



STS-125/HST SM4 & STS-400/LON MOD Flight Readiness Review

***JSC Mission Operations Directorate
Flight Director Office***

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April 14, 2009

Agenda



- **DA8 COFR Requirements/Endorsements**
 - COFR Requirements/Endorsements Summary
 - New Operations
 - » A/E Topics, SMG (no issues in B/U), MCC (no issues in B/U), Flight Techniques
 - Items of Interest
 - Safety Status Review
 - Flight Rules (Generic Volume A, STS-125/HST SM4 & STS-400/LON Annex)
 - FDF (no issues in B/U)
 - Mission Staffing: Training/Certification/Work Guidelines Compliance
 - Non-Critical Processors/Applications (no issues in B/U)
 - Emergency Mission Control Center/EMCC (no issues in B/U)
 - Command Procedures (no issues in B/U)
 - 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**

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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	Y			G		
Anomaly - Procedure	G					
Exceptions/Action Items From Prior Readiness Reviews	G	G	G	G	G	G
CIL/Hazards	G		Y			
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 May 12th at GMT 17:11:12, EDT 13:11:12.
- Launch Window is ~66 minutes.
 - Preferred launch time is ~20 min past open of the launch window (see items of interest).
 - 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 augmented site 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.
- Contingency landing sites limited due to inclination.
 - No ECAL sites.
 - Bermuda is available site for multi-failure scenarios where RTLS/TAL not available.
 - Banjul available for systems aborts post negative Moron boundary.
- MECO apogee will be ~300 nm and will be circularized by OMS2.
- ET Photography
 - +X maneuver for ET Photography may be deleted due to rendezvous phasing concerns.
 - ET Handheld pitch maneuver will be performed even if +X maneuver deleted.
- Landing for KSC 1st opportunity is on May 23 at GMT 13:59:00, EDT 09:50:00.



Ascent/Entry Topics



STS-125 Launch Window and Lighting Summary

Preliminary Launch Window Times For The STS-125 May 12th Launch

Day	KSC Date	RNDZ Day	ET Photo Umbilical	ET Photo Handheld	Open (EDT)	Open (GMT)	Preferred (GMT)	Close (GMT)
Tuesday	12-May	FD3	Daylight	Daylight	13:11:12	17:11:12	17:31:12	18:13:07
Wednesday	13-May	FD3	Daylight	Daylight	12:40:38	16:40:38	17:00:38	17:46:52
Thursday	14-May	FD3	Daylight	Daylight	12:14:24	16:14:24	16:34:24	17:16:14
Friday	15-May	FD3	Daylight	Daylight	11:43:46	15:43:46	16:03:46	16:45:39
Saturday	16-May	FD3	Daylight	Daylight	11:13:10	15:13:10	15:33:10	16:19:27
Sunday	17-May	FD3	Daylight	Daylight	10:42:35	14:42:35	15:02:35	15:48:48
Monday	18-May	FD3	Daylight	Daylight	10:16:21	14:16:21	14:36:21	15:18:11
Tuesday	19-May	FD3	Daylight	Daylight	9:45:43	13:45:43	14:05:43	14:47:36
Wednesday	20-May	FD3	Daylight	Daylight	9:15:07	13:15:07	13:35:07	14:21:23
Thursday	21-May	FD3	Daylight	Daylight	8:44:37	12:44:37	13:04:37	13:50:45
Friday	22-May	FD3	Daylight	Daylight	8:18:17	12:18:17	12:38:17	13:20:09

NOTES:

- 1) Preferred launch time is Window Open plus 20 minutes. Preferred launch time will be selected to minimize APM-related perturbations to the prelaunch conjunction screening process.
- 2) Daylight launch through May 25th.
- 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) ET Handheld lighting is daylight through June 2nd.
- 6) In-Plane launch time is ~ 3 minutes prior to Window Close.

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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



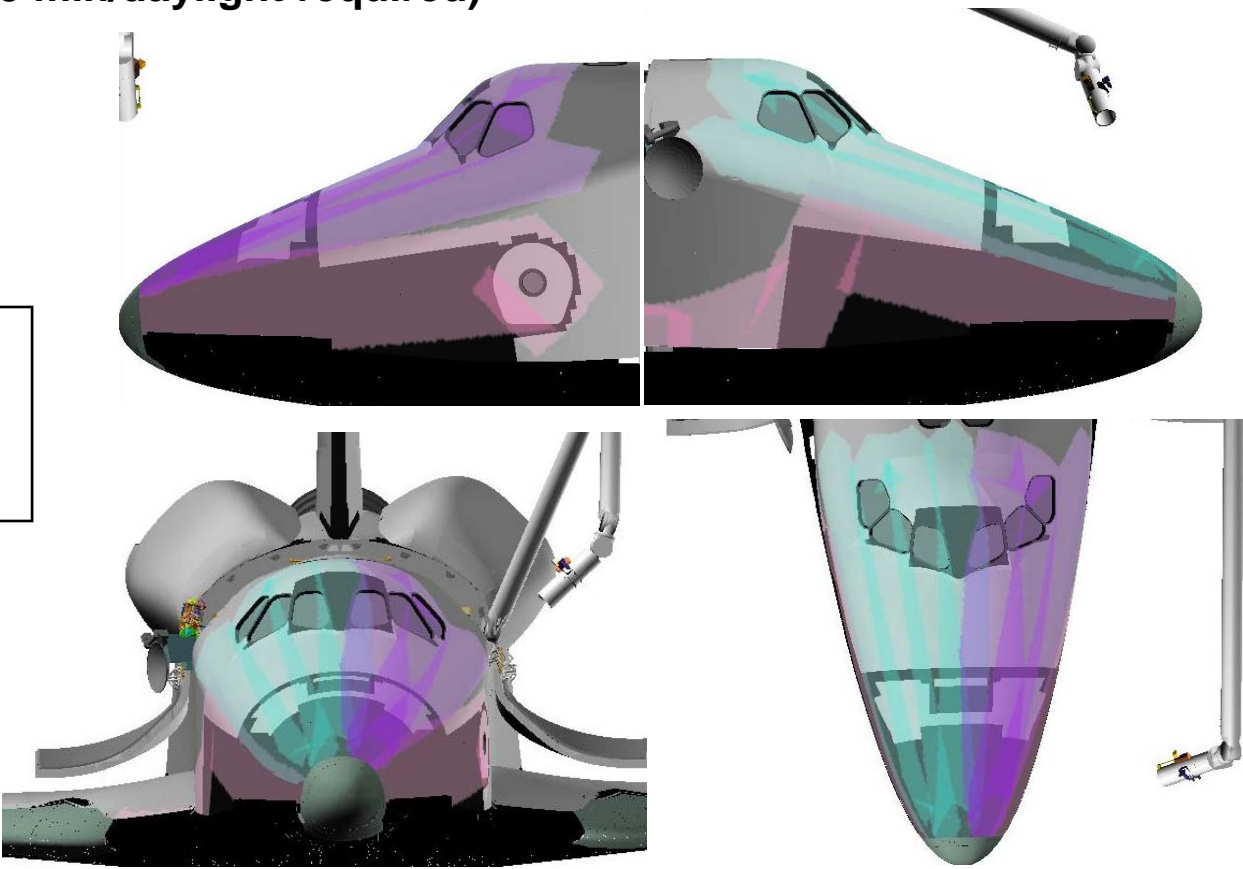
- **Restraining/Power cycle for RNDZ**
 - Actions will be taken to maintain rendezvous capability with Hubble.
 - » Restraining for SSME throttle capability.
 - » Power cycle one of two SSME Controllers to clear performance case.
 - Lower altitudes could result in RMS loads due to mated gravity gradient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



New Operations – RPM Replacement TPS Surveys



- **RMS EE Crew Cabin Survey**
 - Upper Crew Cabin Survey
 - Performed on FD1 (~45 min/daylight required)



- Sea Green – STBD Crew Cabin Scans
- Purple – Port Crew Cabin Scans
- Pink – Areas scanned during FD2 WLE scans



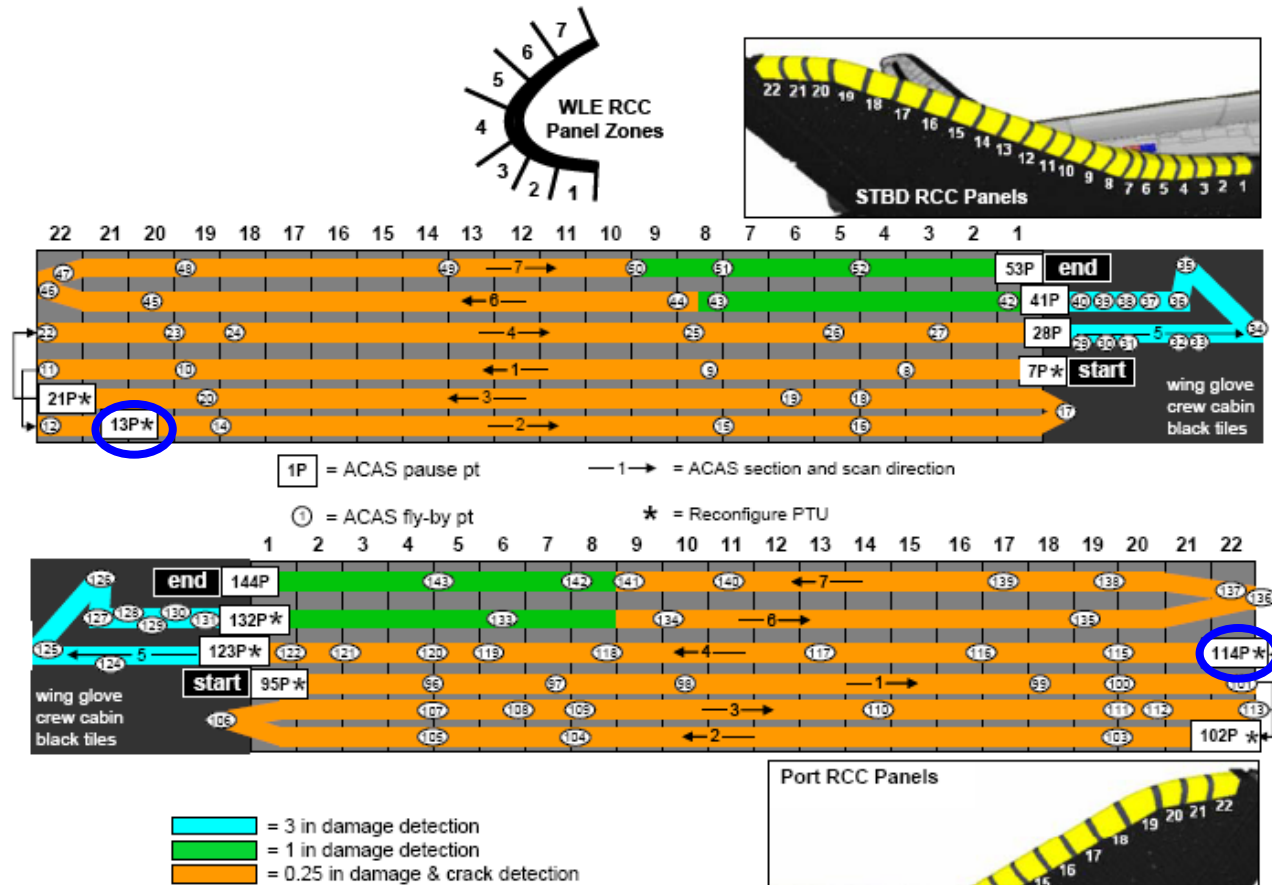
New Operations – RPM Replacement TPS Surveys



- OBSS ITVC Belly Tile Survey

- Performed in conjunction with FD2 Port and STBD WLE Surveys

OBSS SCAN PATTERN CUE CARD – STBD & PORT



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New Operations – RPM Replacement TPS Surveys

