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# STS-120/10A Flight Readiness Review



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**JSC Mission Operations Directorate  
Flight Director Office**

**DA8/J.D. Hassmann, R. LaBrode, N. Knight  
September 17, 2007**



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**Mission Operations Directorate  
Flight Director Office**

# Agenda



- DA8 COFR Requirements/Endorsements
  - COFR Requirements/Endorsements Summary
  - New Operations - Flight Techniques & Joint Operations Panels
  - Space Flight Meteorology Group (SMG)
  - Flight Rules (Generic Volumes A, B, C, D; STS-120/10A Annex)
  - FDF/ODF/SODF
  - Mission Staffing: Training/Certification/Work Guidelines Compliance
  - Non-Critical Processors/Applications
  - Emergency Mission Control Center (EMCC)/Backup Control Center (BCC)
  - Safety Status Review
  - Command Procedures
  - Contingency Shuttle Crew Support/Rescue Flight (STS-320)
  - Level II Actions
- Standard Open Work
- Non-Standard Open Work
- Exceptions
- Flight Readiness Summary





## DA8 COFR Requirements/Endorsements Summary



# DA8 COFR Requirements/Endorsements



REQUIREMENT (SHUTTLE)	Flight Director	Program Integration	Ops Safety	SPAN	Space Flight Meteorology	Team 4					
Non-Crit Processors/Applications	G				G		G	Ready to Support Flight/Only Standard Open work			
EMCC	G				G	G					
Certified Flight Controllers	G			Y	G	G					
Flight Rules	Y										
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		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									
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 Requirements/Endorsements



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												
Certified Flight Controllers	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 Operations (FTP and JOP Summaries in Backup Charts)



# Ascent/Entry Agenda



- ET Photography/Launch Window
- New Operations
  - First Flight of OI-32 Flight Software
  - Prelaunch Conjunction Screening Protocol (PRCB Action)
  - DOLILU manual procedure for ET Attach Load Indicators (SICB Action)
- Spaceflight Meteorology Group (SMG)



# ET Photography/Launch Window Summary



- Launch Period is officially October 23 – December 14<sup>th</sup>.
  - Currently no Range conflicts during this launch period.
- ISS Reboost Plan will provide FD 3 Rendezvous from October 23 through November 7<sup>th</sup>.
  - 3.05 m/s maneuver to meet the Soyuz landing and set up for sequential FD3 opportunities.
  - Will work to schedule additional ISS reboost for launch delays if required.
- Launch Date Summary
  - Daylight launch dates are October 23<sup>rd</sup> through November 1<sup>st</sup>.
  - Daylight ET Umbilical Photography: October 23<sup>rd</sup> through November 6<sup>th</sup>.
    - » Optimal ET Umbilical Photography Lighting does not occur until December 12<sup>th</sup>.
  - Daylight ET Crew Handheld Photography: October 23<sup>rd</sup> through November 9<sup>th</sup>.
    - » Optimal Crew Handheld Photography Lighting from October 27<sup>th</sup> through November 8<sup>th</sup>.





# ET Photography/Launch Window Summary



Day	KSC	RNDZ	ET Photo	ET Photo	Open	Open	In-Plane	FD 3 Close	FD 4 Close
	Date	Day	Umbilical	Handheld	(EDT)	(GMT)	(GMT)	(GMT)	(GMT)
Tuesday	23-Oct	FD3/FD4	Daylight	Daylight	11:33:10	15:33:10	15:38:10	15:43:10	15:46:25
Wednesday	24-Oct	FD3	Daylight	Daylight	11:10:38	15:10:38	15:15:38	15:20:38	
Thursday	25-Oct	FD3/FD4	Daylight	Daylight	10:44:56	14:44:56	14:49:56	14:54:56	14:58:11
Friday	26-Oct	FD3	Daylight	Daylight	10:22:24	14:22:24	14:27:24	14:32:24	
Saturday	27-Oct	FD3/FD4	Daylight	Daylight	9:56:44	13:56:44	14:01:44	14:06:44	14:09:57
Sunday	28-Oct	FD3	Daylight	Daylight	9:34:10	13:34:10	13:39:10	13:44:10	
Monday	29-Oct	FD3/FD4	Daylight	Daylight	9:08:27	13:08:27	13:13:27	13:18:27	13:21:44
Tuesday	30-Oct	FD3	Daylight	Daylight	8:45:56	12:45:56	12:50:56	12:55:56	
Wednesday	31-Oct	FD3/DF4	Daylight	Daylight	8:20:13	12:20:13	12:25:13	12:30:13	12:33:30
Thursday	1-Nov	FD3	Daylight	Daylight	7:57:42	11:57:42	12:02:42	12:07:42	
Friday	2-Nov	FD3/FD4	Daylight	Daylight	7:31:59	11:31:59	11:36:59	11:41:59	11:45:18
Saturday	3-Nov	FD3	Daylight	Daylight	7:09:28	11:09:28	11:14:28	11:19:28	
Sunday	4-Nov	FD3/FD4	Daylight	Daylight	5:43:45	10:43:45	10:48:45	10:53:45	10:57:05
Monday	5-Nov	FD3	Daylight	Daylight	5:21:14	10:21:14	10:26:14	10:31:14	
Tuesday	6-Nov	FD3/FD4	Daylight	Daylight	4:55:31	9:55:31	10:00:31	10:05:31	10:08:51
Wednesday	7-Nov	FD3	Dark	Daylight	4:33:00	9:33:00	9:38:00	9:43:00	
Thursday	8-Nov	FD3/FD4	Dark	Daylight	4:07:17	9:07:17	9:12:17	9:17:17	9:20:37

