



SPACE SHUTTLE PROGRAM
Space Shuttle KSC Integration Office
NASA Kennedy Space Center, Florida



STS-132 Integrated Launch Site Requirements Review

Presenter **Kenneth Nowak**

Date **09-24-09**

Program Freeze Point

PRCB Presentation

S115132A



STS-132 Integrated Launch Site Requirements Review

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Baseline the STS-132 Mission Specific Requirements and Flow Plans. This CR and the associated Data Package were reviewed at the 09-21-09 FRWG.

Flight Operation & Integration*

MO3/USA-PI

Orbiter Engineering*

Requesting Approval

USA-OE

Payload/Cargo Engineering*

Requesting Approval

USA-PI

Status in BackUp

KSC Integration*

MK-SIO

Flight Software

USA-FSW

Orbiter GFE

MV5

EVA

XA

SSME

Status at LSFR

MP21

*Backup material included



SPACE SHUTTLE PROGRAM
Space Shuttle Flight Operations and Integration Office
NASA Johnson Space Center, Houston, Texas



STS-132/ISS ULF4

Launch Site Requirements Review (LSRR)

Flight Requirements Status

FRWG Sept 21, 2009

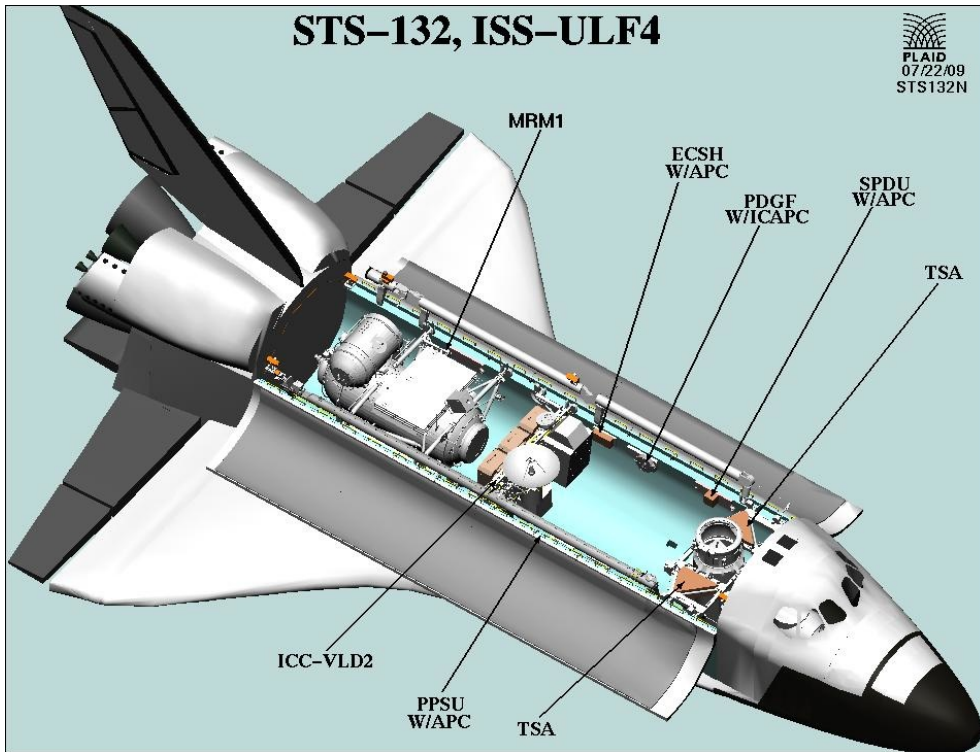
PRCB Sept 24, 2009

Phyllis Grounds, MO3 MIM
Robert Reynolds, USA Flight Mgr.