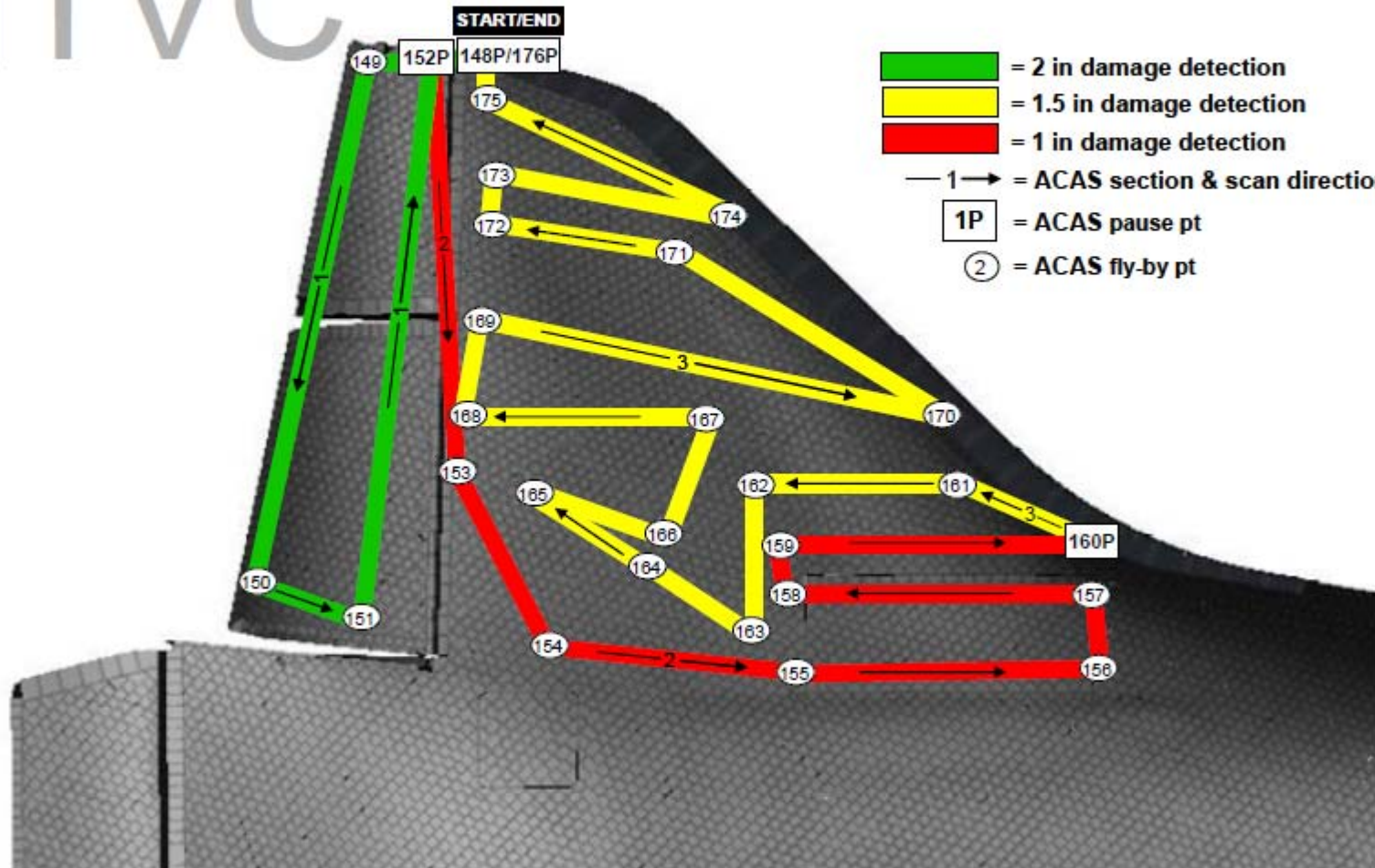


HOOK
VELCRO

OBSS ITVC SCAN PATTERN CUE CARD STBD BELLY TILE SURVEY

• ~ 26 min

ITVC



1
1

PDRS-11a/125/O/B

New Operations – RPM Replacement TPS Surveys



HOOK
VELCRO

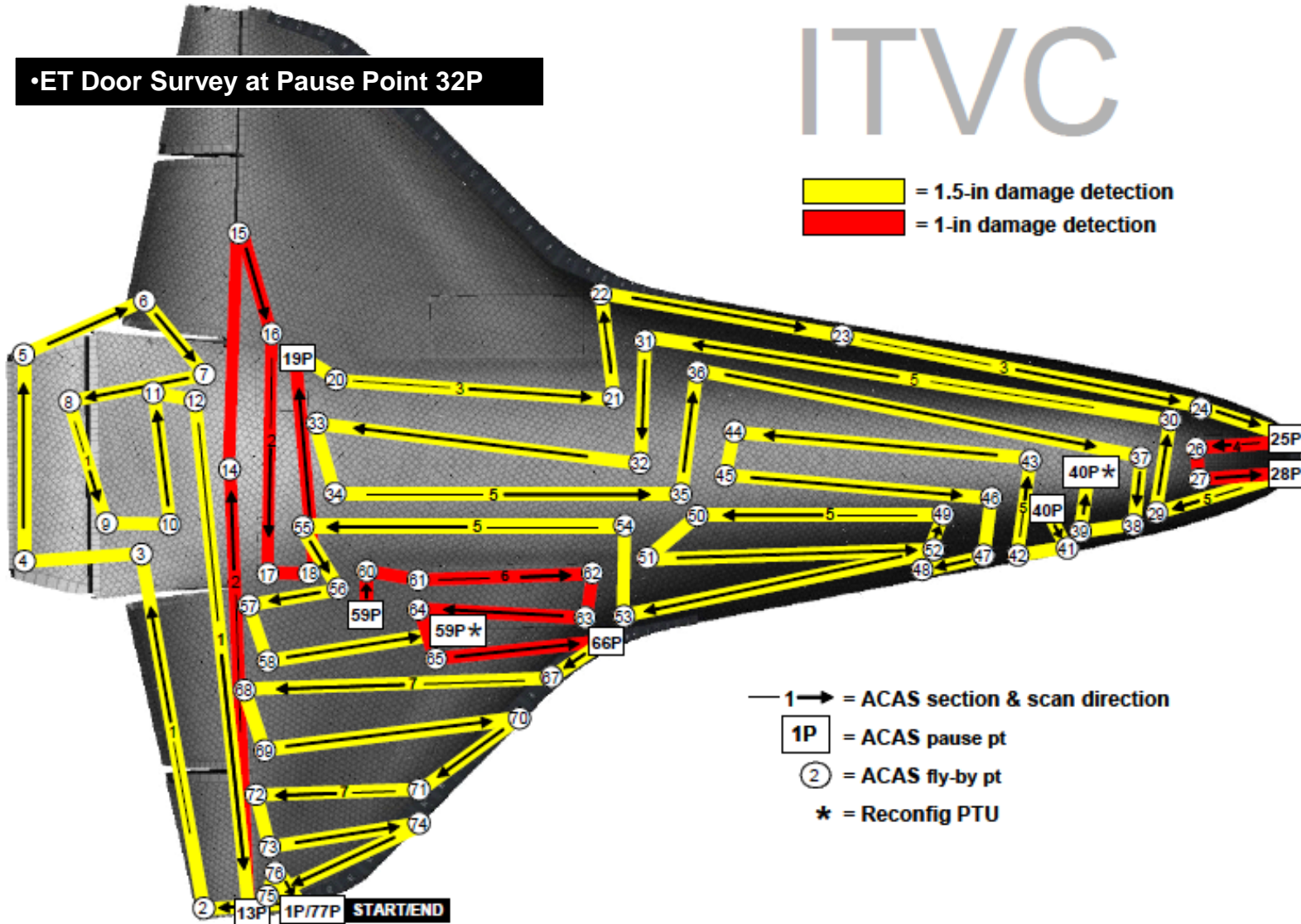


OBSS ITVC SCAN PATTERN CUE CARD PORT BELLY TILE SURVEY • ~ 1hr 55 min

•ET Door Survey at Pause Point 32P

ITVC

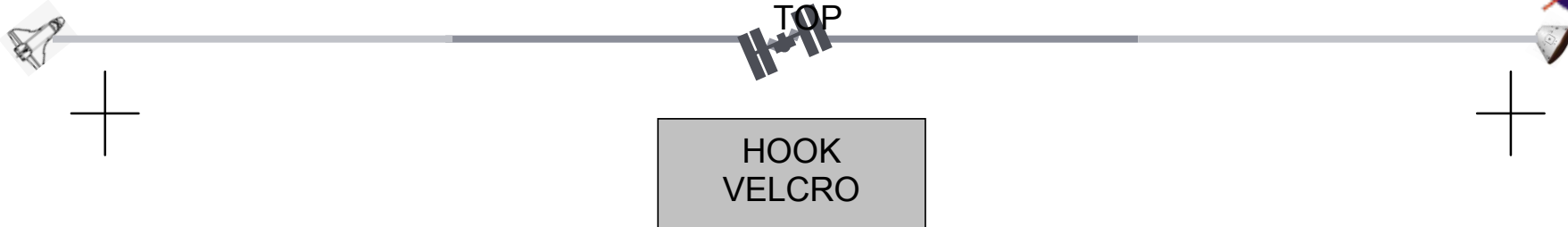
= 1.5-in damage detection
 = 1-in damage detection



— 1 → = ACAS section & scan direction
 1P = ACAS pause pt
 ② = ACAS fly-by pt
 * = Reconfig PTU



New Operations –TPS Surveys



RMS SURVEY TIMELINE CUE CARD

<u>PROCEDURE</u>	<u>STEPS</u>
OBSS UNBERTH (PDRS GEN 7-3)	ALL
OBSS LDRI/IDC RCC SURVEY – STBD (PDRS GEN 7-9)	1 - 2
T0 UMBILICAL AND OMS POD SURVEY - STBD (PDRS FS 2-39)	ALL
OBSS LDRI/IDC RCC SURVEY – STBD (PDRS GEN 7-11)	3-4
OBSS ITVC BELLY TILE SURVEY – STBD (PDRS FS 2-2)	ALL
OBSS LDRI/IDC RCC SURVEY – STBD (PDRS GEN 7-15)	5 - END
OBSS LDRI/IDC RCC SURVEY – NOSE CAP (PDRS GEN 7-27)	ALL
OBSS LDRI/IDC RCC SURVEY – PORT (PDRS GEN 7-35)	1 - 5
OBSS ITVC BELLY TILE SURVEY – PORT (PDRS FS 2-9)	ALL
OBSS LDRI/IDC RCC SURVEY – PORT (PDRS GEN 7-42)	6 - 10
T0 UMBILICAL AND OMS POD SURVEY - PORT (PDRS FS 2-43)	ALL
OBSS BERTH (PDRS GEN 7-52)	ALL

•RPM Replacement - OMS Pod Surveys (~ 15 min) PDRS-12a/125/O/040209

•T0 Survey added to support Imagery for T0 Ice concerns (~ 15 min)

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New Operations – Port IDC Late Inspection

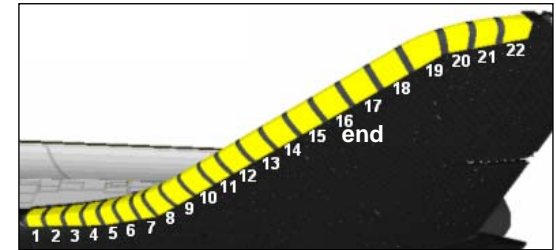
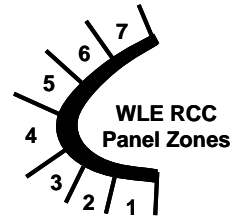
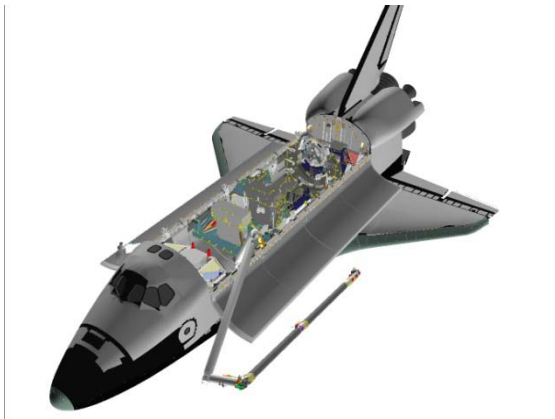


Dedicated Port IDC Survey (critical zones unable to be imaged in parallel with Port Wing LDRI Ops)

TOP

HOOK
VELCRO

OBSS SCAN PATTERN CUE CARD
IDC RCC SURVEY – PORT



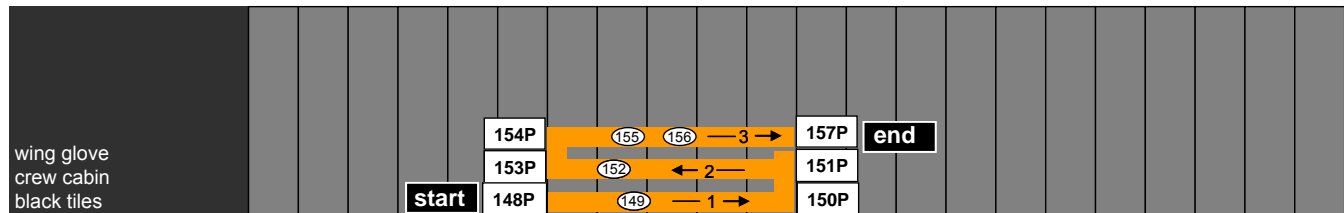
1P = ACAS pause pt

— 1 → = ACAS section and scan direction

① = ACAS fly-by pt

* = Reconfigure PTU

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22



Port RCC Panels

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PDRS-14a/125/O/A



Items of Interest



Minimum Duration Flight (FR 125_A2 -32)

- “If a system failure occurs that results in an MDF, 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- SM4 Mission Success Criteria
 - 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
 - Built to support Minimum Mission success criteria and Mission Priorities

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Items of Interest



EVA Task Replanning Guidelines (FR125_A2-36)

- Pre-flight agreed to plan that minimizes “real-time” discussion and allows next day planning process to be initiated without delay (which is mandatory to in support of 5 “back-to-back” EVAs)
- Developed to support Minimum Mission Success criteria as well as Mission priorities
- Provides EVA re-planning guidelines in support of:
 - Reduced EVA capability (mission timeline) in the scenario where the 5 planned EVAs cannot be accomplished
 - Also provides re-planning guidelines in the event of a science instrument or battery failure (assumes nominal 5 EVAs are available)



Items of Interest



EVA Task Replanning Guidelines (FR125_A2-36) (cont.)

