



# STS-124/1J MOD Flight Readiness Review



**JSC Mission Operations Directorate  
Flight Director Office**

**DA8/A. Hasbrook, M. Abbott, N. Knight, R. Jones, H. Rarick**

**April 29, 2008**

**Agenda Item 3**

**Mission Operations Directorate  
Flight Director Office**

# 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, E; STS-124/1J 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-326 (backup)
  - Level II Actions
- Standard Open Work (backup)
- Non-Standard Open Work
- Exceptions
- Flight Readiness Statement



# DA8 COFR Requirements/Endorsements



Non-Crit Processors/Applications	G				G		G	Ready to Support Flight/Only Standard Open work
EMCC	G				G	G		
Certified Flight Controllers	G			G	G	G		
Flight Rules	G!							
FDF	G	G*						
FTP - 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	G		
CIL/Hazards	G		G				R	Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.
No Constraints	G	G						
Level II (Program) Actions	Y	G						
Mission Requirements	G							
Exception/Resolution	G	G						
Command Procedures	G							
Flt Prep Process Plan Requirements Met		G						N/A
Contractor Process Insight		G						

\* 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									



# Ascent/Entry Topics



- Launch Window and Lighting Summary

## Preliminary Launch Window Times For The STS-124/1J May 31 Launch

Day	KSC Date	RNDZ Day	ET Photo Umbilical	ET Photo Handheld	Open (EDT)	Open (GMT)	In-Plane (GMT)	FD 3 Close (GMT)	FD4 Close (GMT)
Saturday	31-May	FD3/FD4	Daylight	Daylight	16:57:07	20:57:07	21:02:07	21:07:07	21:09:50
Sunday	1-Jun	FD3	Daylight	Daylight	16:34:35	20:34:35	20:39:35	20:44:35	.....
Monday	2-Jun	FD3/FD4	Daylight	Daylight	16:08:53	20:08:53	20:13:53	20:18:53	20:21:35
Tuesday	3-Jun	FD3	Daylight	Daylight	15:46:22	19:46:22	19:51:22	19:56:22	.....
Wednesday	4-Jun	FD3/FD4	Daylight	Daylight	15:20:39	19:20:39	19:25:39	19:30:39	19:32:55
Thursday	5-Jun	FD3	Daylight	Daylight	14:58:09	18:58:09	19:03:09	19:08:09	.....
Friday	6-Jun	FD3	Daylight	Daylight	14:32:26	18:32:26	18:37:26	18:42:26	.....
Saturday	7-Jun	FD4*	Daylight	Daylight	14:09:55	18:09:55	18:14:55	.....	18:19:55
Sunday	8-Jun	FD3	Daylight	Daylight	13:44:12	17:44:12	17:49:12	17:54:12	.....
Monday	9-Jun	FD4	Daylight	Daylight	13:21:42	17:21:42	17:26:42	.....	17:31:42
Tuesday	10-Jun	FD3	Daylight	Daylight	12:55:59	16:55:59	17:00:59	17:05:59	.....
Wednesday	11-Jun	FD4	Daylight	Daylight	12:33:28	16:33:28	16:38:28	.....	16:43:28
Thursday	12-Jun	FD3	Daylight	Daylight	12:07:45	16:07:45	16:12:45	16:17:45	.....
Friday	13-Jun	FD4	Daylight	Daylight	11:45:15	15:45:15	15:50:15	.....	15:55:15

**NOTES:**

- 1) Daylight launch occurs between May 24 and June 26th.
- 2) Launch Window shown at 10 minutes but may be less on launch day due to limited APM.
- 3) Optimal ET Umbilical lighting occurs between June 1st and June 23rd.
- 4) Optimal ET Handheld lighting occurs between June 17th and July 6th.
- 5) FD3/FD4 are days where both a FD3 and FD4 pane may be utilized to extend the launch window.
- 6) Data reflects a 2.65 m/s reboost that is scheduled for April 25th.
- 7) Flight Day 4 Rendezvous launch opportunity.
- 8) June 7th may become a FD3 opportunity depending on atmospheric effects on the ISS state vector over the next several weeks.



# Ascent/Entry Topics (cont.)



- LH2 ECO Sensor Bypass strategy
  - Bypass failed LH2 ECO circuit only if failure occurs in OPS-9 and no significant impact to pre-launch timeline
    - » Booster & DPS ready to support OPS-1 BFS TMBU to bypass LH2 ECO circuit if required
    - » KSC ready to bypass failed LH2 ECO circuit in PASS with OPS-9 Launch Data Bus command
  - A/E FTP #239 (2/28/08) and PRCB Splinter meeting (4/16/08) reviewed and approved this strategy
- MILA Forward Link circuits for Launch & Landing
  - Both primary & backup circuits will be configured on NTR
    - » STS-124 is first flight to use this configuration for launch
  - STS-124 is last flight of MILA NTR ramp-up plan
- Freon radiator hoses: C-bend / Omega-bend root cause determination
  - 482 Procedure incorporated into Deorbit Prep checklist to capture video of all 4 Freon radiator hoses during payload bay door closure
  - Draft procedure available for still photos taken through aft windows
  - Highly desired requirements spelled out in Shuttle Program FRD (FRD17462-124-0047)