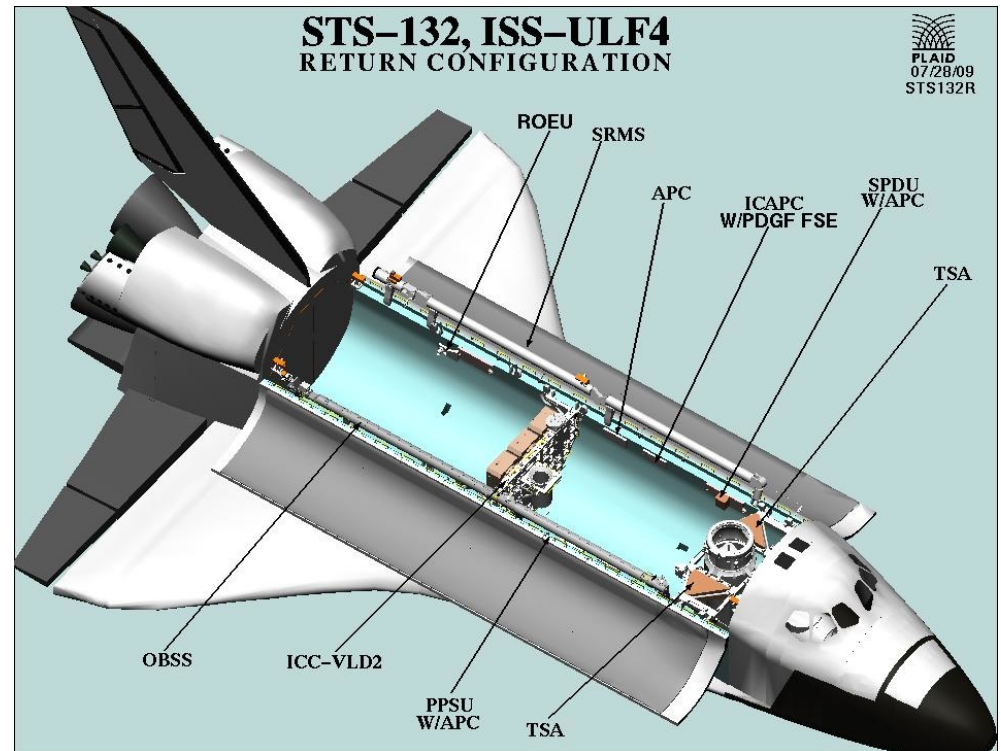


Baseline Ascent/Return		Presenter	
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Ascent Configuration

