



STS-125/HST SM4 & STS-400/LON

MOD Flight Readiness Review



**JSC Mission Operations Directorate
Flight Director Office**

**DA8/Anthony J. Ceccacci
DA8/Norman D. Knight
DA8/Paul F. Dye**

Agenda Item 3

September 2, 2008

**Mission Operations Directorate
Flight Director Office**

Agenda



- DA8 COFR Requirements/Endorsements
 - COFR Requirements/Endorsements Summary
 - New Operations – A/E Topics, SMG, MCC, Flight Techniques
 - Items of Interest
 - Safety Status Review
 - Flight Rules (Generic Volume A, STS-125/HST SM4 & STS-400/LON Annex)
 - FDF
 - Mission Staffing: Training/Certification/Work Guidelines Compliance
 - Non-Critical Processors/Applications (backup)
 - Emergency Mission Control Center/EMCC (backup)
 - Command Procedures (backup)
 - Contingency Shuttle Crew Support/Rescue Flight: STS-125 & STS-400/LON
 - Level II Actions
 - Special Topics
- Standard Open Work
- Non-Standard Open Work
- Exceptions
- Flight Readiness Statement

DA8 COFR Requirements/Endorsements



REQUIREMENT (SHUTTLE)	FD	PI	Safety	SPAN	SMG	Team 4
Non-Crit Processors/Applications	G				G	
EMCC	G				G	G
Certified Flight Controllers	G			G	G	G
Flight Rules	G					
FDF	G	G*				
FTP - New Ops	G					
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			
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				
Contractor Process Insight		G				



Ready to Support Flight/Only Standard Open work



Non Standard Open work with expected resolution prior to flight.



Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.



N/A

*FCOH



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Ascent/Entry Topics



STS-125 Launch Window and Lighting Summary

- Launch scheduled on Oct 8th at GMT 05:34:52, EDT 01:54:32
- Launch Window is ~66 minutes.
 - Preferred launch time is at the open of the launch window.
 - In-Plane launch time is ~60 minutes past window open.
 - » Ascent Performance increases for holds outside T-5 min.
- Flight Day 3 Rendezvous targeted for all launch days.
- TAL site required and Moron is the only one within cross range capability.
 - 10 second gap between RTLS Negative Return and Press to ATO boundary.
 - Moron is the only usable TAL site due to inclination.
 - » Negative Moron occurs at $\sim V_i=14200$ fps (MET 6:00) if needed for a Systems abort.
- ECAL sites not available due to inclination.
 - Bermuda is available site for multi-failure scenarios where RTLS/TAL not available.
- MECO apogee will be ~300 nm and will be circularized by OMS2.
- ET Photography will occur in darkness
 - ET Umbilical photography will be satisfied with the umbilical flash and +X maneuver.
 - ET Handheld pitch maneuver will not be performed.



Ascent/Entry Topics



STS-125 Launch Window and Lighting Summary

Preliminary Launch Window Times For The STS-125 Oct 8th Launch

Day	KSC Date	RNDZ Day	ET Photo Umbilical	ET Photo Handheld	Open (EDT)	Open (GMT)	In-Plane (GMT)	Close (GMT)
Wednesday	8-Oct	FD3	Dark	Dark	1:34:52	5:34:52	6:33:30	6:36:53
Thursday	9-Oct	FD3	Dark	Dark	1:04:14	5:04:14	6:02:54	6:06:07
Friday	10-Oct	FD3	Dark	Dark	0:33:37	4:33:37	5:36:40	5:39:39
Saturday	11-Oct	FD3	Dark	Dark	0:03:54	4:03:54	5:06:02	5:09:13
Sunday	12-Oct	FD3	Dark	Dark	23:36:46	3:36:46	4:35:25	4:38:37
Monday	13-Oct	FD3	Dark	Dark	23:06:08	3:06:08	4:04:49	4:08:02
Tuesday	14-Oct	FD3	Dark	Dark	22:35:32	2:35:32	3:38:34	3:41:47
Wednesday	15-Oct	FD3	Dark	Dark	22:09:19	2:09:19	3:07:55	3:11:08

NOTES:

- 1) Launch will occur at the Window Open time.
- 2) In-Plane times provided for reference only.
- 2) Night launch Oct 5th through Oct 20th.
- 3) Launch Window is on average no more than 66 minutes.
- 4) ET Umbilical is optimal for all launch dates due to the Umbilical Camera Flash.
- 5) Optimal ET Handheld lighting occurs between Sept 5th through Oct 2nd.



Ascent/Entry Topics



STS-400 Launch Window Summary

- Launch Window duration varies and is a function of Flight Day 2 rendezvous phasing.
 - Preferred launch time will target the beginning of Flight Day 2 phasing capability.
 - Will have Flight Day 3 Rendezvous capability if needed to increase the launch window duration.
- No TAL site required for STS-400
 - RTLS and Press to ATO abort boundaries overlap.
 - TAL Support team will release support after STS-125 launch
 - » DOD can respond within 4 days.
 - » NASA will respond on best effort basis.
- MECO apogee will be ~300 nm and will be circularized by OMS2.



Ascent/Entry Topics



• SSME Overboard Mixture Ratio Impacts

- SSME overboard mixture ratio has been decreasing since STS-114
 - » SSME's are consuming more fuel than intended (i.e. low mixture ratio).
- Space Shuttle Program approved MPS inventory update with a lower mixture ratio to reflect expected SSME performance (8/28/08 PRCB).
 - » Schedule did not permit change to commanded mixture ratio in the SSME controller software for STS-125.
- New mixture ratio has impacts on how much Flight Performance Reserve propellant is budgeted to protect against a low level cutoff.
 - » FPR is propellant budgeted to account for SSME dispersions (not failures).
 - » Amount of FPR for 1-sigma will change as a function of mixture ratio.
 - New mixture ratio will require more FPR per sigma.
 - » Statistical curve used to determine how much FPR for a particular mixture ratio is required.
- To be go for launch, Flight Rules require that 3 sigma FPR propellant must be maintained for nominal uphill MECO targets and ET Disposal.
- Launch window reserves include protecting for ET loading errors which will also change as a function of mixture ratio.
 - » New mixture ratio will result in an increase in reserve protected.
- Prelaunch Impacts
 - » New MPS inventory requires greater dispersion protection for launch window and FPR and results in ~1100 lbs APM impact.
 - » Current APM is ~1800 lbs and will be decreased to ~700 lbs.
 - » If actual ET propellant loading data is not available (i.e. via the PLOAD application) the no-PLOAD values need to be determined for this new mixture ratio [OPEN WORK].
- Powered Flight Impacts
 - » Abort boundaries move out accordingly due to the additional FPR required to protect for the sigma levels.
 - » Largest impact is Press boundaries which will move ~30 seconds later (greater TAL exposure).
 - » SSME performance cases are also impacted since more FPR now has to be protected for these cases (greater TAL exposure).



Ascent/Entry Topics



• **OI-32 FSW Issue for Single SSME**

- Automated throttle-down for single SSME completion results in LOCV for certain 2-out SSME scenario's.
- Automated throttle-down can occur prior to when Ascent Guidance stops actively steering towards that altitude and planer targets for large underspeed cases.
 - » A large underspeed (>>500 fps) creates the conditions for this to occur.
 - » Altitude and planer steering are releases at MECO minus 40 seconds.
- Consequences are that Ascent Guidance misses the flight path angle target because it pitches down due to the throttle-down and can not recover prior to MECO.
- Crew procedure available to remedy this concern and involves manual throttle actions taken by the Flight Crew.
 - » Man throttles at 5% propellant remaining, minimum throttle down at 2% propellant remaining, followed by Auto throttles.
- Flight Rules and Crew procedures in place for STS-125 to alleviate this condition.

• **UHF Radio Squelch Issue**

- Onboard squelch failed for UHF Guard frequency.
- Test during TCDT will verify good transmit/receive capability.
- Guard Frequency only used for contingency and ELS abort.

• **Restrung/Power cycle for RNDZ**

- Actions will be taken to maintain rendezvous capability with Hubble.
 - » Restrung for SSME throttle capability.
 - » Power cycle one of two SSME Controllers to clear performance case.
- Lower altitudes could result in RMS loads due to mated gravity gradient attitude and resulting vehicle torques and increased turnaround for the rescue mission.

Ascent/Entry Topics



- **Advanced Health Management System (AHMS) Downlink**
 - STS-125 is first flight with new SSME controller software capability to downlink AHMS main engine controller data while on-orbit
 - » Must be performed prior to removing power from main engine controller
 - » Backup capability to post-landing MADS data retrieval
 - Ascent Checklist update approved
 - » Delay main engine controller power down until 25 minutes MET
 - » Acceptable AC inverter loading for extended period of time
- **Edwards Temp Runway**
 - EDW Temp runway will be utilized if required for AOA, PLS, or EOM support.
 - No issues for Heavyweight vehicle.
 - Flight Rules and Crew Procedures in place addressing landing rollout.
 - » Drag Chute Pyro lifetime issue does not compromise chute deploy.
 - » Rules and procedures in place if chute deploy does not occur.
 - Transition to permanent runway will not occur prior to STS-125 landing.
- **DOLILU Changes**
 - Wind pair redline updated for generic use.
 - » Current limits did not account for SRB performance and liftoff weight.
 - » Limits used to determine if non-assessed winds late in the launch count are acceptable for flight.
 - Incorporated changes specific for 28.5 deg inclination.



Ascent/Entry Topics



- **STS-125 Entry Public Risk Assessment**
 - New limit for 28.5 deg inclination entry trajectories
 - » Same philosophy used for 51.6 deg inclination approaches
 - » 2300 E-06 limit envelopes all 28.5 deg KSC ascending/descending approaches.