# EDW Temporary Runway



- STS-124/1J is first flight to utilize EDW Temporary runway while permanent runway undergoes refurbishment
  - Air Force transition to EDW Temp Runway expected May 16-19
- STS-124 crew scheduled to fly STA approaches to EDW Temporary runway on April 29 for approach & landing visual scene familiarization
- EDW Temporary runway dimensions & characteristics
  - 12,000 ft long by 200 ft wide asphalt/concrete runway.
  - Additional 1,000 ft over/under runs are shuttle load bearing.
- Flight rules & procedures in place to accommodate EDW Temp runway operations
  - Brake Energy  $\leq$  52 Mft-lb
    - » Protects against  $3\sigma$  dispersions from tire fire limit of 70 Mft-lb
  - Delay braking to 4,000 ft rollout distance remaining if heavyweight vehicle
    - » Does not apply to STS-124/1J end-of-mission (lightweight vehicle)





# Aerial photo of EDW Temp Runway



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# Spaceflight Meteorology Group (SMG)



- All NWS/SMG software used to create mission critical products or required for mission support is ready for STS-124/1J.
- All SMG forecasters required to support STS-124/1J meet currency requirements listed in SMG Training & Certification plan.
- No non-standard open work or exceptions
- **Istres HANDAR low wind speed bias since STS-122 December, 2007 launch attempts**
  - Wind speeds reading several knots too low as compared to LFMI METAR data when direction is from 340-040 degrees and speed is greater than 10 knots.
  - Other wind directions show no discernable bias.
  - Procedures necessary to mitigate this problem will be in place by TCDT.
- **Spanish Weather Service Radar Status**
  - Zaragoza radar has been repaired though data is flowing sporadically. Data is expected to be available for launch.
  - Only the lowest elevation data is available (no composite reflectivity product), therefore the TAL rain shower exception flight rule cannot be implemented.
  - Moron composite reflectivity product is not available.
    - Full volume scan radar is available from Rota, Spain via Internet website.
    - Rota radar coverage includes the MRN 20 nm circle.
    - Rota radar data may be considered if applying the TAL rain shower exception flight rule for MRN.
- **French radar coverage has been lost from the Spanish data server.**
  - No radar coverage for FMI.
  - SMG has notified Spanish Weather Service to determine cause of failure.
  - SMG is working with National Weather Service Headquarters to establish direct contacts with French Weather Service.

The undersigned certifies that the Spaceflight Meteorology Group is ready to support the STS-124/1J flight.

/s/ Frank C. Brody

Frank C. Brody

Chief, Spaceflight Meteorology Group

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# New Operations: Orbiter Inspection Deltas



- **FD2 Orbiter Inspection Plan**

- To accommodate the JPM, two significant changes were made to the Orbiter configuration that affect inspection operations
  - » OBSS not installed; boom is stowed on ISS (S1 truss) with sensors covered
  - » SRMS elbow camera is restrained to prevent ascent vibration from causing contact with JPM or port radiator; camera is effectively unusable prior to restraint removal
- Nominal FD2 pre-dock inspections are not possible with this configuration
  - » No OBSS sensor scans
  - » Limited clearance monitoring capability without SRMS elbow camera
- Flight-specific Starboard and Port wing RCC survey auto-sequences have been developed from existing generic EE surveys
  - » Starboard survey expanded to include more coverage of wing glove and wing tip; limited by SRMS reach and clearance to payload bay cargo, thus only the upper surface can be scanned
  - » Port survey covers more area on wing tip, but at increased range compared to generic survey due to limited clearance viewing (under PLBD without elbow camera); zoom settings were optimized to provide optimal resolution
- No special attitude maneuvers are required for lighting; nominal LVLH attitude and daylight/Earthshine are sufficient



# New Ops: Orbiter Inspection Deltas (cont.)



- FD4 OBSS transfer
  - OBSS is transferred from ISS to Orbiter during EVA1 (cat 1 objective)
    - » SSRMS grapples OBSS during EVA prep using newly-developed zero tension grapple technique to prevent storing energy in the boom/OSE prior to EVA release
    - » EV crew removes SRMS elbow camera restraint (cat 1) and OBSS sensor cover, and then releases OBSS from the OSE (SSRMS rigidization is completed during this sequence)
    - » SSRMS is used to maneuver OBSS out of the stanchions and EV crew disconnects the keep-alive umbilical
    - » SSRMS maneuver OBSS to the handoff position
    - » SRMS grapples OBSS and re-applies power via EFGF
    - » SSRMS releases OBSS and SRMS maneuvers to JPM install viewing position
  - Additional OBSS power considerations are listed on next page



# New Ops: Orbiter Inspection Deltas (cont.)



- FD4 OBSS retrieval from ISS: Power Considerations
  - After grapple of OBSS by SRMS, power is re-applied to the sensors
    - » Sensor Package 1 (LDRI/ITVC) heaters are powered by activating SPEE power
      - LDRI initializes in Mode1 (no lasing); no temperature telemetry is available at this time
      - ITVC activation (Mode 2) will be delayed until JPM install viewing to provide req'd ~1 hr warm-up time
    - » Sensor Package 2 (IDC/LCS) is activated via APCU2
      - Crew will perform a full activation of SP2 (not just heater power)
      - Allows retrieval of LCS temperature data via OCA
  - Later in the EVA, APCUs 1 and 2 must both be deactivated temporarily for EVA disconnection of the JPM Launch-To-Activation (LTA) cables
    - » LTA cable disconnect is expected to be complete *before* SP2 is powered, but if necessary, APCU2 power can be cycled per constraints documented in flight rules
    - » No issues are expected with the JPM/OBSS power choreography during the EVA
  - Maximum power off constraint is 120 min for SP1 and 144 min for SP2; expected off time is 35-45 min
    - » Timeline will be actively managed by both MCC and the crew to efficiently integrate the OBSS handoff activities with the JPM LTA cable disconnection
    - » It is an overall objective to minimize time with OBSS unpowered