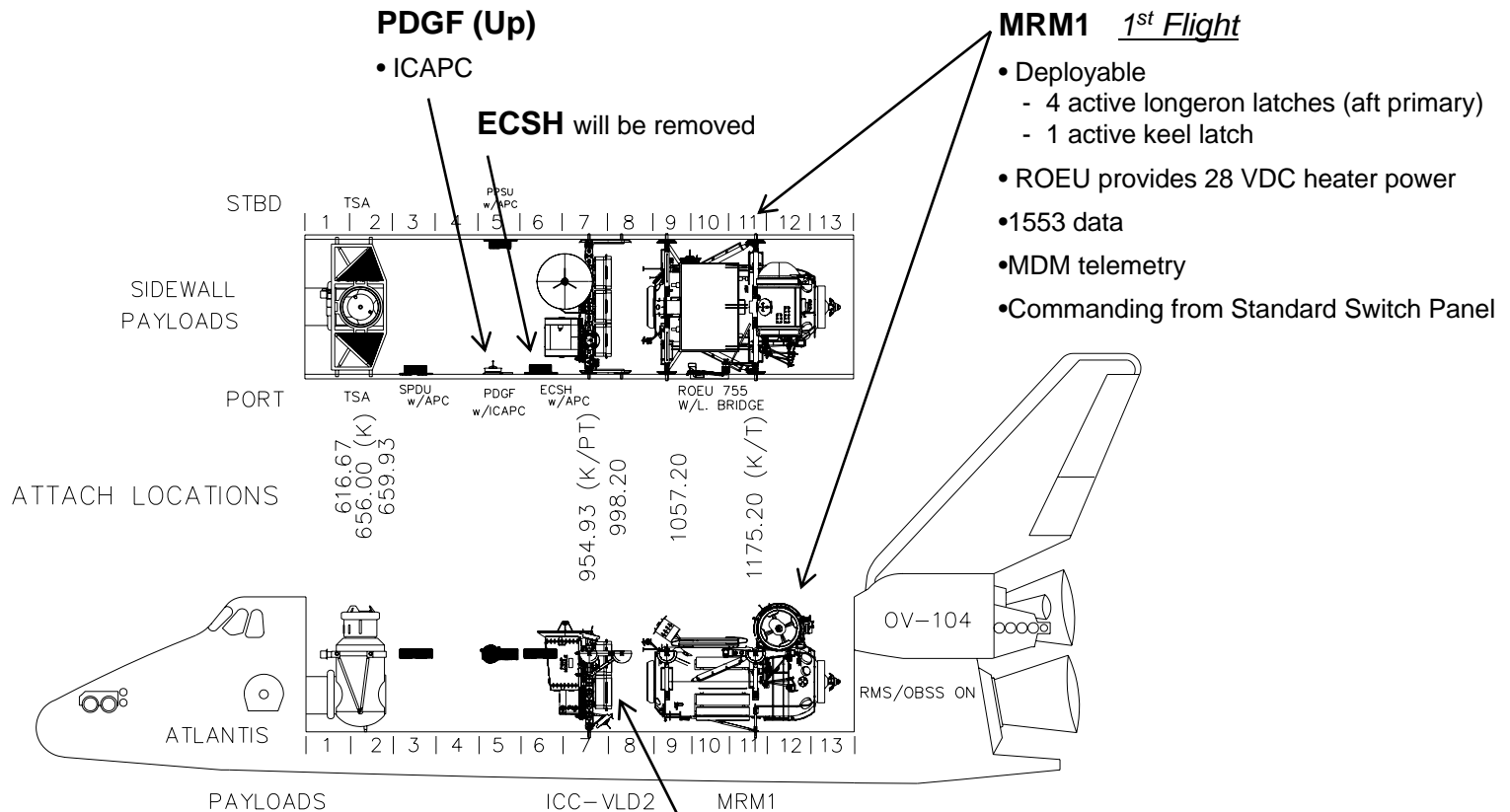


Return Configuration





STS-132 Payload Integration Services/Interfaces		Presenter	
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MRM1 1st Flight

- Deployable
 - 4 active longeron latches (aft primary)
 - 1 active keel latch
- ROEU provides 28 VDC heater power
- 1553 data
- MDM telemetry
- Commanding from Standard Switch Panel

Middeck Powered Payloads

- CGBA-X (Up/Dn)
- CGBA-2 (Up/Dn)
- GLACIER - rear breather (36 CFM) (Up/Swap/Dn)

ICC-VLD 2nd Flight

- Deployable
 - 4 active longeron latches (fwd primary)
 - 1 active keel latch

• Note – SPDU supports OBSS



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LAUNCH

05/14/10
 39A/ MLP TBD
 CREW SIZE: 6UP/6DN

CONFIGURATION

OV-104(32)
 LP04;RP01
 ET-136
 BI-143
 RSRM-111
 (1) TBD (2) TBD (3) TBD
 OI-34
 SRMS, ODS, OBSS, APCU'S
 PPSU, ROEU, ECSH, SPDU

PAYLOAD

ISS-ULF4 (MRM1, ICC-VLD)	ISS-ULF4 MAUI SEITE RAMBO-2 SIMPLEX
--------------------------------	-------------------------------------------------

ORBIT

51.6 DEG
 122 NM
 DIRECT INSERTION
 DURATION: 11 + 1 + 2 DAYS

CONSUMABLES

CRYO TANK SETS	5 (FULL)
GN2 TANKS	5 (FULL)
PAD HOLD	~76 hrs H2 limited
FWD RCS	2175# (MIDPOINT)
AFT RCS	4970# (FULL)
OMS	22760# (FULL)

LANDING

SITE TAL ALT. TAL SCA	KSC ZARAGOZA MORON & ISTRES 911
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PERFORMANCE MARGIN

• SIMULATION MARGIN (CIRAF132)		+3385
• WEIGHT CHANGES SINCE SIMULATION		
• PAYLOAD	- 199	
• OPERATOR	+247	
• CREW COMPARTMENT	+30	
• MPS PROP (NOT INERT)	+260	
• ET	+3	
• RECONSTRUCTED ASCENT PERF COLLECTOR	<u>- 94</u>	
TOTAL WEIGHT CHANGES	+247	- 247
• OTHER PERFORMANCE PROJECTIONS		
• PROTECTION FOR DOL DISPERSIONS		- 700
• USABLE IMPULSE FOR MPS BGT GEN0901S		- 17
• SRB – M.P. UPDATES		- 171
• SRB – BR / 1.80 MIL HIGHER THAN 0.3705 AVG		+360
• ISP/THST FOR GEN BLOCK 2 @ 104.5%		+6
• PROJ TO 5 MIN WINDOW FROM INPLANE		- 600
• PERFORMANCE CHANGES ADJUSTMENT		<u>+17</u>
• CURRENT BASELINED APM (09/22/09)		+2033
• IPT PROJECTIONS		
• ISP/THRUST FOR SSME 2052, 2051, 2047		<u>+25</u>
• IPT PROJECTED APM		+2058



