums and are either developed/approved or are in work to support launch
 - » Significant Open items discussed later



Flight Director Mission Staffing/Training/ Certification/Work Guideline Compliance



- STS-117/13A Flight Directors certified per Flight Director Certification Guide (DA8-00010) Final, dated May 15, 2006
- Additional certified Flight Directors available to support Team 4, EMCC and STS-318 work as required
- All MOD Work Guidelines met, no issues anticipated

Flight Director	Position	Flight Specific Cert Status
Catherine Koerner	Shuttle Orbit 1, Lead	Anticipated 20 Feb 07
Norman Knight	Shuttle A/E	Anticipated 20 Feb 07
Bryan Lunney	Shuttle Orbit 2	Anticipated 20 Feb 07
Richard Jones	Shuttle Planning	Anticipated 20 Feb 07
Mike Sarafin	Shuttle "Team 4"	09 Feb 07
Mike Moses	Prelaunch Planning	Anticipated 20 Feb 07
Kelly Beck	Station Orbit 2, Lead	Anticipated 20 Feb 07
Annette Hasbrook	Station Orbit 1	02 Feb 07
Holly Ridings	Station Planning	12Feb 07
Sally Davis	Station "Team 4"	Anticipated 20 Feb 07



SPAN Mission Staffing/Training/Certification/ Work Guideline Compliance



- **Sufficient personnel will be provided by the Organizations to properly staff all SPAN positions without violating Work Guidelines**



Non-Critical Processors/Applications



- All DA8 Non-Critical Applications certified
- No application changes since STS-116



EMCC



- **No changes to EMCC procedures since STS-116**
- **Personnel identified to support EMCC**



ISS Safety “Watch” Items



- **P6 2B Retract expected to require EVA assist**
 - Formalizing 13A Solutions in Hazard Reports
 - Planning to elevate EMU wrist ring taping requirement to SRP and SSPCB as required
- **SAW Constraints/Failure Tolerance**
 - Plume Load Keep Out Zone
 - BGA/SARJ locking
 - Longeron Shadowing management strategy with tool
- **SAW Constraints lead to reduced power generation for docking and significantly constrain maneuvers**
 - No relief given based on 13A “shaking” response
 - Power analysis and power down plan open work
- **OGS Operations Controls for installation still pending**
 - Installation of hoses planned for 13A if vent valve replaced
 - Hazard Report Modifications required
 - ETA Unknown (must be resolved prior to installation)



Command Procedures



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



Contingency Shuttle Crew Support/STS-318



- Contingency Shuttle Crew Support (CSCS) /Rescue Flight Resource Book is located at http://mod.jsc.nasa.gov/da8/rules/CSCS_Rescue_Flight_Resource_Book/cover.htm
- STS-117 Ascent/Entry Team will support STS-318
- STS-117/118 Teams will support Orbit Operations as required



Flight Controller Ops Handbook (FCOH)



- FCOH procedures is ready to support STS-117/13A
 - SSP FCOH (JSC-26843)
 - » Final, Rev C, dated 3/1/05
 - By current operations, individual procedure updates on Web site at http://mod.jsc.nasa.gov/da8/FCOH/ssp_fcoh/SSP_FCOH_TOC.htm
 - Book Manager will incorporate any updates required for STS 117/13A
 - ISS FCOH (JSC-29229)
 - » Final, PCN-6, dated 10/10/03
 - By current operations, ISS FCOH is always up to date on Web site http://mod.jsc.nasa.gov/da8/FCOH/iss_fcoh/ISS_FCOH_TOC.htm
 - Book Manager will incorporate any updates required for STS 117/13A



Level II Actions



- There are no Space Shuttle Program “Open Actions/Constraints to Flight” assigned to MOD for STS-117/13A
- There are no Space Station Program “Open Actions/Constraints to Flight” assigned to MOD for STS-117/13A





Standard Open Work



Standard Open Work



- **Flight Rules**

- **117/13A Annex Rules Final (2/22 target special JPRCB date)**
- **117/13A Annex Rules PCN-1 (CR Cutoff 2/21/07, 3/5 target JPRCB date)**
 - » **Rules pending final AEFTP/PRCB Review**
 - **ET photography updates (AEFTP)**
 - **3 SSME Helium Interconnect updates (AEFTP)**
 - **SSME LH2 Net Positive Suction Pressure (NPSP) Limit (AEFTP)**
 - **ECO Sensor Failure Definition (PRCB)**
 - **OMS/RCS Maneuver Criticality (AEFTP)**
 - » **Refer to Non-standard Open Work for significant rules pending external analysis**



