

# Space Transportation Vehicle Division

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STS-123 MOD FRR

January 9th, 2008

DS1/Michael Interbartolo

Agenda Item 5

# DS Shuttle CoFR Status Summary

REQUIREMENT	Training	Analysis	DPS	INCO	MMACS	EGIL	EECOM	GNC	PROP	BOOSTER
Critical Processors /Applications	N/A	N/A	N/A	G	G	G	N/A	N/A	G	G
Non-Crit Processors /Applications	N/A	G	G	G	G	G	G	G	G	G
EMCC	N/A	N/A	G	G	G	G	G	G	G	N/A
Training - MCC/POCC	G	G	G	G	G	G	G	G	G	G
Training - Crew	G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Training - SMS	G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LCC/MEL/MIL	N/A	N/A	G	G	G	G	G	G	G	G
FTP - New Ops	N/A	N/A	G	G	G	G	G	G	Y	G
Flight Anomaly Resolution	G	N/A	G	G	G	G	G	G	G	G
Anomaly – Procedures	G	N/A	G	G	G	G	G	G	G	G
Exceptions/Action Items from prior reviews	G	G	G	G	G	G	G	G	G	G
CIL/Hazards	G	N/A	G	G	G	G	G	G	G	G
No Constraints	G	G	G	G	G	G	G	G	G	G
Level II Actions	G	G	G	G	G	G	G	G	G	G
Mission Requirements	G	G	G	G	G	G	G	G	G	G
Engineering Drawings	N/A	N/A	G	G	G	G	G	G	N/A	G
Command Procedures	N/A	N/A	G	G	G	G	G	G	G	G
Flt Prep Process Plan Requirements Met	G	G	G	G	G	G	G	G	G	G
Contractor Process Insight	N/A	G	G	G	G	G	G	N/A	G	G
MOD Work Guidelines	N/A	N/A	G	G	G	G	G	G	G	G

# SSP Electrical Summary

Reactants	Tanks	Liftoff Load (lbm)	Min L/O (lbm)	Margin (lbm)	Padhold (hrs)
H2	5	455.5	385.9	69.6	193.1
O2	5	3886.4	3518.3	368.1	359.2

NOTES: 1) Assumes 15+1+2 day mission

2) Assumes H2 target load obtained and loading completed at L- 45 HRS

3) Assumes O2 target load obtained and loading completed at L- 47.5 HRS

4) 51 lbm of O2 protected for ISS based EVAs, PMA/ODS Repress, JEM ELM-PS Vestibule Repress, and ISS O2 transfer.

## SSPTS NOTES:

- 1) Planned SSPTS output is 3 converters at full power from post-docking until pre-un docking except during EVA 1 when SSPTS is deactivated for 6.5 hours. A single converter is deactivated for a total of 6 hours during water dumps on FD7 and FD11 and XVV maneuvers for OBSS late inspections on FD11.
- 2) SSPTS output energy provided is 1729.8 kWh, which is an average of 6.4 kW output for the 270.18 hrs SSPTS is activated.
- 3) 15+1+2 day mission with 2 SSPTS converters:

	Margin (lbm)	Launch Hold (hrs)
H2	17.9	54.1
O2	-42.0	-42.4

## CSCS NOTE:

- 1) CSCS capability allows for 33 days docked with 37.7 lbm additional O2 margin and unmanned undock on FD36. O2 margin includes ISS crew metabolic for the docked duration.

# SSP Environmental Summary

<b>Consumable</b>	<b>L/O Load</b>	<b>Min L/O</b>	<b>Margin</b>
<b>N2 (lb)</b>	<b>387.3<sup>1,2</sup></b>	<b>353.4<sup>3</sup></b>	<b>33.9</b>
<b>Supply H2O (lb)</b>	<b>353<sup>4</sup></b>	<b>353</b>	<b>0</b>
<b>LiOH (cans)</b>	<b>31<sup>5</sup></b>	<b>31</b>	<b>0</b>

NOTES: 1) Assumes 15+1+2 day mission

2) N2 L/O Load protects reflects KSC 6 lbm prelaunch usage requirement

3) N2 requirement protects for 4 scheduled and 1 unscheduled EVA's

4) Supply H2O loading reflects a 180 lbm offload

5) 67 LiOH canister equivalents are required for a 15+1+3 day mission and 36 will be provided from ISS resources.