- Understanding that all possible 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
 - Contingency system workarounds will be incorporated as required resulting in possible loss of EVA mission objectives to accommodate keeping EVAs within ~ 7 hour duration
 - » Content based on Minimum Mission success criteria and mission priorities



Items of Interest



125_A2-36 EVA TASK REPLANNING GUIDELINES

A. IF THE MISSION MUST BE SHORTENED SUCH THAT THE FIVE PLANNED EVA'S CANNOT BE SUPPORTED, THE FOLLOWING EVA PRIORITIES WILL BE FOLLOWED:

EVA'S REMAINING	PLANNED EVA'S COMPLETED				
	0	1	2	3	4
5	NOMINAL PLAN				
4	EVA 1 - WFC III, SIC&DH, SCM&LOCKS (6:30) EVA 2 - RSU (3), BAY 2 BATT (6:25) EVA 3 - COS, ACS (ALL) (7:30) EVA 4 - BAY 3 BATT, FGS 2, NOBL 5 & 8, FINAL CLOSEOUT (6:30)	NOMINAL PLAN			
3.5	N/A - FOCUSED INSPECTION NOT UNTIL AFTER EVA 1	EVA 2 - RSU (ALL) (4:50) EVA 3 - COS, ACS-PT 1 (6:30) EVA 4 - BAY 3 BATT, BAY 2 BATT, NOBL 8, ROT, NOBL 5 (5:45) EVA 5 - ACS PT2, FGS 2, FINAL CLOSEOUT (6:00)			

B. IN THE EVENT OF SPECIFIC HST HARDWARE FAILURE DEFINED BELOW, THE FOLLOWING EVA REPLANNING GUIDELINES WILL BE FOLLOWED:

1. WFC III BLIND MATE CONNECTOR FAILURE DURING ALIVENESS TEST (CANNOT BE RECOVERED WITH CRIB SHEET ACTIONS) OR CHANNEL SELECT MECHANISM FAILURE DURING FUNCTIONAL TEST:
 - EVA 1 - NOMINAL: WFC III, SIC&DH-R, LOCKS, SCM (6:30)
 - EVA 2 - NOMINAL: RSU, BAY 2 BATT (6:25)
 - EVA 3 - REPLAN: COS, ACS (ALL) (7:30)
 - EVA 4 - NOMINAL: STIS, NOBL 8 (6:30)
 - EVA 5 - REPLAN: REINSTALL WF/PC-II, BAY 3 BATT, NOBL 5, FINAL CLOSEOUT (6:00)

Hardware Fail Example - WFCIII

Mission O Flight Dir



Items of Interest



125/HST SM4 EVA Glove Usage Plan

- Modified/Turtle Skin EMU gloves will be used 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/limited clearance requires maximum dexterity/tactile feeling (36 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
 - STIS Complex task (117 fasteners) comparable to ACS repair
- SSP Concurrence/approval at 9/10/08 “Glove Safety Issue Briefing”
- 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



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



Unscheduled EVA (#6) Impacts

- 11+2 mission duration (cryo limiting) limits mission “flexibility”
- FD2 Inspections, FD3 HST Rendezvous/Berthing, 5 “back-to-back” EVAs, HST Deploy, Late Inspection, Crew OFF duty day, Entry Prep and D/O utilize all available 11 mission days
- If a Deploy Day EVA is required to provide HST Deploy capability, EOM +2 protection may be in jeopardy to provide additional mission timeline to complete remaining mandatory mission activities
 - Depends on EVA duration and what can be completed on FD9
- Documented in Flight Rule 125_A2-37 “Mission Extension Impacts if Sixth EVA Performed for HST”



Items of Interest – Orbit Adjust Strategy



- AEFTP reviewed OA placement and decided to move OA burn to FD9 to protect a known reduction in MMOD risk as compared to the remote chance of requiring a STS-400 rescue mission.
 - Risk numbers for MMOD damage are 1:185.
 - OA burn reduces MMOD risk by 3%.
 - Risk numbers for requiring STS-400 are 1:17,000.
 - OA burn only applicable for Late Inspection damage and therefore risks are further reduced.
 - » If damage found on FD2 inspections then OA will not be performed.
- Risks trades associated with OA on FD9
 - Increased propellant cost for STS-400 to rendezvous in an elliptical orbit since baseline was circular.
 - STS-400 launch window for FD2 is significantly reduced and in some cases not available but FD3 window will be available for those cases.
 - Rendezvous dynamics in elliptical orbit have been simulated in SES and pose no concern.
 - RMS loading due to gravity torques in highly elliptical orbit pose no concerns.
 - STS-125 disposal can be implemented although the number of disposal opportunities are significantly reduced. Some gaps exceed 10 hours.
 - STS-400 CONUS landing maintained.



Items of Interest – Orbit Adjust Strategy



- **OA is currently planned (~ 7/19:52) post HST Deploy prior to Late Inspection on FD9 to help with MMOD exposure mitigation through EOM**
 - ~ 72 hours in 308 x 160 NM Orbit prior to Deorbit
- **Exact Perigee will determined based on Prop margins and ability to support Deorbit Opportunities through EOM+2 (2+2+2)**
 - 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
 - All dependent on available propellant margins
- **Contingency Scenarios/Timeline challenges could result in rescheduling the OA until after Late Inspection (Priority will be given to insure Late Inspection completed and imagery downlinked to ground prior to crew sleep on FD9)**
 - Late Inspection risk reduction ~ 6% (OA ~ 3%)
 - Execution/completion of the Late Inspection, as planned, provides the earliest opportunity/capability to clear the vehicle for entry or if required, initiate planning for EVA repair as well as continuing with the LON processing to support earliest launch attempt if required.
 - OA would be scheduled as soon as practical
- **OA will not be performed for early LON scenarios which resulted from Ascent Debris damage**
 - Focus will be on execute STS-400/LON Ascent profile as developed for expedient rescue
 - » MMOD mitigation not required for 125/HST
 - OA will be scheduled for 400/LON post rescue ops
- **Strategy captured in Flight Rule 125_A2-98 Post Release Orbit Adjust)**
 - As discussed and agreed at AE FTP #246, March 6, 2009

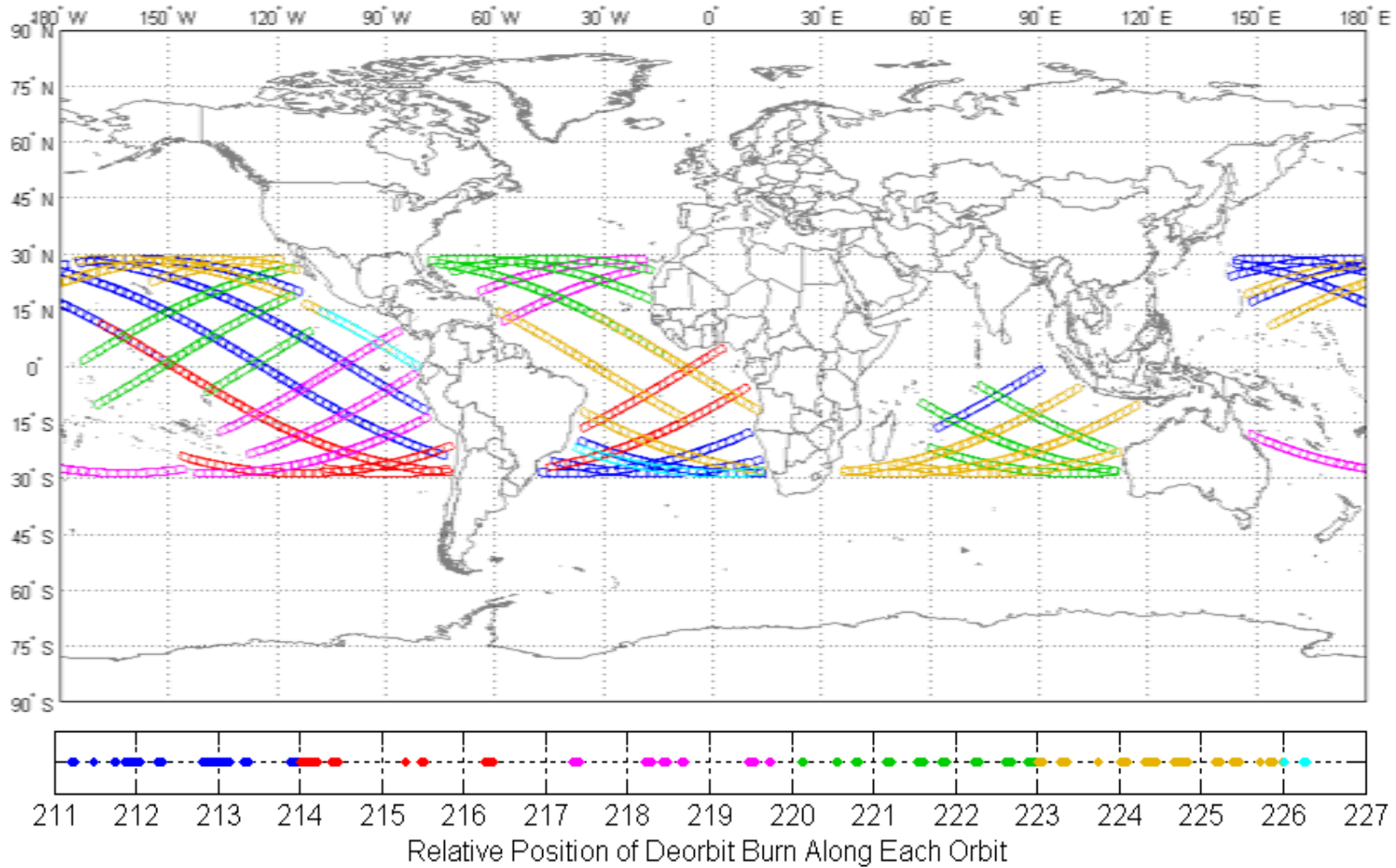
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Items of Interest



STS-125 Pre-OA OCT14 (no Orbit Adjust)
Disposal Footprints Colored by Orbit Rev of Deorbit Burn



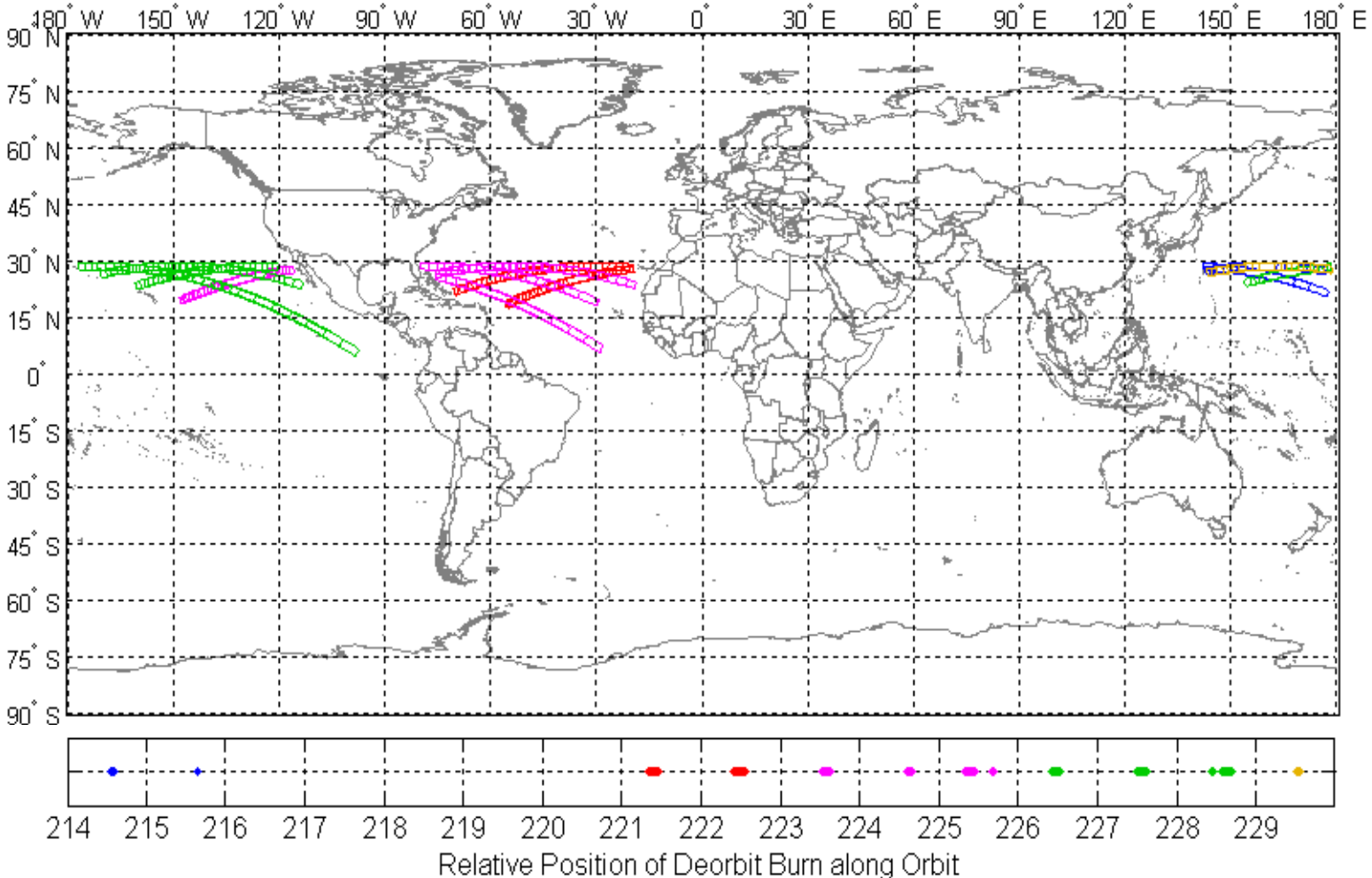
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Items of Interest