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FLIGHT MASS PROPERTIES

WEIGHTS AND CG'S ARE WITHIN ACCEPTABLE LIMITS

<u>CASE</u>	<u>TOUCHDOWN</u>	<u>MACH 3.5</u>
	<u>WEIGHT pounds (LIMIT)</u>	<u>X C.G. inches (LIMIT)</u>
NOMINAL	209732 (233000)	1077.9 (1075.7)
RTLS	236568 (245000)	1081.4 (1077.2)
TAL	234895 (244000)	1082.5 (1077.2)
AOA	231203 (242000)	1079.9 (1075.7)
CONT RTRN	211584 (233000)	1078.0 (1075.7)

**NOTE: RTLS INCLUDES 185 SEC ARCS & 25 SEC FRCS DUMPS
TAL INCLUDES 120 SEC ARCS & 90 SEC FRCS DUMPS
1109 LBS AFT BALLAST**

ESTIMATES BASED ON CIRAF132 AND MODIFIED FOR WEIGHT CHANGES THRU 09/22/09.

**STS-132 LSRR
OV-104 FLIGHT 32
CONFIGURATION UPDATES
PRCB
September 24, 2009**

Alvin Jenkins USA Orbiter Element
Elena Seastrom Boeing VPE



STS-132 OV-104 Flight 32 – LSRR Updates

Program Authorization Is Requested For The Following:

- MECSLSI Updates

Note: No Orbiter Modifications have been identified to date for implementation

Information Only:

- Potential Mission Equipment Modification
- Chits
- Wing Leading Edge (WLE) Spar Inspection
- Auxiliary Power Unit (APU) Life Time Extension

Back-up:

- TPS Risk Reduction Priorities List and Allocation Breakdown

STS-132 OV-104 Flight 32 – MECSLSI Updates

- **Update the V072-200212 MECSLSI with the following tech order changes:**
 - **External Airlock (Mission Kit MV0828A)**
 - Remove M072-341828-023
 - Add M072-341828-029
 - Paper Clean up only to correct the dash number configuration
 - **RMS End Effector (Mission Kit MV0082A)**
 - Remove M072-544502-036
 - Add M072-544502-033
 - Paper Clean up only the current end effector will remain on the vehicle

Potential Mission Equipment Modification

- **Starboard Lightweight Tool Stowage Assembly (LWTSA)**
 - The final Starboard LWTSA configuration is being identified and may require a cushion modification

Chits

CHIT	TITLE
J6275A	ORBITER STRUCTURE IML SURFACE CORROSION SAMPLING INSPECTION
J6399	0-GAUGE PROTECTION FOR OV-104, FLIGHTS 31-35
J6410	AFT STUB CRACKED TILE INSPECTION
J6501	STS-129 CIH CLOSE CLEARANCE MEASUREMENTS
J6527	FRCS THRUSTER CANISTER STUD INSPECTIONS - F5R AND F5L
J6528	PUTTY REPAIR TILE REPLACEMENT FOR RISK REDUCTION
J6543	ET FERRY FLIGHT DOOR ATTACH FITTING INSPECTION (Ferry flight only)
J6559	UPPER AFT STUB TILE INSPECTION FOR IN-PLANE CRACKS (In review)
K6561	GROUND LIGHTNING MONITORING SYSTEM (GLMS) (In review)

Potential Chit

- **W2 and W5 Windows Torque Increase**

- Chit J6536 performed torque checks on OV-105 W1, W3, W4, W5 and W6
 - Results showed windows are still experiencing torque loss
- OV-104 W2 and W5 (multi-flight) have been re-torqued to the 70 in-lbs as directed by OPO
- Plans for torque checks and/or re-torques on STS-132 are still under review

