



STS-119/ISS-15A MOD Flight Readiness Review



JSC Mission Operations Directorate
Flight Director Office

DA8/K. Alibaruho, P. Dye, R. Jones, E. Nelson
January 13, 2009

Agenda Item 3

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Agenda



- DA8 COFR Requirements/Endorsements
 - COFR Requirements/Endorsements Summary
 - New Operations – A/E Topics, SMG, MCC, Flight Techniques & Joint Operations Panels
 - Safety Status Review
 - Flight Rules (Generic Volumes A, B, C, D; STS-126/ULF2 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)
 - Command Procedures (backup)
 - Contingency Shuttle Crew Support/Rescue Flight: STS-119 (LON vehicle)
 - Level II Actions
- Standard Open Work (backup)
- Non-Standard Open Work
- Exceptions
- 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	Y			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

* FCOH



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DA8 COFR Req'ts/Endorsements (cont.)



REQUIREMENT (STATION)	Flight Director	Program Integration	Ops Safety	SPAN	Team 4						
Non-Crit Processors/Applications	G						G	Ready to Support Flight/Only Standard Open work			
BCC	G				G						
Certified Flight Controllers	G			G	G						
Flight Rules	G										
ODF/SODF	G										
JOP - New Ops	G						Y	Non Standard Open work with expected resolution prior to flight.			
Flight Anomaly Resolution	G			G							
Anomaly - Procedure	G										
Exceptions/Action Items From Prior Readiness Reviews	G	G	G	G	G						
CIL/Hazards	G		Y				R	Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.			
No Constraints	G	G									
Level II (Program) Actions	G	G									
Flight/Increment Planning (Mission Requirements)	G										
Exception/Resolution	G	G									
Command Procedures	G							N/A			
Contractor Process Insight		G									



New Ops: Boundary Layer Transition DTO



- Boundary Layer Transition DTO

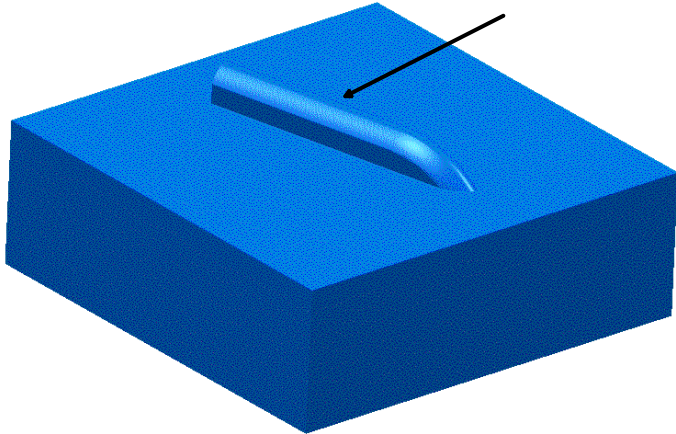
- DTO will attempt to gather data during entry regarding the aerothermal effects caused by the boundary layer transitioning from laminar flow to turbulent flow at a high Mach number
- Boundary Layer trip induced by a protuberance placed on a lower surface tile on the port wing
 - » Protuberance height of 0.25 inches is expected to trip boundary layer at Mach =15
 - » Thermocouples installed on protuberance tile and downstream tiles will capture data
 - » Protuberance placed at optimal location that minimizes the potential for incurring ascent debris damage in the same general location
- Annex flight rule, 15A_A2-6, documents desired crossrange cutouts to avoid roll reversals near Mach = 15
 - » Orbit adjust for DTO prioritized below all other mission objectives

New Ops: Boundary Layer Transition DTO (cont.)



Protuberance Tile

Protuberance is 4" long, 0.3" thick, 13 deg offset from the tile pattern and only RCG coated

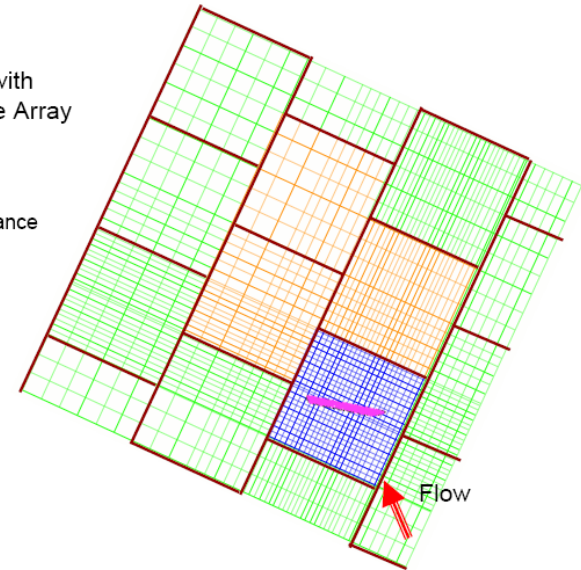


6" x 6" BRI-18 tile with TUF/RCG coating on four sides and OML and 0.160" SIP

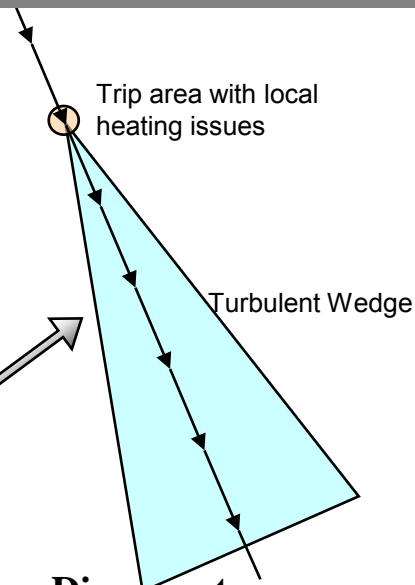
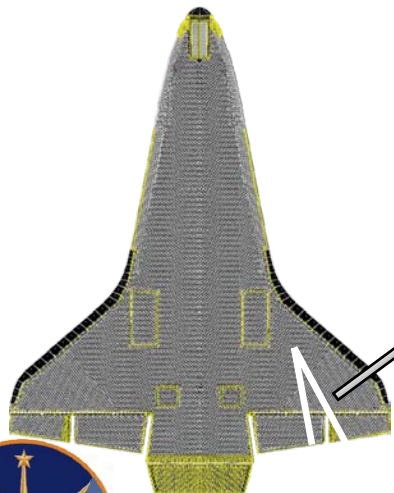
Local Area

