

Space Transportation Vehicle Division



STS-124 MOD FRR

April 29th, 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	387.6	67.9	188.8
O2	5	3886.4	3481.3	405.0	393.2

NOTES:

- 1) Assumes 13+2+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) Margins based on special assessment and assumes no O2 offload.
- 5) The additional docked SSPTS IVA day costs 169.7 kWh, 14.5 lbm H2, 128.9 lbm O2
- 6) The additional undocked inspection day costs 317.0 kWh, 27.0 lbm H2, 228.4 lbm O2
- 7) Mission average power with SSPTS is 10.5 kW; without SSPTS is 13.73 kW
- 8) SSPTS output energy required is 1099 kWh which assumes 3 OPCU converters available for 178 hrs. The OPCU converters are assumed off for 27 hrs for ISS solar array feathering events.
- 9) No O2 transfer protected. 23.8 lbm O2 budgeted for 3 scheduled EVAs, 1 unscheduled EVA, PMA repress, JLP and JEM vestibule represses
- 10) Assumes 84.9 kWh for JEM from powerup through transfer to ISS.
- 11) CSCS capability with the original 305 lbm offload allowed for 25 days docked with 39.1 additional O2 margin and unmanned undock on FD28. O2 margin includes ISS crew metabolic for the docked duration.
- 12) NOTE: The SSP is reevaluating whether or not to perform a 100 lbm offload due to late breaking APM data and c.g. concerns. Final decision may not be made until L-17 loading. Estimated O2 margin reduction for APM is 305 lbm, with 292 hrs O2 padhold. H2 remains as above.**

SSP Environmental Summary

Consumable	L/O Load	Min L/O	Margin
N2 (lb)	387.3^{1,2}	343.6³	43.7
Supply H2O (lb)	353⁴	353	0
LiOH (cans)	31⁵	31	0

NOTES: 1) Assumes 13+2+2 day mission

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

3) N2 loading protects for 3 scheduled ISS based EVAs and 1 unscheduled ISS based EVA

4) Supply H2O loading reflects a 180 lbm offload

5) 64 LiOH canisters are required for a 13+2+3 day mission.

The equivalent of 33 canisters will be provided from ISS resources. 11 pre-positioned canisters will be taken from the LiOH stockpile, and the equivalent of 22 canisters will be provided by ISS CDRA (dual bed) to support Shuttle docked operations.

Status of Standard Open Work Shuttle (Training – Crew & Flight Controllers)

- **Crew Training Status:**

The flight specific Crew Training Plan has been developed from the Crew Training Catalog and is being executed. All standalone lessons and crew flight specific training objective are scheduled to be completed prior to launch, with no waivers.

- **MCC Training Status:**

The FOIG approved flight specific integrated simulation training plan has been developed and is being executed. All flight specific integrated training is schedule to be completed prior to launch, with no waivers.

Status of Standard Open Work Shuttle (Training – MCC)

- **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.
- All Flight Controller certification requirements are complete except as follows:

Various Physicals, Proficiency and Final Certifications to be completed prior to flight with backup personnel available if required for all positions.

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 approximately April 30, 2008.

Status of Non-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:

OBSS Keep-Alive Power Requirements - A flight specific OBSS Keep-Alive Power Flight Rule for STS-124 is in-work and waiting a final analysis from Engineering. This Flight Rule will provide guidance on our overall thermal clock during the OBSS transfer from the S1 truss to the SRMS as well as guidance on APCU cycle times for LTA safing during or after the transfer. ECD 5/16.

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 APU-24 Update- The APU PRT is proposing a change to LCC APU-24 PCA APU Controller RPC Power ON Anomaly. The update will clarify the preplanned contingency procedure. The MMACS team is still working the details of the change with the working group and the latest change will be discussed at the LCCWG this week.
 - LCC AFM 10 Update- LCC AFM-10 Landing Gear Uplock Indication Anomaly is being updated by the LCCWG, MMACS team and the Landing/Decel PRT. The current version does not require adequate gear deploy redundancy to meet the LCC general redundancy requirements for launch. The new version of the LCC will require that all landing gear sensors be functional prior to launch.
 - These LCC changes are not required for STS-124 and given their changing status may not be implemented for the flight.