# New Ops: Orbiter Inspection Deltas (cont.)



- FD5 OBSS sensor checkout
  - Checkout activities requested by sensor providers have been accommodated
    - » Checkout includes LDRI mode cycle and Flat Field data, plus LCS/IDC scans
    - » Checkout position places sensors ~6 ft from Nose Cap RCC
  - Overall procedure (maneuvers and checkout) is timed for 1.5 hrs
  - If FD5 checkout is cancelled due to higher priority objectives, Focused Inspection (FD7) will be the first opportunity to use the sensors
- Focused Inspection, if required, will take place on FD7
  - Similar in planning and execution to those conducted on previous flights, however clearances are even tighter with JPM installed on Node 2
  - A 4 hr activity is hard-scheduled in the Flight Plan; this time may be reduced, eliminated, or even expanded, as required
  - If sensor checkout is cancelled on FD5 and Focused Inspection is not required, consideration will be given to performing checkout operations on FD7
- FD11 Post-Undock Inspection
  - Post-Undock Inspection will be the full “FD2 Inspection” done on other missions
  - Steps normally skipped in “Late Inspection” *will* be performed (wing glove & crew cabin)
  - An additional nominal flight day (crew off-duty) and a contingency +1 day are included post-undock to provide time for inspection data analysis and/or additional tasks



# New Operations: CO<sub>2</sub>/Airflow Management



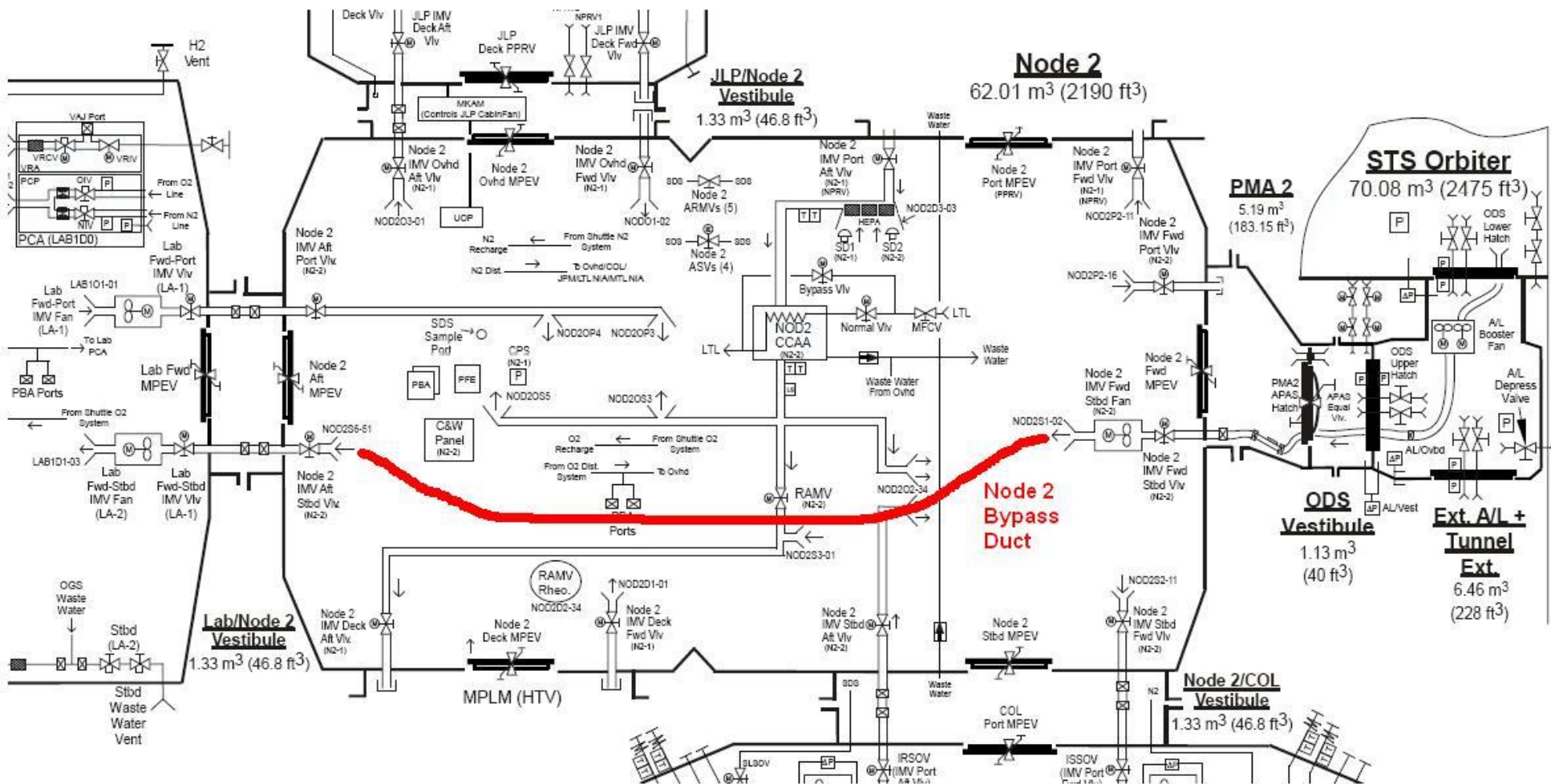
- Several procedural and equipment modifications are being implemented to improve overall CO<sub>2</sub> levels and airflow across the joint stack
  - Worked as an STS-123/1JA post-flight action via the Generic JOP/Orbit FTP
  - Recommendations will continue to evolve as data are collected and experience is gained, but several items are ready for implementation on STS-124/1J
- Airflow management
  - ISS will install 23 ft bypass duct between Node 2 and U.S. Lab (see page 18)
  - Orbiter will install 18 ft Spacehab duct to supply cabin air to Booster Fan, allowing conditioned air to be used by Orbiter crew rather than sending it all to ISS (page 19)
  - ISS portable fans will be available for use on Orbiter (extra batteries manifested)
  - Orbiter mid-deck is configured to allow OCAC reversal as an available option, although this is not nominally planned
- CO<sub>2</sub> management
  - ISS will have capability to increase CDRA blower speed and lower LTL temperature to improve CO<sub>2</sub> removal if additional CO<sub>2</sub> reduction is needed
  - Potential deferral of non-critical Metox regenerations to stage
  - Orbiter crew will have the option to change LiOH “early” if ppCO<sub>2</sub> reaches 5 mmHg
  - Full crew conferences will be scheduled elsewhere than the Orbiter mid-deck