Spaceflight Meteorology Group (SMG)



- All NWS/SMG software used to create mission critical products or required for mission support is ready for STS-125/400.
- All SMG forecasters required to support STS-125/400 meet currency requirements listed in SMG Training & Certification plan.
- SMG using alternate weather satellite data during launch operations.
 - GOES-East (75 deg) satellite scheduled for eclipse operations 10/1/08 – 10/18/08 (0345Z-0630Z)
 - GOES-West (135deg) imagery providing half hourly coverage during GOES-East eclipse
 - GOES-13 (105deg) backup satellite activated for operations testing through eclipse season
- Some Moron radar products remain unavailable during the Spanish Weather Service radar network modernization.
 - Moron composite reflectivity products remain unavailable in MIDDS and AWIPS
 - SMG coordinating with Spanish Weather Service (AEMET) for estimate of data availability
 - US Navy's Rota radar data also cover the Moron area and are viewable with web browser

The undersigned certifies that the Spaceflight Meteorology Group is ready to support the STS-125/400 flight.

/s/ Frank C. Brody

Frank C. Brody

Chief, Spaceflight Meteorology Group

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Flight Director Office



New Operations: MCC



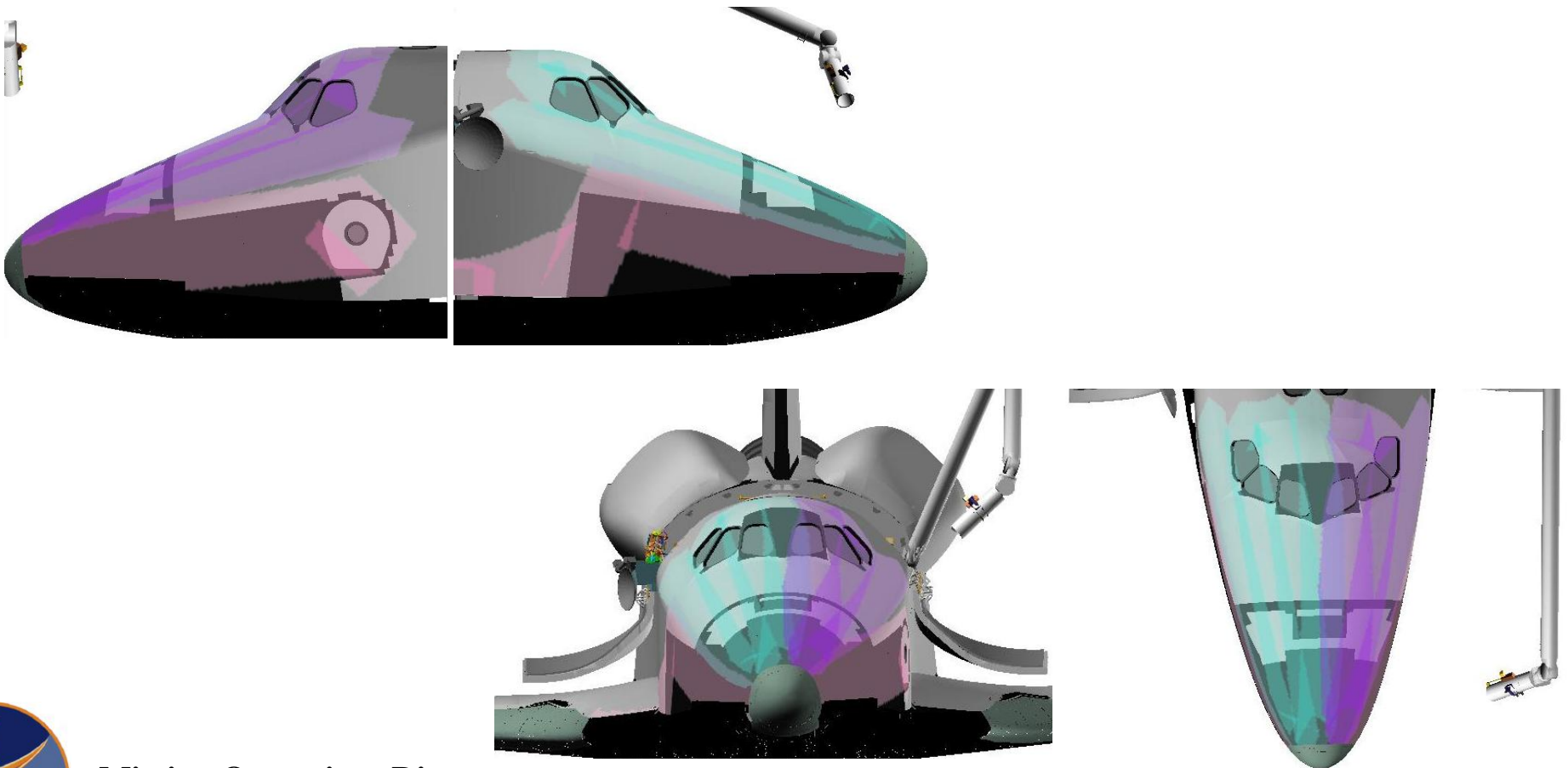
- Shuttle support workstations transitioned to the Linux workstations/software
 - Workstation Install Complete:
 - » BFCR (HST Customer) - 2/27/08
 - » WMPSR – 7/22/08
 - » WFCR – 6/27/08
 - No major problems with Linux machines or software applications during Orbit or A/E simulations in support of STS-125/HST
 - STS-125/HST Linux Cert Mode Lockdown planned for 9/8/08
- ISS Operations have been running on Linux since 4/11/08



New Operations – RPM Replacement TPS Surveys



- RMS EE Crew Cabin Survey
 - Upper Crew Cabin Survey
 - Performed on FD1



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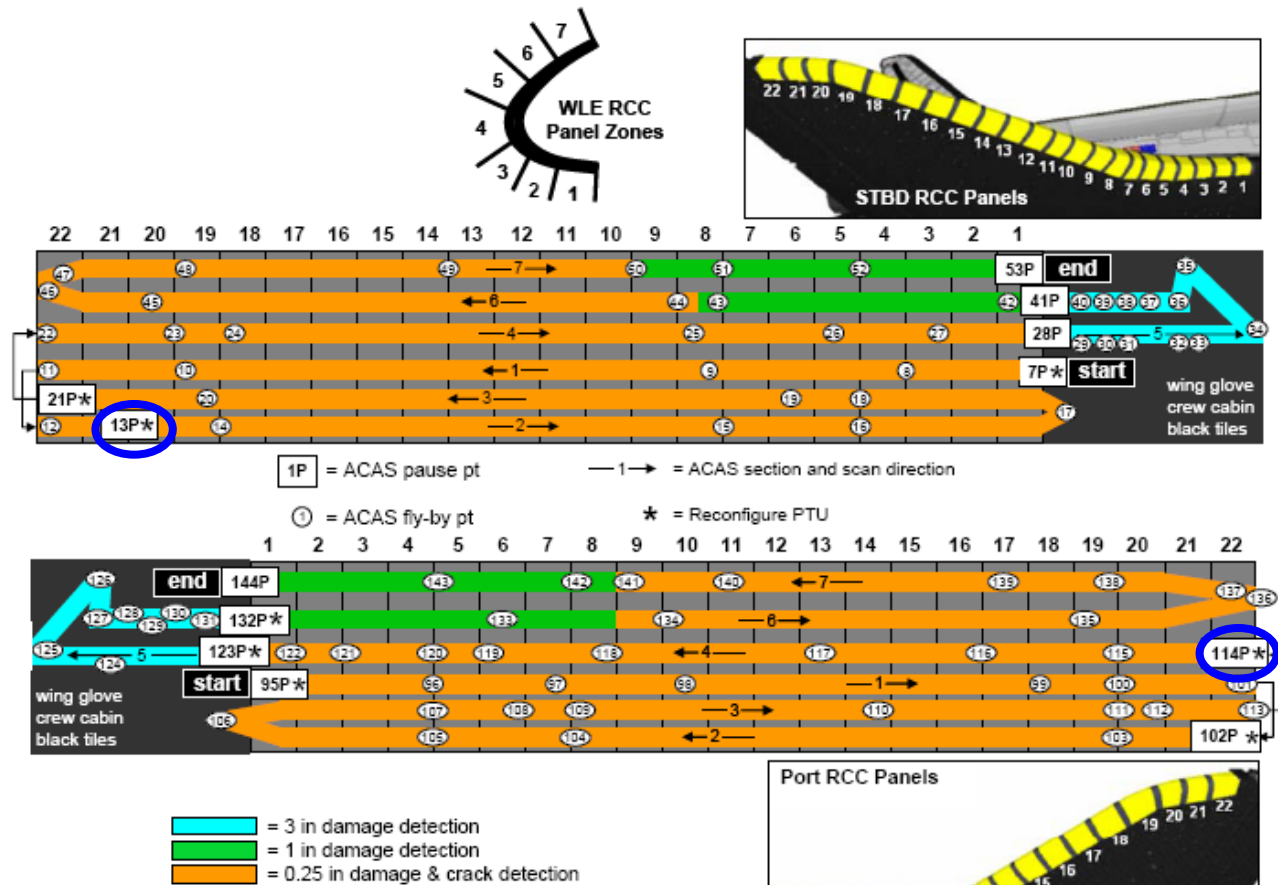
New Operations – RPM Replacement TPS Surveys



- OBSS ITVC Belly Tile Survey
 - Performed in conjunction with FD2 Port and STBD WLE Surveys



