

Space Transportation Vehicle Division



STS-132 MOD FRR

April 1, 2010

DS/Whitney Maples

DS Shuttle CoFR Status Summary

REQUIREMENT	Training	DPS	INCO	MMACS	EGIL	EECOM	GNC	PROP	BOOSTER
Critical Processors/Applications	N/A	G	G	G	G	G	G	G	G
Non-Crit Processors/Applications	N/A	G	G	G	G	G	G	G	G
EMCC	N/A	G	G	G	G	G	G	G	N/A
Training - MCC/POCC	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
Training - SMS	G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LCC/MEL/MIL	N/A	G	G	G	G	G	G	G	G
FTP - New Ops	N/A	G	G	G	G	G	G	G	G
Flight Anomaly Resolution	G	G	G	G	G	G	G	G	G
Anomaly – Procedures	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
CIL/Hazards	G	G	G	G	G	G	G	G	G
No Constraints	G	G	G	G	G	G	G	G	G
Level II Actions	G	G	G	G	G	G	G	G	G
Mission Requirements	G	G	G	G	G	G	G	G	G
Engineering Drawings	N/A	G	G	G	G	G	G	G	G
Command Procedures	N/A	G	G	G	G	G	G	G	G
Fit Prep Process Plan Requirements Met	G	G	G	G	G	G	G	G	G
Contractor Process Insight	N/A	G	G	G	G	G	G	G	G
MOD Work Guidelines	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	420.5	35.0	102.8
O2	5	3886.4	3672.4	213.9	213.1

- NOTES: 1) Assumes 12+0+2 day mission with 3+1 ISS-based EVAs
- 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) 20 lbm O2 protected for PMA/ODS press, 3 scheduled/1 unscheduled EVAs
- 5) CSCS capability allows for 16 days docked with TBD lbm O2 margin and unmanned undock on FD19. O2 margin includes metabolic for 6 ISS crew for the docked duration.

SSP Environmental Summary

Consumable	L/O Load	Min L/O	Margin
N2 (lb)	321.75^{1,2}	314.34³	7.41
Supply H2O (lb)	353⁴	353	0
LiOH (cans)	31⁵	31	0

NOTES: 1) Assumes 12+0+3 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) 69 LiOH canisters are required for a 12+0+3 day mission. 29 cans stowed in the LiOH Box with 2 installed. 9 cans will be taken from the USOS Contingency Reserve and the equivalent of 29 cans will be provided by ISS CDRA in dual bed mode and Vozdukh. 12 cans launched in MRM1 will be used to replenish ISS Contingency Reserve upon MRM1 ingress after Shuttle undocking.

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 (MEL)

- 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 STS-132 MEL-13 - The Flight Specific Minimum Equipment List has been submitted to the LMS System and was approved by the LCC WG on 3/17/10. Votes were due 3/26/10; expect the updates to be approved OSB by the PRCB. ECD 4/9/10.

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:

APU Operations While Docked - Analysis is in work to examine the effect that the stack would experience from running a single APU while docked to ISS. The preliminary form of the ULF4_C10-1 APU Operations While Docked flight rule has been submitted to the appropriate book manager. Once all flight specific analyses are complete, update to the rule will be made if required. ECD 4/1/10

Hook Requirements for Docked Operations - Analysis to examine the docking interface loads that would be experienced with multiple hooks out scenarios is complete. The preliminary form of the ULF4_C10-2 Hook Requirements for Docked Operations flight rule has been submitted to the appropriate book manager. Once all flight specific analyses are complete, updates to the rule will be made if required. ECD 4/1/10

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

- DAP configurations and constraints - (Awaiting C. S. Draper Laboratory Memo): The current version of the flight rules and crew procedures 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. Final memo expected L-30 days. **Preliminary results of Draper Analysis indicate that we may need to change DAP parameters to meet the DX request for a 5 ft box around the certified SSRMS positions for the battery R&R EVAs. This would require flight rule, and FDF modifications.**