# New Operations: CO<sub>2</sub>/Airflow Mgmt (cont.)



## Node 2 Bypass Duct Configuration

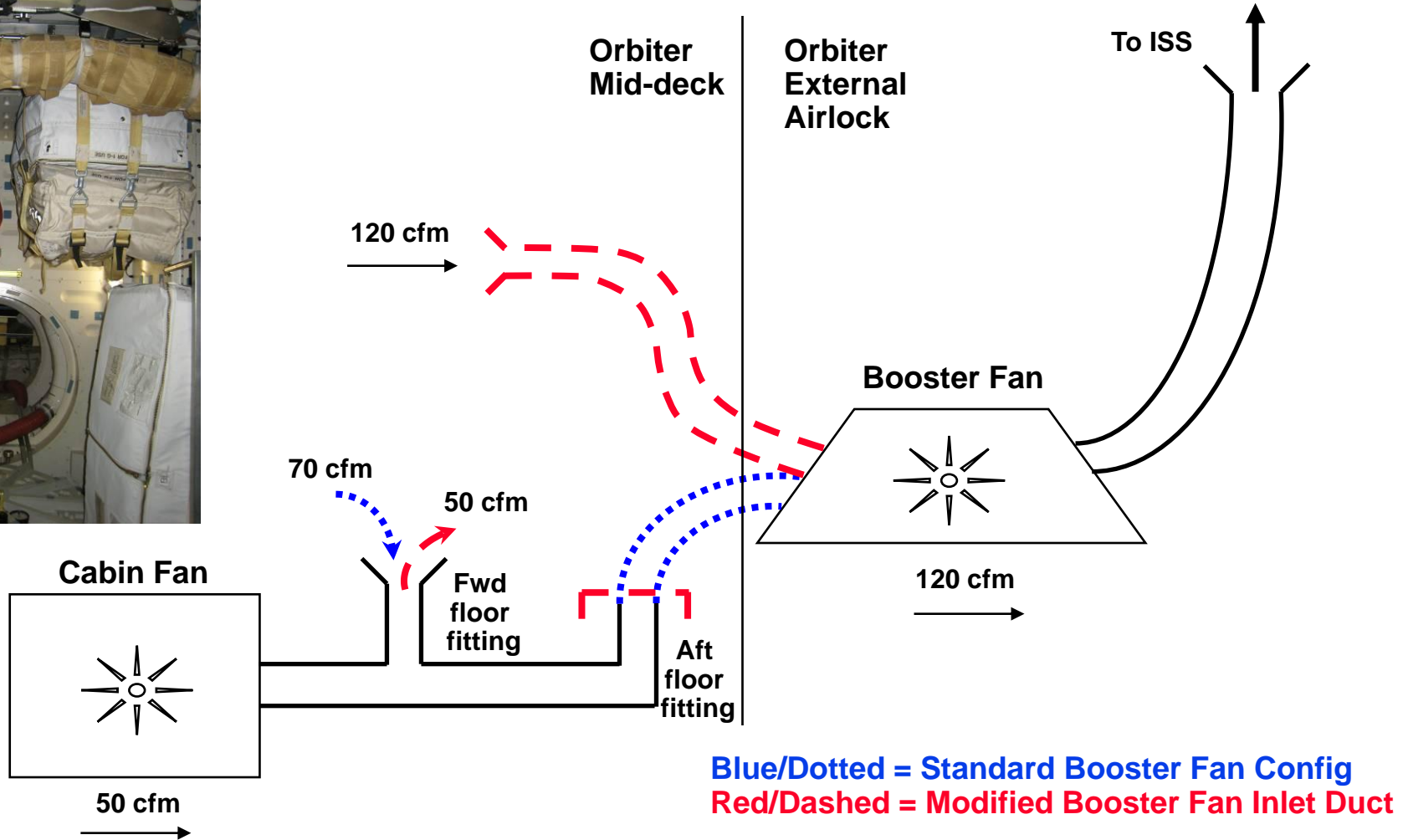


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# New Operations: CO2/Airflow Mgmt (cont.)