OBSS SCAN PATTERN CUE CARD – STBD & PORT



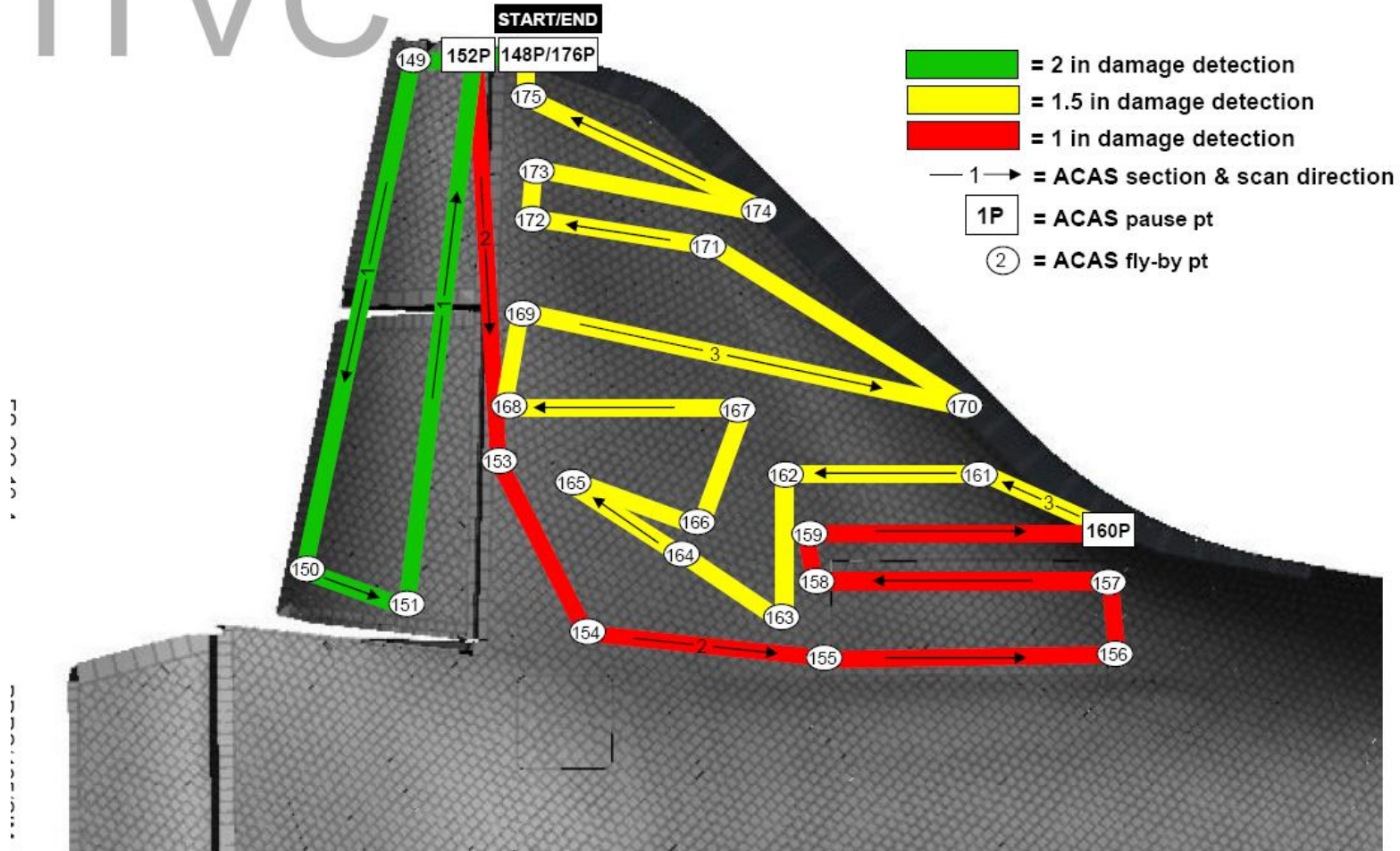
New Operations – RPM Replacement TPS Surveys



OBSS ITVC SCAN PATTERN CUE CARD
STBD BELLY TILE SURVEY

HOOK
VELCRO

ITVC



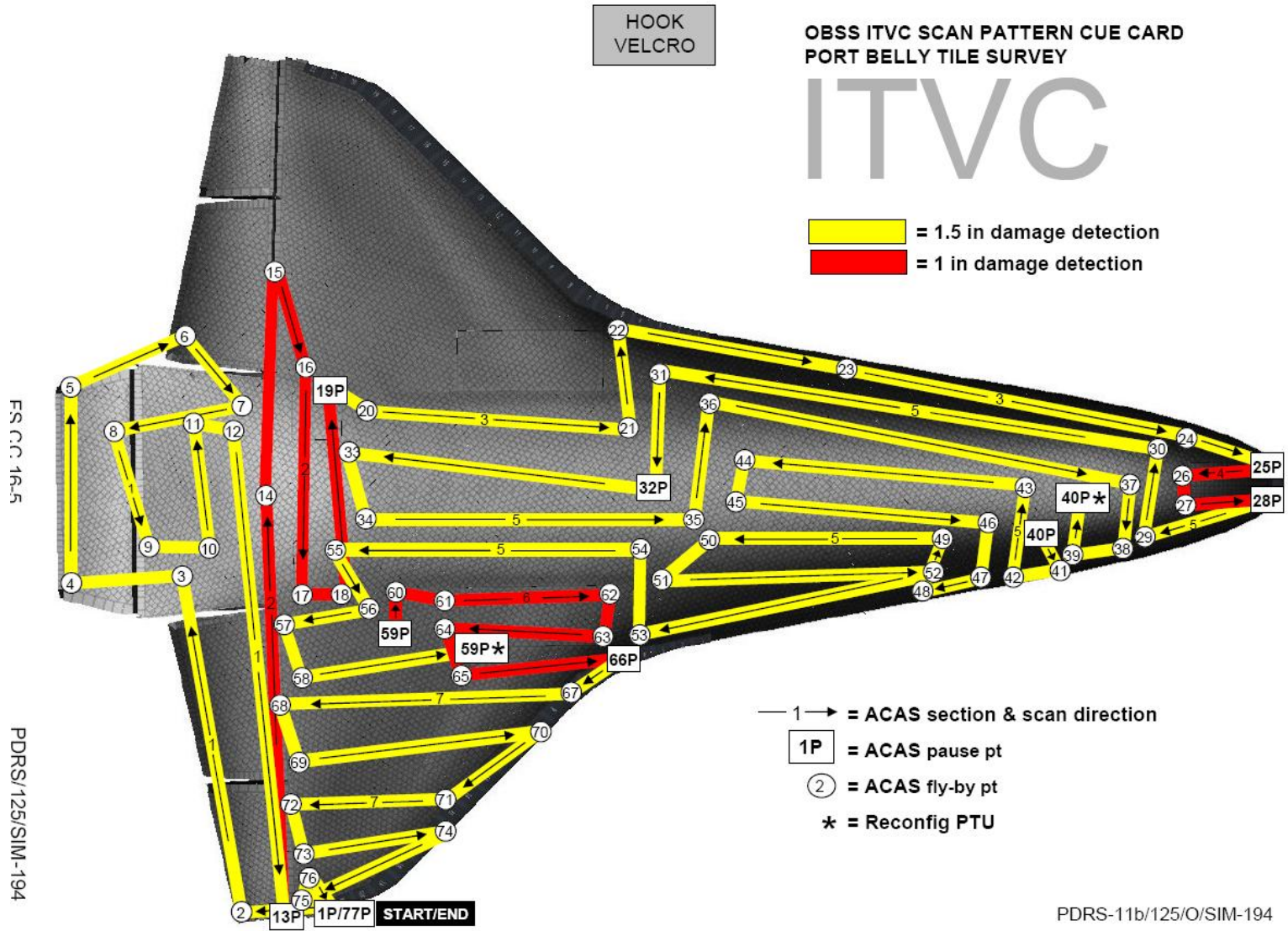
PDRS-11a/125/O/SIM-194

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DA8/Ceccacci, Knight, Dye - 125/HST SM4 400/LON MOD FRR - 9/2/08



New Operations – RPM Replacement TPS Surveys



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Items of Interest - Minimum Duration Flight Support



- **Flight Rule 125_A2 -32 Minimum Duration Flight** states that “If an MDF is declared, the mission will continue as planned until otherwise directed by MMT”
 - Rule carryover from previous HST Servicing Missions
 - » Rationale discusses the uniqueness of the mission (last shuttle HST servicing missions) and the additional risks being accepted to continue to nominal EOM
 - » Assumes “Single fault tolerance” is retained and that there are no “generic” failure concerns
 - Philosophy similar to how ISS mission MDFs are structured
 - » Continue with mission until Cat 1 objectives complete
 - If MMT determines additional risks are not warranted and requests early mission termination, mission duration determination and number of EVAs to be re-planned will utilize the following:
 - » **125_A2-XX Servicing Mission Success Criteria (PCN-1)**
 - Defines Minimal Mission and Full Mission success criteria
 - » **125_A2-36 EVA Task Replanning Guidelines**
 - Re-planning guidelines based on mission priorities as well as Number of EVAs completed –vs- Number of EVAs remaining
 - Re-planning guidelines as a result of HST replacement hardware failures



Items of Interest - EVA Task Replanning Guidelines



- **Flight Rule 125_A2-36 EVA Task Replanning Guidelines**
 - Provides EVA re-planning guidelines in support of a reduced EVA capability in the scenario where the 5 planned EVAs cannot be accomplished
 - » As a result of reduced mission duration, loss of EVA time due to Focused Inspection requirements, or loss of EVA time due to problems encountered during the EVA thus losing a scheduled task
 - Also provides re-planning guidelines in the event of a science instrument or battery failure (assumes nominal 5 EVAs are available)
 - Pre-flight agreed to plan that minimizes “real-time” discussion and allows the next day planning process to be initiated without delay which is mandatory in support of the 5 “back-to-back” EVAs.
 - » Understanding that all failure combinations are not defined, but the basic philosophy used for the Flight Rule development can be employed/utilized for any failure scenario
 - » Philosophy:
 - Minimize changes to the planned EVAs as much as possible and focus on what can be accomplished in the nominal timeline
 - Although failures may change relative priorities, it’s important to retain the big picture and utilize procedures/timelines that have been extensively choreographed , trained and have become second nature to the crew, which provides the maximum efficiency and highest probability of successfully completing all mission objectives.