BLT TMM with Overlay Tile Array

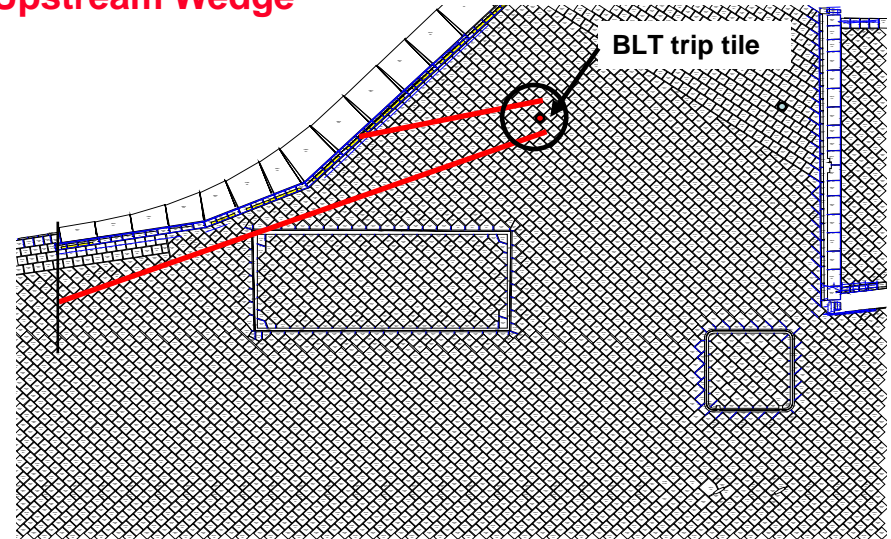
- LI-900
- LI-2200
- Bri-18
- Protuberance



Downstream Wedge



Upstream Wedge



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New Ops: Flow Control Valve Anomalies



- STS-126 Flow Control Valve Failure Impacts for STS-119
 - STS-126 LH2 flow control valve (FCV) for the left SSME failed open at 01:26 MET
 - » FCV controls flow of gaseous H2 from SSME to ET for ullage pressurization
 - » As expected, ET ullage pressure remained within ICD limits
 - 1 FCV failed open or closed does not adversely impact ET pressurization
 - Other 2 FCV cycle appropriately to control ET ullage pressure
 - Post flight investigation PRELIMINARY findings
 - » Portion of FCV poppet head failed due to micro-crack conditions present at manufacture, fatiguing (duration of fatigue is unknown), liberating, and allowing increased flow rates into the ET
 - OV-103 FCVs removed and replaced with spare valves with low flight-duty time
 - » NDE inspections performed on spare valves and no micro-cracks were found
 - Open Work
 - » Mission Operations working closely with Orbiter for flight rationale
 - Operational techniques for 2 flow control valve failures in the presence of an engine out is under examination
 - » Open Work: New ops techniques that may be used to mitigate next worse failure
 - » Expected completion: Jan 23 (in time to support Ascent #3)

Ascent/Entry Topics



- Launch Window and Lighting Summary

KSC Day Window Open	KSC Date	RNDZ Day	ET Photo Umbilical	ET Photo Handheld	Open (EST)	Open (GMT)	In-Plane (GMT)	FD3 Close (GMT)	FD4 Close (GMT)
Thursday	12-Feb	FD3	Daylight	Daylight	7:27:06	12:27:06	12:32:06	12:37:06	
Friday	13-Feb	FD3/FD4	Daylight	Daylight	7:01:23	12:01:23	12:06:23	12:11:23	12:14:34
Saturday	14-Feb	FD3	Daylight	Daylight	6:38:52	11:38:52	11:43:52	11:48:52	
Sunday	15-Feb	FD3/FD4	Daylight	Daylight	6:13:09	11:13:09	11:18:09	11:23:09	11:26:19
Monday	16-Feb	FD3	Daylight	Daylight	5:50:37	10:50:37	10:55:37	11:00:37	
Tuesday	17-Feb	FD3/FD4	Daylight	Daylight	5:24:55	10:24:55	10:29:55	10:34:55	10:38:05
Wednesday	18-Feb	FD3	Dark	Daylight	5:02:23	10:02:23	10:07:23	10:12:23	
Thursday	19-Feb	FD4	Dark	Daylight	4:39:50	9:39:50	9:44:50		9:49:50
Friday	20-Feb	FD3	Dark	Daylight	4:14:09	9:14:09	9:19:09	9:24:09	
Saturday	21-Feb	FD4	Dark	Daylight	3:51:36	8:51:36	8:56:36		9:01:36
Sunday	22-Feb	FD3/FD4	Dark	Dark	3:25:55	8:25:55	8:30:55	8:35:55	8:39:05
Monday	23-Feb	FD3	Dark	Dark	3:03:24	8:03:24	8:08:24	8:13:24	
Tuesday	24-Feb	FD3/FD4	Dark	Dark	2:37:41	7:37:41	7:42:41	7:47:41	7:50:51
Wednesday	25-Feb	FD3	Dark	Dark	2:15:09	7:15:09	7:20:09	7:25:09	
Thursday	26-Feb	FD3/FD4	Dark	Dark	1:49:27	6:49:27	6:54:27	6:59:27	7:02:37

NOTES:

- 1) Assumes 0.5 m/s ISS reboost on 12/17, 3.15 m/s reboost on 1/15, and another 1.65 m/s reboost on 2/4
- 2) Phase Angle on 2/21 slightly exceeds the FD3 limits. Special trajectory considerations are required for a FD3 rendezvous
- 3) Dark launch at window open from February 13 through March 15. In-Plane launch on 2/13 in daylight.
- 4) Partial Daylight ET Hand-held Photography lighting on 2/20 & 2/21
- 5) ET Umbilical camera flash is available and +X maneuver will be performed on all days
- 6) FD3/FD4 are days where both a FD3 and a FD4 pane may be utilized to extend the launch window
- 7) Beta cutout begins on April 25

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Ascent/Entry Topics (cont.)