Standard Open Work



- **Training**
 - **Complete STS-117 Ascent/Entry and Orbit integrated simulations (3/9E)**
 - **Complete Flight Director flight specific certifications (2/20E)**



Standard Open Work



- **Verification of final safety hazard reports and NCR's vs flight products**
 - MOD Integrated Cargo Hazard Assessment (ICHA)
 - » STS-117 Verification Tracking Log (2/22E)
 - MOD Integrated Experiment Hazard Assessment (IEHA)
 - » ISS FLT 13A Verification Tracking Log (2/22E)
 - Independent Safety Verification Review
 - » Shuttle ISVR Report (3/1E)
- **ISS reboost on GMT 061 (3/02/07) to set up FD 3 rendezvous for first six days of launch period**
 - FD3 Rendezvous on 3/15-3/20, 22, 24, 26
 - FD4 Only on 3/21, 3/23, 3/25
- **Complete “Road To” Items**
 - MSS and SSAS Checkout 2/20E
 - Pre-2B Retract Surveys
- **STS-117/13A Briefings to Russian Teams (2/21E)**





Non-standard Open Work



Non-Standard Open Work



- **Independent Safety Verification Review**
 - ISS Flight ISVR Report (3/1E)
 - » Verification of late hazard reports
- **Significant Flight Rules open work later than standard template**
 - Significant rules pending external analysis
 - » SARJ/BGA constraints
 - » SAW Deploy Thermal Constraints and recovery
 - » TRRJ Manual positioning constraints
 - » MSS Thermal constraints
 - » Attitude envelopes and attitude control constraints/capabilities
 - » APU Operation while docked
 - Some rules may not meet PCN-1 Cutoff date, requiring PCN-2 at L-2 MMT
 - Expect resolution prior to launch



Exceptions



- None



Flight Readiness Summary



- **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-117/13A mission**
- **All Standard/Non-Standard “Open Work” will be closed out or have a closure plan prior to Level 1 FRR (2/27-28/2007)**





Backup



Open Work – Flight Rules PCN-1



- **Joint rule changes pending programmatic direction**
 - Updates to 13A_C2-15 Shuttle Non-Propulsive Consumables Mgmt
 - Updates to 13A_C2-82 Drag-through Cables (8274)
- **Joint rule changes pending external analysis**
 - Updates to 13A_C2-51 Mated Attitude Constraints
 - Updates to 13A_C2-74 Docked Loads Constraints
 - Updates to 13A_C2-76 S3/S4 Install Powerdown Constraints (8273)
 - Updates to 13A_C2-85 Mated FES Dump Constraints
 - Updates to 13A_C8-2 USTO Constraints
 - Updates to 13A_C8-3 Analyzed CMG Capability During Dynamic Ops
 - Updates to 13A_C8-4 Attitude Control, Mnvr Constraints, Priorities
 - Updates to 13A_C2-80 Stbd SARJ Position and Rotation Constraint
 - Updates to 13A_C12-3 MSS Thermal Constraints
 - Addition of 13A_C2-X Solar Array Feathering Reqts and Constraints



Open Work – Flight Rules PCN-1



- **Other Joint Updates**

- **Addition of 13A_C1-X S/G and A/G Availability During Joint Ops (8213)**
- **Updates to 13A_C2-101 STS-117/13A Rapid Safing**
- **Addition of 13A_C2-XX Auto Handover to RS Ena during Mated Ops (8257)**
- **Addition of 13A_C2-XX Contingency Solar Array Jettison (8268)**
- **Updates to 13A_C15-1 EVA Guidelines (8288)**
- **Addition of 13A_C15-X S3/S4 Thermal Cover Jettison Rule (8107)**



Open Work – Flight Rules PCN-1



- **ISS Updates pending external analysis**
 - Updates to 13A_B2-2 ISS Stage Attitudes and Attitude Deviations
 - Updates to 13A_B2-4 S4 Solar Array Deployment Attitude, SARJ, and BGA Configuration
 - Updates to 13A_B8-1 USTO Constraints
 - Updates to 13A_B9-4 Plasma Hazard Mitigation
 - Updates to 13A_B18-2 Manual TRRJ Positioning (8276)
- **Other ISS Updates**
 - Updates to 13A_B2-5 Debris Avoidance Maneuver on DC-1 Nadir (8164)
 - Addition of 13A_B4-XX Jettisoned Hardware During EVA (8270)
 - Addition of 13A_B9-XX PVCU Loss Response (8284)
 - Addition of 13A_B17-X Power Constraints on Depress Pump Operations
 - Addition of 13A_B18-XX Radiator Venting Rule (8264)