## Shuttle Mid-deck Booster Fan Inlet Configuration



**Blue/Dotted = Standard Booster Fan Config**  
**Red/Dashed = Modified Booster Fan Inlet Duct**





# New Operations: Joint Emergency Ingress



- A potential issue was recently identified with the response to a cabin leak while the Orbiter is docked to ISS
  - Joint Emergency Egress procedure is executed for this case to isolate the leak
  - If the Shuttle is leaking, there is a potential for trapping the Shuttle crew in the Orbiter with an unsupportable leak (dp/dt may preclude hatch opening and return to ISS)
- A Joint Emergency *Ingress* procedure was developed to cover this case
  - Provides a viable hatch opening sequence/procedures to allow re-ingress of ISS with the ISS crew's help
  - Provides minimum steps for Orbiter powerdown and reconfiguration
  - Note that this would likely result in the need to jettison the non-functional Orbiter
- STS-124/1J will be the first mission with this procedure in place
  - Initial development was worked through the STS-124/1J JOP and then taken forward to the Generic JOP; GJOP also reviewed Orbiter jettison issues/techniques
  - A mission-specific flight rule will provide for consideration to transfer the Orbiter crew to ISS for applicable Orbiter cabin leaks (provides the trigger to use the JEI procedure)
  - Development was limited to the overall basic procedure and vehicle configuration; generic rules and procedures will continue to evolve (low level of effort)



# New Operations: JAXA



- SSIPC will provide the command and control function for the JPM element including the JEMRMS
- Japanese Pressurized Module (JPM)
  - JPM Launch to Activation thermal clock shows good margins. JEMRMS not powered until JPM is installed on Node 2 port and activated.
  - Launches with one string of avionics installed. Second string is contained in the JLP which was launched on STS-123. Second string of avionics racks will be transferred into JPM on FD6 and activated
  - JEMRMS will be deployed during joint mission in two stages
    - » Initial deploy will allow EV crew to remove remaining MLI and launch locks
    - » Final deploy will put arm in its nominal on-orbit stow location



# New Operations: EMU Glove Plan



- Both EV crew will have one pair of modified EMU gloves that have TurtleSkin™ patches sewn onto the thumb and index fingers in the region of interest
  - TurtleSkin™ is significantly tougher than Vectran
  - No requirement to wear overgloves when wearing the modified EMU gloves
  - Any RTV loss will not be reason to don overgloves
  - Periodic glove inspections will occur and post-EVA glove photos will be taken and downlinked for assessment
  - EVA will be terminated for a visible cut or hole
- If crew's prime gloves are considered no-go after post EVA inspection is completed, crew backup gloves are not modified so crew will wear overgloves for all remaining EVAs, but will remove them if needed for the following reasons (flight rule 1J\_C15-9):
  - Trouble completing Category 1 or 2 objectives
  - Safety issues (tether swap, ability to safely translate to airlock etc)
  - Tasks that are impractical to perform with overgloves



# New Operations: MCC



- ISS FCR (FCR-1) transitioned to the Linux workstations
  - The final flight specific integrated simulation was performed utilizing the new workstations and no significant issues were noted
  - ISS Increment operations will have operated utilizing the new workstations for ~6 weeks prior to the STS-124/1J mission
  - Note that ISS MPSR workstations were transitioned after FCR-1





# Safety Issues



- Power Margins given status of starboard SARJ
  - Insufficient power margin to maintain Core Loads, post JEM Install, after a worst case single point failure (e.g., MBSU 2A) at low Beta angles
  - Response options include
    - » Autotrack SSARJ, consuming significant portion of fatigue life
      - Sustained Autotrack may induce canted surface damage beyond DLA drive motor capability
    - » Maneuver ISS to YVV (uncertified until mid-summer)
    - » Take IP modules to survival power, close hatches (politically untenable)
- Soyuz return vehicle viability
  - Return capability is 1 level of control for most ISS Hazards
    - » Most vulnerable in areas with existing failures (such as power generation)
    - » Return is only remaining option if above response plan cannot be sustained long enough to repair in the worst case power failure scenarios
  - Investigation and associated safety impacts pending



# 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, JOPs, and the FRCB
- The following generic publications are applicable for STS-124/1J
  - Volume A (STS), Final, PCN-9 dated 1/22/08
  - Volume B (ISS), Final, PCN-12, dated 4/7/08
    - » PCN-13 scheduled for SSPCB approval on 5/6/08
  - Volume C (Joint), Final, PCN-4, JPRCB approval expected 5/5/08
  - Volume D (Soyuz/Progress), Final, PCN-4, dated 9/18/07
  - Volume E (ATV), Final, PCN-2, dated 4/14/08
- STS-124/1J flight rules annex
  - Final, dated 4/7/08
  - PCN-1 targeted for JPRCB approval on 5/15/08



# FDF/ODF/SODF



- DA8 has participated in FDF/ODF/SODF processes and procedure reviews as required
- FDF/ODF will be ready to support STS-124/1J
- New US procedures are primarily for:
  - OBSS transfer from ISS to Orbiter
  - Node 2 Prep for JPM activation
  - JPM installation/activation
  - JLP relocation



# Flight Director Mission Staffing



- All STS-124/1J Flight Directors are certified per Flight Director Certification Guide (DA8-00010), Final, dated September 24, 2007
- Additional certified Flight Directors are available to support Team 4, EMCC, and STS-326, 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 May 5, 2008

Shuttle Flight Directors		ISS Flight Directors	
Matt Abbott	Lead/Orbit 1	Annette Hasbrook	Lead/Orbit 2
Mike Sarafin	Orbit 2	Bob Dempsey	Orbit 1
Paul Dye	Planning	Emily Nelson	Orbit 3
Tony Ceccacci	Orbit 2/Planning		
Norm Knight	Ascent		
Richard Jones	Entry		