STS-125 OCT14: 300x160 nmi Orbit
Disposal Footprints Colored by Deorbit Time



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Items of Interest



Conjunction Screening

- HST Altitude “provides” an unique challenge for collision avoidance screening and processing
- ~ 300 x 300 NM altitude “provides” more objects to assess pre-launch
 - STS-125/HST Assessment will be performed for Preferred launch, +1 minute, and +2 minutes
 - » Expected to be tracking ~ 5 objects for each launch time.
 - Flight Rule 125_A2-XXX documents this process
- Preferred launch time 20 minutes after window open provides a stable launch time and decouples the conjunction screening process from the ET loading process
 - Time may change as a function of APM but will be finalized near the L-8 day timeframe



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)
 - Same protocol as performed on STS-109 where peak was 5.7 MM/Hg FD4 pre-sleep
 - 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 ≥ 5.0 MM/Hg and give them an option to change out the LiOH at the time
 - Follows same philosophy used on STS-124 (captured in FR 125_A2-78)
- 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



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



Items of Interest



SCSC Exceptions - Approved (9/08)

- CR# S063948: Less than 2 hour minimum Post Sleep, FD4-FD8 for EV/IV crewmembers (SCSC 2.3.1)
 - PSA constraints for Shuttle based EVAs were not updated when ISS based EVAs were added to the SCSC
 - ISS based EVA Post Sleep minimum is 1hr 15 min to support EVA Prep and Post activities (early start in the day) and to protect > 2 hours pre-sleep for a 6:30 EVA
 - STS-125/HST Timeline developed to support 1:15
- CR# S063947: Interruption of Pre Sleep, FD4 – FD8 for CDR (SCSC 2.3.1.1)
 - Activities within 1hr prior to sleep
 - STS-125/HST timeline schedules ~ 15 min of 10.2 psia maintenance ops prior to sleep
 - » Required to ensure proper Cabin atmosphere during crew sleep (retain EVA pre-breath protocol limits)



Items of Interest



SCSC Exceptions - Approved at 4/13/09 FOICB

Additional SCSC Violations/waivers for May 12, 2009 Flight Plan

- CR#S070013: Less than 2 hour minimum of Post Sleep minimum for CDR,PLT on FD3 (SCSC 2.3.1a)
 - Violation results from resulting from an early NH due to launching 20 minutes into the window
 - » CDR – 1:45, PLT-1:50
 - 3 hrs of pre-sleep scheduled
- CR# S070014: PSA Aggregate violation (< 5 hrs) for MS2 on FD9
 - Violation results from added Late Inspection constraints (Lighted WLE scans) and new Port IDC scan
 - » PSA – 4:40 (post sleep 2:10, pre-sleep 2:30)
- CR# S070015: Interruption of Pre Sleep, FD9 for MS3 and MS5. Activities within 1.5 hrs prior to sleep (SCSC 2.3.1.1)
 - After Late Inspection complete, MS3 is scheduled to perform LDRI downlink playback scans not received by realtime Ku coverage
 - » Activity ends ~ 1:10 prior to sleep
 - Post LDRI downlink, MS5 configures OCA to support 48Meg downlink to allow the IDC images to be downlinked in an expedited manner (5 min activity)



Items of Interest



119 FDO Workstation & pre-launch Abort command via H/W push button

- Inadvertent Abort Light Command sent from MCC FDO console to the vehicle, at approx. L-5:35.
 - Button not actuated by FDO or TRAJ.
 - Standard pre-launch FDO and Flight Director abort light command checks to the Orbiter had been successfully performed ~ 4 hours earlier.
 - Root cause has not been determined.
 - No record of previous inadvertent abort light commands from MCC consoles.
- The MCC abort light command illuminates the cockpit abort light and DOES NOT command abort initiation.
- Per Flight Rule A2-58, Abort Light, the crew requires 2 cues before initiating an abort. The abort light in the cockpit can be one of those cues.
- The STS-125 Crew has been briefed on this anomaly.
- Other MCC command push buttons that could be affected if a generic failure exists with these PBI's.
 - GNC Controllability light – requires confirmation from MCC in addition to the light command for action to be taken by the ROCC.
 - INCO command panel – critical commands are two stage.



OPEN NASA OCADs (Cont.)



- ACO (3)
 - Mate/Demate of Connectors (2)
 - Rapid Safing of PLB (1)

(X) : OCADs to be submitted
(Y) : Existing OCADs awaiting Group Lead Approval



HST OPEN HAZARD REPORTS



- ARHR HST SM4 3A *Structural Failure of MULE Platform* - pending OOB, **ECD 04/30/09**
- ARHR HST SM4 EVA2 *Astronaut Injury Due to SM4 Contact Hazards* - pending OOB, **ECD 04/30/09**



STS GFE OPEN HAZARD REPORTS



- **WORK LIGHT** – Open pending review of discrepant wiring (separate paperwork then for ISS) – **ECD 4/30/09**



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, PCN-2, dated April 9, 2009



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 April 24, 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 – 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 EVA timelines



CSCS Support – 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)
- STS-125/HST Manifested to support 25 Days CSCS Duration
 - LiOH: 78 cans (46 cans 11+2, 32 cans for CSCS)
 - Food: Nominal 11+2 plus Food Bars
 - Waste Management: WCS and Apollo Bags
 - Water: Fuel Cell production will support
 - O₂/N₂: Cabin environment can support

CSCS Support – 400/LON



- STS-400/LON ready to launch 7 days after STS-125/HST launch
- 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
- Consumables
 - 6 N2 Tanks (full)
 - 5 Cryo Tanks (full)
 - » Pad Hold: O2 – 429.6 hrs, H2 – 210.8 hrs (~ 3 additional On-Orbit days if on time launch)
- Network Comm Support Plan identified
- MCC Support Plan identified
 - 125 Team will move to RFCR after HST Deploy/CSCS declaration

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Level II Actions



- None



Special Topics



1. STS-125/HST Summary of MMOD Mitigation Plan
2. LON Support
 - LON Declaration and SSP Support Strategy
 - Powerdown Management Strategy
 - CSCS Capability
 - FD10 LON Support Capability (Failed RCC repair)



Special Topics



STS-125/HST Summary of MMOD Mitigation Plan

- Mission has been designed (timeline, attitudes, TPS Inspections, etc.) to minimize critical TPS exposure to MMOD while staying within the HST systems operational constraints
 - Follows standard practices/Flight Rules
 - Additional mitigation steps taken for Late Inspection and EOM



Special Topics – MMOD Mitigation Plans: ATL



STS 125 ATL summary



Attitude	Time (hr)			% mission	Risk*
	wrt Late Inspection		Total		
	Prior	After			
-ZLV -XVV	115	59	174	67	1x
25 Bias -ZLV -XVV (HST)	15.3	0	15.3	6	1.2x
EVA Sun protect (HST)	20	0	20	8	1.8x
Biased -YLV -ZVV (H2O dump no HST)	1.75	1.75	3.5	1	1.1x
-ZLV +YVV (H2O dump w/ HST)	5	0	5	2	1.8x
+XLV -ZVV (Rndz)	3.5	0	3.5	1	0.9x
TPS Inspection	9	5	14	5	3.4x
HST battery charging	12	0	12	5	2.5x
Inertials (EOM, IMU align, Burns, Grapple, Release,)	6.5	4.5	11	4	3.4x
	188.05	70.25	258.3		

* MMOD LOV risk as a function of -ZLV -XVV

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Special Topics – MMOD Mitigation Plans: ATL



- -ZLV-XVV (Used for the majority of the mission)
 - No Ku optimization
 - No wing fwd to avoid poor S-bd periods
 - No wing fwd to provide stars for non-mnvr IMU alignments
- Biased –ZLV –XVV (HST)
 - 25 deg yaw bias requirement from HST to checkout new Rate Sensing Units (RSU) post EVA #2
 - Required for the entire crew sleep period
- EVA Sun Protect
 - Required during each EVA
 - » protect HST aft shroud and ORUs from direct sunlight
 - » Maintains PLB to earth as much as possible
 - » Secondary objective to minimize EVA and Orbiter MMOD exposure
 - In each orbit
 - » About 45 min of biased –ZLV –XVV
 - » About 25 min in a Belly sun inertial
 - » About 25 min mnvr back to LVLH



Special Topics – MMOD Mitigation Plans: ATL



- Water Dumps
 - When HST present must use **-ZLV**
 - » HST requirement
 - » Only option is **+YVV**
 - When HST not berthed, used a better MMOD attitude
 - » Mostly bay into velocity vector (protects underside)
- Rendezvous (**+XLV -ZVV**)
 - Standard profile
 - better than **-ZLV** for MMOD
- TPS Inspection
 - Not constrained for MMOD
 - » Optimized for lighting and Ku comm
 - » Highest risk attitude
- HST Battery Charge
 - HST requirement to point **-XSI**
 - » MMOD optimized by keeping the PLB in the orbit plane



Special Topics – MMOD Mitigation Plans: ATL



- Inertial Attitudes
 - No MMOD optimization to EOM inertial attitudes
 - +X RCS and OMS burns performed heads up (small improvement)
 - No MMOD optimization for grapple or release
 - Crew conference performed in good MMOD inertial attitude with good Ku comm



Special Topics – MMOD Mitigation Plans: Orbit Adjust



Orbit Adjust

- Plan is to target OA for ~ 160NM Perigee after HST Deploy prior to Late Inspection on FD9 (~ 7/19:50 MET)
 - ~ 72 hours in 308 x 160 NM Orbit prior to Deorbit
 - Minimizes flux field at lower average attitude





Late Inspection

- First four passes of STBD and Port WLE LDRI scans will be scheduled during daylight
 - Provides required lighting for IDC imagery (increased detection capability) that is taken in parallel with LDRI scans
 - » STBD Wing: Zones 1-4, panels 1-19; Zones 3 and 4, panels 20-22
 - » Port Wing: Zone 2, panels 5-22; Zone 3 panels 6 and 7; Zone 4, panels 6-19
- Dedicated Port IDC Scan added
 - Port Wing Zones 1-4, panels 8-11; during daylight
 - Captures those critical areas that could not be imaged in parallel with the Port LDRI scans (hardware geometry limitations)
- Provides additional Damage Detection Capability



Special Topics – LON Support



LON Declaration and SSP Support Strategy

- At STS-125 T-0, STS-400/LON T-0 is at 7 days
- STS-400/LON capability will remain at Pad B thru FD10 to mitigate any late problems/failures that result in the need for LON/CSCS activation, including MMOD impacts that result in unreparable damage
 - LON/CSCS capability and status will be assessed daily at the STS-125 MMT
 - Processing will not go beyond L-3 days activities until after FD10, if/when LON activation is declared by the MMT (Agency and Exec concurrence)
 - » This will not be LON Activation - rather, it would be continued processing toward T-0
 - This provides margin to the baseline capability for the planned CSCS/LON activation scenario
- CSCS capability on-orbit for Atlantis is adequate to cover the LON launch, rendezvous timeline, and planned EVA rescue scenario with little margin
 - FD10, post Late Inspection LON Declaration limiting scenario



Special Topics – LON Support



Powerdown Management Summary

- Power management decisions:
 - Power/mission content reduction to provide:
 - » Required time to support LON
 - » “X” margin in a LON scenario
- Goal is to manage “On-orbit stay” or CSCS capability utilizing various power/powerdown options
 - Modified Group C Powerdown – Loss of critical systems insight due to powering off MDMs. Minimizing use of PGSCs (PGSCs only powered when required for tasks)
 - HST: Continue w/EVA(s) or Deploy
 - » Average power/EVA day ~ 17.3 KW (Group B)
 - » Average power w/o HST& SES powered down ~ 12.8 KW (Group B)
 - » Average power/EVA day ~ 16 KW (Modified Group C)
 - » Average power w/o HST& SES powered down ~ 11 KW (Mod Group C)
 - Group C+ Powerdown
 - » Minimal Orbiter Configuration for Crew and Orbiter survival (~7.9 KW)
 - Loss of Entry capability due to powering Off of APU/Hydraulics heaters
 - Results in APU Tanks and hydraulic lines freezing
 - LON required to return 125 crew home
- Entry capability will be retained until 400/LON Launch/confirmed Rendezvous capability (post MECO)