- ISS reboost strategy
 - Two reboost burns raise ISS orbit to ~193 nm
 - » Jan 14: 3.02 m/s mnvr
 - » Feb 5: 1.70 m/s mnvr
 - Reboost plan balances multiple Shuttle and Russian priorities
 - » Large phase angle at the maximum limit on first launch day (Feb 12)
 - Feb 12 launch window may close on phasing constraints instead of ET performance
 - » 5 consecutive FD3 opportunities
 - » Russian phasing for 32P launch opportunity on Feb 10
 - 32P docking 3 days later on STS-119 FD2
 - No backup launch opportunity for 32P on Feb 11

Ascent/Entry Topics (cont.)



- sMIA Diode Cracking concerns on OV-103
 - sMIA diodes on primary ports on FF4 & FA4 deemed 'suspect' by Orbiter Project
 - » Manufacturing defect found in lots 7715 & 7535
 - Cracked 'wave-forming' diode determined to be root cause of GPC set split observed during STS-124 prelaunch processing
 - KSC will preemptively port mode string 4 during S0007 prelaunch count to avoid the 'suspect' diodes on the primary ports
 - » Entire mission will be flown on secondary ports
 - » Primary ports are viable and not considered failed from a prelaunch LCC perspective or on-orbit flight rule perspective
- SSME Overboard Mixture Ratio Update
 - Per 11/17/08 PRCB Directive, the SSME controller commanded mixture ratio will be updated to 6.049
 - » Same value used for STS-126 and as previously directed for STS-125/STS-400
 - No ascent performance holdbacks are required
 - The associated MCC updates will be incorporated per the nominal processes
- O2 Visor Flow LCC
 - LCC intent is to verify two O2 systems are functional prior to launch
 - » LCC encompasses functionality check made by EECOM with 'Good Visor Flow' call at L-2:00 minutes

Ascent/Entry Topics (cont.)



- Edwards Permanent Runway
 - First flight to transition back from EDW Temporary Runway
 - STA verification completed January 12-15
 - FAA certification for MSBLS is January 16-18
 - FDF & onboard runway I-loads already in good mission configuration
- DOLILU changes for STS-119
 - Block update content for minor MCC & Boeing IV&V hardware/network updates
 - New weather balloon processing strategy to mitigate MSC computer concerns
 - SICB expected to review the following DOLILU CR content outside of board and concur by Jan 20 for the following:
 - » Documented criteria for delaying I-load design from L-4:50 to L-3:35 hour balloon
 - » Refined wind data requirements if L-2:20 hour balloon is not available

Ascent/Entry Topics (cont.)



- High Pressure Fuel Turbopump Intra-channel qualification limit
 - Qualification limit check performed during engine start
 - Allowable delta between intra-channel turbine discharge temperature measurements increased from 100 °R to 130 °R
 - » Accounts for hardware variation effects
- APU QD Heater Modification
 - First flight of heater/over-temp thermostat modification on APU systems 1 & 2 GN₂ servicing QDs
 - Will prevent slow on-orbit GN₂ leaks that can resemble hydrazine fuel leaks
- Ascent Vibration DTO
 - Supports Constellation Program launch oscillation assessment
 - Accelerometers placed on back of 3 crew seats (MS1, MS3, MS5)
 - 100% Mid-deck lighting required so mid-deck crew can perform visual assessment portion of DTO
 - » Crew will determine what can/cannot be visually discerned on a cue card
 - » Battery-powered V10 camera will record mid-deck crew members performing DTO

Spaceflight Meteorology Group (SMG)



- All forecasters required to support STS-119 meet requirements listed in SMG Training & Certification plan.
- Improved French radar data is now available on AWIPS. The TAL rainshower allowance flight rule can be applied at Istres.
- The automated weather systems at Moron and Zaragoza are not reporting data. Nav aids will troubleshoot upon arrival at site for mission support.
- The EDW wind towers will be returned from the temporary runway to the prime 22/04 runway prior to the mission.
- Planned System Changes:
 - AWIPS: Software changes will be completed by January 23rd. No hardware changes are planned prior to the mission.
 - MIDDS is ready to support the mission.

The undersigned certifies that the Spaceflight Meteorology Group is ready to support the STS-119 flight.

/s/ Frank C. Brody

Frank C. Brody

Chief, Spaceflight Meteorology Group

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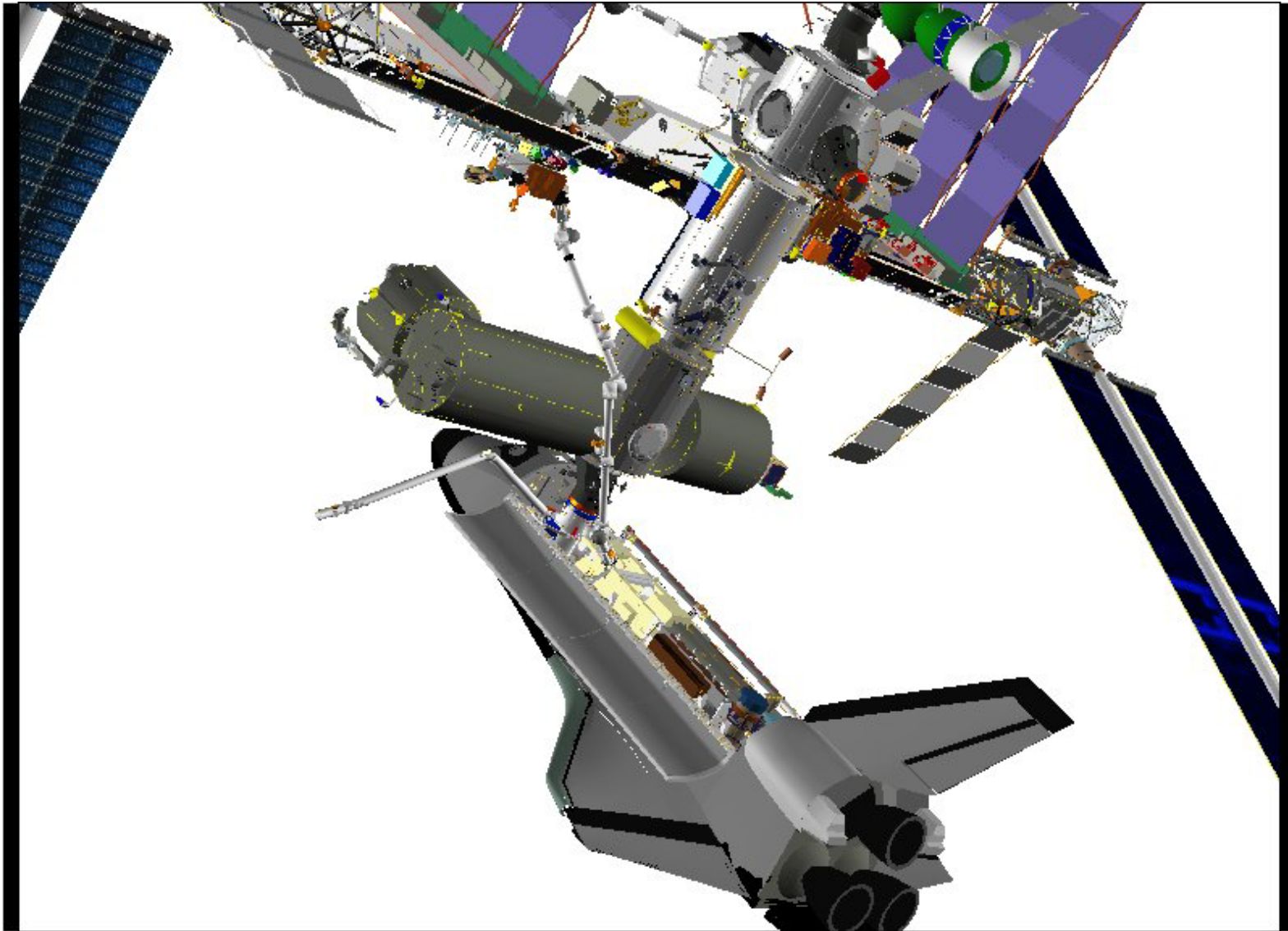
New Operations: FD 4 S6 Unberth & Maneuver