# EMCC/BCC



- No changes to EMCC procedures since STS-123
  - Personnel are identified to support EMCC, if required
- No changes to BCC procedures since 1J/A
  - Personnel and Facilities are ready to support
    - » HSG in Moscow is prime for 2008 hurricane season
    - » MSFC certified availability is expected ~ July 2008



# Non-Standard Open Work



- Level II (Program) Actions - 124/1J Flight Effectivity/Constraint
  - There is one Open Space Shuttle Program Open Action with an STS-124 Flight Effectivity that is assigned to MOD
    - » S063851B 1-1 JSC-DA: STS-123 Mission Management Team (MMT) review
    - » Review and present the current ppCO<sub>2</sub>/LiOH management plan to preclude exceeding ppCO<sub>2</sub> limits early in the mission and report to PRCB (123-MMT-001)
    - » Targeted for 05/8/08 PRCB
  - There are no open Space Station Program Open Actions that have a 1J Flight Effectivity assigned to MOD for STS-124/1J
- Potential threats
  - Delay of Soyuz relocation (mission)
  - Delay of ATV undock (stage)



# 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-124/1J mission and 1J stage
- All standard/non-standard open work will be closed out or have a closure plan prior to ISSP SORR (5/6/08) and SSP FRR (5/12/08) with no exceptions





# Backup





# Remaining STS-124/1J Integrated Sims



- Orbit
  - None
- Ascent/Entry
  - 4/28: S0044 with KSC
  - 5/2: Ascent #3 (suited) + post landing
  - 5/9: TCDT with KSC
  - 5/12: Entry #3
  - 5/14: Post Insertion (suited)
  - 5/20: Ascent #4



# Standard Open Work



- STS-124/1J Flight Rules Annex
  - Final PCN-1 targeted for JPRCB on May 15, 2008
- FDF/SODF
  - Final crew review May 15, 2008
  - Final errata, L-2 days
- Training
  - Complete STS-124 Ascent/Entry simulations (L-7 days)
  - Complete Flight Director flight specific certifications (ECD 5/5/08)
- 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
  - SACM (L-30 days)
  - Power Analysis (ECD L-1 wk)



# Standard Open Work (cont.)



- Complete “Road To” Items and Prepack
  - MSS Prelaunch checkout (ECD 5/20-21)
  - EVA preparations (ECD L-1 week)
  - ACBM checkout (ECD L-3 weeks)

# Standard Open Work: Safety



- MOD INTEGRATED EXPERIMENT HAZARD ASSESSMENT (IEHA)
  - EVA Only (ECD: L-2W)
- INDEPENDENT SAFETY VERIFICATION REVIEW
  - SHUTTLE ISVR REPORT (ECD: L-2W)
  - ISS ISVR REPORT (ECD: L-2W)



# Ascent/Entry Flight Techniques Panel (AEFTP)



- Six Ascent/Entry Flight Techniques Panel (A/E FTPs) were held with topics supporting STS-124
  - A/E FTP #231
    - » Edwards Temporary Runway Impacts
  - A/E FTP #235
    - » EDW Temp Runway Operational Procedure Development Status
  - A/E FTP #236
    - » EDW Temporary Runway Status
  - A/E FTP #238
    - » EDW Temporary Runway Brake Energy Recommendation
    - » MILA Forward Link Transition from NSAP to NTR
  - A/E FTP #239
    - » ECO Bypass Operational Impacts
    - » STS-122 Post Flight Discussion (Photo TV Documentation of Radiator Hose)
  - A/E FTP #240
    - » STS-123 Post Flight Discussion





# A/E FTP #231 Summary



- Operational impacts stemming from Edwards Temporary runway
  - Background information for permanent runway refurbishment and temporary runway installation
  - Spare Navigation/Landing aid posture
  - SMG wind tower support posture
  - Expected launch manifest during EDW temp runway operations
  - Review of brake energy thresholds associated with expected landing gear hardware damage
  - Summary of techniques to mitigate operational concerns on 12,000 ft runway
  - Summary of flight rules and I-load design deliveries affected by EDW temporary runway operations
- A/E FTP #231 did not down-select any operational techniques to mitigate brake energy concerns, but did specify the need to test any operational techniques at the Ames Vertical Motion Simulator training session in September/October 2007.



# A/E FTP #235 Summary



*Note: Previous off-line splinter meeting held to down-select brake energy mitigation technique*

- Shuttle Engineering Simulator (SES) investigation of delaying brake application to 4,000 ft remaining during rollout
  - Two CB pilots performed man-in-the loop evaluations of the proposed braking procedure for a wide range of vehicle and environmental conditions using the SES cockpit simulation
  - Compared man-in-loop SES data against 3-DOF “auto” simulation data from both DDS and SES
  - Reviewed SES test case definitions to see what would be carried forward to Ames VMS test session
- Orbiter Project Office brake energy reconstruction
  - Orbiter Rollout Energy Simulation (ORES) model takes flight data inputs for actual landing gear touchdown events, brake pressures, winds, and atmosphere information to calculate brake energy experienced during rollout
- Reviewed Ames VMS braking model readiness for upcoming test session
- A/E FTP #235 concurred with the Ames VMS test matrix proposal. The matrix was modified slightly to consider a night landing test case.