Open Work – Flight Rules PCN-1



- **Shuttle**

- Updates to 13A_A2-6 A31P Laptop Usage Priorities
- Addition of 13A_A5-X ECO Sensor Definition
- Addition of 13A_A2-X ET Photography (to address handheld with no +X)
- Addition of 13A_A2-X OMS/RCS Maneuver Criticality



Remaining STS-117/13A Integrated Sims



- **Orbit**
 - **FD4 S3/S4 Install Run 2 – 2/14/07**
 - **FD6/7 2B Retract – 2/16/07**
 - **FD3 Powerdown PV – 3/xx/07 (schedule in work)**
- **Ascent/Entry**
 - **2/23: Terminal Countdown Demonstration Test**
 - **2/26: Ascent #3**
 - **3/01: Post Insertion**
 - **3/08: Entry #3**
 - **3/09: Ascent #4**





Ascent/Entry Flight Techniques Topics Applicable to 117/13A



Ascent/Entry Flight Techniques Panel (AEFTP)



- Total of 2 Ascent/Entry Flight Techniques Panels (A/E FTPs) held in support of STS-117
 - A/E FTP #225 STS-116 Post Flight Review (January 10, 2007)
 - A/E FTP #226 (January 19, 2007)
- All required changes to Ascent/Entry flight rules, crew procedures, and MCC procedures have been dispositioned or scheduled for AEFTP #227
 - AEFTP #227 will address the following:
 - » SSME Running Interconnect Action closure
 - » SSME NPSP lower limit change
 - » ET Handheld Photography with no +X disposition
 - » ECO Sensor loss definition if required
 - » OMS/RCS Maneuver Criticality
- A/E FTP community ready to support STS-117 pending open work



A/E FTP (Continued)



- **STS-116 Post Flight (A/E FTP #225)**
 - Reviewed mission support including trajectory and systems performance, Space Flight Meteorology, Landing Site and MCC/Network support
 - White Sands Space Harbor Landing Site Lessons Learned
 - » For subsequent missions, KSC will be prepared to provide purge and power units with documented procedures, if required due to low WSSH temperatures
 - » Crew procedures are being assessed for OMS/RCS and ET Doors and will be uplinked for STS-117 if required
 - » Workload for MCC team assessing 3 landing sites on the same day was discussed with no issues identified
 - » Program action for team to assess WSSH requirements being discussed



A/E FTP (Continued)



- **STS-116 Post Flight (A/E FTP #225) (cont)**
 - **Advanced Health Management System (AHMS)**
 - » **AHMS SSME Controller launched on Right SSME with Vibration Monitoring inhibited**
 - **New controller performed nominally**
 - **Single vibration sensor disqualified during thrust bucket due to “quiet” pump**
 - » **STS 117 will launch with 3 AHMS SSME Controllers**
 - **Left and Center SSME will have the vibration redline monitoring system inhibited**
 - **Right SSME will have the vibration monitoring system enabled**
 - **Trajectory Server**
 - » **Recent increased frequency of Trajectory Server problems discussed**
 - » **Software problems occur about 5 times per year**
 - » **Each failure is reviewed and fixes are identified and implemented**



A/E FTP (Continued)



- **STS-116 Post Flight (A/E FTP #225) (cont)**

- **Landing Site Issues**

- » **KSC Xenon Light Failure pre-launch – 1 burned out bulb, 1 burned wiring; both lights replaced pre-launch**

- » **EDW**

- **Ball/Bar: Bar bulbs burned out – human error with too much voltage applied**

- **Runway barrier in place during STA dives after confirmation they were removed – Backup AF personnel did not follow protocol**

- » **Moron and Istres TACAN – continued maintenance issues with these units**

- » **Balloon issues at TAL sites – trouble with GPS lock on balloons**

- **ROCC File Transfer Problem**

- » **ROCC computer used for transferring trajectory failed**

- » **Backup method (9 mm tapes) was unsuccessful, files transferred via floppies and 4 mm tapes, and STS 116 launch fully supported**