Status of Non-Standard Open Work Shuttle (FTP- Flight Anomaly)

• FLIGHT ANOMALY RESOLUTION - All previous in-flight anomalies have been resolved and all operational or procedural changes required have been implemented and verified. Exceptions are noted below:

–STS-123 APU Fuel Tank Nitrogen Leak- During STS-123 APU 1 experienced a fuel tank nitrogen leak. During the mission due to the possibility of the leak being liquid hydrazine fuel, analysis was performed in order to determine the nature of the leak. It was analytically determined that a liquid fuel leak on orbit is highly unlikely based on the signature. The STS-123 analysis will have a bearing on how fuel tank pressure decays are managed real time in the future. Flight rule impacts due to this analysis are still being assessed. Additionally, due to the STS-123 Leak scenario, the analysis process to approve running an APU while docked has been improved to more thoroughly incorporate loads analysis. The additional analysis that will be performed includes load transients from elevon actuation and from port “popping” during secondary actuator check. The entirety of the analysis that will be used to build the standard Running an APU while docked flight rule is expected to be completed by 5-15-2008. The associated flight rule is in the annex in its expected form and will be CRed late or real-time if necessary due to unexpected findings in the analysis.

–STS-122 KU-Band Radiation IFA Closure - A 482 to the Generic ORB OPS C/L has been submitted to add a check, ensuring the KU OUTPUT switch is in LOW power mode prior KU Stow to preclude the possibility of repeating the STS-122 IFA. INCO is also reviewing all Shuttle and Joint Shuttle-ISS Ku-band system Flight Rules and ground and flight procedures to determine if any generic changes are needed to improve operational controls described in Integrated Hazard Report ICOM-01, Cause C. Results of the review will be presented to Orbit FTP. IFA will be closed after the 482 has been approved and the Orbit FTP review has been completed. ECD 5/9.

Status of Non-Standard Open Work Shuttle (FTP- Flight Anomaly)

•FLIGHT ANOMALY RESOLUTION (cont.)

–CO2 Symptoms (STS-123 AR 3237 and STS-120 AR 3007): CO2 symptoms on the Shuttle (while docked and undocked) have been noted on several missions beginning with STS-114. The following changes have been made or are in work for STS-124:

•Configuration Changes

- The ISS will use a duct to move the Orbiter air directly into the Lab rather than relying on the air to be transferred to Node 2 and then the Lab.
- ISS will Increase CDRA blower fan speed to increase CO2 removal.
- The Orbiter will fly an additional duct to send only unconditioned air to the ISS. The conditioned air previously being sent to the ISS will come out of a register on the Middeck floor.

•Flight Rule Changes – the flight rule limit for the Shuttle will be lowered from 7.6 (6.1) mmHg to 5.0 mmHg.