- **Capture OV-104 Output Waveforms to Address Diode Concerns**

- Evaluation to determine health of current conducting diodes in flight critical data bus communication ports
 - Pending the PRT and OPO decisions

STS-132 OV-104 Flight 32 – Information

Wing Leading Edge (WLE) Spar Inspection

- Structural inspections of the wing leading edge spars are due prior to the last manifested flight of OV-104 (due date January 22, 2010)
 - Performance of these inspections is intrusive and classified as a significant flow impact
 - 11 LH wing and 9 RH wing panels remaining to be inspected
 - PRT's position is full compliance with the requirement is required prior to 1/22/10
 - Last WLE spar full inspection on OV-104 was performed in July 2003; prior OMDP inspections were performed in December 1997
 - Coating system refurbishment and re-performance of structural inspections was to be accomplished at the next OV-104 OMDP which was to occur prior to flight 29
- 12 RCC panels and associated spar fittings were removed during the STS-129 flow to perform sampling inspection
 - Panels 10-16 LH and 12-16 RH
 - No active corrosion identified
- Exception and Program accepted risk would be required if inspections are not performed in full prior to January 22, 2010

STS-132 OV-104 Flight 32 – Information

Auxiliary Power Unit (APU) Wetted Time Extension

- APUs are due to be replaced prior to the last manifested flight of OV-104, STS-132, based on the 5 year wetted time requirement
 - Presently five spare APUs are available through the end of the program
 - 4 ‘planned’ removals required per the 5 year OMRSD limitation in 2010
 - At least 1 ‘unplanned’ removal can be expected based on logistics projections
- Allowable APU wetted time TACCS File II OMRSD was recently increased from 4 years to 5 years based on historical inspection results
 - Further extension of the allowable time period beyond the current 5 years requires additional inspection and test data
- APU wetted time extension options were presented at the LOCCB on 9/17/2009: Option approved to seek extension based on Disassembly and Inspection of the Fleet Leader at the Vendor
 - The testing will be complete in mid-December
- APU removals will not be required during the STS-132 flow, if the APU wetted life is extended to 6 years

STS-132
ISS-ULF4 – MRM1 / ICC-VLD
Launch Site Requirements Review
Payload Cargo Engineering Status

Yvette Carmona

281.212.6492

FRWG: 09/21/09

PRCB: 09/24/09

STS-132 LSRR

Engineering Flight Product Status

<u>DrawingTitle</u>	<u>Rev</u>	<u>EO</u>	<u>Released</u>		
V072-200212	MECSLSI	New	-	06/30/09	
VA72-200212	Cargo Arrangement Drawing		New	-	07/01/09
VD72-200212	Avionics Interface Diagram	New	-	07/01/09	
VS72-200212	Integrated Avionics Schematic		New	-	07/01/09
VS70-540424	Retention Schematic Diagram		New	-	06/29/09

Engineering Open Work

- FRED ECD: 10/20/09
 - Includes MECSLSI changes for External A/L, RMS EE, and TSAs

Rescue-Flight Status

- STS-132 Reconfiguration Engineering Products will be developed by the standard Flight To Follow (FTF) process

STS-132 LSRR

Mission-Unique Deviation to NSTS 60523

Background

- NSTS 60523, Orbiter/Payload Integration Standardization Document, defines a standard payload avionics configuration for all vehicles and requires PRCB approval for changes or mission-unique exceptions
- Request authorization to revise mission-unique waiver #10 to NSTS 60523 that was approved by PRCB CR S064102 on 04/27/09 to change Mini-Research Module-1 (MRM-1) payload-monitoring requirements

Recommendation

1. Revise number of MDM PF-1 and PF-2 DIHs required since MRM-1 power #2 signal will no longer be used
2. Provide additional cabling to support MRM-1 cable changes (includes 1553 service)

(See Backup for details of changes)

STS-132 LSRR

Cargo Close-Clearance Process

The following Close-Clearance area has been identified:

- MRM-1 Aft Port Scuff Plate to SRMS MPM
 - Currently just over one-inch (1”) of dynamic clearance
 - This will be monitored during the VLA to see if a close clearance measurement will be required



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Backup Material

FRWG Presentation (With Minor Changes)