- » **ROCC is reviewing their procedures (primary and backup) to improve response to hardware problems**



A/E FTP (Continued)



- **STS-116 Post Flight (A/E FTP #225) (cont)**
 - **Network issues**
 - » **Wallops 11M Antenna had problem auto-tracking during the roll to heads up maneuver**
 - **Antenna operator switched to LTAS (C-band slaving) and established solid track**
 - **LTAS will be used for subsequent missions with Autotrack as backup**
 - » **JSC MILA Command Circuits misconfigured at GSFC**
 - **JSC Commands to MILA were routed on both NSAP and NTR**
 - **Discovered after about 3 hours and corrected (pre-launch)**
 - **Procedures were reviewed and patch panels appropriately disabled**
 - » **WSSH Landing Data**
 - **Network worked with KSC personnel to establish post landing TDRSS communication requirements for post landing operations**
 - **Details documented and Network will update appropriate documentation to capture these lessons learned**



A/E FTP (Continued)



- **STS-116 Post Flight (A/E FTP #225) (cont)**
 - **System Issues**
 - » **FES Primary B failure to come out of Standby and was declared failed for the mission**
 - **Post flight troubleshooting resulted in FES PRI B controller, wire harness and shutdown sensor R&R**
 - » **Starboard PLBD Close Microswitch**
 - **Thermal effects most likely the cause**
 - **KSC asked to investigate microswitch**
 - » **APU 3 Gearbox Temperature**
 - **Slight increase in APU bearing temperature**
 - **Under investigation but thought to be the result of entrained nitrogen in the fluid**



A/E FTP (Continued)



- **AHMS Pad Abort Limits (A/E FTP #226)**
 - **AHMS controller on Right SSME on STS-117 in Vibration Redline Active mode and Center and Left SSME in Vibration Monitor Only mode**
 - **AHMS Pad Abort Limits checked between Engine Start + 5.04 sec and Engine Start + 5.80 sec**
 - **Any single qualified accelerometer can vote for engine shutdown with AHMS controller in active mode between 5.04 – 5.80 seconds prelaunch**
 - **Pad Abort Limits selected to balance risk of an erroneous pad abort risk against risk of lifting off with anomalous turbopump performance**
 - » **Pad Abort Limit vibration redline set at 3.5 grms with noise threshold of 3grms**
 - **AHMS LCC withdrawn because sensors are passive and no credible accel failure**
 - **Forward work**
 - » **Controller software modification expected on STS-120 to designate separate noise threshold for Pad Abort Limit and Mainstage**
 - » **Updates to Pad Abort Limit Vibration redline and noise threshold are expected**



A/E FTP (Continued)



- **STS-117 ET Lighting/Photography Plan (A/E FTP #226)**
 - Perform +X for umbilical imagery regardless of lighting conditions
 - » Minimal prop penalty for +X translation
 - » Expand on STS-116 experience where RCS jet firings illuminated ET
 - Perform ET hand-held imagery for all launch dates because photography is a benefit to the Program
 - A/EFTP currently working procedural details for late hand-held imagery in order to minimize prop costs, procedural complexity, and insure photos
 - A/E FTP forward work:
 - » Finalize resolution requirements with ET Project and SEI (at what range is photography no longer useful)
 - » Reassess imagery results after STS-117 and finalize generic procedure to cover future missions



A/E FTP (Continued)



- **Contingency Payload Return Landing Weight (A/E FTP #226)**
 - Each flight, Flight Design performs a thermal screening for multiple SSP-required scenarios (TAL, AOA, ATO, Unplanned Payload Return, and EOM) in support of STS requirements
 - Several recent flights have not passed the unplanned payload return screening and required special mission specific analysis by Boeing
 - Based on analysis to date, unplanned payload return analysis will always be cleared if EOM, ATO, or AOA limits are cleared
 - Proposal to modify SSP requirements to perform the initial pre-flight screening, but defer detailed analysis for the thermal violations of the unplanned payload return case until, and if, it is required in real-time
 - The A/E FTP concurred with this proposal and it will go forward to the FOICB