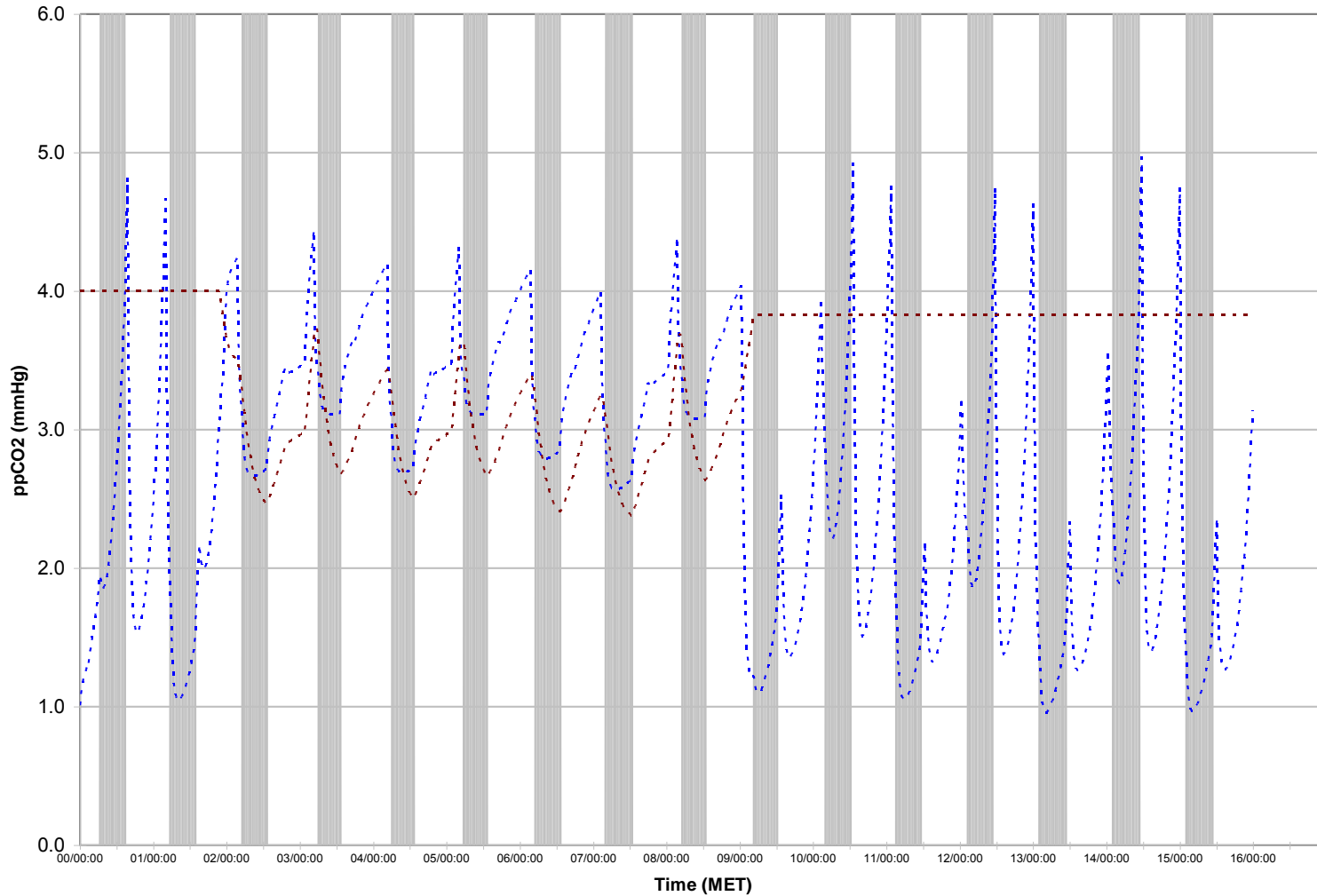
•Procedure Changes – procedures will be put in place in the Shuttle and ISS data files to use the additional duct in the Orbiter.

•Flying batteries for use in ISS MRK (fans)

•Looking at reversing OCAC(fan) if required

STS-124/1J ppCO2 Predicted Profile

STS-124 ppCO2 Levels



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Status of Non-Standard Open Work Shuttle (FTP- Anomaly Procedure)

•ANOMALY-PROCEDURE - Any special procedures or flight rules required because of uncorrected anomalies have been written, reviewed, and verified. This applies to vehicle problems the program elected not to fix but fly "as is" as well as ground problems which were not corrected but procedurally worked around for this flight. Exceptions are noted below:

–Radiator Retract Hose during PLBD Close Imagery Requirement- The shuttle program is requesting that imagery of the Radiator retract hoses be captured during PLBD closure to record the formation of any bends in the hoses. The imagery may help with the root cause analysis. Due to the request the Deorbit Prep Checklist is being modified to include provisions for the crew to set up PLB cameras and record video during the PLBD closure.

Status of Non-Standard Open Work Shuttle (Level II Actions)

- LEVEL II ACTIONS - All Level II actions assigned to this area have been evaluated and determined to be neither an exception nor a constraint to the review, except as follows:
 - Level II Action PRCBD S063851B** - Review and present the current ppCO₂ LiOH management plan to preclude exceeding ppCO₂ limits early in the mission. Report to the PRCB. (123-MMT-001). The STS-123 CO₂ management plan including changes to improve airflow will be presented to the PRCB on 5/15/08.

Conclusion Shuttle

All identified open work will be
completed in time to support
STS-124