- Due to lack of SRMS clearance with JEM Module and length of the ISS truss, robotics ops for S6 maneuvering are complex
- SRMS uncradles and maneuvers out of the way to an S6 unberth viewing position
- With SSRMS on MBS PDGF-1 (MT WS 6), SSRMS Unberth's S6 from Orbiter PLB
- SSRMS maneuvers S6 to the handoff position, SRMS grapples S6
- MT Translates to WS 1
- SRMS maneuvers S6 to the hand-back position
- SSRMS grapples S6 at the hand-back position and maneuvers to the overnight park position



FD4 - S6 Grapple



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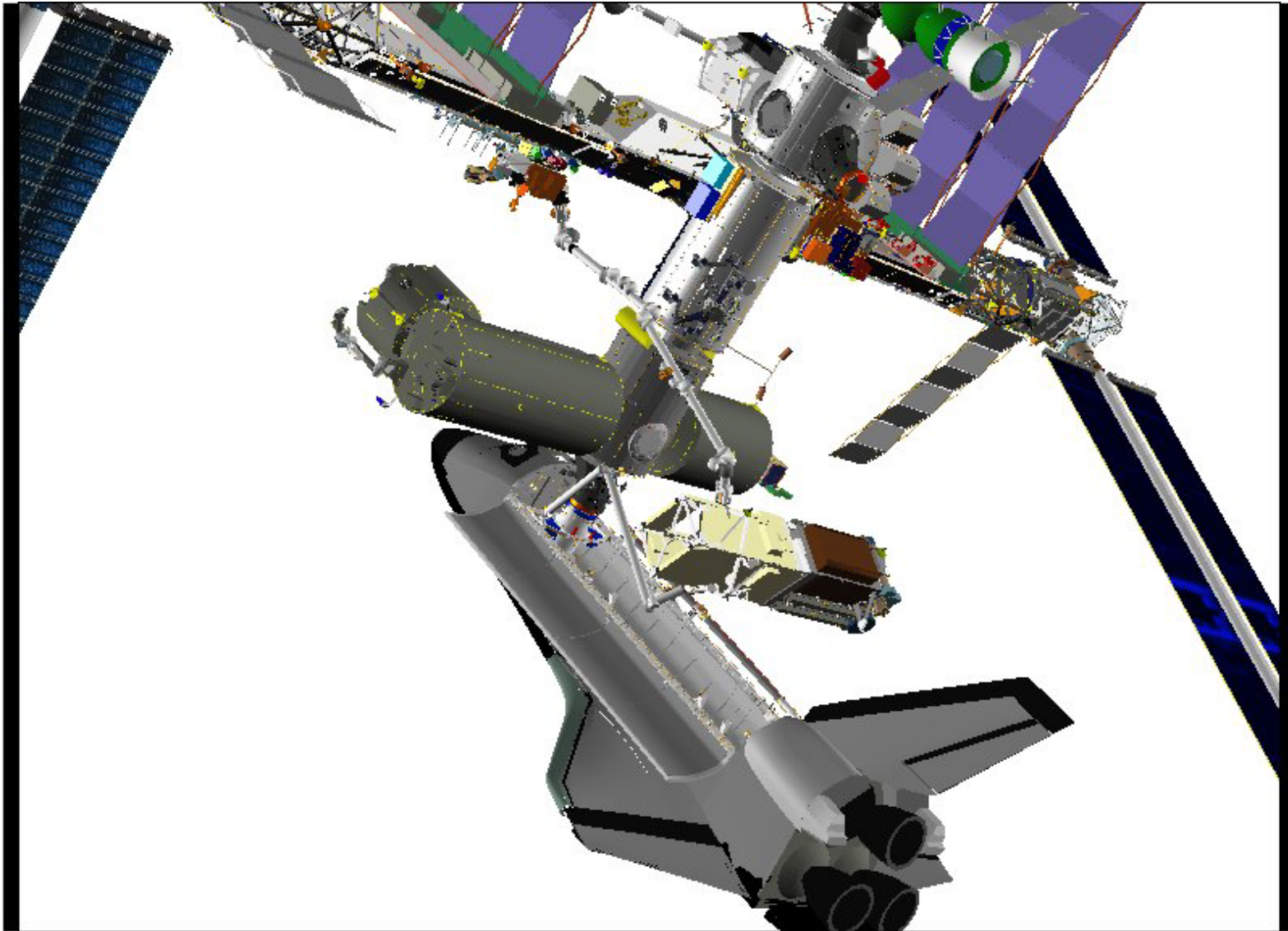
DA8/Alibaruho, Dye, Jones, Nelson - 119/15A MOD FRR - 1/13/09

FD 4 – S6 Unberth



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FD 4 - S6 Handoff to SRMS



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New Operations: Stack CO2 Measurement