Special Topics – LON Support



CSCS Capability

- Multiple “point” cases/scenarios assessed and available on DA8/STS-125/HST website
 - <http://mod.jsc.nasa.gov/da8/Ftp/sts125/index.htm>
- CSCS duration (“On-orbit stay” capability) is entirely dependent on when (MET) and what powerdowns are invoked as well as Cryo remaining
- CSCS Duration can range from:
 - Entry Protection until LON Launch : ~ 16 to 19 days total capability
 - No Entry Protection: Up to 25 days with early LON declaration
- Limiting support case/scenario is an LON declaration post Late Inspection/RCC repair attempt
 - Limited capability since 10 days of “nominal” mission are behind us (cryo limiting consumable)



Special Topics – LON Support



125/HST Late Inspection LON Support Capability (failed RCC Repair) Dual Pad* LON Launch 11/18:00

400	Nom Rescue T/L					LON T-3 Days			FD1	FD2	FD3	FD4		
									Launch	Grapple 0/23:00	EVA 1	EVA2 EVA3 Release 3/06:00		
125	FD1-5 as planned	FD6	FD7	FD8	FD9	FD10 8/13:30 9/05:00	FD11	FD12 10/13:30 11/05:00	FD13	FD14 12/12:30 13/04:30	FD15 13/12:30 14/04:30	FD16 14/12:30 15/04:30	FD17 15/12:30 16/04:30	
		EVA3	EVA4	EVA5	- HST Deploy - Late Inspect	- LI RCC Repair Required - <u>Mod Group C</u> @ 8/17:00	-FCS C/O -RCS Hotfire -OBSS Unberth -Repair EVA Prep	-RCC Repair EVA -OBSS Berth -LON Declared 11/01:00	-LON Launch 11/18:00 - <u>Group C+</u> <u>Post MECO</u>	Grapple 12/17:00		Release 15/00:00		On-Orbit Stay Capability ~15/06:30

•LON Launch count down in parallel with Repair EVA to support 11/18:00 Launch



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Special Topics – LON Support



125/HST Late Inspection LON Support Capability (failed RCC Repair) LON Launch 12/17:30

400	Nom Rescue T/L									<u>FD1</u>	<u>FD2</u>	<u>FD3</u>	<u>FD4</u>	
										Launch	Grapple 0/23:00	EVA 1	EVA2 EVA3 Release 3/06:00	
125	<u>FD1 – 5</u> as planned	F D 6	F D 7	F D 8	<u>FD9</u>	<u>FD10</u> 8/13:30 9/05:00	<u>FD11</u>	<u>FD12</u> FD12 10/13:30 11/05:00	<u>FD13</u>	<u>FD14</u> 12/12:30 13/04:30	<u>FD15</u> 13/12:30 14/04:30	<u>FD16</u> 14/12:30 15/04:30	<u>FD17</u> 15/12:30 16/04:30	
		EVA 3	EVA 4	EVA 5	- HST Deploy - Late Inspect	- LI RCC Repair Required - <u>Mod Group C</u> @ 8/17:00	-FCS C/O -RCS Hotfire -OBSS Unberth -Repair EVA Prep	-RCC Repair EVA -OBSS Berth -LON Declared 11/01:00		LON 12/17:30 <u>Group C+</u> <u>Post</u> <u>MECO</u>	Grapple 13/16:30	On-Orbit Stay Capability ~14/22:30	Release 15/23:30	



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Special Topics – LON Support



Summary

- 125/HST can support LON Nominal Rescue timeline “assuming” LON launch 11/18:00
 - 125/HST release 15/00:00, Orbiter Bingo (to support disposal) 15/06:30
 - Dual Pad required to support
- 125/HST cannot support Nominal Rescue Timeline with a 12/17:30 LON launch but can support Accelerated EVA Rescue timeline
 - Nominal EVA timeline release 15/23:30, **Capability ~14/22:30**
 - Accelerated EVA Rescue timeline required
 - » ~19 hrs “end to end” starting immediately post grapple
 - » 125/HST Release 14/11:30



Standard Open Work



- STS-125/HST STS-400/LON Flight Rule Annex (PCN-2)
 - ~ 5 CRs still in work. Real Time Flight Rule Change planned.
- FDF
 - Final Crew review April 30, 2009
- Training
 - Complete remaining A/E JISs
 - Complete Flight Director Flight Specific certifications (ECD April 24, 2009)



Standard Open Work – Safety



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



Non-Standard Open Work



- None



Non-Standard Open Work – Safety



- Resolution of New/Modified OCADs written in support of replacement SI C&DH Hardware (Expected submittal on 4/06/09)



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 (4/20-21/09) with no exceptions**





Back Up



Spaceflight Meteorology Group



- All forecasters required to support STS-125 meet requirements listed in SMG Training & Certification plan.
- Planned System Changes:
 - AWIPS: Software upgrade completed on April 6th. A new storage device will be installed by April 10th.
 - No other changes expected to AWIPS.
 - MIDDS 21.1 release to occur on April 10th.
 - MIDDS is ready to support the mission.
 - No satellite eclipse conflicts during mission.

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

/s/ Frank C. Brody

Frank C. Brody

Chief, Spaceflight Meteorology Group

Mission Operations Directorate
Flight Director Office



Remaining STS-125/HST Integrated Sims



- **Orbit**
 - Complete (last sim April 8, 2009 /Rendezvous)
- **Ascent/Entry**
 - 4/13: FDO/BSE
 - 4/15: D/O Prep
 - 4/23: Entry #3
 - 4/27: Ascent #4
 - 4/29: Post Insertion
 - 5/3: Entry #4
 - 5/7: Ascent #5



Remaining STS-400/LON Integrated Sims



- **Orbit**
 - 4/20: Long Rendezvous/Grapple
 - 4/30: Short Rendezvous/Grapple, Release/Sep
- **Ascent/Entry**
 - 4/17: Ascent #1
 - 4/22: Entry #1
 - 5/4: Ascent #2



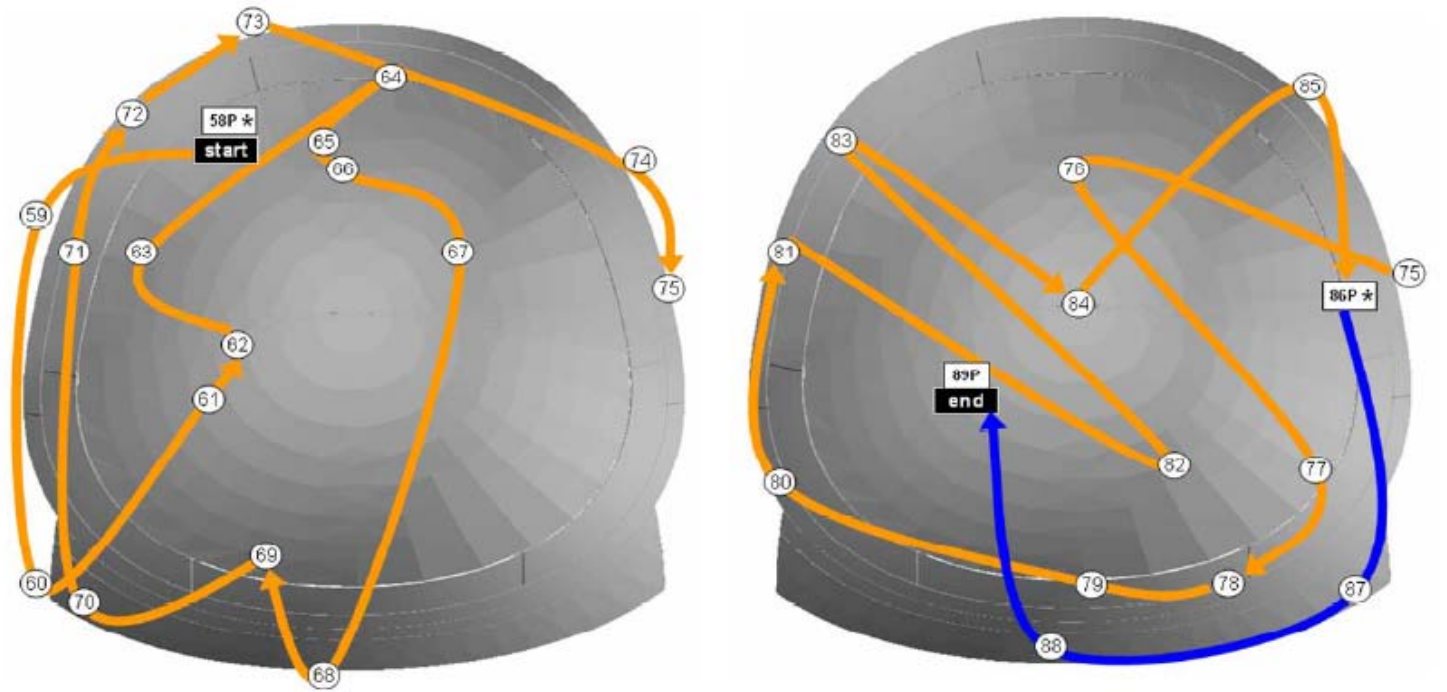
Nose Cap Survey



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

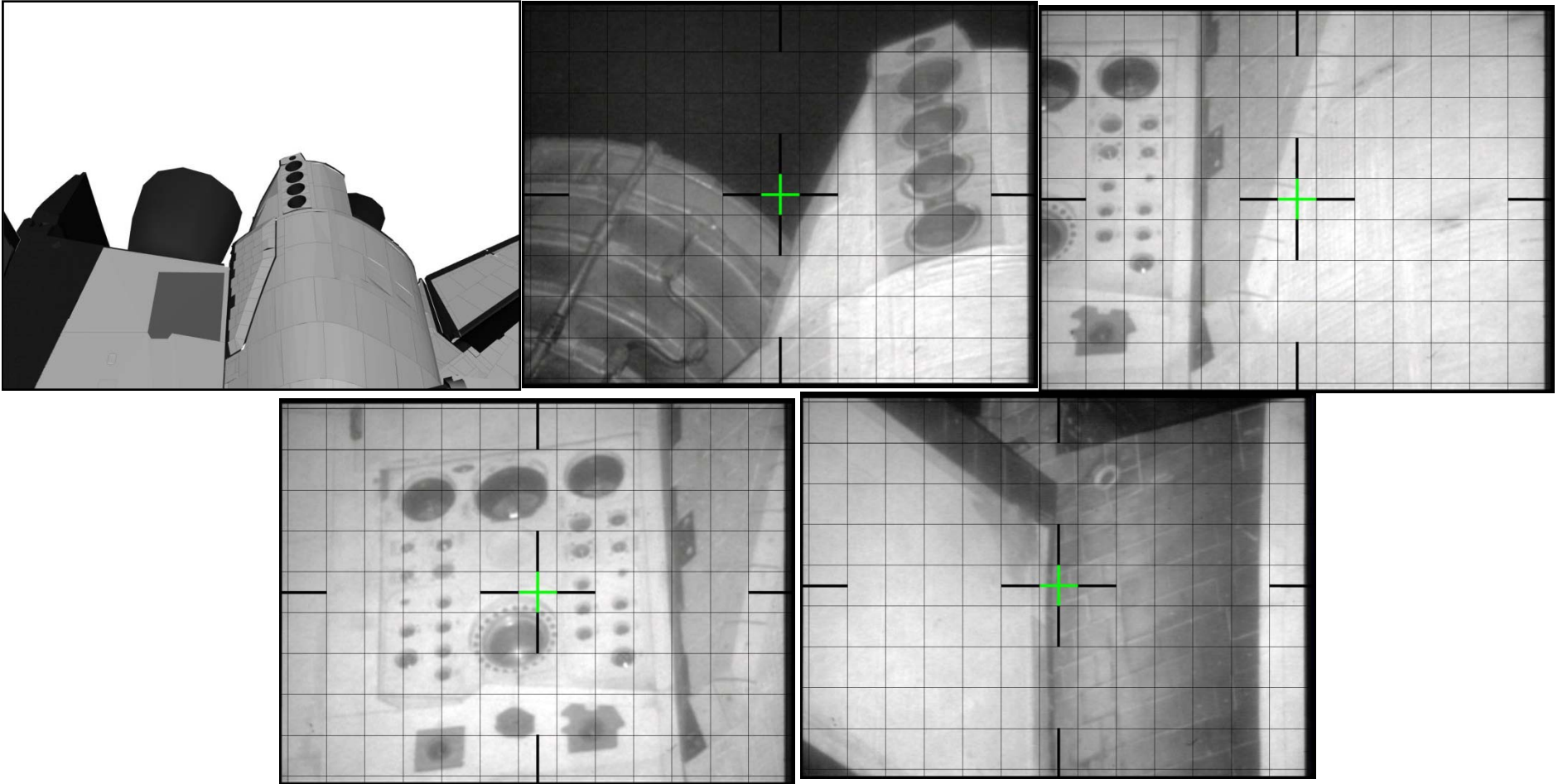


PDRS-7b/O/B



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New Operations – T0 Surveys (STBD)