## NOTES:

- 1) Dark Launch when shaded.
- 2) Launch Window shown at 10 minutes but may be less on launch day due to limited APM.
- 3) Eastern Standard Time begins (GMT-5 hours) at 2am on 11/4.
- 4) Assumes 3.05 m/sec ISS Phasing burn on September 24th.
- 5) Launch period October 23 - December 14 (Beta < 65 deg)
- 6) Optimal ET Umbilical lighting does not occur until Dec 12th.
- 7) Optimal ET Handheld lighting occurs between October 27th and Nov 8th.
- 8) FD3/FD4 are days where both a FD3 and FD4 pane can be utilized to extend the window.

# New Operations – A/E



## • First Flight of OI-32 Flight Software

– Ascent/Entry operations include the following new capability all of which have been exercised by MCC in simulations.

### » Heads Up Display (HUD) available in the BFS.

- Now consistent with PASS landing operations.
- No Flight Rules or Crew procedure changes required.

### » BFS Transient Halt Software

- Minimizes operational impacts due to transients by immediately regaining function.
- Crew procedures updated to reflect new capability.

### » Automated SSME Throttle Down

- Software now automatically throttles down the last remaining SSME to minimum power level to protect against turbine overspeed.
- Flight rules and Crew procedures updated for two SSME and single SSME operations.

### » IMU/IMU Matrix Align

- Provides the ability to quickly regain an IMU in OPS 3.
- No A/E Flight Rule or Crew procedure changes required.

### » PASS Trajectory Display

- Provides PASS insight to MECO cutoff cue which is used for Manual MECO scenarios.
- No Flight Rule or Crew procedure changes required.

### » BFS Data Tapes Available during Powered Flight

- If BFS engaged, provides crew with basic flight instrument data (mach/velocity, alpha, altitude, altitude rate, acceleration) during powered flight.
- No Flight Rules or Crew procedures changes required.

### » OMS Crossfeed Valve Software Mask

- New capability to mask a failed microswitch status during prelaunch to allow full function of the OMS Crossfeed valves during abort dumps.
- LCC update in work.

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# New Operations – A/E



## • **Prelaunch Conjunction Screening Protocol (PRCB Action)**

- STS-118 post OMS-2 conjunction resulted in a scrub of current Flight Rules and MCC procedures.
- Current protocol has screening performed by JSpOC (DOD) based on a predicted post OMS-2 state vector provided by the FDO at L-1 day and again at L-3 hours.
- Current Flight Rules require a launch delay to the next even minute if a conjunction is predicted to be within a 5 x 15 x 5 km box (radial, down track, and cross track, respectively).
- Positional uncertainties exist for all orbiting objects.
  - » Down track is the most uncertain and cross track (plane) is the most stable
  - » Study performed in 2006 with a limited data set of missions (~15) indicate that a significant uncertainty exists between the predicted OMS-2 vector provided at L-3 hours and actual vector post launch.
    - Radial ~2 km, Down Track ~24 km, and Cross Track ~ 0.4 km
- For conjuncting objects, the radial miss distance is the most stable.
  - » Down track miss distance is the most uncertain.
  - » If the objects are not co-planar (likely), cross track and down track distances are coupled.
  - » Therefore, predicted cross track miss distance contains a similar amount of uncertainty as down track miss distance and results in the "pizza box" philosophy used for STS Orbit and ISS screening.
- For on-orbit conjunctions, once object is identified by the screening box, probability of collision (Pc) methodology is used to determine if action is required.
  - » This requires an established covariance for both objects.
- Pc methodology is not used prelaunch because a covariance for predicted insertion vector accuracy has not been established.
  - » Uncertainties include: down track position (unconstrained by guidance), guidance timing variations, navigation uncertainties, position constraint release, ascent performance, post MECO +X, MPS dump.
- New protocol for prelaunch screening may involve a larger screening box to identify potential threats coupled with a smaller take action box that is weighted heavy on the radial miss distance. <PRCB on 9/27>