Items of Interest - 125/HST SM4 EVA Glove Usage Plan



- **Planned usage of Modified/Turtle Skin EMU gloves for all EVAs with the following exceptions:**

- **EVA 3**

- » **In support of ACS Task, EV1 (Grunsfeld) will wear non-modified gloves (no Overgloves during the EVA) to accomplish repair**
 - **Complex task requires maximum dexterity/tactile feeling**
 - **Poor visibility and lighting**
 - **Releasing and capturing a large amount of non-captive fasteners (36 fasteners)**
 - **Using manual screwdriver to “feel” initial release of fasteners in order not to strip them**
 - **Fine alignment required to not damage hardware/tools**
 - **Interfacing with several 1/4 turn fasteners**

- **EVA 4**

- » **Currently EV3 has planned to wear Modified/Turtle Skin gloves for the STIS repair task**
 - **On EVA 2, EV3 (Mass) will determine if the Modified glove will provide the required dexterity/tactile feeling to support the STIS repair task**
 - **If EV3 feels that the modified gloves will hinder the STIS repair efforts, he will switch to the non-modified gloves (no Overgloves) on EVA 4 to increase the probability of a successful STIS repair**
 - **STIS Complex task (117 fasteners) comparable to ACS repair**





• Risk Mitigation

- Exceptions identified are supported /in sync with the philosophy identified in XA-08-001 “Overglove Use Policy During US EVA”
 - » Crew in Orbiter Payload Bay
 - » New Flight Hardware
 - » Required task dexterity
 - » Etc.
- Known “sharp edges’ on HST Hardware clearly identified and warnings included in EVA procedures
- Unknowns HST
 - » Only ~ 14% of EVA (5) time on exterior of telescope
 - » Only ~ 2.5 % of EVA (5) time on HST Handrails (MMOD)
 - EVA 3 – EV1/FF ~ 8.5 ft translation on -V2 bottom handrail (see backup)
 - EVA 4 – EV3/FF ~ 8.5 ft translation on -V2 bottom handrail, ~ 20 ft translation on +V3 top and right side handrail (see backup)
- Standard glove inspections during EVA and post EVA
 - » If unexpected damage occurred, the location/cause could be quickly identified and that marked as a Warning/KOZ
 - Due to task locations, most of worksites on HST are never revisited





- **Risk Mitigation (cont.)**

- Non-modified glove usage plan will be re-visited if continued “unexpected” damage is identified on Modified/Turtle Skin gloves that would put non-modified gloves/crew at risk
 - » Very High confidence that this won’t be the case based on past HST history
- Detailed “Translation by Translation” and Task review performed at 125/HST Flight Techniques so the “community” could fully understand the HST EVA compliment and differences from ISS
 - » XA and EVA safety part of the discussions and agreements
- Plan presented at EVA CCB
 - » Chairman Concurred



Items of Interest - EV “Unable to Support” Planned EVA



- With 5 “back-to-back” EVAs it was important that we had an agreed upon plan/philosophy/guideline so we could quickly react to this scenario
- Planning Philosophy agreed upon at FTP (crew, EVA, HST, and DA8)
- EVAs will be executed in the sequence as pre-flight planned

– Pros

- » Provides highest probability of safely and successfully completing the maximum amount of mission objectives (stick to the plan)
 - EV crew members cross-trained and can be substituted to support tasks
 - Re-sequencing of EVAs results in a significant amount of inefficiencies
 - EVAs currently optimized and include planned tasks to minimize EVA duration for subsequent EVAs (PET will be longer than 6:30 if not completed)
 - You will lose a task swapping the EVA order
- » Does not require replanning of HST Command Plan
 - Keep it simple and as planned/minimize possible mistakes
- » Minimize EMU swaps and EVA tool reconfigurations
 - Minimize impacts to timeline

– Cons

- » “Back to Back” EVA for one EV crew



Items of Interest - EV “Unable to Support” Planned EVA (cont.)



- Plan assumes that the EV who could not support that day’s EVA would recover and be able to support remainder of his planned EVAs
 - If EV unable to recover the plan would still be to execute the EVAs in the pre-flight sequence and:
 - » Swap out crew members to minimize “back-to-back” EVA requirements
 - » Consideration will be given to deleting an EVA and re-plan using EVA Task Replanning Guidelines
 - Dependent on crew fatigue and/or EVA Cross Training



Items of Interest - PPCO₂ Management



- **STS-125/HST LiOH Plan is to perform dual can change outs except Pre-sleep on FD1, FD3, FD4, FD5, FD6, FD7 and FD8 (which are single can)**
 - **Predicted Levels (Predictions assume 7hrs of crew exercise a day)**
 - » **Max Peak is 6.2 MM/HG pre-sleep on FD9**
 - » **Between 5 – 6.1 MM/HG prior to post sleep LiOH change out on FD4 – FD8**
 - **Same protocol as performed on STS-109 where peak was 5.7 MM/Hg FD4 pre-sleep**
 - **Predicted level assume LiOH change out 1 Hr before Pre-sleep and 1 hour after crew wake.**
- **Plan is to give the crew a heads up when the PPCO₂ is \geq 5.0 MM/Hg and give them an option to change out the LiOH at the time**
 - **Follows same philosophy used on STS-124**
- **Changes to LiOH change out plan/PPCO₂ management will be determined based on actual PPCO₂ levels/rates that are seen during the mission**
 - **Later or earlier change outs may be requested**
- **CDR (who was CDR on STS-109) reviewed 125 predictions and 109 actuals and is in agreement with the proposed plan**



Items of Interest – Orbit Adjust for MMOD Exposure Mitigation Strategy



- **Plan it to target for ~ 160NM Perigee after Late Inspection imagery review ~ 8/19:30 FD10.**
 - ~ 48 hours in 308 x 160 NM Orbit prior to Deorbit
 - OA not “1 for 1” Deorbit cost due to large elliptical Orbit
- **Higher priority objective is Deorbit Opportunity protection (2+2+2) which may require increasing the perigee slightly to meet the required landing opportunities**
 - May not get specifically to 160 NM but any reduction in altitude decreases the MMOD probability
- **Prop Priority Table (starting from 2-2-2 protection)**
 - » 10. PROVIDE ADDITIONAL DEORBIT ATTEMPTS UP TO 2-2-2, INCLUDING ANY REQUIRED ORBIT ADJUST BURNS (MAY BE COMBINED WITH ORBIT ADJUST FOR MMOD)
 - » 11. ET PHOTOGRAPHY PITCH MANEUVER
 - » 12. FCS CHECKOUT WITH APU RUNNING
 - » 13. OMS ENGINE FAIL
 - » 14. ORBIT ADJUST FOR MMOD MITIGATION
 - » 15. HST REBOOST
 - » 16. SECONDARY PAYLOAD OPERATIONS
 - » 17. ADJUST ORBIT FOR ADDITIONAL LANDING OPPORTUNITIES



Items of Interest - Loss Of Ku Plan



- **A Contingency Plan has been developed in support of Loss of Ku**
 - Provides operations plan to support Loss of KU capabilities
 - Best effort to maximize available capability
 - Which Include:
 - » **TPS Inspections**
 - Record data per nominal plan (DTV Tape, IDC Laptop, Digital stills)
 - Crewmember assigned to watch LDRI/ITVC data (via monitor) and log GMT if they notice a possible defect/something off nominal in scans
 - Update TFL to support SSV during inspection activities
 - Current priority goes to HST data (since nominally KU available)
 - Utilize S-Band FM system for imagery data dumps over MILA or Dryden (possibly ESTL if ground track supports)
 - ~ 1 hr 15 minutes avail/day with MILA/Dryden
 - Highest priority goes to the areas the crew identified during the OBSS scans
 - » **SSR dump management**
 - » **MFX/760 Activation on A/G 2**
 - Limited capability
 - Does support some WLES operations



Safety Issues



- None



OPEN NASA OCADs



- **EVA (1)**
 - NOBL-ER Adhesive
- **ACO (26)**
 - Mate/Demate
 - Contingency EVA
 - Ignition of Flammable Atmosphere
 - Inadvertent FSS Movement
 - Inadvertent Operation of FSS Mechanisms
 - Inadvertent Operation of HST Mechanisms
 - HST RF Exceedences
 - Rapid Safing
 - SLIC Thermal Exceedence



OPEN NASA OCADs (Cont.)



- **Pending updates to existing/new OCADs**

- **HR-24 *Radio Frequency Transmissions***

- » ***Cause 1, Control 1 - OCAD #58290***

- » ***Cause 2, Control 1 - TBS***

- » ***Cause 3, Control 1 – TBS***

- **HR EVA-4A *EVA/IVA Electrical Arcing/IVA Electrical Shock***

- » ***Cause 3, Control 1 - OCAD #58338***

- **HR EVA-6 *Astronaut Injury from Exposure to Excessive Electromagnetic Radiation***

- » ***Cause 1, Control 1 – OCAD #58352***

- » ***Cause 1, Control 2 – OCAD #TBS***

- » ***Cause 2, Control 1 – OCAD #58353***



Flight Rules



- All required generic volume A rules have been developed, reviewed, and approved by the appropriate Flight Techniques Panels and the FRCB
- The following generic publications are applicable for STS-125/HST SM4 and STS-400/LON
 - Volume A (STS), Final, PCN-9 dated 1/22/08
- STS-125/HST SM4, STS-400/LON Flight Rules Annex
 - STS-400/LON rules combined with STS-125/HST Annex since only a minimum set of 400/LON specific rules were required (Section 2: Flight Ops, Section 22: STS-400/LON)
 - » Final, dated August 21, 2008
 - » PCN-1 targeted for PRCB approval on 10/2/08



FDF



- DA8 has participated in FDF processes and procedure reviews as required
- FDF will be ready to support STS-125/HST SM4 and STS-400/LON

Flight Director Mission Staffing



- All STS-125/HST SM4 and STS-400/LON 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, and EMCC as required
- MOD Work Guidelines are met
- Flight-specific certifications are expected to be complete by Sept 19, 2008

STS-125/HST SM4 Shuttle Flight Directors		STS-400/LON Shuttle Flight Directors	
Tony Ceccacci	Lead/Orbit 1	Paul Dye	Lead/Orbit 1
Rick LaBrode	Orbit 2	Mike Sarafin	Orbit 2
Paul Dye	Planning	Richard Jones	Planning
Norman Knight	Ascent/Entry	Norman Knight	Ascent/Entry