- On STS-123 / ISS-1J/A, crew reported CO2 symptoms on Shuttle
- On STS-124 / ISS-1J, several ventilation and systems config changes were made, CO2 symptoms were alleviated
- ISSP gave action to EC to assess integrated systems performance and determine which of the system 1J mods helped the CO2 issues
 - A proposal was made at STS-126/ULF-2 JOP #7 (7/1/08) to return ISS ducting to as-designed config for ULF-2 to assess affect of ISS ventilation mods
 - The JOP decided to fly ULF-2 in the 1J config because it was proven and SSPCB upheld decision
 - Stack ventilation configuration for STS-126/ULF-2 was the same as STS-124/ISS-1J, and no CO2 issues were reported
 - EC approached STS-119/ISS-15A JOP with a proposal to form a tiger team to further assess issue
 - 15A JOP did not endorse formation of a tiger team (due to limited time) but proposed performing a detailed stack CO2 survey every docked day to assess system performance
 - » An ISS crew member will take CO2 readings with CDMK in every module and orbiter twice per day, once at mid-day and once prior to pre-sleep
 - » STS and ISS ventilation config will be the modified config identical to 1J and ULF-2
 - » Readings will provide more resolution and insight into performance of modified ventilation config to help EC strategize on how to further assess system performance without risking crew comfort and crew performance

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New Operations: WHC Checkout



- ISS Program Waste Hygiene Checkout Requirements
 - IDR requirement to check out WHC with high load (6 crew)
 - Flight 15A requirement to demonstrate ability to go without Orbiter liquid waste dumps in prep for 2J/A.
- Plan to address both requirements met by performing a high load (6 crew) checkout of the WHC for 2 days starting on FD 9
 - 6 STS crew would use WHC between FD 9 and FD 11
 - All STS crew trained in US WHC operation
- WHC checkout at risk due to on-orbit problems with UPA/DA
 - If Urine Processor Assembly inoperative during 15A, cannot perform WHC high load checkout without using limited supply of expendable containers (eg EDV's)
 - 18S Joint Soyuz mission last opportunity to test WHC w/ 6 crew prior to planned 6-crew ops if checkout not performed on 15A
- MOD can support R&R of UPA/DA on 15A if req'd
 - ISSP has not made final decision to fly DA or replace it during 15A but is working parallel paths to support flying DA middeck on 15A and returning failed DA
 - Expect decision in 2 – 3 weeks pending results of troubleshooting of on-orbit DA
 - E18 CDR/Fincke & E18 FE-2/Magnus trained to perform R&R [2 Hrs for 2 crew]
 - IFM procedures drafted and will be submitted real-time if needed
 - Plan can be modified to support DA R&R with minimal impact to other Cat 1,2 Tasks

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New Operations: Late ISS Maneuver for Dock



- OM proposed modifying ISS timeline for FD 3 to delay ISS maneuver to docking attitude
 - Allows for an additional 2.5 hours of ISS arrays in autotrack
 - Improves power generation for high beta dockings, like 15A
 - Reduces the depth of planned docking powerdown and risk to science
 - Per modified timeline, ISS would be in docking attitude prior to Orbiter arrival on the R-Bar
- Proposal was presented to the Generic JOP and approved pending approval by 15A JOP
 - 15A JOP approved plan and implemented during FD 3 Flight Specific Docking Simulation
 - No operational issues were observed with the modified timeline
 - Preliminary concurrence from MCC-M SUDN specialists received
 - Formal coordination of modified timeline for Russian systems configuration in work (CHIT 6801)
 - » CHIT response due from MCC-M on GMT 37 (February 5, 2009)
 - » Russian JOP facilitating discussions, no issues identified from Russian side yet



Safety Issues



- Robotic failures during maneuvers to S6 install could lead to Inability for ISS to sustain Docking Loads
 - Zero-failure tolerant during SRMS maneuver to S6-to-SSRMS handback
 - » SRMS is 0FT to achieving S6 handback position
 - » SSRMS has capability to grapple S6 given any SRMS joint failure and allow the shuttle to depart
 - » ISS unable to sustain subsequent Docking Loads unless S6 structurally mounted
 - Several of the cases result in inability to Press to Install due to robotic clearance issues
 - Minimal verification that resolution options are viable
 - » Feasibility assessment associated with ability to either Press to Install or Safe S6 for subsequent loads (or Jettison) if RMS joint fails has gaps
 - » DX2 assessment suggests S6 can either press to install or return to PLB
 - Risk Acceptance NCR in work (ECD 1/21)
 - 15A JOP will develop a Flight Rule for PCN-2 to document ops philosophy (ECD 1/26)

Safety Issues (cont)



- Positive Plasma

- Probability assessment in work for positive plasma risk
 - » Associated NCR to SRP - ECD 1/14
- For 119/15A, with addition of S6, potential current levels increase ($V \times B$)
 - » 126/ULF2 assessment showed body current through the most likely path (of highest concern) to be minimal
 - » Remaining current paths for ULF2 were accepted on coarse probability assessment
- 15A probability assessment updates ULF2 assessment
 - » Accounts for 15A ISS configuration
 - » Establishes tool with flexibility for future assessments
 - » May be able to incorporate on-going medical TIM data regarding current effects and/or additional current path studies for 15A
- Not expecting ops impacts for hazard control
- 15A plan built assuming no additional ops action required

Safety Issues (cont)



- Negative Plasma

- Expected to be worse than ULF2 due to increase in solar activity and addition of S6 SAWs
 - » Shunting not sufficient outboard of SARJ (approx -45V) after both PCUs fail
- Negative plasma NCR in work (to SRP - ECD 1/14)



Flight Rules



- All required generic volume A, B, C, and D 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-119/ISS-15A
 - Volume A (STS), Final, PCN-9 dated 1/22/08
 - Volume B (ISS), Final, PCN-4 dated 12/11/08
 - Volume C (Joint), Final, PCN-4 dated 5/5/08
 - Volume D (Soyuz/Progress), Final, PCN-5, dated 9/10/08
- STS-119/ISS-15A flight rules annex
 - Final, approved at JPRCB on 12/15/08
 - PCN-1 targeted for JPRCB approval on 1/26/09
 - PCN-2 will be required due to late changes to mission objectives and late analysis