# New Operations – A/E



- **DOLILU manual procedure for ET Attach Load Indicators (SICB Action).**
  - Analysis tools that model the loads for the aft ET attach struts were in error with respect to the strut geometry.
  - ET Project has worked with the community to determine how the correct geometry affects the load indicators for these affected struts.
  - New limits are being established for 4 ET load indicators that are part of the DOLILU loads assessment (SICB 9/18).
  - DOLILU manual procedure for STS-120 will monitor the new limits and automate this check with a software block update for future missions.
- **ET Door Close Procedure**
  - STS-118 IFA – ET Door manual close procedure resulted in potential hardware damage due to uplock latches being driven prior to the doors being fully closed.
  - Procedure has been updated and trained to remove any threat of latching the doors before the door motors reach end of travel.
- **Launch Countdown Timeline Changed.**
  - S0007 launch countdown has been modified to remove 1 hour from the timeline.
    - » Driver for this was less time for ice formation and thus minimizing potential debris concerns.
  - ET Tanking will occur 30 minutes later and the T-3 hour hold will also be shortened by 30 minutes.



# Spaceflight Meteorology Group (SMG)



- All NWS/SMG software used to create mission critical products or required for mission support is ready for STS-120/10A
- All SMG forecasters required to support STS-120/10A meet currency requirements listed in SMG Training & Certification plan.
  - CONUS and TAL forecasters certifications are current.
- No non-standard open work or exceptions
- Previous open work to reduce TAL support problems closed
  - TAL balloon problems on STS-118 were reduced from previous missions.
  - Improvement due to an enhanced pre and post mission HSFS tag up with weather support personnel to coordinate problem resolution and procedure updates.
  - Flight frequency has also added to this improvement as HSFS weather personnel gain experience.

**The undersigned certifies that the Spaceflight Meteorology Group is ready to support the STS-120/10A flight.**

**/s/ Frank C. Brody**

**Frank C. Brody**

**Chief, Spaceflight Meteorology Group**

**Mission Operations Directorate  
Flight Director Office**



# New Operations – EMU Gloves



- STS-118/13A.1 Flight Rule (13A.1\_B15-1) addressing EVA termination for vectran damage will be carried over to the STS-120 annex
  - Rule rationale will be updated to address specific STS-120 EVA tasks
- STS-118 techniques for glove inspections will be implemented on STS-120
  - Glove inspections will be performed at every day/night transition and at the end of each major EVA task
  - MOD is discussing additional glove inspection points with Engineering and the Programs
- Glove photos
  - Both EVA crewmembers gloves will be photographed as part of the Post EVA procedure and crew will provide a verbal assessment of glove condition
  - Photos will be downlinked and glove condition will be assessed after each EVA
- Spare gloves
  - XA is considering flying an additional pair of gloves (three pairs total) for crew members scheduled to perform three or more EVAs (Parazynski, Wheelock, Whitson, and Tani)



# New Operations – TRAD DTO



- Addition of a DTO to verify on-orbit tile repair capability requested by Shuttle Program
  - Final approval expected at 9/24 JPRCB
  - Requires 14+0 mission duration and 5<sup>th</sup> EVA
  - Requires back-to-back EVAs (DTO EVA4 FD10, PMA2 prep EVA 5 FD11)
    - » DTO EVA – Shuttle Crew, EVA 5 – ISS Crew
  - Target time for EVA 4 ~ 4 hrs to allow A/L Prep for EVA 5 the next day
- Overall DTO Objective: To evaluate STA-54 material, EVA procedures and T-RAD hardware during an end-to-end EVA demonstration



# New Operations – OI-32



- First Flight of OI-32 Flight Software
  - Orbit operations include the following new capability all of which have been exercised by MCC in simulations.
    - » On-Orbit DAP Notch Filter Performance Improvement.
      - Improve fuel usage by having feed forward of predicted rate change to notch filters to eliminate filter induced lag.
      - No Flight Rules or Crew procedure changes required.
    - » Hot Stick Rate Estimate Feedforward Improvement
      - Modify forward to scale minimum impulse firing on a hot stick upmode transition.
      - Crew procedures updated to reflect new capability.
    - » OPS 2 ADI Rate Switch Scaling Change
      - Rescale so that maximum absolute value displayed for PDF ADI rate pointer scales is 0.1 d/s with switch in low and 2.0 d/s in high.
      - Flight rules and Crew procedures updated for two SSME and single SSME operations.
    - » Annunciation of Shuttle Alarms on ISS
      - Allow several Shuttle C&W alarms (Smoke Detection, C&W Master Alarm, SM Alert) to be rung on ISS
    - » Lambert Guidance Improvement
      - Eliminates need to retarget a Lambert computed burn should it not be completed by TIG + 90 sec..
      - Crew procedures updated to reflect new capability.
    - » IMU/IMU Alignment Upgrade
      - Add function equivalent to a direct uplink to current REFSMMATs. Add capability to recover an IMU quickly by matrix alignment to a referenced IMU.
      - Crew procedures updated to reflect new capability.