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FO&I Backup Charts



STS-132/ULF4 Flight Requirements Status	Presenter Robert Reynolds	
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STS-132 FRD Revision 005, dated August 25, 2009: <https://sspweb.jsc.nasa.gov/efrd/>

Projected CR's

- 1. Add EVA Hardware to support MRM1 Contingency Operations.**
- 2. Delete ECSH and PPSU**



STS-132/ULF4 Requirements Status	Presenter Phyllis Grounds	
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1. ULF 4 MIP (NSTS 21541)

- **Current version available on PILS: Basic + Change 4, dated 8/18/09**
- **Open CR's -- none**
 - **CR -0009 closed 9/15/09, "Electrical Power Table 5-1 Cabin Payload bus to MRM1" in editing**
- **Pending CR's:**
 - **Update to Appendix E, pending FPSR assessment**
 - **Update to launch package control weight**
 - **ICC VLD updates to delete LTA cable task and associated power requirements**
 - **Purge requirements, section 9**
 - **TBD closures -**

2. Payloads Of Opportunity status:

SEITE – NSTS 21542, Basic + Change 1 dated 9/4/08

SIMPLEX – NSTS 21327, Revision A, dated 6/16/08

RAMBO-2 – NSTS 21556, Basic, dated 2/23/09

MAUI, NSTS 21530, Basic + Change 2, dated 5/5/08



STS-132/ULF4 Flight Requirements Status	Presenter Phyllis Grounds	
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- **Flight Definition and Requirements Document (FDRD)**
 - **Pending CR to delete the Sidewall SPA BEAM, PPSU, and ECSH and incorporate ICAPC/PDGF.**

Back-up

- **TPS Risk Reduction Priorities List and Allocation Breakdown**

TPS Risk Reduction Priorities List

Mandatory (everyflow expectation)

- Flight damage, OMRS Rqmts/Chits, LRU access, & deferred work
- Multi-flow Chits {
- Corrosion Sampling (10% of total tile allocation) *Chit J6275A*
 - Putty repairs in RCC & Window DTA Zones (23% with 10 tile min.)(Chit J6514,J6497,J6504)
 - Continue G/F R & R on a best effort basis - zones 2B subset
 - *Deferred work may be redeferred with acceptable inspection*

Prioritized Opportunity

- 1 - 9 1 thru 9 complete on all vehicles (with one exception #7 on OV-104)
 - 7 Inboard Elevon "Hub" Tile Modification – 104 only remaining (2 Tiles Port Side)
- 10 MLGD BRI-18 – Outboard Middle 1/3 -24 Tiles (6 Door/6 STR)
- 11 ET Door - Remaining STR side of Door & leading edge on Door - 40 tiles (24 STR/ 16 door)
- 12 MLGD BRI-18 – Outboard AFT 1/3 - 24 Tiles (6 door/6 STR)
- 13 Nose Area 9lb/90 SIP Upgrade to FRCI-12 – 14* Tiles (7/side) (*103 16 tiles,thruster)
- 14 Base Heat Shield 9lb/90 SIP Upgrade to AETB-8 – 42 Tiles (32/stinger, 10/Box Attach point)