CSCS Support: STS-125/HST



- STS-125/HST CSCS documentation is located on the DA8 STS-125/HST Flight Techniques page
 - <http://mod.jsc.nasa.gov/da8/ElecPitches/sts-125/charts.aspx>
 - Documentation Includes:
 - » STS-125/HST SM4 Group C+ Powerdown /Powerup
 - Delta from RTF version to provide Orbiter Attitude Hold
 - » STS-125/HST SM4 Star Of Opportunity Align
 - Power up and Power Down of Star Trackers to support IMU Align.
- STS-125/HST FDF & LON support
 - STS-125/HST Rendezvous Book
 - » STS-400/LON Rendezvous and Release Procedures
 - » STS-125/HST SM4 Disposal Timeline
 - Updated/Simplified from RTF version to support Orbiter Disposal (no unmanned undocking, no sep burns, etc.)
 - Will include and be synced up with actions prior to and post separation with 400
 - 28.5 deg Inclination required Disposal burn targeting update
 - Pacific Ocean with “debris footprint” North of Hawaii
 - STS-125/HST EVA Checklist will include Rescue EVAs

CSCS Support: STS-125/HST

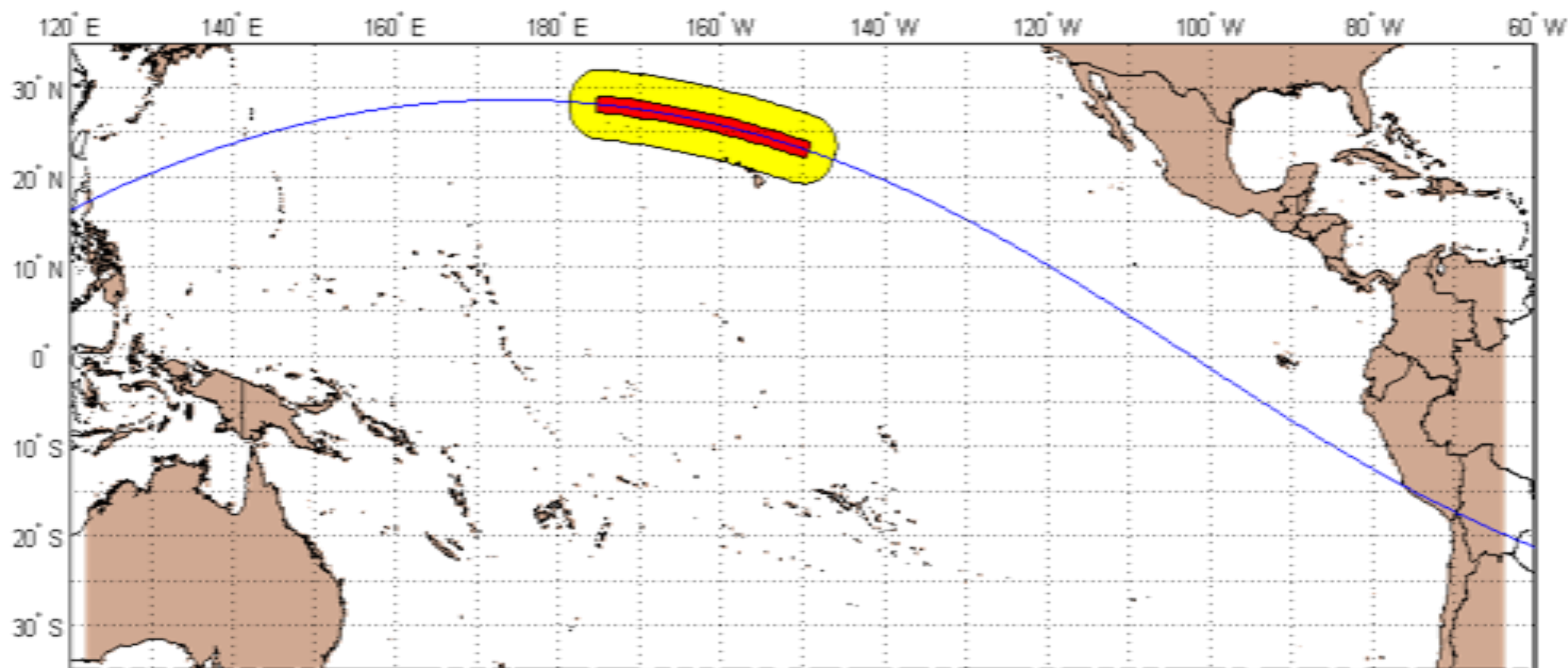


- STS-125/HST Orbit 1 and Orbit 2 Teams will work 13 hr shifts through Disposal Burn
 - Select FCR systems will support as required dependent on activities scheduled
- STS-125/HST Ascent/Entry team will support STS-400/LON
 - Remainder of mission staffing defined (see Flight Director Mission Staffing chart)

CSCS Support: STS-125/HST



STS-125 DISPOSAL AREA



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CSCS Support: STS-125/HST



- Multiple cases assessed and available on DA8/STS-125/HST web site
- CSCS duration dependent on when CSCS declared and what power downs invoked (Example cases below):
 - FD2 @ 1/04:00 (Prior to crew sleep) ~ 24/04:04
 - » Large/un-repairable damage detected during FD2 Inspections
 - » Group C+ (loss of Entry capability) @ 1/04:00
 - FD10 @ 9/01:30 (Prior to crew sleep) ~ 19/01:00
 - » Modified Group C @ 2/04:00 (after HST berthed)
 - » HST Deployed on FD6, TPS repair attempt EVA on FD7
 - » Group C+ (loss of Entry capability) @ 9/01:30
 - FD10 @ 8/17:00 (Prior to Orbit Adjust) ~ 16/12:30
 - » Late Inspection results not favorable
 - » No RCC repair attempt/went immediately to Group C+ (loss of Entry capability) @ 8/17:00
 - » STS-400/LON grapple ~15/16:00
 - 6 day launch prep timeline + 23 hours Rendezvous on FD2
- All cases support 125/HST powerup for Disposal and 3 rescue EVAs



CSCS Support: STS-400/LON



- STS-400/LON at “Readiness Level 1” to support Rescue mission
 - Six day launch countdown
- SSP support strategy is to keep STS-400/LON available and release support after Late Inspection imagery review completion midday on FD10
- Mission Summary (7+4+2):
 - FD1: PI, RMS C/O, RNDZ Tools C/O, 10.2 Depress
 - FD2: RNDZ w/125, EMU C/O, EVA Prep
 - FD3: EVA 1 (PET 5:30)
 - FD4: EVA 2, EVA 3, Release and Sep from 125
 - FD5: TPS Inspection
 - FD6: Off Duty, Cabin stow, Seat Installation
 - FD7: EOM -1
 - FD8: Deorbit



Level II Actions



• STS-124 ADI Error Needle Excursions - Closed

- During STS-124 Crew reported that the ADI needles were erratic during OMS burns in OPS 2.
- Post flight testing revealed that a OI-32 Flight Software changes to the ADI Rate switch in OPS 2 resulted in the erratic behavior.
 - » Rates changed from 10, 5, and 1 deg/sec to 5, 1, and 0.2 deg/sec respectively.
- Crew procedure change to reflect that MED (1 deg/sec) be used for OPS 2 OMS burns.
- Shuttle Program accepted this action closure.

• STS-124 FCS C/O (S063871D) - Closed

- Debris noted during FCS C/O on STS-124 and Shuttle Program levied an action to determine if crew monitoring was required during this procedure.
- Integrated team comprised of applicable Program elements concluded that only benefit of crew monitoring was to determine a tile loss event.
 - » TPS PRT concluded that Tile, RCC, and Blankets are robust and we have never lost any of these components via comparison of orbit photography and postlanding assessments.
- Schedule APU operation during daylight pass and have a single crew member stationed at AFT windows during this time only.
 - » Will utilize the Nikon with 400 mm lens and have camcorder as a backup.
- Team also concluded that vehicle inspection is not required for any unidentified objects although it does not preclude using good judgment (i.e. secondary cue that something may be of concern).

• UHF Radio Criteria (S062826R2) - Open

- Shuttle Program asked MOD to construct a Flight Rule loss definition for the UHF Radio.
- Rule is complete and will be part of the STS-125 Annex, Final, PCN-1.



SSP FRR Special Topics



- STS-125/HST Summary of MMOD Mitigation plan (Attitudes, Late Inspection, Orbit Adjust)
 - Assigned at 8/28/08 PRCB
- CSCS Capability in Support of FD10 Late Inspection LON Callup
 - Assigned at 8/28/08 PRCB



Standard Open Work



- STS-125/HST STS-400/LON Flight Rule Annex
 - PCN-1 targeted for PRCB on Oct 2, 2008
 - Launch Window Philosophy Flight Rule for STS-125/STS-400.
- FDF
 - Final Crew review Sept 25, 2008
- Training
 - Complete remaining Orbit and A/E JIS
 - Complete Flight Director Flight Specific certifications (ECD Sept 19, 2008)



Standard Open Work – Safety



- **INDEPENDENT SAFETY VERIFICATION REVIEW**
 - HST ISVR REPORT (ECD: L-2W)



Non-Standard Open Work



- No PLOAD ET Load Application – Need to determine the amount of dispersion protection required when actual ET Loadings can not be determined.
 - New mixture ratio for STS-125 drives need for additional protection for loading errors.
 - Estimated completion date is Sept 9th, 2008.

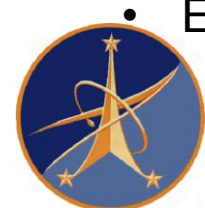


Non-Standard Open Work (cont.)