# New Operations – OI-32 cont.



- First Flight of OI-32 Flight Software
  - Orbit operations include the following new capability all of which have been exercised by MCC in simulations.
    - » THC Command Response Improvement
      - THC Selection Filter will “OR” the signal from current cycle and previous cycle to generate a selected signal for THC validation and processing by THC SOP.
      - No Flight Rules or Crew procedure changes required.
    - » Rendezvous Nav Item Entry Corrections.
      - Correct keyboard item entries to Rendezvous Navigation during OPS 2.
      - No Flight Rules or Crew procedure changes required.
    - » RMS Auto Mode Cleanup
      - Fix for Severity 2 DR 121214 “RMS Position Hold Doesn’t Hold Position” and other minor RMS changes.
      - Eliminates current Flight Rule which does not allow enabling POHS while in auto mode.
    - » Add ET Umbilical Door Command to RTC Table
      - Provide RTC capability to command through MDM FA4 to drive both ET Umbilical Door motors in the closed direction.
      - No Flight Rules or Crew procedure changes required.
    - » Phase Plane Modifications to Reduce VRCS Shelf-pulsing
      - Reduces probability of a violation of the SODB limits of 1000 firings/hr for vernier jets



# New Operations – SSPTS



- Station to Shuttle Power Transfer System (SSPTS), first flight of OV-103
  - If SSPTS does not operate as planned, the mission duration will be 12 + 0 and EVA 5 will move to the 10A stage.



# New Operations – Shuttle Flight above 60° Beta



- Orbiter will be above 60° Beta between Oct. 28 – Nov. 3, 2007.
  - Potential for thermal conditioning of the orbiter during docked ops and/or prior to deorbit
  - Flight specific thermal analysis is in work by ES
  - If thermal conditioning required:
    - » Swap between –XVV and +XVV, while docked
    - » Up to 12 hours of PTC, post undocking prior to D/O Prep



# 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, JOPs, and the FRCB
- The following generic publications are applicable for STS-120/10A
  - Volume A, Final PCN-8 dated 5/24/06
  - Volume B, Final PCN-5, dated 8/27/07
  - Volume C, Final PCN-2, dated 11/20/06
  - Volume D, Final PCN-4, dated 9/18/07
- STS-120/10A flight rule annex
  - Final version will be scheduled for the week of 9/24/07 JPRCB
  - PCN-1 targeted for presentation at 10/15/07 JPRCB



# FDF/ODF/SODF



- DA8 has participated in FDF/ODF/SODF processes and procedure reviews as required
- FDF/ODF will be ready to support STS-120/10A
  - OI-32 resulted in multiple procedure updates, all of which have been completed
  - New US procedures for are for PMA2 relocate, Node 2 installation/operations and P6 relocation



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



- All STS-120/10A Flight Directors are certified per Flight Director Certification Guide (DA8-00010), Final, dated February 2, 2007
- Additional certified Flight Directors are available to support Team 4, EMCC, and STS-320, as required
- All MOD Work Guidelines are met: Due to the expected mission duration, Shuttle Orbit 2 and Shuttle Planning teams are covered by 2 Flight Directors each (see below)

Flight Director	Position	Flight Specific Cert Status
Rick LaBrode	Shuttle Lead, Orbit 1 (FD2 – FD12)	Anticipated Oct. 9, 2007
Norm Knight	Ascent	Anticipated Oct. 9, 2007
Mike Moses	Shuttle Orbit 2 (FD2 – FD13)	Anticipated Oct. 9, 2007
Matt Abbott	Shuttle Orbit 2 (FD1, FD14 and wave-off FDs)	Anticipated Oct. 9, 2007
Mike Sarafin	Shuttle Planning (FD2 – FD13)	Anticipated Oct. 9, 2007
Tony Ceccacci	Shuttle Planning (Pre-launch, FD1, FD14 and wave-off FDs)	Anticipated Oct. 9, 2007
Bryan Lunney	Entry	Anticipated Oct. 9, 2007
Derek Hassmann	Station Lead, Orbit 2	Anticipated Oct. 9, 2007
Dana Weigel	Station Orbit 1	Anticipated Oct. 9, 2007
Heather Rarick	Station Planning	Anticipated Oct. 9, 2007



# SPAN Mission Staffing: Training/Work Guideline Compliance



- Sufficient personnel will be provided by the Organizations to properly staff all SPAN positions without violating Work Guidelines
  - Reduced SPAN Manning will be in effect for this mission, first reduction since STS-114/LF1
  - Also will be using Organizational weighted balanced manning for SPAN team initiated with STS-118/13A.1



# Non-Critical Processors/Applications



- All DA8 Non-Critical Applications certified
- No application changes since STS-118/13A.1
- Flight Director “Entry” Display Updates
  - Certification completion date scheduled as 9/21/07.
  - Changes made allow com-faulted parameters to be displayed as “bad” data.
  - Not mandatory for STS-120.