FDF/ODF/SODF



- DA8 has participated in FDF/ODF/SODF processes and procedure reviews as required
- FDF/ODF will be ready to support STS-119/ISS-15A
- New US procedures are primarily for:
 - S6 Installation & Activation
 - Updates to Caution, Warning, & Emergency procedures due to new power channelization
 - EVA Assembly Tasks

Flight Director Mission Staffing



- All STS-119/ISS-15A Flight Directors are certified per Flight Director Certification Guide (DA8-00010), Final, dated October 24, 2008
- Additional certified Flight Directors are available to support Team 4, EMCC, and STS-127/LON flight, as required
- MOD Work Guidelines are met: Due to the expected mission duration, Shuttle Orbit 2 and Planning Teams are augmented
- Flight-specific certifications are expected to be complete by January 30, 2009

Shuttle Flight Directors		ISS Flight Directors	
Paul Dye	Lead/Orbit 1	Kwatsi Alibaruho	Lead/Orbit 1
Mike Sarafin / Tony Ceccacci	Orbit 2	Heather Rarick	Orbit 2
Norm Knight / Bryan Lunney	Planning	David Korth	Planning
Richard Jones	Ascent/Entry	Bob Dempsey	Team 4
Tony Ceccacci	Team 4		

EMCC/BCC



- No changes to EMCC procedures since STS-124/1J
 - Personnel are identified to support EMCC, if required
- BCC procedures were recently updated to include lessons learned since 1J/STS-124 (from Hurricanes Gustav and Ike)
 - Personnel and Facilities are ready to support
 - » MSFC/HOSC certified availability

Non-Standard Open Work



- Level II (Program) Actions – 119/15A Flight Effectivity/Constraint
 - There are no open Space Shuttle Program Open Actions that have an STS-119/ISS-15A Flight Effectivity assigned for MOD
 - There are no open Space Station Program Open Actions that have a ULF2 Flight Effectivity assigned to MOD for STS-119/ISS-15A
 - Closed Actions
 - » STS-126/ULF-2 IFA Closure – Prelaunch EPS Quantities
 - » STS-124/ISS-1J IFA Closure – JEM Unberth
- Ascent abort flight techniques to mitigate flow control valve failures will be identified by Jan 23
- Flight Rule to address decisions required for S6 Install following single SRMS joint failure will be developed by Jan 26
- Potential threats
 - MOD currently has no direction from ISSP / OM concerning required Ops Controls for Positive Plasma issue
 - Controls requiring changes in attitude for S6 Install (EVA 1) and P6 Battery Prep (EVA 2) will require rework of ATL, rework of MT translation analyses, rework of S6 Install LTA and control analysis and dependent ops products
 - » Would be significant threat to readiness for a 2/12/09 launch date
 - » MOD is ready to address required controls once analysis results are received from ISSP

STS-126/ULF2 IFA Closure – Prelaunch EPS Qty's



- STS-126-D-001 IFA Status - Closed
 - STS-126-D-001: Updating Minimum EPS Consumables Liftoff Quantities Inside L-5 Days
 - » EGIL and Fuel Cell PRT in agreement
 - » Process inside of L-5 days: JSC-MAS CHIT followed by Flight Design E-Consumable website update within 24 hours
 - » JSC MOD telecon with KSC NTD, PRSD, & SPE/OPE elements reviewed the STS-119 plan on Jan 9
 - No issues identified



STS-124/1J IFA Closure – JEM Unberth



- Y-axis oscillations observed during STS-124/1J JEM payload unberth using SSRMS
- FOICB (1/12/09) agreed to close IFA with the following rationale from MOD, CSA, ER, & CB:
 - STS-124/1J JEM unberth command rate was much faster than previous flights unberthing heavy payloads
 - » STS-119/15A crew briefed on 1J lessons-learned & re-sensitized to importance of slow THC ramp-in
 - » Crew robotics training modified to provide plotted performance data regarding unberth tasks, in addition to previous verbal instructor feedback
 - STS-124/1J published PRLA release sequence contributed to observed motion
 - » STS-119/15A S6 unberth procedures incorporate 1J lessons-learned
 - SSRMS brakes – ON during PRLA release (instead of position-hold) to minimize stored energy in arm during unberth
 - Rate scaling utilized for initial unberth
 - JEM payload and scuff plate design had known ICD violations that allowed reduced clearance
 - » STS-119/15A ICD violations within flight experience base & less severe than for JEM

Exceptions



- 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-119/ISS-15A mission and ISS-15A stage
- All standard/non-standard open work will be closed out or have a closure plan prior to SSP FRR (1/21/09) with no exceptions
- ISSP SORR was conducted on 1/15/09; closeout for non-standard open work will be reported to ISSP prior to Level 1 FRR (2/3/09)





Backup



Remaining STS-119/15A Integrated Sims



- Ascent/Entry
 - 1/21: TCDT
 - 1/23: Deorbit Prep
 - 1/26: Ascent #3
 - 2/5: Entry #3
 - 2/6: Ascent #4



Ascent/Entry Flight Techniques Panel (A/E FTP)



- Six Ascent/Entry Flight Techniques Panel (A/E FTPs) were held with topics supporting STS-119/15A
 - A/E FTP #236
 - » Boundary Layer Transition DTO
 - A/E FTP #239
 - » OI-33 Review
 - A/E FTP #240
 - » SSME LCC Update
 - A/E FTP #242
 - » SSME LCC Update
 - A/E FTP #243
 - » DOLILU Wind Change Redline
 - » I/O Reset Considerations
 - » OI-32 Automatic 2% Throttle-down Issues
 - » Operational Impacts for Low Mixture Ratios
 - A/E FTP #245
 - » STS-126 Post-flight Review
 - » STS-119 sMIA Diode Posture



A/E FTP #236 Summary



- **Boundary Layer Transition DTO Review**

- **Operational Impacts**

- » It is desirable to avoid roll reversals during mach numbers where boundary layer trip will occur
- » Orbit Adjust can be used to accomplish this goal
 - Difficult to balance all mission objectives with a single orbit adjust
- » AEFTP community agrees that orbit adjust for DTO should be low priority

- **Entry Trajectory techniques to mitigate ascent debris concerns**

- » Ascent debris evaluations in the same tile areas near the protuberance are complicated
- » Lower surface inspection maps show critical damage size is the same whether the 0.25 inch protuberance is there or not

- **Entry GN&C evaluation**

- » Conservative flight control stability analysis results were examined
- » No additional propellant budgeting is required to account for roll/yaw control increments induced by protuberances up to 0.75 inches