# Status of Standard Open Work Shuttle (Training – MCC)

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- **SMS & MCC Team Certification Status:**
  - All SMS training instructors have completed required training according to their Certification Guides. All operators have been certified and all certification records are complete.
  - Various Flight Controller Physicals, Proficiency and Final Certifications will be completed prior to flight. (backup personnel are available if required for all positions)
- **MOD Work Guidelines:**
  - All flight controllers meet the MOD work guidelines with no exceptions:

# Status of Standard Open Work Shuttle (LCC/MEL/MIL)

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- LCC/MEL/MIL - The Launch Commit Criteria Minimum Equipment List and Mandatory Instrumentation Lists have been reviewed and verified as complete and accurate. Any flight unique requirements have been specified, exceptions as noted:

**STS-123 MEL-13**: Shuttle TA has worked with the LCCWG to review the MEL-13 (STS-123 Flight Specific Minimum Equipment List). It was presented to the LCCWG on 12/5 and is awaiting to be scheduled for the Noon Board. ECD 1/15/08

# Status of Standard Open Work Shuttle (CILS/Hazards)

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- **CIL/Hazards:** All procedures and flight rules which furnish and operational control for a Crit 1 or 1R Critical Items List item have been verified. Any new CIL items have been reviewed for possible operation control requirements and the appropriate procedure or flight rule implemented and verified. All such procedures or flight rules are flagged in the documents where they appear. The payload hazards have been reviewed and any flight rules or procedures required to provide operational control of the hazards, as identified in the Integrated Cargo Hazard Assessment and all applicable Payload Safety Packages, have been implemented and verified. Required "Cautions" and "Warnings" have been incorporated. Exceptions are noted below:

**ICHA:** Awaiting the STS-123 ICHA. Review of this document with the crew does not occur until about a month before flight.

# Status of Standard Open Work Shuttle (FTP- New Ops)

- **New Ops Work Status:** All significant differences from previous flights have been reviewed by FTP, POWG, or other appropriate operations forum and where required documented in either new procedures or new flight rules, except as follows:

Final DAP Configuration/Constraints (Awaiting C. S. Draper Laboratory Memo) -The current versions of the FDF and Flight Rules contain the preliminary data from C. S. Draper Laboratory. Upon receipt of the official memo, GNC will review the document and update any DAP constraints in the FDF and Flight Rules as required. This will include specific DAP parameters (attitude & rate deadbands, maneuver rate, ALT config, etc.), RCS jet group selection/deselection for mated control, orbiter external airlock pressurized/depressurized constraints, robotics operations DAP constraints, and any other required system constraints. ECD is 1/15/08.

APU Operation while Docked - Flight specific analysis required for the various docked APU operation scenarios. Analysis will drive flight specific constraints Flight Rules. Flight Rule ECD 1/21/08.



# Status of Non-Standard Open Work Shuttle (LCC/MEL/MIL)

- LCC/MEL/MIL - The Launch Commit Criteria Minimum Equipment List and Mandatory Instrumentation Lists have been reviewed and verified as complete and accurate. Any flight unique requirements have been specified, exceptions as noted:
  - LCC MPS 53 (LH2 ECO voltages) has been updated to reflect knowledge gained of the ECO Voltage Monitoring system. Beginning with STS-123, this LCC will be effective down to T-31 seconds rather than its current end effectivity of T-5 minutes. Additionally, a new lower voltage limit of 0.5 volts has been added as well as reducing the existing upper limit from 13.128V down to 2.5V. Changes to this LCC, due to the 122 ECO sensor failures, are possible.
  - LCC MPS 54 (LO2 ECO voltages) The 11/14/07 PSIG directed that the process of developing a LCC on the LO2 ECO voltages similar to the existing LCC on the LH2 voltages (MPS 53) be developed. STS-123 is the earliest possible flight for this LCC. Changes to this LCC, due to the 122 ECO sensor failures, are possible.
  - LCC MPS 22 (MPS LH2 Low Level Sensor Anomaly) Prior to STS-122 launch attempt # 1, this LCC required that 3 of 4 LH2 ECO sensors be functioning and 4 of 4 LH2 ECO sensor be indicating WET. Following the multiple ECO failures on STS-122 launch attempt 1, this LCC was changed to 4 of 4 functioning for Launch attempt 2. The failure signature from STS-122 launch attempt 1 pointed to a failure in the ET feed through connector. Failures in this component can result in a total loss of the LH2 ECO system. To ensure a functioning system 4 of 4 functioning sensors were required. It is unclear whether this will be re-visited prior to STS-123.