# EMCC/BCC



- No changes to EMCC procedures since STS-118
- Personnel identified to support EMCC
- No changes to BCC procedures since 13A.1
- Personnel identified to support BCC



# SAFETY THREATS



- Protections for freezing/rupturing Node2 IFHX
  - To avoid freezing and rupturing IFHX during Stage EVA, Node 2 Install sequence dependant on Lab TCS loop temp
  - New thermal analysis in work (ECD 9/20/07)
    - » Previous analysis assumptions did not match timeline
  - Strategy for Resolution: If No Joy on new analysis adjust EVA timeline to meet analysis constraints
- Plasma mitigation
  - Expect voltage exceedence of 3-6V based on existing criteria (e.g. 40 Volts) after 2 PCU failures
    - » Would result in No-Go for “in progress” and future EVAs if 1 PCU failed
  - Strategy for Resolution: Requires new NCR for violations up to 46V (6V above limit) (analysis and NCR in work)
- TRAD DTO
  - Zero failure tolerant to Toxic leak until knob removed
  - Safety assessment pending
  - Strategy for Resolution: Get Knob removed pre-launch, and accept associated delta-pressure structural margin issues

# 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-320



- 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-120 Ascent/Entry Team will support STS-320
- STS-120/122 Teams will support Orbit Operations as required



# Level II (Program) Actions



- As of 9/17/07, there are three Space Shuttle Program “Open Actions/Constraints to Flight” assigned to MOD for STS-120/10A
  - **PRCB Action - S063666C** - REPORT ON THE POST MECO COLLISION AVOIDANCE DETECTION CAPABILITIES. REPORT TO THE PRCB. (STS-118 MMT DEBRIEF)
  - **SICB Action - S052158CT** -UPDATE ET FITTING LOAD APPLICATION POINTS. UPDATE DOL PROGRAMS TO INCORPORATE THE ET FITTING LOAD APPLICATION POINTS, REVISION 1, AND REPORT RESULTS TO THE SICB.
  - **PRCB Action – S063698** – ENSURE THAT THE STS-120 CREW IS TRAINED TO FLY THE MISSION AND CONDUCT THE ROBOTIC OPERATIONS WITHOUT THE USE OF THE MINICAM. (Crew has been trained – formal closure in work).
- All Actions will be closed prior to flight.
- As of 9/17/07, there are no Space Station Program “Open Actions/Constraints to Flight” assigned to MOD for STS-120/10A





## Standard Open Work



# Standard Open Work



- ISS reboosts on September 24th and ISS drag reduction set up sequential FD 3 rendezvous for first seventeen days of launch period.



# Standard Open Work



- Flight Rules
  - STS-120/10A flight rule annex
    - » Final version schedule for week of 9/24/07 JPRCB
    - » PCN-1 targeted for presentation at 10/15/07 JPRCB
    - » No significant issues expected; some open CRs are dependent on analysis that will not be complete in time for the Final
- FDF/SODF
  - Final FDF updates
  - Final SODF updates
- Training
  - Complete STS-120 Ascent/Entry and Orbit integrated simulations (10/18E)
  - Complete Flight Director flight specific certifications (10/09E)





# Standard Open Work



- Finalize pressure management plan for docked mission
- Finalize power profile plan for docked mission
- Complete “Road To” Items



# Standard Open Work



- MOD INTEGRATED CARGO HAZARD ASSESSMENT (ICHA)
  - **STS-120 VERIFICATION TRACKING LOG (ECD: 10/05/07)**
- MOD INTEGRATED EXPERIMENT HAZARD ASSESSMENT (IEHA)
  - **ISS FLT 10A VERIFICATION TRACKING LOG (ECD: 10/05/07)**
- INDEPENDENT SAFETY VERIFICATION REVIEW
  - **SHUTTLE ISVR REPORT (ECD: 10/05/07)**





## Non-standard Open Work



# Non-Standard Open Work



- **Prelaunch Conjunction Screening Protocol (PRCB Action)**
  - Procedure and Flight Rule changes may be required.
- **DOLILU ET Attach Load Indicators (SICB Action).**
- **INDEPENDENT SAFETY VERIFICATION REVIEW**
  - ISS ISVR REPORT (Best Case ECD: 10/11/07)



# Non-Standard Open Work - OPEN OCADs



- PHALCON (7+2)
  - Array mgmt for Plasma
  - LS Constraints
  - Non Fault-bond constraints \*
  - Mate/Demate inhibits \*
- EVA (5+11)
  - Shunt jumper vent thermal clock
  - Sharp Edge
  - ORU venting
  - TRAD Constraints \*
  - P6 Install "brakes on" response \*
  - RTAS constraints \*
  - Tie-down plans \*
- OSO (2+4)
  - Rack config for return
  - Rack config for reboost
  - CBM constraints \*
- ACO (1+1)
  - Rack config for N2 Relocate
  - Partially Deployed SAW loads constraints \*
- ECLSS (1+1)
  - Emerg Egress MRK config
  - N2 Ingress constraint \*
- THOR (2+2)
  - N2 heater jumpers when on N1
  - N2 Thermal clock
  - Un-retracted FGB array Rad constraint \*
  - N2 Ingress constraint \*
  - N2 HX freezing constraints \*
- ADCO (+4)
  - Dock/Undock Moding constraints \*
  - Partially bolted RTAS constraints \*
- ROBO (+1)
  - CBM capture constraint \*