Orbit Flight Techniques Topics Applicable to 117/13A



Mission Operations Directorate
Flight Director Office

Orbit Flight Techniques



- **Improved TPS inspection scans**
 - First significant change since Return to Flight (STS-114)
 - Eliminates clearance concerns
 - Automates maneuvers between scans
 - Improves overall coverage
 - » Integrates crew cabin survey into wing scans
 - » Fixes LDRI inspection gaps
 - » Includes carrier panel
 - » Provides concurrent IDC imagery opportunities
 - Potential overall time savings of up to 2 hours on FD2
- **-Z Star Tracker and Rendezvous Navigation**
 - Swapped OV104's Solid State Star Tracker with Image Dissecting Tracker (IDT) in -Z location, approved at noon board October 13th, 2006
 - Solid State tracker is more susceptible to bright objects than IDT
 - » As elements are added to ISS, it appears brighter
 - » Resulted in shortened pre-NCC star tracker pass on STS-115
 - IDT flown for STS-117 to preserve redundancy/margin for rendezvous navigation





Generic Joint Operations Panel Topics Applicable to 117/13A



Generic JOP Topics



- **Joint Emergency Egress (JEE) and Joint Expedited Undocking Separation (JEUS) Procedure updates**
 - Added high level direction for EV crew when EV hatch is open
 - Moved closure of Lab forward hatch earlier in procedure
 - Updated steps for SARJ and BGA constraints prior to undock
 - » Both SARJs and the 2A and 3A BGA must be parked
 - » Additional BGA action may be taken if time is available
 - » Park positions pending analysis
- **Joint Mission Shuttle Hazmat data uplink process**
 - ACO served as “middle-man” for uplink process on previous flights with no direct responsibility for the product or the uplink
 - GJOP obtained agreement that the Shuttle BME will perform this task for STS-117/13A and subsequent flights
- **Flight Rule updates**
 - Mated Water Dump flight rule to allow mated water dumps in biased TEA
 - KU Band Ops During Approach and Docking flight rule





STS-117/13A Joint Operations Panel Topics



Mission Operations Directorate
Flight Director Office

STS-117/13A JOP Topics



- **Launching with a Photovoltaic Radiator (PVR) Installed**
 - Original STS-117/13A requirements included relocation of an EETCS radiator from P6 to S4 to become its PVR
 - Required 4 Eva's to complete 13A objectives since relocation required the equivalent of one EVA
 - Operational risks associated with radiator relocation presented to ISS Program with recommendation to launch with a PVR
 - ISS Program funded assembling S4 radiator from spare parts and installed on S4 pre-flight during Return to Flight time period
- **S4 Radiator anomaly**
 - S4 radiator failed original acceptance test criteria due to the inability to deploy within the specified time and to retract within the specified distance
 - Some hardware modifications were made and analysis showed positive deploy margins
 - To protect for potential uncertainties in the analysis, radiator deploy scheduled during EVA1 to provide the option to deploy using the PGT if IV deploy is unsuccessful



STS-117/13A JOP Topics



- **S3S4 Unberth and Maneuver to Handoff**
 - **Similar unberthing technique as P3P4 due to tight clearances with OBSS**
 - **CMG Momentum Management control expected to be acceptable for S3S4 unberth to overnight park**
 - » **Handover to the Russian segment would be allowed since the port SARJ is allowed to rotate under Russian Segment control**
 - » **Flight rule pending Russian concurrence but no issues expected**



STS-117/13A JOP Topics



- **S3S4 Installation**
 - **Maneuver out of high roll attitude morning of FD4 on USTO**
 - » **Should allow sufficient time to activate Momentum Manager prior to install**
 - **SVS and Camera Requirements**
 - » **S1OL key camera, drove R&R priority**
 - » **Install may proceed without SVS if SVS solution not available**
 - **RMS Sideview Camera (RSC) focal length selected for clearance monitoring for TPS inspection**
 - **SRMS wrist prime camera, Payload Bay Camera B backup camera**
 - » **AVU files will be provided via uplink**
 - **Files available in MCC for uplink on 3/1**
 - **Hard drives removed from the manifest as part of the Ascent Performance Margins trades**
 - **2 of 3 Ready to Latch flight rule**
 - » **If only 2 of 3 Ready to Latch indications obtained, can proceed with installation without EVA verification under certain criteria which ensures proper alignment**
 - » **Similar philosophy as documented in CHIT for 12A**
 - » **Flight Rule will be published in 13A Flight Rules Annex PCN-1**