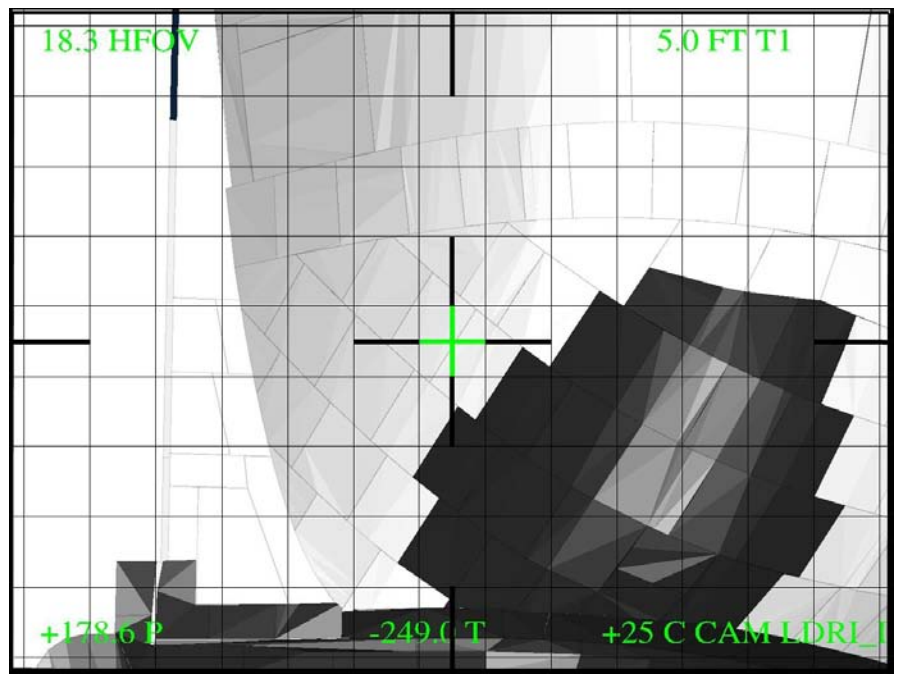
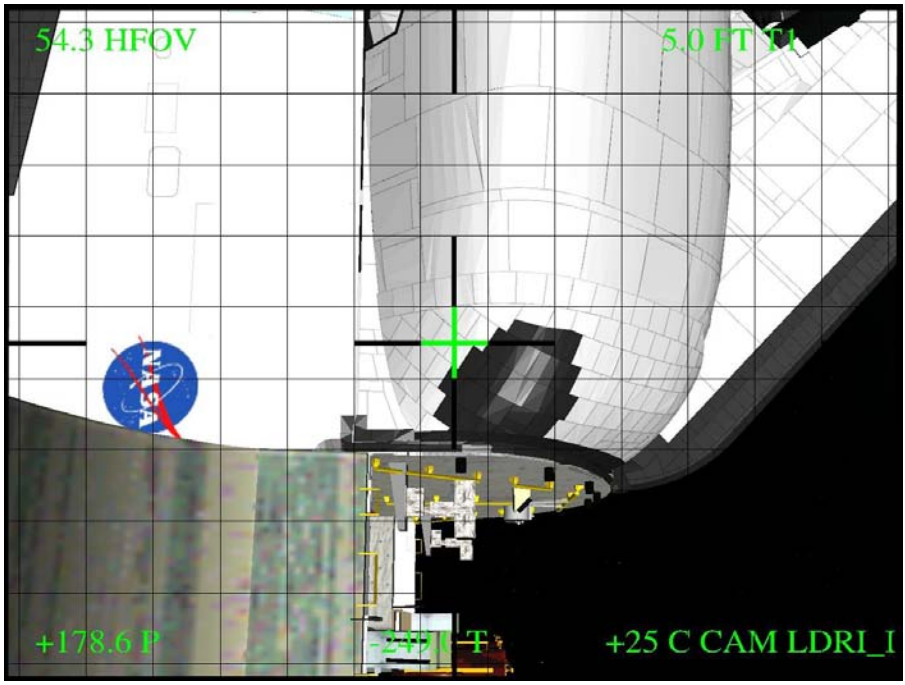


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New Operations – RPM Replacement Surveys

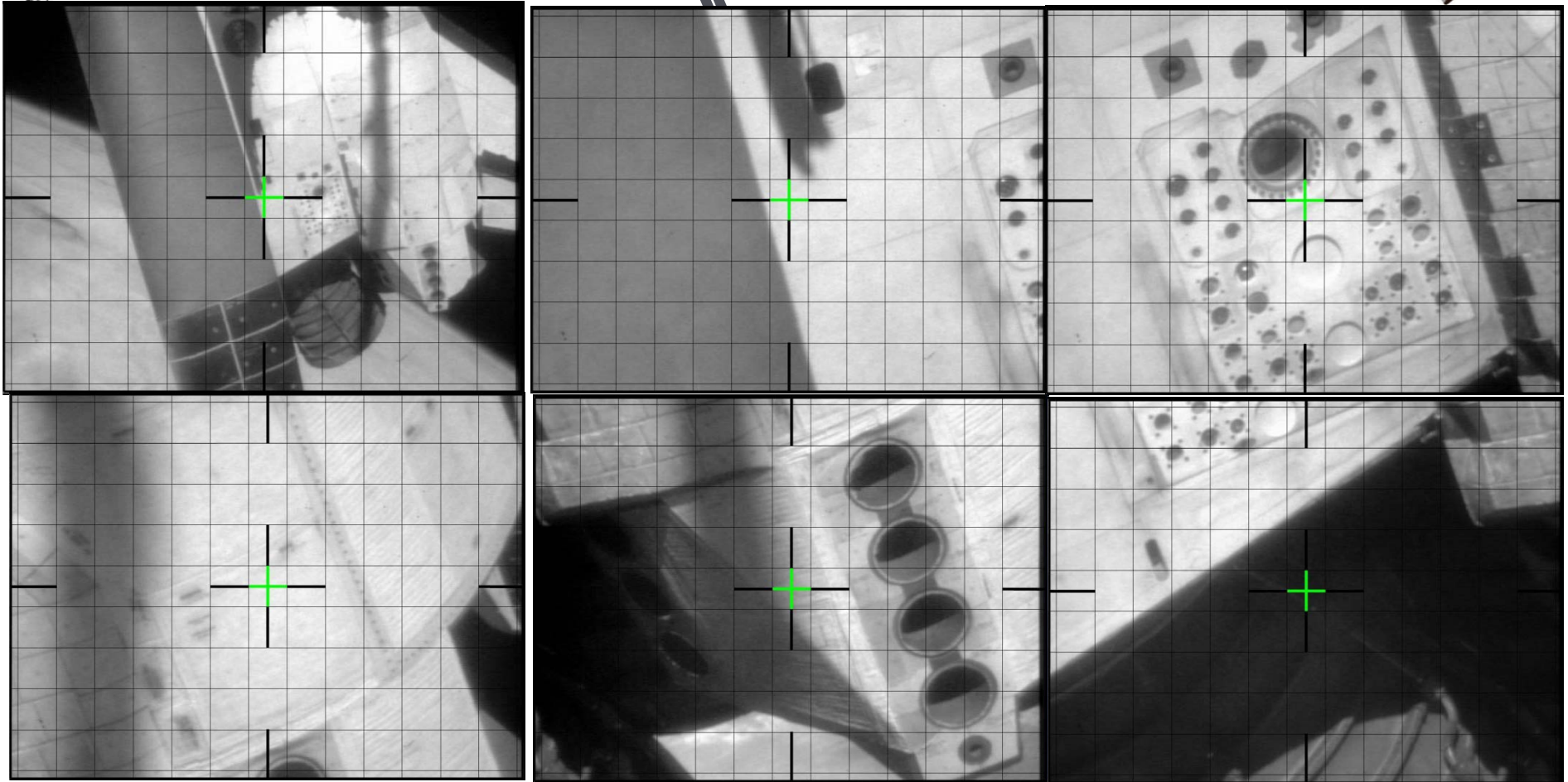


STBD OMS POD



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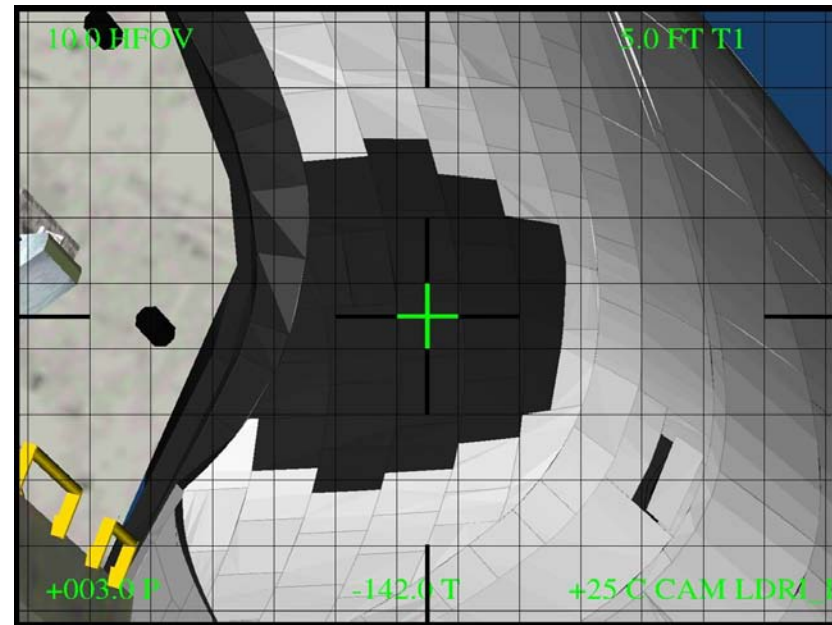
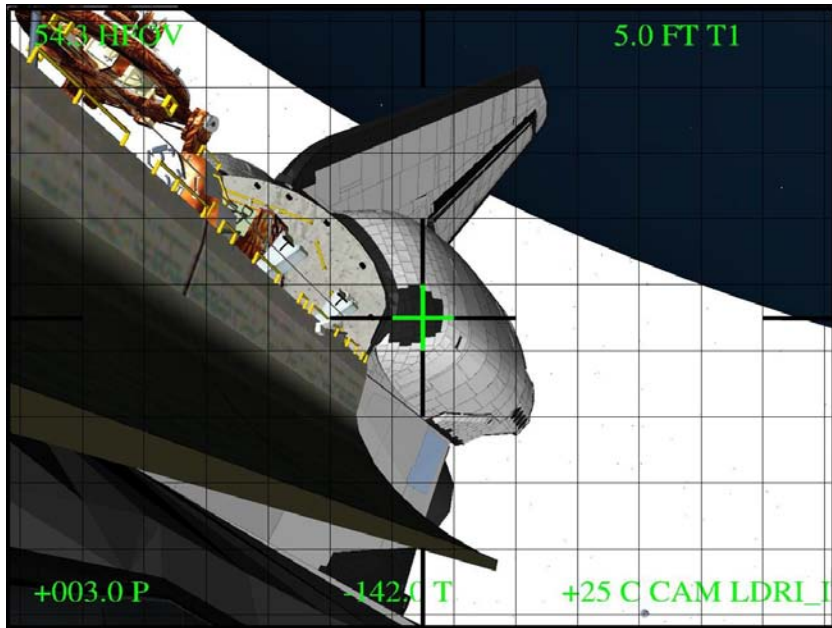
New Operations – T0 Surveys (Port)