EVA Open Work – Flight Rule Violation

- Flight Rule A15-17 Requires that Payload Bay be configured such that an Entry is possible at the end of any EVA
- On STS-400, the rope strung along the RMS will interfere with the RMS Elbow and Wrist MPM striker bars, and cross the shoulder join, precluding stowage of the RMS as well as jettison.
- Possible solutions being considered include
 - Not using the rope at all (will add some TBD time to each translation, but tether protocols will be maintained)
 - Deconfiguring the rope at the end of each EVA, then reconfiguring again (will add approximately 30 minutes to each EVA)
 - Changing the way the rope is fairleaded to the RMS (could require re-analysis by Engineering)
 - Accepting the risk of the rope interfering with the RMS stow and jettison
 - » The failure cases that this rule protects are several levels deep
 - » If we were in this case, we would be leaving crewmembers behind on STS-125, which would be bad case as well
 - » The only case this protects for is the need for an immediate de-orbit, such as a large cabin or Prop leak.
- Expect resolution by Sept 11th



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-125/HST SM4
 - All standard/non-standard open work will be closed out or have a closure plan prior to the SSP FRR (9/11-12/08) with no exceptions





Backup



Remaining STS-125/HST Integrated Sims



- Orbit
 - 9/18: HST EVA 5
 - 9/19: HST Rendezvous
- Ascent/Entry
 - 9/3; FDO/BSE
 - 9/8: D/O Prep
 - 9/9: FDO/BSE #2
 - 9/17: Ascent #3
 - 9/25: Post Insertion
 - 9/30: Entry #3
 - 10/2: Ascent #4

Remaining STS-400/LON Integrated Sims



- Orbit
 - 9/12: EVA 2/3 Release
 - 9/16: Short RNDZ/Grapple
- Ascent/Entry
 - 9/5: Post Insertion
 - 9/15: S0044
 - 9/24: Entry #1
 - 9/26: Ascent #2

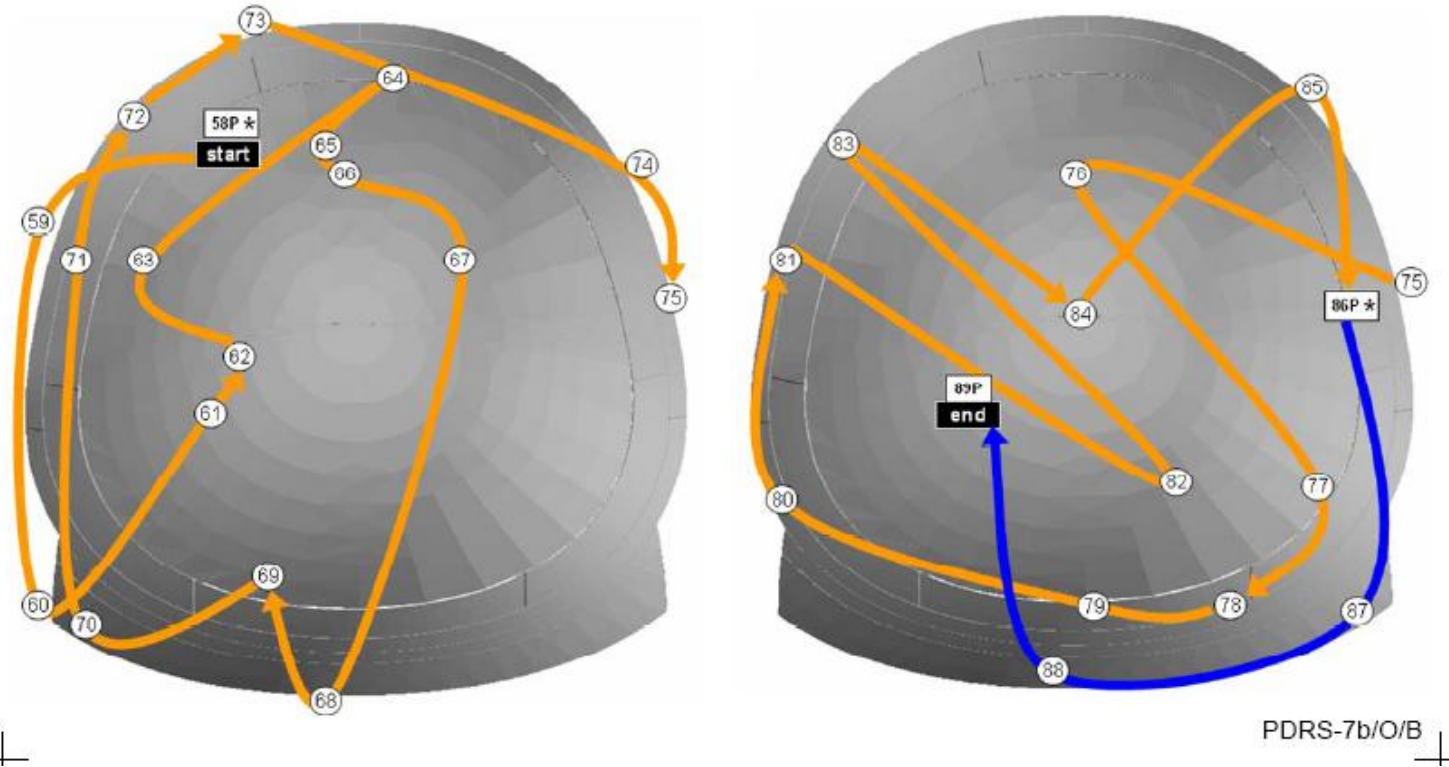
Nose Cap Survey



OBSS SCAN PATTERN CUE CARD – NOSE CAP

NOTE
Point 75 is NOT a pause point. The 1st ACAS section is separated here for graphical clarity

- = 1st ACAS Section
- = 2nd ACAS Section
- 1P = ACAS pause pt
- 1 = ACAS fly-by pt
- = Scan direction
- * = Reconfigure PTU



125/HST SM4 EVA Glove Usage Plan



- EVA 1
 - Grunsfeld (EV1) – Modified/Turtle Skin
 - Feustel (EV2) – Modified/Turtle Skin
- EVA 2
 - Massamino (EV3) – Modified/Turtle Skin
 - Good (EV4) – Modified/Turtle Skin
- EVA 3
 - Grunsfeld (EV1) – Un-Modified (No-Overgloves)
 - Feustel (EV2) – Modified/Turtle Skin
- EVA 4
 - Massamino (EV3) – Modified Turtle Skin**
 - Good (EV4) – Modified/Turtle Skin
- EVA 5
 - Grunsfeld (EV1) – Modified/Turtle Skin
 - Feustel (EV2) – Modified/Turtle Skin

** To be determined during EVA 2



125/HST SM4 EMU Glove Manifest



	<u>Prime</u>	<u>Backup</u>	<u>Contingency</u>
Grunsfeld	Modified/Turtle Skin	Non-modified	Modified/Turtle Skin
Feustel	Modified/Turtle Skin	Modified/Turtle Skin	Non-modified
Massimino	Modified/Turtle Skin	Non-modified	N/A
Good	Modified/Turtle Skin	Non-modified	N/A

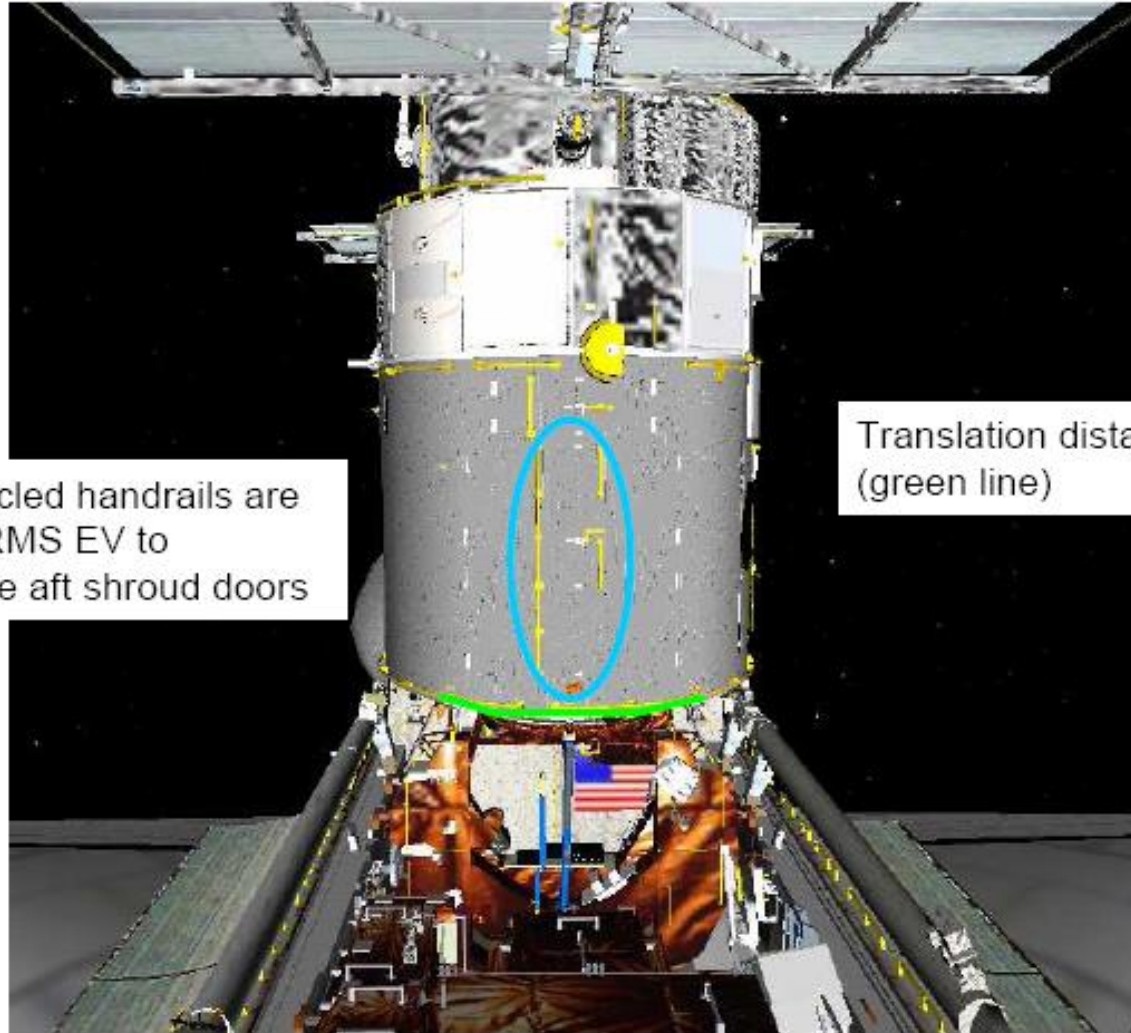




EVA 3 (HST Handrails Used for COS & ACS Tasks)