STS-117/13A JOP Topics



- **Launch to Activation Constraints**
 - No issues with LTA constraints
 - -XVV can be flown for Orbiter MMOD risk reduction and satisfy LTA constraints
- **S3 Activation and EVA 1 task dependencies**
 - EVA 1 tasks are dependent on commanding required during S3 activation
 - » Umbilical connections, shroud removal, DLA install, PVR deploy
 - S3 activation procedures designed to provide as much margin as possible before the crew is ready to start an activity dependent on ground commanding
 - EVA 1 timeline designed to have other tasks that can be brought forward if EV crew needs to wait for ground commanding



STS-117/13A JOP Topics



- **1A/3A Solar Array Deploy**
 - Same deploy plan as 12A incorporating thermal conditioning of the arrays during deploy sequence
 - 13A unique attitudes and attitude control plan
 - » 1A: Maneuver to deploy attitude, attitude correction after mechanism motion performed using USTO
 - » 3A: Maneuver to deploy attitude using USTO, attitude correction after mechanism motion and post-deploy maneuver to attitude using VRCS
 - USTO maneuver rate of 0.1 deg/sec so maneuver can be completed during eclipse
 - Analysis to determine thermal constraints and recovery periods is still open



STS-117/13A JOP Topics



- **2B Retract**

- Multiple JOP meeting/splinters conducted to review 4B lessons learned, develop plans for 2B, and to review status of 2B survey data
- Minor procedure changes from 4B Retract incorporated into 2B Retract plan
 - » Detension blanket prior to retraction to increase probability panels will fold properly
 - » Incorporate Beta Gimbal Assembly sinusoidal motion proactively to reduce the probability that guide wires will hang on grommets
 - » EVA shaking of array will not be performed due to concerns with fatigue/lifetime
- Lighting requirements will be based on crew's assessment of whether they have adequate visibility to proceed with retract
- Overall IV and EV retract plan based on minimizing EVA time spent retracting 2B to increase the probability of completing all tasks critical to 13A.1 in three EVA's
 - » Results in EVA assisted retract being split between EVA's 2 and 3
 - » EVA2 to get 2B in a configuration to attempt IV retract
 - Correct backward panel folding
 - Clear guide wires/grommets that would preclude FD7 IV retract
 - Address detached leader/spring from tension bar
 - » EVA 3 to complete retract



STS-117/13A JOP Topics



- **SARJ Preparation**
 - Requirements/constraints on solar array prep activities
 - Alpha Joint Interface Structure (AJIS) struts, brace beams, launch locks, and launch restraint sequence





Russian Joint Operations Panel Topics Applicable to 117/13A



Mission Operations Directorate
Flight Director Office

RJOP Topics



- **STS-117/13A Briefings to Russian Teams**
 - In work and expected to be completed by February 21, 2007
- **Flight Rules**
 - Concurrence on new rules or any STS-116/12A.1 rule changes
 - Russian Payload Constraints into flight rules as needed
- **Long Range Attitude Plans**
 - Agreed through April 6 2007
 - -XVV use to protect Ku-band in March (March 2 – March 16) is still in review
 - Updated every 4-6 weeks for two-month period
- **STS-116/12A.1 Lessons Learned**
 - In work and expected to be completed by February TBD, 2007





- **STS-115/12A Lessons Learned**
 - **During critical events, MCC-M agrees to use RGS for discussions with the crew and to use S/G for critical discussions only**
 - » **Critical events (EVA, SSRMS ops, etc.) were agreed upon at the 12A.1 TIM**
 - **MCC-M agreed to notify MCC-H before use of “call to comm” tone so that crew will be aware of tone**
 - **MCC-M agreed to timeline the ISS amateur radio deactivation prior to EVA and request crew confirmation call**
 - **MCC-M agreed to deactivate GTS for EVA days with flight rule documenting GTS deactivation times**
 - **Progress propellant purge must not occur during Shuttle docked time and if required should be performed before FD2**
 - » **DA8 will pursue a GGR&C or flight rule to document**



RJOP – Russian Segment Status



- **No RS systems anomalies are PRELIMINARY or OPEN which impact readiness for STS-117/13A however, there may impacts to the 13A return manifest and/or the 13A stage.**
 - **AR 2202 Regul Set 2 Failure (Regul telemetry inoperable)**
 - » **MCC-M can activate БИТС telemetry if an there are two Molniya satellites available (other satellite is necessary for Regul commanding)**
 - » **Regul Set 3 may be activated for telemetry but it is limited in data rate and functionality**
 - » **No capability to repair set 2, and there is no spare on board. Expect IP RUSSIA to request bringing home set 2 on 13A for repair**
 - » **No impact to planned 13A flight/stage objectives however, 13A return manifest may need to include this unit**
 - **AR 1949 Kurs-A [2AO-BKA] Failure to Retract during Progress 23P Docking**
 - » **Flight rule D2-5 should be updated to reflect actual docking plan**
 - **24P docking, which occurred after 23P docking, did follow original rule**
 - » **RS EVA 18 (February 2007) will retract or remove Kurs A antenna**
 - » **No impact to planned 13A flight objectives. If RS EVA 17 is unsuccessful, 23P undock planned during 13A stage (currently April 7) may become an issue.**