New Operations – RPM Replacement TPS Surveys



Port OMS POD



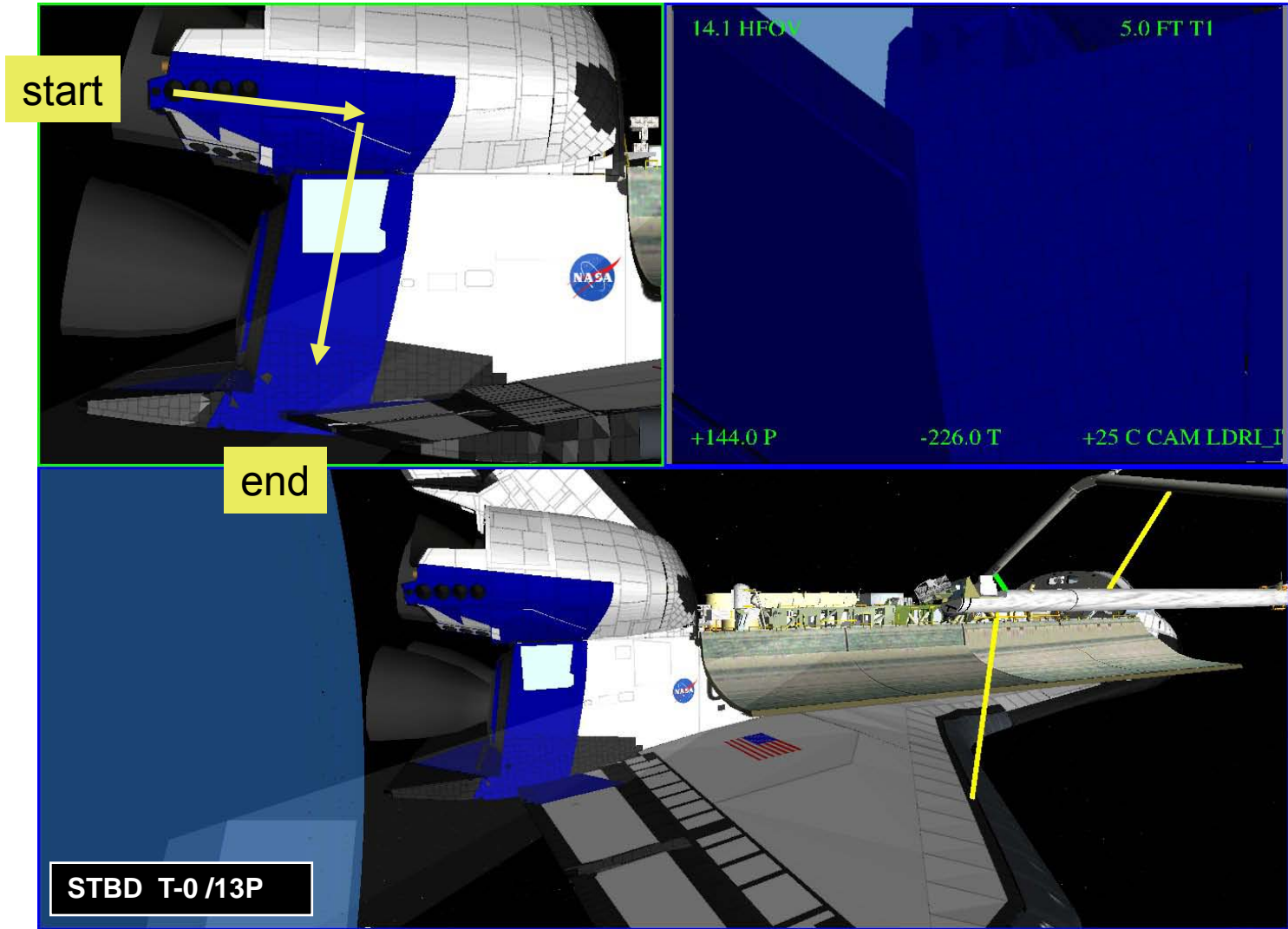
New Operations: MCC



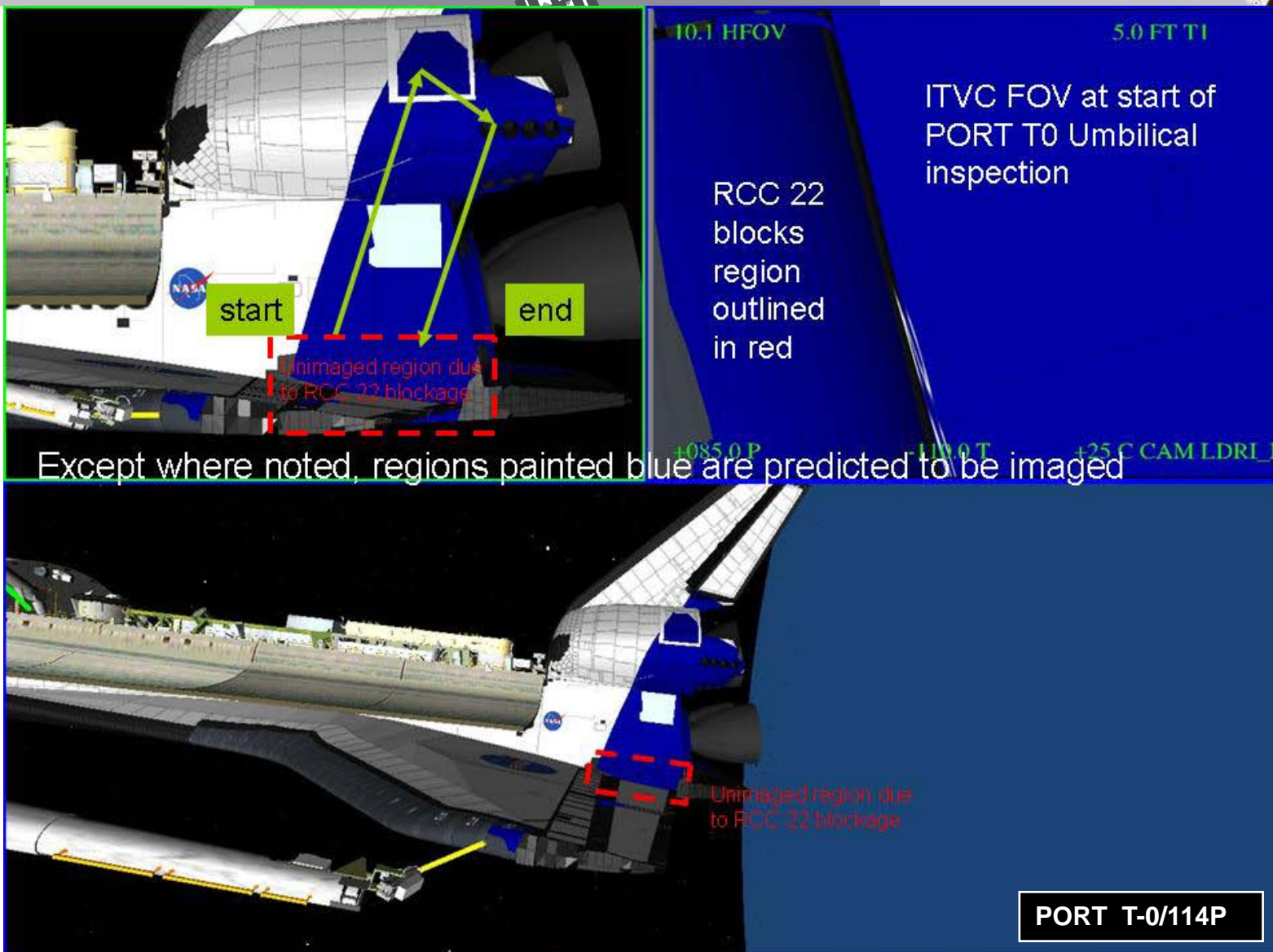
- None



New Operations – T-0 Surveys



New Operations – T-0 Surveys



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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



Items of Interest



125/HST SM4 EVA Glove Usage Plan

- Modified/Turtle Skin EMU gloves will be used 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



Items of Interest



125/HST SM4 EVA Glove Usage Plan (cont.)

• 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



Items of Interest



125/HST SM4 EVA Glove Usage Plan (cont.)

- Risk Mitigation (cont.)
 - 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

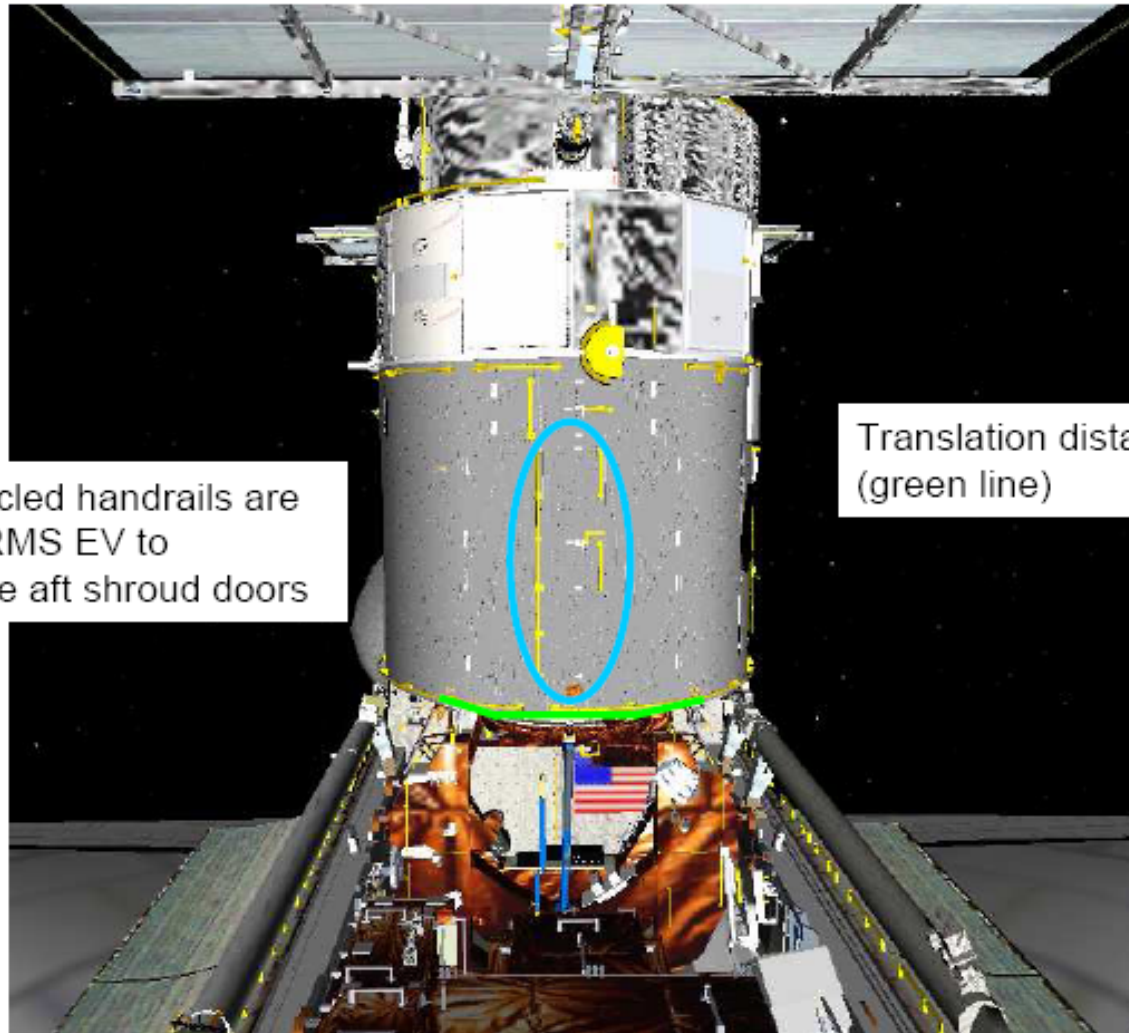




EVA 3 (HST Handrails Used for COS & ACS Tasks)



- V2



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

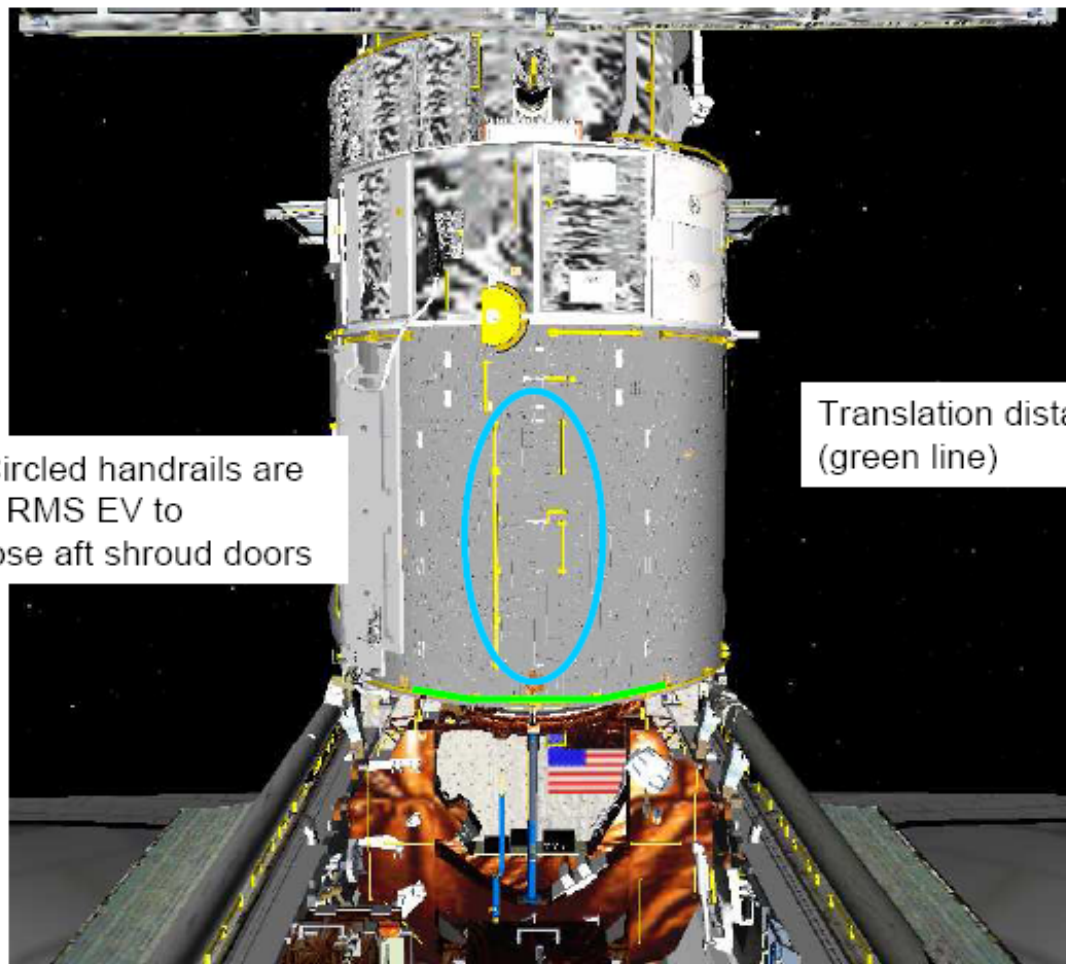
Translation distance ~8.5 ft (green line)