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

- Procedure Updates due to Flying CGBA2 (NLP-CELLS-2) Unpowered – Due to the MIP CR approved on 03/25/2010 to fly CGBA2 (NLP-CELLS-2) unpowered, several FDF and SODF changes will be required in the ASC C/L, PI, PL PWRDN, and ASSY OPS. ECD 4/1/10
- VRCS to Momentum Manager Direct Handover - The VRCS to Momentum Manager Direct Handover will be certified for STS-132, and will be used as the nominal handover method. **DDC was planned to be certified when the SSRMS is holding the ICC at the overnight park position, this may not be possible, and if so associated flight rules would need to be changed.**

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

- **Dual Docked Ops (DDO)** - There could possibly be a DDO occurrence on STS-132/ULF4 with the docking of 23S at the SM Aft port location, if STS-132 were to have a launch slip. Discussions are on-going and analysis is still in work to make sure that performing a DDO will be “certified”.
 - From a GNC perspective, due to the complexity of docking, the DDO rendezvous would occur on ISS assets. Orbiter control is not being considered outside of the maneuver to and from attitude. Also, if required, to protect for plume impingement, the Star Tracker doors may be closed prior to the DDO and re-opened at the completion of the DDO. Discussions are still on-going.
 - Propellant for mated maneuvers is not budgeted pre-flight; however, ULF4_C2-12 On-Orbit Propellant Priority outlines the relative priority for planned mated maneuvers and attitude, if Shuttle maneuvers were to be required.
 - Dual docked ops will impact the LiOH plan such that there is the potential to take the ISS contingency reserve below the redline of 20 cans. Dual docked ops will also impact the waste water management plan, as the extended mission duration could result in more urine being stored in CWCs on the middeck.

Item of Interest – Orbiter C&W

- The MRM1 payload will be hooked up to the Orbiter OIU and PDI for telemetry and command capability while the module is in the payload bay. Because the MRM1 payload uses the OIU and has its own TFL, the Orbiter will not support ISS return link and ISS C&W monitoring capability for the first two docked days. Until the customer no longer requires telemetry, projected to occur immediately after MRM1 Unberth on FD5, the Orbiter ISS C&W parameters will remain inhibited. The orbiter crew will maintain insight into any ISS emergency events via tones heard through the Docked Audio Interface Unit (DAIU) and will monitor ISS status via ship-to-ship (big-loop comm) and calls from MCC-H.

Item of Interest – LiOH Plan

- The STS-132/ULF4 LiOH plan has been updated to account for the operational CDRA unit being located in Node 3 vice the US Lab. ECLSS model predictions have indicated that orbiter CO₂ levels will be affected due to the increased distance the orbiter air will travel before being scrubbed.
- Nine LiOH cans will be needed from the USOS Contingency Reserve in addition to the orbiter's standard manifest of 31 LiOH cans to maintain ppCO₂ levels below 5 mmHg for a 12+0+3 mission with 6 ISS crew.
- Should the STS-132/ULF4 mission fly during a 3 ISS crew period, only 2 LiOH cans will be required from the USOS Contingency Reserve.
- There is potential for the Lab CDRA to be activated during the mission and reduce the number cans needed from the USOS Contingency Reserve, but is timeline dependent.
- To replenish any cans that are used from the USOS Contingency Reserve, 12 additional LiOH cans are manifested to fly in the MRM1 payload which will be ingressed post-undocking.
- For a 6 ISS crew mission the USOS Contingency Reserve will be at 30 cans following undocking. For a 3 ISS crew mission, the reserve will be at 37 cans. Both cases will preserve the Contingency Reserve redline throughout all remaining shuttle missions.

STS-131 Space Transportation Vehicle Division Readiness Statement

The Space Transportation Vehicle Division has performed the reviews necessary to assess the flight readiness relating to vehicle systems requirements definition, crew and flight controller training, and operations. We have determined all applicable responsibilities acceptable for flight pending closure of the identified open work and issues.

Original signed by _____ April 1, 2010

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As compiled by: DS/Whitney Maples