RJOP – Russian Segment Status



- **No RS systems anomalies are in DISPO which impact readiness for STS-117/13A**
 - **AR 2131 VELO R&R and Control Unit Malfunction**
 - » Ergometer was R&R'd and the new control unit did not work. It was then replaced with the old control unit and it worked nominally. New control unit will be returned.
 - » No impact to planned 13A flight/stage objectives.
 - **AR 2102 FGB Smoke Detector #8 Non-operational**
 - » The 9 other FGB smoke detectors are operating nominally.
 - » R&R will be scheduled (spare expected on 24P).
 - » No impact to planned 13A flight/stage objectives.
 - **AR 1623 FGB Temperature Sensor Error**
 - » Temp sensors are providing low and off-scale low readings.
 - » Problem is suspected to be a commutator and will be R&R'd approximately 1-2 weeks post- 12A.
 - » Redundant temp sensors are being used. Hull and panel temperatures are nominal.
 - » No impact to planned 13A flight/stage objectives.
 - **AR 1386 Improper Thruster Configuration for Unscheduled 20P Progress Ingress**
 - » Progress repress was performed without thrusters inhibited.
 - » Flight Rule change in work: ECD Feb 28, 2007.
 - » No impact to planned 13A flight/stage operations.



RJOP – Russian Segment Status



- Elektron
 - **RS EVA 16** replumbed the vacuum line from the BMP to an unused ground servicing port.
 - **Current unit #9** - *The BCCK unit was replaced on GMT 2006/297. An external valve was installed on GMT 2006/303 to provide the same function as the failed KЭ1 valve. The failed KЭ1 valve will be kept in the open position and the external valve (installed between the water purification columns and the liquid unit) will be used to control the filling of the buffer tank. Elektron operation was successfully recovered on GMT304. The cause of the KЭ1 valve failure is unknown at this time and will not be known until the return of the BCCK*
 - *CT-6064 panel is probably shorted on the + power input fed from the X1TP connector which connects only to the PБC 10/3-X2 connector (not the BCCK) which explains the sparking events when the external casing is near structure. If this is the case, the preference is to not open and close valves from the CT-6064. However, the 6064 panel can be used to monitor micro-pump operation and valve status when configured in the BCCK configuration (i.e. powered via the BCCK). A new CT-6064 Panel was flown on 24P.*
- SM Gas Analyzer Signal Converter
 - **ppO2 and ppCO2** measurements are unreliable and not being used.
 - **R&R** will be scheduled once converter unit is found.
 - **GMT 17** the ГА ГЛ2106 Carbon Monoxide Gas Analyzer fan failed
- [CKB-1]
 - **currently not working** due to a failed heat exchanger, loss of redundancy.
- SM Windows
 - #13 **damage to outer pane (~ 4 mm); E13 crew installed an additional IV cover on the window which protects for an inner pane failure, but does not allow crew to use window. EA is working with IPRUSSIA.**
 - #1 **photos downlinked during E14 and are being analyzed by EA and IPRUSSIA.**
 - #2 **E12 crew reported damage, need photos to assess.**
 - #8 **photos downlinked during E14 and analyzed, no further work required.**
 - #9 **defects photo'd and downlinked but more photos needed**
- FGB Smoke Detection
 - **SD 8 inoperable**, all others (9) are operating nominally
- FGB Gas Analyzers
 - **Deactivated**, using SM gas analyzer data
- FGB Temp Sensors
 - **Temp sensors are providing low and off-scale low readings. Redundant temp sensors (hull and panel) are being used (until R&R).**
- FGB Thermal Control
 - **[1H1] pump is not working (no plans to replace) since the remaining eleven pumps are nominal.**
- SM Temp Sensor
 - **SM [PO] temp sensor failed high (other sensors available for that area) and will be R&R'd**
- [ACH]
 - **Not yet operational (antenna problems) – needed for ATV1.**
- 24P
 - **fan/heater assembly used in 22P was installed in 24P. This fan had previously experienced problems**