- V2



Note: Circled handrails are used by RMS EV to open/close aft shroud doors

Translation distance ~8.5 ft (green line)

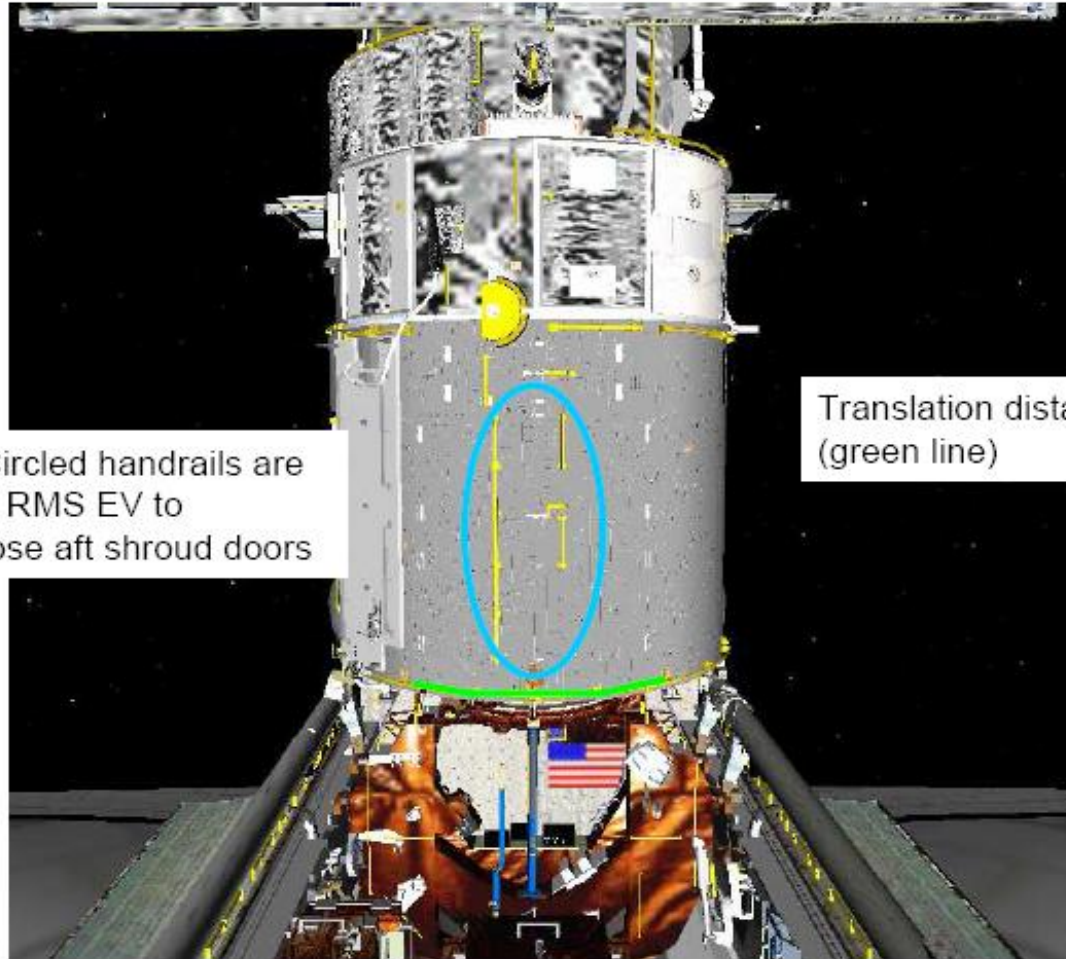




EVA 4 (HST Handrails Used for STIS Task)



+ V2



Note: Circled handrails are used by RMS EV to open/close aft shroud doors

Translation distance ~8.5 ft (green line)

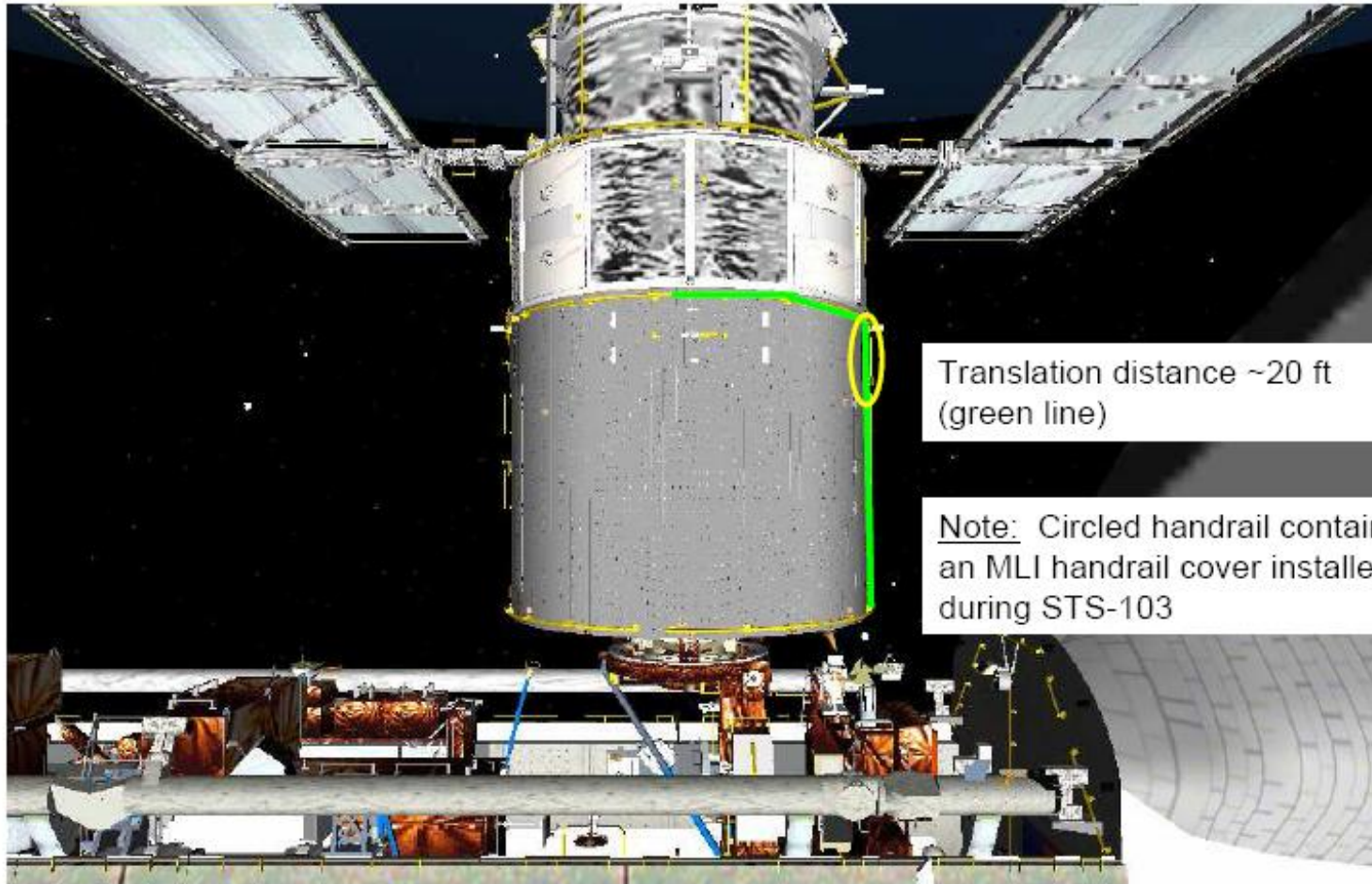




EVA 4 (HST Handrails Used for NOBL Task)



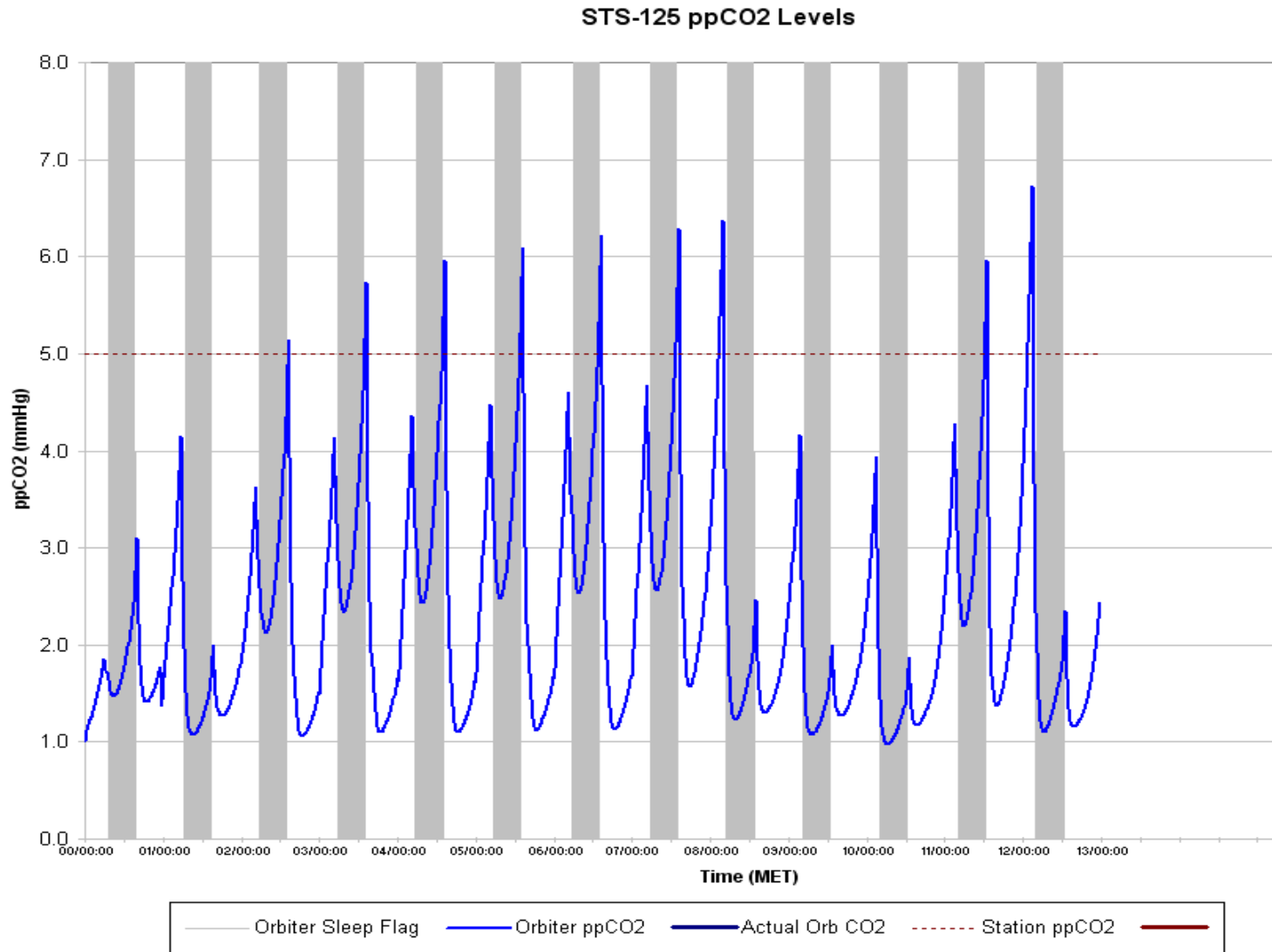
+ V3



Translation distance ~20 ft
(green line)