- **Overall conclusions**

- » There are no significant operational impacts that preclude performing the BLT DTO
- » Risk balances between collecting data and mission success must be considered

A/E FTP #239, #240 & #242 Summary



- OI-33 Review
 - Joint FTP with Orbit
 - Reviewed OI33 content and identified required updates to operational products
 - Significant A/E OI-33 CRs include:
 - » RTLS ET Separation Enhancements – alpha management, jet prioritization scheme
 - » GNC Spec 54 Crew Bearing Display for additional crew horizontal situational awareness
 - » Automatic Single Engine Roll Control for 3 SSMEs out in Major Mode 102
 - » ECAL Energy Compensation – provides better energy state estimates during phugoids
 - » BFS GPS Auto Update frequency changed to be same as PASS
- SSME LCC Update
 - Proposed additional pre-launch monitoring for main engine shutdown pushbuttons
 - » OI-32 introduced new downlink parameters so pushbutton contact dilemmas can be detected in OPS-9
 - » Instead of a one-time check, the launch team will constantly monitor pushbutton contacts down to T-31 sec for 2 of 2 pushbutton contacts failed 'on'
 - LCC for Limit switch contact failures still in work

A/E FTP #243 Summary



- DOLILU Wind Change Redline

- Wind pair redline updated for generic use
 - » Current limits did not account for SRB performance and liftoff weight
 - » Limits used to determine if non-assessed winds late in the launch count are acceptable for flight

- I/O Reset Considerations

- Current procedures allow crew to execute an I/O Reset for a bypassed LRU
- If a non-universal I/O error caused the bypass, executing a GNC I/O RESET could cause a redundant set split as recently witnessed during troubleshooting of the MDM FA2 anomaly prior to STS-124
- In order to mitigate the possibility of the set split during dynamic flight, crew procedures have been updated to have the crew check with MCC prior to executing the I/O RESET
 - » MCC has more insight to the bypassed LRU and can quickly determine if a non-universal I/O error is present
 - » If no comm is available with the ground, per established protocol, the crew may execute the I/O RESET if required
 - » GNC I/O RESETs imbedded in nominal procedures do not require the MCC check

A/E FTP #243 Summary (cont.)



- OI-32 Automatic 2% Throttle Down
 - Long Term Workaround for Single SSME Completion
 - » OI-32 introduced code to simplify crew task by automating throttle down for two out SSME scenario's but had unexpected consequences
 - » LOCV for certain 2-out SSME scenarios that cause an unplanned re-entry shortly after OMS-1
 - Crew procedures incorporated into FDF to remedy this concern based on A/E FTP assessment
 - » For Single SSME scenarios the Crew will select Manual throttles at 5% propellant remaining, minimum throttles at 2% propellant remaining, followed by Auto throttles
 - AEFTP decision was to not implement a Flight Software change to remedy this condition
 - » Procedures have been used for many years before OI-32 and requires a multi SSME failure to be implemented
- Operational Impacts for Low Mixture Ratio (MR)
 - SE&I assessment of SSME MR indicated a negative trend since 2004
 - Resulted in a community wide study to determine cause and corrective action
 - Program concluded that a new baseline update to the SSME controller MR was necessary to account for this MR trend
 - Update could not be incorporated into SSME controller for STS-125 and drove Operational workarounds to account for the new MR
 - » Impacts to Flight Performance Reserve budget required to prevent a low level cutoff and how to manage this in the Abort Region Determinator (ARD)
 - » PLOAD application output that determines how much FPR based on the ET Loading had to be biased to account for new MR
 - With STS-125 delayed this issue is no longer a concern since the SSME controller MR was modified for STS-126 and subsequent, thus eliminating the need for MOD to modify products/processes

A/E FTP #245 Summary



• STS-126 Post Flight Review

- DOLILU Working Group will develop balloon management strategy to better workaround aging 45'th SW computer (MSC) network
- Large HAC and associated dynamics did not impose additional workload on crew. Good description from the MCC prior to deorbit and letting auto roll onto the HAC aided this result.
- Lesson learned from landing on Temporary Runway at EDW: Tell the crew the expected Nose Gear touchdown prediction point
- Significant number of network issues and operator errors at MILA, JSC, and EDW during ascent/entry operations

• STS-119 sMIA Diode Posture

- Reviewed sMIA diode failure analysis results observed in lot codes 7715 and 7535
 - » Copper alloy may have been introduced by improper machining technique
 - » Diode cracking may have been exacerbated by presence of copper alloy
- OV-103 has 7715 & 7535 diodes on primary string for FA4 and FF4
 - » No EIUs on OV-103 contain these 'suspect' diodes
- AEFTP community concurred to port mode in the prelaunch timeframe and fly string 4 on secondary ports

Standard Open Work



- STS-119/ISS-15A Flight Rules Annex
 - PCN-1 targeting JPRCB 1/26/09
 - PCN-2 targeting IMMT/MMT at L-2 on 2/10/09
- FDF/SODF
 - Final crew review 11/3
 - Final errata, L-2 days
- Training
 - Complete STS-119/ISS-15A Ascent/Entry simulations (L-7 days)
 - Complete STS-119/ISS-15A Orbit Flight Specific simulations (L – 7 days)
 - Complete Flight Director flight specific certifications (ECD 1/23/09)
- Pressure profile
 - Complete coordination of pressure management plan with MCC-M (ECD L-1wk)
- Finalize solar array constraints and power profile plan for docked mission
 - Initial analysis shows objectives are supportable by limiting loads and adjusting power share ratios.
 - Powerdowns may be needed, prelim analysis suggests no impact to planned US, ESA, or JAXA payload ops
 - SACM (L-30 days)
 - Power Analysis (ECD L-1 wk)

Standard Open Work (cont.)