# A/E FTP #236 Summary



- KSC NTD options for installation of landing aids on EDW Temporary runway
  - Nominal option requires landing aids from EDW permanent runway to be transferred to temporary runway
  - Contingency option to preserve landing aids on EDW permanent runway while fully instrumenting EDW Temporary runway requires additional MSBLS units from WSSH runway
    - » Contingency option protects against runway transition close to or during shuttle mission
- Ames VMS test data for delayed braking application at 4,000 ft rollout remaining
  - Test data supports viability of delayed braking technique
  - Test data shows flight rule limit for rollout margin of 1500 ft is preserved
  - Piloting dispersion data used to derive proposed brake energy limit of 52 Mft-lb
    - » Protects 3- $\sigma$  dispersions from tire fire limit of 70 Mft-lb
    - » Protects 1- $\sigma$  dispersions from brake energy axle damage limit of 60 Mft-lb
- A/E FTP #236 concurs with the nominal instrumentation option, but also supports contingency instrumentation option for EDW Temporary runway. Acceptance of the proposed brake energy limit was deferred until runway availability percentages were understood at the proposed limit.

# A/E FTP #238 Summary



- EDW Temp brake energy flight rule limit and runway availability percentages
  - Brake energy recommendation remained 52 Mft-lb because it provides near 100% runway availability based on monthly atmosphere analysis, assuming heavyweight vehicle characteristics
  - Heavyweight vehicles only require delayed braking at 4,000 ft remaining
- Generic braking procedure update for STS-124 and subs
  - Braking procedure only considers 2 cues
    - » Brake initiation at 5,000 ft rollout remaining or 120 knots groundspeed
  - Clarifies when maximum braking is required
    - » Max brakes required only if groundspeed is greater than 140 knots at 5,000 ft remaining
- MILA NTR circuit ramp-up plan
  - NTR circuit ramp-up plan will incrementally increase NTR circuit availability at MILA starting with STS-122 and ending with STS-124
  - STS-124 will configure both primary and backup MILA forward link circuits on NTR for launch and landing
- A/E FTP #238 accepted EDW Temporary runway flight rule recommendations for brake energy limit & braking techniques and accepted NTR ramp-up plan.



# A/E FTP #239 Summary



- Pre-launch ECO bypass strategy
  - Bypass eliminates risk of a failed WET sensor latching a DRY indication after the Arming Mass event
    - » Protects against another sensor failed DRY resulting in premature low level cutoff prior to the nominal MECO
  - Considered a “nice to have” capability to be exercised if other constraints allow
  - While still in Ops 9, PASS LDB bypass command for a failed open ECO circuit is recommended, but not required if the bypass action jeopardizes the launch timeline
    - » BFS TMBU would be sent after the BFS is transitioned to Ops 1
  - No ECO bypass (GMEM or Ops 9 recycle) will be attempted after transition to Ops 1 due to significant timeline impacts and subsequent risks to launch operations
- STS-122 post flight review
  - Crew reported significant overhead to understand Photo/TV setup/teardown for video documentation of ‘omega bend’ during payload bay door closure
    - » Crew training can mitigate this concern
  - The MILA NTR forward link circuit exhibited acceptable performance
    - » STS-123 will continue with the MILA NTR ramp-up plan
  - Due to poor pre-launch performance of the AMPS High Resolution GPS balloons, Jimspheres will be considered as the primary balloon system for STS-123 and subs
- A/E FTP #239 concluded ECO bypass strategy was acceptable. A/E FTP recommends implementation for STS-124 and subs and will discuss with Shuttle Program.



# A/E FTP #240 Summary



- STS-123 post flight review
  - The MILA NTR forward link circuit exhibited acceptable performance
    - » STS-124 will continue with the MILA NTR ramp-up plan
  - STS-123 was last flight of the 3 String GPS Ramp Up plan
    - » No GPS issues were identified and GPS will be used nominally on the next flight of Endeavour.
  - Launch and landing weather balloons continue to have reliability issues
    - » SMG and LSO personnel will continue to work with the Air Force to improve weather balloon reliability at all sites
  - KSC touch down distances >3500 ft are not desirable due to increased tire wear
    - » Current crosswind limits envelope this concern
  - UHF performance in low power mode was acceptable
    - » Actual in-flight ascent performance under review to answer why UHF did not break squelch pre-launch
  - Pre-launch voice circuit problems between JSC and KSC caused by network card failure
    - » Backup communication loops/paths will be established
    - » LCC and Flight Rule cleanup is required
  - Post landing voice and command handover issues at MILA will be addressed through training





# STS-124/1J JOP Topics



- JPM activation, nominal and contingency
  - Identified the required activities to support a nominal JPM activation utilizing the racks that launched in the JPM
  - Identified the required activities to support a contingency JPM activation utilizing the racks that are launched in the JLP
- JPM ingress, nominal and contingency
  - Reviewed the plan and techniques for performing a nominal ingress of the JPM
  - Reviewed the plan and techniques for performing a contingency ingress to transfer JPM avionics racks and configuring JPM systems for a contingency Channel A activation
- Contingency Matrix
  - Developed a contingency matrix for key items in the JPM activation sequence to identify the failure, the impacts of the failure, and the workarounds possible
- JEMRMS
  - Thermal limits
  - Activation and deploy sequence to support MLI and Launch Lock removal by EV crew
  - BDS setup and operations – not required for unloaded JEMRMS
  - Reach limits and controls
- CMG controllability and attitude control plan
  - Reviewed the attitude control plan and backup attitude control modes for JPM installation