# Status of Non-Standard Open Work Shuttle (FTP- New Ops)

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## •New Ops Work Status:

Edwards AFB Temporary Runway - Final AEFTP discussion and approval of EDW Temp runway flight rules is still required. All required DS/MMACS inputs prior to submitting the Flight Rule updates have been made, with ongoing discussion centering on brake energy requirements. EAFB temporary runway is expected operational by 02/08. AEFTP approval expected and Flight Rules complete by 01/21/08. Temp runway does not require new onboard or ground procedures.

Virtual Spacecraft operations - If the ATV launch and mission happens to overlap with the STS-123 flight the overall impact would be another TDRS user requesting limited network services. To reduce the impact of this new user to the network, shuttle and station are being asked to offset the time requested by ATV by giving up their network time. Virtual spacecraft operations allow the shuttle and station to share a TDRS antenna. The conditions for virtual spacecraft to work with minimal impact would be during times of shuttle Ku-band availability. Virtual spacecraft has been tested in the past and has been proven to work well. A Flight Specific Rule will be submitted to document the priorities and which mission objectives require dedicated TDRS assets. ECD 1/31/08

# Status of Non-Standard Open Work Shuttle (FTP- New Ops)

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- New Ops Work Status:

**MPS ECO Voltage Instrumentation use on STS-123 - STS-122 is the third flight of the Main Propulsion System (MPS) Engine Cutoff (ECO) sensor voltage monitoring circuitry. Following the failure of multiple LH2 ECO sensor circuits on STS-122 Launch attempt # 1 on 12/6/07, it was determined that this instrumentation would be used for the first time on STS-122. Two real time flight rules were submitted and approved by the MMT for inclusion in the 122 FR Annex. 1E A5-3 documented the criteria that would be used to define a failed ECO circuit based on the voltage data. 1E A5-4 defines what the response to a loss of low level cutoff protection would be. Two integrated simulations were conducted where these flight rules were exercised. Numerous actions came out of these simulations and a special AEFTP was held on 12/18/07 to discuss possible changes to these rules. It is anticipated that changes to the originally approved Flight Rules will result and hence new operations are possible on STS-123.**

# Status of Non-Standard Open Work Shuttle (Constraints)

- NO CONSTRAINTS - There are no known constraints to the safe completion of this mission and all objectives. Exceptions are noted below:

Main Landing Gear Thermal Constraints - Main Landing Gear thermal limits may be an attitude constraint during high Beta angle periods. Awaiting delivery and analysis of final Attitude Timeline. ECD 01/15/08.

PTU - While there is no open work for DS, the resolution of this vibration issue for the PTUs on OV-105 is a constraint to launch. Vibration testing in January should show that a third mission with the updated vibration profile is not an issue.

Camera Pan/Tilt Unit(PTU) anomaly - A recent vibration qual testing on the newer model (-510) PTU experienced an isolator failure. The failure implicates the older (-508) PTU's that are installed on OV-104 and OV-105 since the isolators on -508 come from the same lot as the -510 qual PTU. Root cause analysis and flight rationale is in development for STS-122 and will most likely be carried over to STS-123. Testing is planned for early January to put a twice flown PTU under the new mission vibration profile and show that a third flight is not an issue for the hardware on OV-105.

Radiator Retract Hose - While there is no open works for DS, the resolution of this failure to properly retract the rad retract hose during closing of the payload bay doors on OV-103 is a constraint to launch.

Aft Starboard Radiator Retract Flex Hose (STS-124 Flow): - While the starboard payload bay door on OV-103 was in the process of closing, the aft Radiator Retract Flex Hose failed to retract. This hose instead buckled in the shape of an omega, with bend radii ranging from 1"-1.5". This hose is only certified to bend at a minimum bend radius of 3". A sniff check was performed, and there was no evidence of Freon leaking from this hose as a result of the buckling. Radiator flow was initiated, and the buckling did not cause a degrade in the Freon flow rate through this hose. X-ray evaluation did not reveal any cracks in this hose. The rollers in the Radiator Retract Storage Container Assembly were also inspected, concluding that the rollers spin freely with no evidence of FOD impeding roller movement.

They opened and closed the door under observation while the radiator on Freon Loop 2 was isolated. The bending reoccurred, but the root cause was not discovered.

Impact: The hose as well as the Radiator Retract Storage Container Assembly will be R&R'd. This is a constraint to fly STS-122 if inspection shows similar buckling of the radiator retract hoses on OV-104, indicating a generic problem posing a risk to the structural integrity of these hoses.

# Conclusion Shuttle

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All identified open work will be  
completed in time to support  
STS-123