Note: Circled handrail contains
an MLI handrail cover installed
during STS-103

PPCO2 Management (cont.)



SPAN Staffing



- ISS SPAN Support: Not required for this mission
- ISS SPAN Systems: Not required for this mission
- 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



HST OPEN HAZARD REPORTS



- ARHR HST SM4 1 *Structural Failure of the FSS - pending OOB, ECD 08/22/08*
- ARHR HST SM4 2 *Structural Failure of ORU Carrier - pending OOB, ECD 08/22/08*
- ARHR HST SM4 3A *Structural Failure of MULE Platform - pending OOB, ECD 08/22/08*
- ARHR HST SM4 4 *Structural Failure of the On-orbit HST - pending OOB, ECD 08/22/08*
- ARHR HST SM4 36 *Structural Failure of the SLIC Carrier - pending OOB, ECD 08/22/08*
- ARHR HST SM4 EVA2 *Astronaut Injury Due to SM4 Contact Hazards - pending OOB, ECD 08/22/08*
- ARHR HST SM4 EVA4B *EVA Electrical Arcing / Electrical Shock - pending OOB, ECD 08/22/08*

EVA GFE OPEN HAZARD REPORTS



- EMU ANTENNA CABLE (ECD TBD)
- MANIPULATOR FOOT RESTRAINT (MFR) - DAMAGE DISCOVERED ON THE SUPPORT OF THE LAUNCH LATCH HOOK ON THE MANIPULATOR FOOT RESTRAINT. (ECD TBD)
- EMU LITHIUM ION BATTERY CHARGER - JSCEP0253 - WHILE PERFORMING STEP 3.2.46 OF ESTA-T-7B085Q IT WAS NOTICED THE CHARGER FAULT LIGHT WAS ILLUMINATED FOR CHANNEL B. (ECD TBD)



STS GFE OPEN HAZARD REPORTS



- PAN/TILT UNIT ASSEMBLY (PTU) - ECD 8/22/08
- PRC-112G RADIO - ECD 9/19/08
- SHUTTLE CEE O2/COMM ASSEMBLY - ECD 8/30/08
- HAND HELD MICROPHONE ASSEMBLY - ECD 8/29/08
- CARBON DIOXIDE MONITOR ASSEMBLY (CMK) - ECD 8/20/08
- DIGITAL EXTERNAL - ECD 08/31/2008
- TANK THERMAL PROTECTION SYSTEM CAMERA FLASH ASSY - ECD 08/07/2008
- IMAX - ECD 08/07/2008
- XH-1G HIGH DEF CAMCORDER - ECD 08/07/2008
- 90 DEGREE CAMERA AUTOTRAC, MINICAM - ECD 08/15/2008
- NEXT GENERATION DIGITAL CAMERA - ECD 08/22/2008
- EMITTANCE PRIMER COATING (EPC) - Phase III FESRRP scheduled for 8/28/08
- RCC CRACK REPAIR MATERIAL - ECD 08/22/2008
- DET TPS CAMERA ASSEMBLY - Explosion-proof testing is planned for late August. RAESR update will follow. ECD 8/29/08
- MEDICAL ACCESSORY KIT - ECD 8/31/08



Non-Critical Processors/Applications



- All DA8 Non-Critical Applications certified
- One Flight Director applications changed since STS-124/1J
 - MIDS Weather Application for the Flight Director Console was updated to reflect new capability.



EMCC



- No changes to EMCC procedures since STS-124
 - Personnel are identified to support EMCC, if required



Command Procedures



- Personnel are prepared and ready to execute the command procedures as documented per MOD Command Policy/Flight Rules

A/E FTP



- Four A/E FTPs held in support of STS-125
 - A/E FTP #240 (April 11)
 - A/E FTP #241 (May 1)
 - A/E FTP #242 (June 27)
 - A/E FTP #243 (Aug 29)





- **Advanced Health Management System (AHMS) Downlink**
 - STS-125 is first flight with new SSME controller software capability to downlink AHMS main engine controller data while on-orbit
 - » Must be performed prior to removing power from main engine controller
 - » Backup capability to post-landing MADS data retrieval
 - Ascent Checklist update approved
 - » Delay main engine controller power down until 25 minutes MET
 - » Acceptable AC inverter loading for extended period of time
- **DOLILU Criteria for Delaying I-load Design**
 - Reviewed CR proposal for delaying I-load design from L-4:35 hr balloon to L-3:25 hr balloon
 - » Drives new mandatory weather balloon criteria for L-2:20 hr balloon
 - Follow-on analysis still in work





• STS-400 Launch Count Execution

- STS-125 has 25 days of CSCS capability with Group C powerdown
- STS-400 launch available at Launch + 7 days from Pad 39B
 - » STS-400 will work up to and hold at L-3 days after STS-125 launches
- Trajectory Server redundancy available for dual mission execution
 - » 4'th Trajectory Server now ready to support simulations and missions

• STS-125 & STS-400 Launch Window Review

- 66 minute planar window opening on ET sideslip angle heating and closing on ET disposal
 - » No cutouts between phasing windows on 2-pane launch days
- No changes required for prelaunch conjunction screening process
 - » Expect multiple objects in screening volume





• STS-125 Ascent Abort Site Review

- 1 TAL site (Moron) required to fill last RTLS/first ATO abort gap
- Contingency abort capability to Bermuda
 - » Yaw steering I-loads optimized for landing site capability and SAR force ranging
- Banjul serves as inplane ELS TAL site
 - » Selected onboard at negative MRN
- Other ELS sites available from a trajectory standpoint, but undesirable

• STS-125 Entry Public Risk Assessment

- Range Safety Panel expecting new E_c limit for 28.5 deg inclination entry trajectories
 - » 2700 E-06 limit envelopes all 28.5 deg KSC ascending/descending approaches
 - » Same NASA NPR philosophy used for 51.6 deg inclination approaches ($E_c = 1800$ E-06)





• STS-125 Recovery Prebank Assessment

- Mission-specific recovery prebank chart developed for STS-125
- Downrange redesignation changes
 - » 28.5 deg compatible downrange sites are both CONUS & ELS (Bermuda, Amilcar Cabral) sites
- Assess performing ELS redesignation at lower wing leading edge temperature limit compared to 51.6 deg missions

• STS-400 RTLS Design Issues

- Lightweight, high performance characteristics of STS-400 introduces unique design considerations
- Range-Velocity MECO target redesigned with new design point to mitigate ET third peak heating concerns for late engine out conditions
- RTLS Pullout Nz target increased slightly to 2.3 g to avoid flight control instability region in Alpha Transition phase of gliding flight





• SSME Launch Commit Criteria

- Booster group proposed modifications for 2 existing LCCs
 - » New prelaunch monitoring philosophy for main engine shutdown pushbuttons
 - OI-32 introduced new downlink parameters so pushbutton contact dilemmas can be detected in OPS-9
 - Introduce constant monitoring, instead of a one-time check, for 2 of 2 pushbutton contacts failed 'on' in OPS-1
 - » LCC for Limit switch contact failures still in work

• GPS Ramp-up Summary

- GPS performance has been very good on the 6 ramp-up flights
- Nominal procedure will continue to be taking GPS in both PASS and BFS in OPS 301 prior to the deorbit burn and after high-speed C-band tracking confirms the navigation state





• STS-123 Post Flight Review

- UHF performance in low power mode acceptable for launch & landing
- Nominal GPS performance (last 3-string ramp up mission)
- Launch & Landing weather balloon reliability issues observed
- Touchdown distances > 3500 ft at KSC are undesirable
- Prelaunch voice circuit issues at KSC
- Post-landing MILA configuration issues delayed handover

• STS-124 Post Flight Review

- Asymmetric SRB thrust tail-off caused roll excursion at SRB separation
- Ascent FDO will characterize tracking uncertainties when performing prelaunch conjunction screening
- No glare observed by CDR, despite glare predictions
- No 'omega-bend' observed during payload bay door closing, nor during post-landing processing
- Satellite visible imagery mismatch between SMG and Flight Director workstations during 'rapid scan' operations



125/HST FTP



- STS-125/HST Flight Techniques Panels
 - 125/HST FTP #1 – 8/29/07
 - 125/HST FTP #2 – 9/27/07
 - 125/HST FTP #3 – 1/18/08
 - 125/HST FTP #4A – 4/4/08
 - 125/HST FTP #4B – 4/7/08
 - 125/HST FTP #5 – 5/21/08
 - 125/HST FTP EVA Splinter – 5/7/08
 - 125/HST FTP Orbit Adjust Splinter – 6/17/08
 - 125/HST FTP #6 – 6/18/2008
 - 125/HST FTP #7 – 7/25/08
 - 125/HST FTP #8 – 8/28/08