- EGIL (+1)
  - Mate/Demate inhibits\*

**Most of these OCADs were submitted within last week**

**\* OCADs expected but not yet submitted**



# 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-120/10A mission
- All standard/non-standard open work will be closed out or have a closure plan prior to **ISSP SORR (9/24)** and **SSP FRR (10/9-10/10/2007)**





Backup





# Remaining STS-120/10A Integrated Sims



- Orbit
  - None
- Ascent/Entry
  - 9/17: Post Insertion
  - 9/20: Entry #2
  - 9/25: Deorbit Prep Simulation
  - 10/2: Ascent #3
  - 10/10: TCDT with KSC
  - 10/16: Entry #3
  - 10/18: Ascent #4





# Ascent/Entry Flight Techniques Topics Applicable to 120/10A



# Ascent/Entry Flight Techniques Panel (AEFTP)



- **Three Ascent/Entry Flight Techniques Panel (A/E FTPs) held with topics supporting STS-120 thus far with one additional A/E FTP planned on 9/21/07.**
  - A/E FTP #228 (Joint with OFTP #230) – OI32 Review
  - A/E FTP #230
    - » OI32 Workplan Review
    - » Master Timing Unit Failure management for OI32
    - » OI32 Throttledown for SSME NPSP Protection
  - A/E FTP #234
    - » STS-118 Post Flight Review (8/30/2007) resulted in three IFAs
      - STS-118-D-003: ET Umbilical Door RTL Indication and Latch Command Timing
      - STS-118-D-004: L-2:20 Launch Window Sheet Incorrect Pane 2 Open Time
      - STS-118-D-005: Unexpected Close Conjunction Post OMS-2 burn
    - » 482 for ET Umbilical Door Closure procedure is in final review and simpack available for STS-120 training.
    - » FDO Procedure update for Launch Window sheet workaround is in final review.
- **A/E FTP #235 planned on 9/21/07**
  - Review of STS-120 Prelaunch Conjunction evaluation process in response to the STS-118 MMT action.
- **A/E FTP community ready to support STS-120 pending final disposition of Prelaunch Conjunction procedure, DOLILU Loads procedure, and the completion of standard open work.**



# A/E FTP #232 Summary (Continued)



- Significant Network issues associated with landing at Edwards AFB (cont):
  - Ground Receipt Time Delta: During entry a 2 second delta between ground receipt time and onboard time was noted
    - » Impacted DPS ability to monitor onboard GPC time health.
    - » Investigation in work by the Network.
- Significant MCC Issues:
  - GDR: FDO noted pre-launch and ascent GDR data dropouts using Traj Server 2 as prime.
    - » MOD IFA STS-117-D-001
    - » Mitigation steps to have users logout that were not required did not remedy the data anomaly.
    - » Observed data dropouts approximately every 20 seconds.
    - » Traj Server 3 was used for entry with no data quality impacts (loading is also substantially less)
    - » Troubleshooting in work to determine root cause but not held as a constraint to STS-118.
  - GNC Controllability Light: Hardware PBI did not function during pre-launch checkout.
    - » MOD IFA STS-117-D-002
    - » Workstation reboot finally restored function
    - » MCC troubleshooting procedures updated to include system engineer if present
    - » LCC & Flight Rule being reviewed to clarify redundancy required between MCC and Eastern Range
  - MCC Pre-launch UPS Failure:
    - » UPS system performed with no issues during STS-117.
    - » DV action to perform MPSR power separation at next available work window.
  - FCO Abort Switch: FCO lost heartbeat with FD Workstation on at least two occasions
    - » Recycle of software application corrected the problem



# A/E FTP #232 Summary (Continued)



- OI-32 Review
  - Joint FTP with Orbit
  - Reviewed OI32 content and identified required updates to operational products.
  - Also identified topics for further discussion at FTPs.
  - Followup A/E FTP topic reviewed work plan for updating operational products in support of training and flight.
- OI-32 Master Timing Unit Failure Management
  - With a failed MTU, the GPC will use it's own internal clock as a time source.
  - GPC clocks are not accurate enough to maintain a good time sync with GPS. The end result is that GPS and GPC get out of sync and will not work together.
  - OI-32 provides a FSW update that automatically adjust the time difference to a range acceptable to both LRUs.
    - » Initiated via crew item entry and will be inhibited until the MTUs fail.
  - The problem is that MTU failures are not obvious to crew in Ops 3.
  - Actions were assigned to update the FDF for crew indications of an MTU failure.
- OI-32 Throttledown for SSME NPSP Protection
  - OI-32 provides automatic single SSME completion steps, which simplifies crew procedures for manual throttle down and shutdowns.
  - Several procedure and Flight Rule updates were reviewed and concurred with.