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)

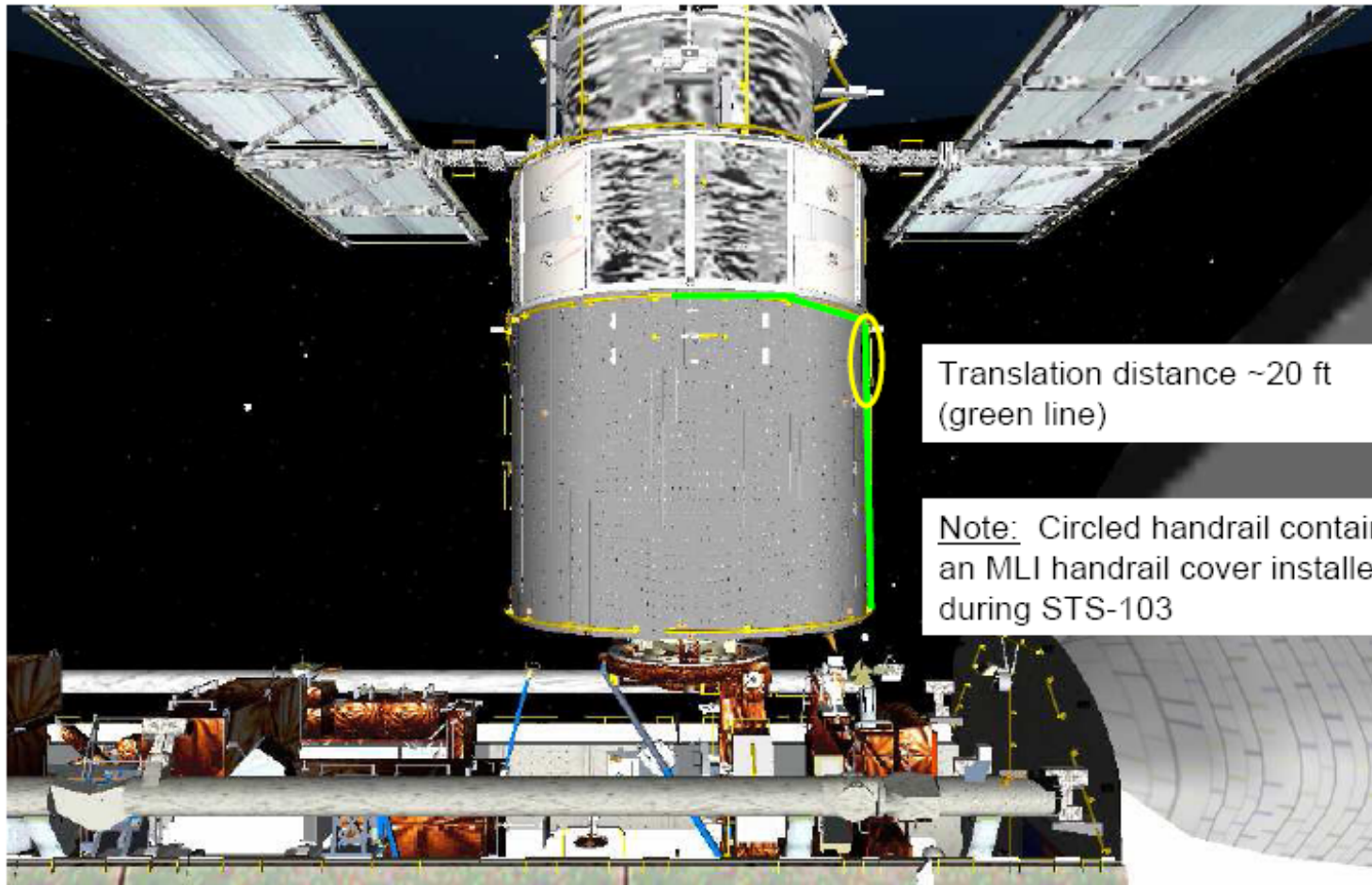




EVA 4 (HST Handrails Used for NOBL Task)



+ V3

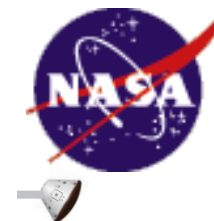


Translation distance ~20 ft
(green line)

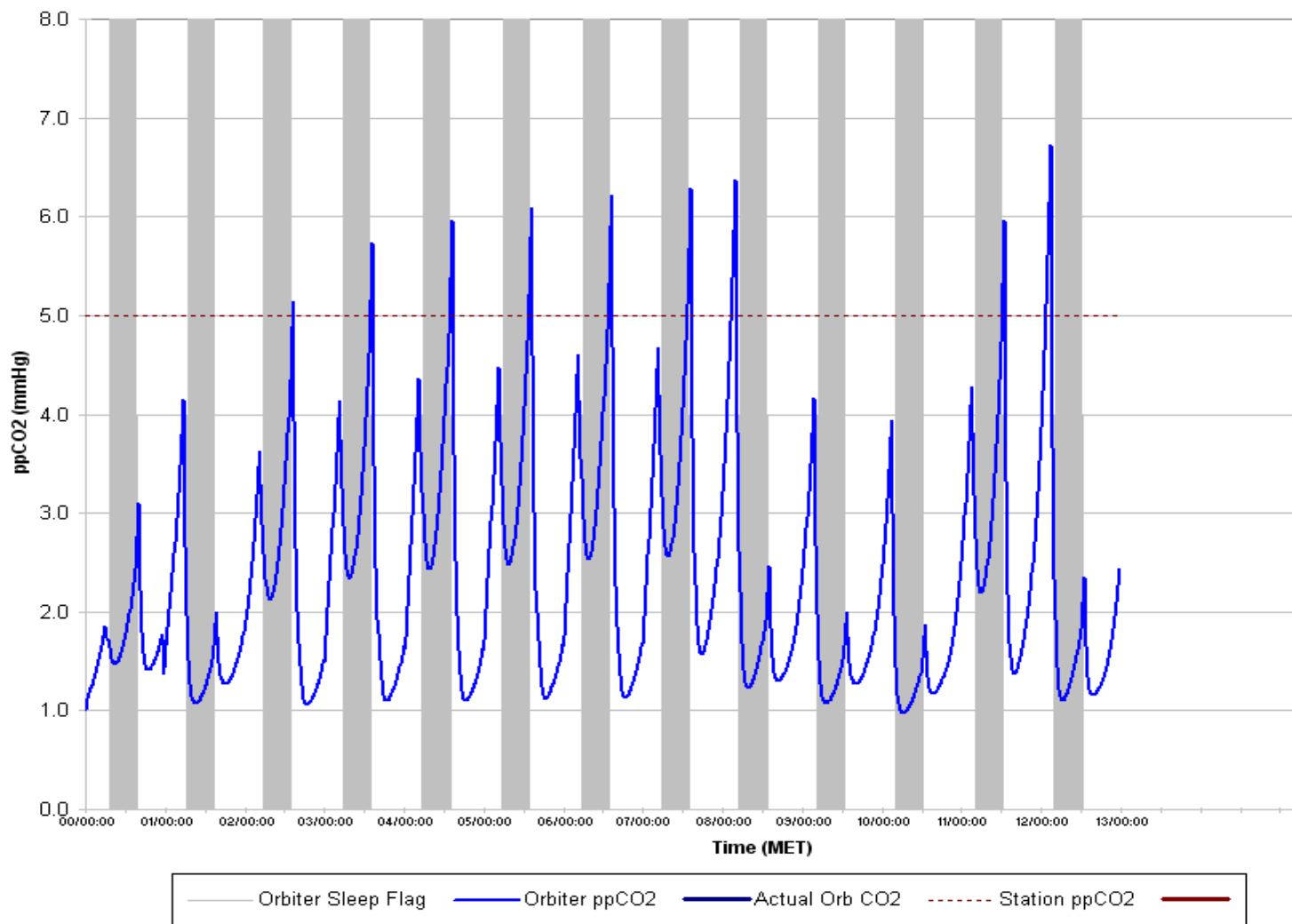
Note: Circled handrail contains
an MLI handrail cover installed
during STS-103



PPCO2 Management (cont.)



STS-125 ppCO2 Levels



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Safety Issues



- None



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



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



Non-Critical Processors/Applications



- All DA8 Non-Critical Applications certified



EMCC



- No changes to EMCC procedures since STS-119
 - 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



- **Seven A/E FTPs held with topics relevant to STS-125**
 - A/E FTP #240 (4/08)
 - A/E FTP #241 (5/08)
 - A/E FTP #242 (6/08)
 - A/E FTP #243 (8/08)
 - A/E FTP #244 (10/08)
 - A/E FTP #245 (12/08)
 - A/E FTP #246 (3/09)





- 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 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 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





- 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 Ec 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 (Ec = 1800 E-06)





- **OI-32 Automatic 2% Throttle Down**

- Long Term Workaround for Single SSME Completion
 - » OI-32 introduced code to simplify crew task by automating throttle down for two out SSME scenario's but had unexpected consequences
 - » LOCV for certain 2-out SSME scenarios that cause an unplanned re-entry shortly after OMS-1
- Crew procedures incorporated into FDF to remedy this concern based on A/E FTP assessment
 - » For Single SSME scenarios the Crew will select Manual throttles at 5% propellant remaining, minimum throttles at 2% propellant remaining, followed by Auto throttles

- **Operational Impacts for Low Mixture Ratio (MR)**

- SE&I assessment of SSME MR indicated a negative trend since 2004
- Program concluded that a new baseline update to the SSME controller MR was necessary to account for this MR trend
- Update could not be incorporated into SSME controller for STS-125 and drove Operational workarounds to account for the new MR
 - » Impacts to Flight Performance Reserve budget required to prevent a low level cutoff and how to manage this in the Abort Region Determinator (ARD)
 - » PLOAD application output that determines how much FPR based on the ET Loading had to be biased to account for new MR
- With STS-125 delayed this issue is no longer a concern since the SSME controller MR was modified for STS-126 and subsequent, thus eliminating the need for MOD to modify products/processes





- **STS-126 Post Flight Review**

- DOLILU Working Group will develop balloon management strategy to better workaround aging 45'th SW computer (MSC) network
- Large HAC and associated dynamics did not impose additional workload on crew. Good description from the MCC prior to deorbit and letting auto roll onto the HAC aided this result.
- Lesson learned from landing on Temporary Runway at EDW: Tell the crew the expected Nose Gear touchdown prediction point
- Significant number of network issues and operator errors at MILA, JSC, and EDW during A/E operations

- **STS-119 sMIA Diode Posture**

- Reviewed sMIA diode failure analysis results observed in lot codes 7715 and 7535
 - » Copper alloy may have been introduced by improper machining technique
 - » Diode cracking may have been exacerbated by presence of copper alloy
- OV-103 has 7715 & 7535 diodes on primary string for FA4 and FF4
 - » No EIUs on OV-103 contain these 'suspect' diodes
- AEFTP community concurred to port mode in the prelaunch timeframe and fly string 4 on secondary ports





- Advanced Health Management System (AHMS) Downlink
 - 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





- **I/O Reset Considerations**

- Current procedures allow crew to execute an I/O Reset for a bypassed LRU
- If a non-universal I/O error caused the bypass, executing a GNC I/O RESET could cause a redundant set split as recently witnessed during troubleshooting of the MDM FA2 anomaly prior to STS-124
- In order to mitigate the possibility of the set split during dynamic flight, crew procedures have been updated to have the crew check with MCC prior to executing the I/O RESET
 - » MCC has more insight to the bypassed LRU and can quickly determine if a non-universal I/O error is present
 - » If no comm is available with the ground, per established protocol, the crew may execute the I/O RESET if required
 - » GNC I/O RESETs imbedded in nominal procedures do not require the MCC check





- SSME LCC Update
 - Proposed additional pre-launch monitoring for main engine shutdown pushbuttons
 - » OI-32 introduced new downlink parameters so pushbutton contact dilemmas can be detected in OPS-9
 - » Instead of a one-time check, the launch team will constantly monitor pushbutton contacts down to T-31 sec for 2 of 2 pushbutton contacts failed 'on'
 - LCC for Limit switch contact failures still in work





- 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



125/HST FTP



- STS-125/HST Flight Techniques Panels
 - 125/HST Crew Task Panel – 7/12/07
 - 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 EVA Splinter – 5/7/08
 - 125/HST FTP #5 – 5/21/08
 - 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
 - 125/HST FTP Tagup – 10/1/08
 - 125/HST FTP Tagup – 10/22/08
 - 125/HST FTP #9 – 1/6/09
 - 125/HST FTP #10 - TBD