# STS-124/1J JOP Topics



- Thermal analysis for JLP relocation worst case cold ( $\beta^{\circ} +65$ )
  - No critical condensation concerns identified for JLP module Plan is to utilize two MRK's to reduce humidity in module
    - » If only one MRK functions no condensation will occur if JLP is reactivated within 32 hours of the heaters being deactivated. Timeline meets constraint
  - No condensation concerns identified for JLP/JPM vestibule
    - » No dew condensation would be observed if the vestibule pressurization begins at least 2 hours after the JLP reaches preinstall and if the JLP heaters are reactivated within 34 hours of the JLP heaters being deactivated.
    - » Even if condensation was observed, the ISS program has accepted condensation in the vestibule
    - » Timeline meets constraints
  - Thermal concerns identified for the JPM radial port inside the pressurized volume
    - » Concern begins once ACBM thermal cover is removed on EVA 2 and stops once JLP installed.
      - Dewpoint predicted to be reached within 4 hours.
    - » Mitigation options considered
      - Lower the dewpoint
      - Fly +XVV for window of vulnerability
      - Power the CPA's to warm vestibule
      - Accept the risk of condensation
    - » JAXA did a preliminary analysis and powering the CPA's does provide some benefit
    - » Based on current launch date no concern as dewpoint will not be reached for  $\beta^{\circ} \leq +20$ 
      - Becomes a concern again if launch date slips to July1



# Japanese JOP Topics



- OIPs
  - Generic OIPs
  - Vol C OIPs (3 open but not needed for 1J)
- Voice Loop configurations for nominal operations, simulations, LSOS and simultaneous operations
- Flight Rules
- JAXA flight controller concepts and training
- PCS Display Development
- Procedure Development



# RJOP Topics



- STS-124/1J Briefings to Russian Teams
  - In work and expected to be completed by launch minus 1 week

# 1J Stage Additions / Threats



- Deferred JEM Tasks and JLP Relocate Task
  - E17 crew would be able to support these tasks if required
- ATV Undock may be delayed from Aug 7 to Sep 5
  - ESA proposal to use more propellant; Russians may have 30P production problems.
  - X2R7 was not tested with ATV docked – impacts/options in work.
  - A few rack relocations will be impacted if X2R7 is delayed – under review.
  - May delay 30P (SOLO payload onboard).
- 16S Relocation may be delayed from May 6 to later in 1J Stage
  - This will allow 15S Ballistic Re-entry Commission to complete review, findings and resolutions.
  - Impact to 29P docking: 29P will dock to FGB nadir, no Progress roll control from this port, thus impacting solar array and power down plans for docking and 1J.
  - May delay RS EVA 20 or have FE-2 located in 16S during EVA (no issues from MOD with either plan).

# 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





# SPAN Staffing (cont.)



- MOD standard SPAN manning plan as established prior to STS-120/10A
  - Standard Target for manning completion is L-2 weeks
- Personnel will be provided by the Organizations to properly staff all SPAN positions without violating Work Guidelines
- Recent new Operations
  - STS-123/1J/A support resulted in no issues (first flight for SPAN Station Systems to be on call on overnight shift)
- Background: Reduced Manning went into effect with STS-120/10A
  - STS-120/10A
    - » Migrated to rotational SPAN manager to level load among divisions
    - » Combined Shuttle Systems and Shuttle Support
    - » SPAN DX and SPAN DM went on call outside of their critical activities
    - » SPAN DO one shift per day
    - » No issues with reduced support during the mission
  - STS-122/1E
    - » SPAN DO on call outside of MMT chart support
    - » No issues with reduced support during the mission



# ISS Open Hazard Reports



- FHRC-IA-MECH-109
- MCH-0109
- NASDA-0019
- NASDA-0024
- NASDA-0029

\* Pre-verified



# GFE Open Hazard Reports



## • EVA

- ORU Temp Stowage Device (OTSD)
  - » Open to NCR-FESRRP-OTSD-001-1J

## • STS

- Wing Leading Edge Impact Detection System (WLEIDS) Sensor-Side Relay Firmware Repair
- DETTPS Camera Assembly
- A31P Docking Station
- CTVC Assembly
- Nikon D2XS Digital Camera and Accessories
- Microphone
- Digital External Tank Thermal Protection System (DET TPS) Flash Assembly
- Shuttle Crew Escape Equipment Communication System



# GFE Open Hazard Reports



- **ISS**

- Hand Held Microphone Assembly
- A31P Laptop
- AED
- Nikon D2XS Digital Camera and Accessories
- Acoustic Countermeasure Hardware



# Payload Open Hazard Reports



- **ISS**
  - None
- **Shuttle**
  - None



# ISS Open NCRs



- NCR-FESRRP-OTSD-001-1J Crew induced loads to OTSD or OTSD with ORU attached
- NCR-NASDA-PMKH-09 Sharp Edges of the JEM Airlock Bumper Shield

# Open NASA OCADs



- EVA (11)
  - Mate Demate
  - Touch Temp
  - JEMRMS Keep out zone
  - LTA power back-feed constraints
  - OBSS FSE Mech constraints
  - OTSD WIF constraints
- PHALCON (1)
  - Mate Demate
- ROBO (5)
  - Energy Management
  - Simo robotic ops constraints
  - LTA power back-feed & mate/demate constraints
- PDRS (2)
  - RMS-OBSS Rate Constraints
  - OBSS FSE Mech constraints
- SURGEON (2)
  - TVIS Maintenance
  - AED Constraint





# Non-Critical Processors/Applications



- All DA8 Non-Critical Applications certified
- No Flight Director applications changed since STS-123/1JA



# 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-326



- 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](http://mod.jsc.nasa.gov/da8/rules/CSCS_Rescue_Flight_Resource_Book/cover.htm)
- STS-124 Ascent/Entry Team will support STS-326
- Personnel are available to support Orbit Operations as required