SPAN Manning



- **ISS SPAN Support:** Manning provided by USA CAF Personnel
- **ISS SPAN Systems:** Manning provided by DF
- **SSP SPAN Support:** Manning provided by DA8 & DT
- **SSP SPAN Systems:** Manning provided by DF
- **SPAN DO:** Manning provided by DO
- **SPAN DM:** Manning provided by DM
- **SPAN DX:** Manning provided by DX
- **SPAN Managers:** Manning provided by DT, DF, DX, DO, DM



STS-117/13A Safety Status Overview



DA8 COFR

Category	HRs Open	NCR/AR Open	Open ISS OCADs	Open STS OCADs	Open ISVRs
Shuttle Integration	0	1	-	1	0
Shuttle Orbiter	0	3	-	0	0
Shuttle SSME	0	0	-	-	-
Shuttle ET, SRB, RSRM	0	0	-	-	-
ISS 13A	16	4	49	-	16 (4 Pre)
GFE					
- EVA	0	0	0	8	0
- Shuttle	6	0	-	1	0
- Station	2	0	3	-	0
Payload					
- Shuttle	0	0	-	0	0
- Station	0	0	0	-	0



Mission Operations Directorate
Flight Director Office

SHUTTLE SAFETY HIGH RISK



- **Loss of TPS**
 - **IDBR-01**
 - » **ET Foam: Ice Frost Ramp, Intertank Flange**
 - » **ET Ice: Feed line bracket, feed line bellows, ET Umb**
 - **T.02 Foam**
 - » **Manual Sprayed and poured foam (not redesigned)**
 - » **External impact**
 - » **Design limitations**
 - **T.04 Ice**
 - **ORBI-007 MMOD**
 - **INEV-01 Bird Strike**
- **Explosion in the Aft Compartment**
 - **IMEO-01**
 - **ORBI-036**
- **Lag H2**
 - **IMPS-09**
- **Abort Risk (RTL)**
 - **IGNC-01**
- **Lightening (all Mission Phases)**
 - **ILIT-01**
- **WSB freezing (Multiple APU cooling loss)**
 - **ORBI-344**



Mission Operations Directorate
Flight Director Office

SHUTTLE OPEN HAZARD REPORTS



- **Integration**
 - IDBR-01*
- **Orbiter**
 - ORBI-344 WSB PGME
 - ORBI-111* COPV
 - ORBI-278* COPV
- **ET**
- **SSME**
- **RSRM**
- **SRB**

*** Pre verified**



ISS OPEN HAZARD REPORTS



- COL-1002*
- ECL-0205 ‡
- ECL-0210 ◆
- ECL-0404 ◆ ‡
- EPS-0503*
- EVA-0301
- EVA-0311
- IVA-0209 ‡
- MCH-0109*
- OGS-009 ‡
- OGS-010 ‡
- OGS-011 ‡
- OGS-013 ‡
- WRM-0138 ‡
- TCS-0091* ‡

- TBD – 2B Retract EVA Assist

* Pre-verified

◆ Updates for OGS Install/VV R&R

– Some will require update prior to 13A for 12A.1 stage pre-configuration tasks

‡ Updates for OGS Act



ISS Open NCRS



NCR-ISS-181

Regen-ECLS Hydrogen Overboard Vent Valve Single Seal to Space Vacuum

NCR-ISS-196

Payload Water Reservoir (PWR) Over-Pressurization

NCR-TBD

**SARJ Locking Constraints Risk
(not a constraint to launch)**



**Mission Operations Directorate
Flight Director Office**

GFE Open Hazard Reports



• STS

- SOMS Resuscitator Assembly – pending redlines and closure verifications, ECD 02/07/07
- EVA Digital Camera – pending EMI waiver extension 02/15/07
- Wicket Safety Cap Assembly – approved OOB 02/05/07
- Li-BCX D Cell ECD 2/22/07
- Li – Fe Disulfide Cell – Cell Cert closed prior to STS-117; EP5 needs to submit RAESR to NT for review. Sched. at risk.
- SCEE Communications System Phase III ECD 02/09/07: 0 Hr/0 OCAD

• ISS

- Impedance Adapter Cable – IAC 02/05/07; Phase III ECD 02/22/07
- EVA Digital Camera – pending EMI Waiver Extension ECD 02/15/07