# A/E FTP #232 Summary (Continued)



- STS-118 Post Flight - Reviewed mission support including trajectory and systems performance, Space Flight Meteorology, Landing Site and MCC/Network support.
- Significant Ascent/Entry conclusions from STS-118:
  - Crosswind DTO
    - » Crosswind component from KSC15 wind tower data at touchdown did not exceed 10 knots (DTO requires > 10 kts of crosswind).
    - » CDR compensated for a significant left crosswind gust as the vehicle crossed the runway threshold; therefore some crosswind DTO objectives were accomplished.
  - Linux workstations for DOLILU operations
    - » A/E FTP agreed to begin the removal of the DOLILU AIX servers and workstations
    - » Regression tests, Ascent weather simulation, and TCDT will be accomplished on the Linux system prior to STS-120.
    - » STS-120 will be first flight to exclusively use Linux servers and workstations for DOLILU task.



# A/E FTP #232 Summary (Continued)



- Significant Ascent/Entry issues from STS-118:
  - Flight Day 1 Close Conjunction
    - » Post OMS 2, Ascent team notified of conjunction with miss distance of 2.3 km RSS (-0.12 x -0.93 x 2.1 km) and Time of Closest Approach (TCA) in ~15 min (MET 0/01:34).
    - » Ascent flight control team did not perform an attitude maneuver or an avoidance translational maneuver.
    - » For STS-120, DM working with JSpOC to determine appropriate sizing of screening box and action box.
    - » This item is scheduled for A/E FTP #235 (9/21/07)
  - Launch Window Pane Error
    - » Launch window application produced incorrect pane 2 open time.
    - » Error was detected 30 minutes later and was corrected.
    - » FDO Console Handbook Procedure update will specify required sequence of user inputs to avoid launch window application error.



# A/E FTP #233 Summary



- ET Umbilical Door RTL Indication and Latch Command Timing
  - » ET Door Close Procedure changed prior to STS-114 to accommodate concern for failed microswitch.
    - ET door switch taken to “OFF” when crew sees “Close” talkback
    - “Close” talkback in the cockpit driven by ready-to-latch indication and not the “close” microswitch
  - » Concern was raised that the door or latch mechanism could have been damaged by driving the uplocks before the door was fully closed.
  - » 482 change will leave ET door switch in “Close” until after the uplock latches are latched.
- OPS 3 Transition Concerns with ADTA #3 Commfaulted
  - » User Note (OI-5) documents the possibility of an SM GPC fail-to-sync condition during Ops transitions when LRUs are commfaulted.
  - » During STS-118, ADTA #3 was commfaulted and a modification to the Deorbit Checklist was developed, but not implemented.
  - » DPS office and software community are weighing risks before recommending permanent change to Deorbit Prep checklist. This item is scheduled for A/E FTP #235 (9/21/07)
- TAL Runway Visual Scene Setup
  - » Xenon lights at Zaragoza TAL runway remained powered off until T-9 minutes.
  - » NASA agreements with the TAL runway authorities dictate when “ownership” of the TAL runway is turned over to NASA for visual scene setup.
  - » DA8 will work with Astronaut Office and KSC Landing & Recovery Division to evaluate the TAL visual scene requirements.







# Orbit Flight Techniques and Generic JOP Topics Applicable to 120/10A



# OFTP/JOP



- The Orbit Flight Techniques Panel (OFTP) and Generic Joint Operations Panel (GJOP) conducted an STS-118/13A.1 Post-Flight Review on Aug. 30<sup>th</sup>.
- No actions applicable to STS-120 were assigned.
- Three Orbit-related MOD IFAs were brought forward from STS-118
  - STS-118-D-001: Ku Mask for SSRMS out of sync with SSRMS operations
  - STS-118-D-002: OBSS Sensor Mode Change for 6 to 2 per MCC Call
  - STS-118-D-006: Building 30M Power Failure
- None of these IFAs are a constraint to STS-120/10A





## STS-120/10A Joint Operations Panel Topics



# STS-120/10A JOP Topics



- P6 relocation and activation
  - End-to-end plan for P6 relocation from Z1 to P5 was covered at multiple STS-120/10A JOPs
  - JOP discussions included robotic operations, P6 thermal capability, P6 activation sequence and P6 SAW deploy
- Node 2 ingress
  - The plan and techniques for ingress Node 2 while installed on Node 1 was reviewed at multiple STS-120/10A JOPs
  - JOP discussion included ventilation hardware configuration and constraints for number of crew inside Node 2
- CMG controllability and attitude control plan
  - Attitude control plan and backup attitude control modes for Node 2 installation and P6 relocation were discussed at STS-120/10A JOP #16 on 7/27/07 and JOP #17 on 8/27/07.
- PMA-2 cable disconnection during EVA 4
  - Functions lost when PMA-2/Lab umbilicals are disconnected during EVA 5 were discussed at STS-120/10A JOP #16 on 7/27/07; impacts are understood and acceptable