- Complete “Road To” Items and Prepack
 - Uplink 15A MSS Recon Files (L – 4 wk)
 - Uplink 15A SODF to IPV (L – 4 wk)
 - EVA Hardware / Tool Config (L – 1 wk)
 - Misc systems configuration and maintenance (eg CCAA swap, EPS ORU pre-fresh)



Standard Open Work: Safety



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

OPEN NASA OCADs



- **BME (3)**
 - Hygiene based microb growth mitigations
 - **Loads constraints for ARED/VIS ***
- **EVA (7)**
 - BGA KOZ
 - SAW deploy KOZ
 - PV Rad deploy KOZ
 - 4-bar KOZ
 - BB latches KOZ
 - S6 Install clearance monitoring
 - SSU/ECU shroud removal
- **OSO (1)**
 - WRS maintenance constraint
- **PHAL (10)**
 - Longeron shadowing autosafing sw updates
- **PDRS (1)**
 - OBSS rate constraint
- **ROBO (8)**
 - S6 unberth constraints
 - Stale cue avoidance
 - Collision avoidance
 - **MT/CETA/PL to SARJ interference constraints ***
 - **MT latching (3 of 4) constraint ***
- **THOR (1)**
 - S6 thermal constraints
- **EVA (2)**
 - PTU cable guide KOZ
 - TMA lanyard constraint
- **Crew Systems (7)**
 - STS-40X constraints

* OCAD not yet submitted

STS-119/ISS-15A JOP Special Topics



- Regen ECLSS Requirements: WHC High Load Checkout
 - Assessed minimum set of Regen ECLSS Checkout requirements to support ISSP march to 6-person crew. Agreed to perform high load checkout of the WHC
- S6 Unberth & Maneuver
 - Assessed traditional method of unberthing truss from PLB on FD 3 post-docking and determined original 13+1+2 timeline could not support without SCSC violations
 - Requested rebaseline of mission as a 14+1+2 so that all S6 Unberth & Maneuver ops could occur on FD 4 and S6 Install on FD 5
- FD 3 Late ISS Maneuver to Docking Attitude
 - Approved OM proposal to delay ISS maneuver to the docking attitude to allow for better power generation during high betas
- ISS Ventilation & CO2 Assessment
 - Discussed ISS Program proposal to investigate what aspects of the ducting configuration on STS-124/1J and STS-126/ULF-2 were the main contributors to the improvement in flow and resulting elimination of CO2-related issues
 - Per input from CB, recommended to proceed with original ducting configuration plan but developed a plan to collect stack CO2 data to help assess integrated ISS / Orbiter ventilation performance
- LOAC Recovery Plan for S6 Unberth & Maneuver (future, 1/23/09)
 - Will define and approve plan for recovery from loss of attitude control during manipulation of the truss
- FGB PDGF Installation & Checkout (requirement deleted 12/2/09)
 - Developed plans for installation and checkout of FGB PDGF

Russian Integration



- STS-119/ISS-15A Briefings to Russian Teams
 - In work and expected to be completed by launch minus 1 week



SPAN Staffing



- ISS SPAN Support: Staffing provided by USA CAF Personnel
- ISS SPAN Systems: Staffing provided by DI plus support from DA8 and DA7 if required
- SSP SPAN Systems: Staffing provided by DS plus support from DA8 and DA7 if required
- SPAN DO: Staffing provided by DO
- SPAN DM: Staffing provided by DM
- SPAN DX: Staffing provided by DX
- SPAN Managers: Staffing provided by DM, DO, DX. Additional ad hoc support from DA8, DA7, DS, and DI

MCC Applications: Non-critical Processors



- No changes to Flight Director applications for STS-119 / ISS-15A



Command Procedures



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



Item of Interest: SCSC Exception



- One violation will occur as part of nominal mission plan for the FD 6 Focused Inspection case
 - ISS is in +XVV (Orb +ZVV) from shortly after docking until after S6 install due to LTA thermal constraints for S6
 - If FD 6 FI required, the following activities must be performed in sequence late on FD 5 to support
 - » Complete S6 Install / EVA 1
 - » MT Translate WS 1 -> WS 4
 - » Solar Array feather & lock in prep for attitude maneuver; SSRMS walkoff from MBS PDGF 1 to Node-2 PDGF
 - » Orbiter start attitude maneuver to ISS -XVV (Orb -ZVV)
 - » Orbiter Free Drift / ISS Start Momentum Management when in Attitude
 - Because of various structural constraints precluding doing some of the above activities in parallel, the Shuttle crew's initiation of the maneuver (2 min activity) and their mode to STS free drift (30 sec activity) occurs deep in their Pre-Sleep, technically an SSC violation
 - Alternative is to remain in ISS +XVV for an additional 12 – 24 hours for FI case
 - Accepting the SCSC violation is minimal impact to crew and better for Orbiter MMOD risk
 - SCSC Exception presented to and approved by FOICB on Mon, 1/12/09

Contingency Shuttle Crew Support / STS-127/LON



- 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-119 Ascent/Entry Team will support STS-127/LON mission
- Personnel are available to support Orbit Operations as required

ISS OPEN NCRS



- NCR-ISS-225: Loss of ISS robotic capability to remove S6 from SRMS
- NCR-ISS-232: Electric Shock to EVA Crewmember from EMU Arcing to Plasma (Positive Charge)
- NCR-ISS-233: Electric Shock to EVA Crewmember from EMU Arcing to Plasma (Negative Charge)
- NCR-ISS-188-15A: Lack of Two Failure Tolerance to Prevent Longer Shadowing (autosafing software update)

GFE OPEN HAZARD REPORTS



- **EVA**

- Contamination Detection Kit - ECD 1/16/09

GFE OPEN HAZARD REPORTS



• STS

- ISS Work Light - ECD 02/06/09.
- PRC-112G Radio - ECD 02/01/09
- Crew Seat DTO Enhanced Wide Band Micro Triaxial Accelerometer Unit (EWBMTAU) - ECD 01/08/09

GFE OPEN HAZARD REPORTS



• ISS

- ISS Work Light - ECD 02/06/09
- Cycle Ergometer and Vibration Isolation and Stabilization System (CEVIS) - ECD 01/07/08
- Water Transfer Accessory Kit 1 - ECD TBD
 - » Depending on an NT/EC Task Agreement, the RAESR will be written in time to support 15A. ECD will be determined at that time
 - » Recommending removal from manifest
- ISS Battery Charger
 - » ECD does not support 15A
 - » Recommending removal from manifest

PAYLOAD OPEN HAZARD REPORTS



- ISS

- CBC Return: Awaiting submittal of Russian SDP - ECD 1/22/09
- ISS Lockers: Awaiting series/reflight SDP – ECD 1/22/09
- JEM E-3 Camera Body/AA Battery Compartment: SDP in review - ECD 1/20/09
- NLP-Vaccine-3: Awaiting series/reflight SDP – ECD 1/22/09

- Shuttle

- None