## Russian Joint Operations Panel Topics Applicable to 120/10A



# RJOP Topics



- STS-120/10A Briefings to Russian Teams
  - In work and expected to be completed by launch minus 1 week



# SPAN Manning



- ISS SPAN Support: Manning provided by USA CAF Personnel
- ISS SPAN Systems: Manning provided by DI
- SSP SPAN Support: Manning **POSITION DELETED FOR 120/10A**
- SSP SPAN Systems: Manning provided by DS
- SPAN DO: Manning provided by DO **SUPPORT REDUCED FOR 120/10A**
- SPAN DM: Manning provided by DM **SUPPORT REDUCED FOR 120/10A**
- SPAN DX: Manning provided by DX **SUPPORT REDUCED FOR 120/10A**
- SPAN Managers: Manning provided by DM, DO, DX, DI, DS, DA7



# SAFETY ISSUES



- ET
  - Walking load induced cracks in Foam (during fabrication)
    - » Contributor to cryo pumping failure mode
    - » Previously the only consequence was crushed foam (a non-hazard)
  - DTA including ricochet
    - » May increase some probabilities
- SSRMS Safing (“brakes on”) during P6 Install
  - Preliminary analysis shows 10 sec to loads exceedance
    - » Marginal for crew ability to respond
- Potential for stuck MT to preclude nominal Orbiter undock
  - While SRMS holds P6 for MT translate
  - MSS system is 1 Failure Tolerant
  - Risk Acceptance NCR in work (ECD 9/19/07)
    - » FR to Safe after first (LDU, 1553) failure needs to be developed





# SHUTTLE OPEN HAZARD REPORTS



None

# ISS OPEN HAZARD REPORTS



- COL-1002
- COL-1003
- COL-1006
- EME-0602\*
- EPS-0309\*
- EPS-0503\*
- EVA-0312
- GNC-0701
- MCH-0109
- STR-0108\*
- STR-0907\*
- STR-1009\*
- SWC IP-STR-108\*
- TCS-0062\*
- TCS-0066
- TCS-1210
- SDTO-10A

\* Pre-verified



# ISS OPEN NCRS



<b>NCR-ISS-211</b>	<b>Lack of MSS Operability Failure Tolerance</b>
<b>NCR-ISS-203-B</b>	<b>Lack of Two-Fault Tolerance to EVA Plasma Shock Hazard</b>
<b>NCR-ISS-212</b>	<b>Lack of RTAS Failure Tolerance for Removal of P6 from Z1</b>
<b>NCR-ISS-TBD</b>	<b>Lack of Two-Fault Tolerance for Moding at Undock</b>
<b>NCR-ISS-208</b>	<b>Pins on the Powered Side of the Connector during Mate/Demate</b>
<b>NCR-ISS-TBD</b>	<b>Lack of Two Failure Tolerance to Exceeding Structural Loads if SSRMS Safes during P6 Install</b>
<b>NCR-TBD</b>	<b>SARJ Locking Constraints Risk (not a constraint to launch)</b>



# GFE OPEN HAZARD REPORTS



- STS

- 90 Degree Camera Autotrac
- RCC Plug Repair (ECD – 09/28/07)
- Medical Accessory Kit (MAK) (ECD – 08/30/07)
- Pan Tilt Unit (OBSS) (PTU) (ECD- TBD)
- Wing Leading Edge (WLE) Enhanced Wide-Band Micro-Triaxial Accelerometer Unit (EWBMTAU) (ECD – TBD)
- Wet/Dry Vacuum Cleaner (ECD – TBD)
- Lens, Fisheye, Nikon 8mm (ECD – 09/18/07)
- Trajectory Control Sensor Flight Kit (TCS) (ECD – 10/02/07)
  - » OCAD not submitted as of 09/12/07
- T-RAD DTO (ECD – 9/17/07)



# GFE OPEN HAZARD REPORTS



- ISS
  - EVA Digital Camera (ECD – TBD)
- EVA
  - Solar Array Contingency Taped Tools (ECD – TBD)
  - Plug Installation and Verification Tool (PIVT) (ECD –TBD)
  - EVA Thermal Sensor (w/Goose Neck Probe ) (ECD – TBD)
  - On-Orbit Installed Gap Spanner (ECD – 09/07/07)
  - Primary Life Support System (PLSS) (ECD – 09/31/07)



# PAYLOAD OPEN HAZARD REPORTS



- Shuttle
  - None
- ISS
  - HDTV Camera Lens (ECD: 10/01/07)
  - MSG / InSPACE-2 Integrated (ECD: 9/19/07)
  - Spore
    - » ESA PSRP reviewed payload
    - » Late manifest, awaiting hazard reports from ESA (ECD: TBD)
  - SSLM (ECD: 9/24/07)