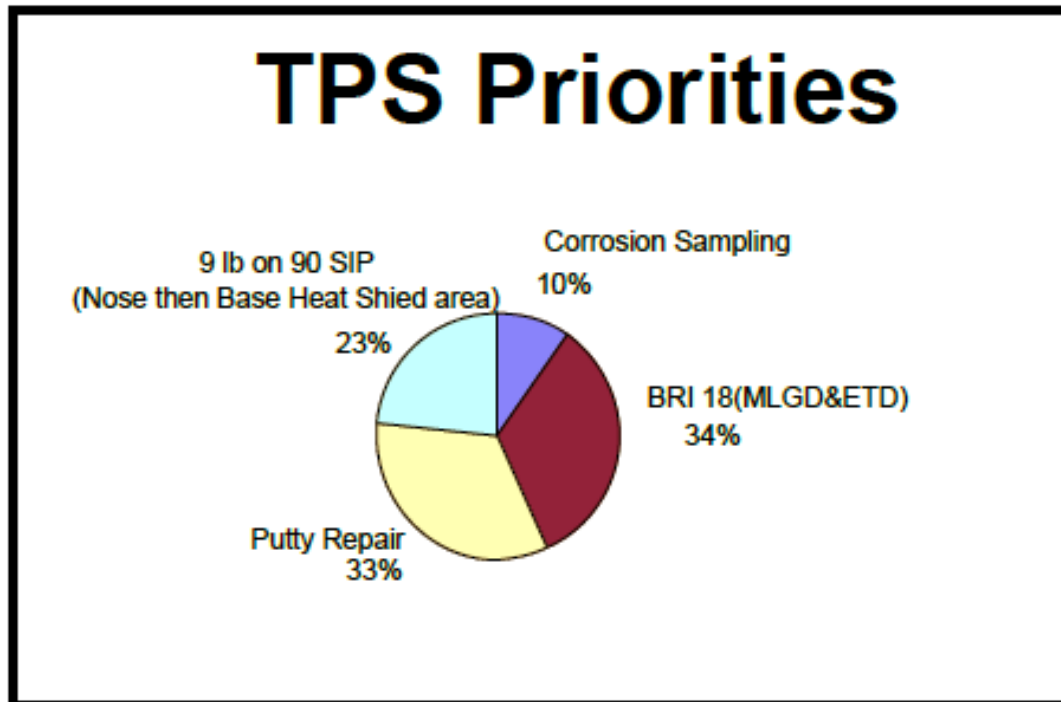
TPS Risk Reduction Priorities List (Cont.)

- 15 **Body Flap Stub "Piano Key" Upgrade to AETB-8 -40 Tiles** (Order as defined in PRT map)
- 16 **Gap fillers in Subset 2B - 5 Zones** (Defined as a line across MLGD edge)
- 17 **Remaining BRI-18 Tile – Remaining MLGD (top priority) / ET Door / LESS carrier panels/NLGD**
 - MLGD (Inboard, forward edge working to AFT door edge)
 - ET Door
 - LESS - panels 8, 9, 10, 7, 6, 5, 4, 3, 2, 1, 11, 12, 13 (in that order)
 - NLGD (attrition – do leading edge first)
- 18 **Mod work** (WLE sneak flow, WLE Horsecollar Gap Fillers,)
- 19 **MADS Instrumentation Failures** (104 & 105 L/H OMS Pod)(place holder)
- 20 **Remaining Gap Fillers & Window BRI-18**
 - Windows 2, 3, 4, & 5 Upper Carrier Panels (top priority)

Current Fleet Status

Priority Number	Total	OV-103	OV-104	OV-105
1. BRI-18 Tile - MLGD FWD O/B Corner	28	complete	complete	complete
2. BRI-18 Tile - MLGD FWD Edge	22	complete	complete	complete
3. BRI-18 Tile - MLGD O/B Side	18	complete	complete	complete
4. BRI-18 Tile - STR side of ET Doors	20	complete	complete	complete
5. BRI-18 Tile – LESS Carrier Panels 8-10 (103 & 104)	24	complete	complete	n/a
6. BRI-18 Tile – STR side of ET Doors I/B	8	complete	complete	complete
7. Inboard Elevon "Hub" Tile Mod	4	complete	2	complete
8. I/B Elevon 9lb/90 SIP	34	complete	complete	complete
9. O/B Elevon 9lb/90 SIP	6	complete	complete	complete
10. MLGD – Outboard Middle 1/3	24	0	0	3
11. ET Door remaining STR side	40	1	10	0
12. MLGD - Outboard AFT 1/3	24	0	0	1
13. Nose Area 9lb/90 SIP	14 (16 ^{OV103})	3	complete	0
14. Base Heat Shield 9lb/90 SIP	42	10	complete	complete
15. Body Flap Stub "Piano Key" tiles	40	1	14	0
16. Gap fillers in Subset 2B	5 Zones	2	1	0
17. Remaining BRI-18 - MLGD (top priority) / ET / LESS carrier panels / NLGD	MLGD 100	MLGD 0	MLGD 1	MLGD 0
	NLGD 123	NLGD 15	NLGD 19	NLGD 47
	LESS 68 (92 ^{OV-105})	LESS 7	LESS 5	LESS 19
	ET Door 28	ET Door 5	ET Door 2	ET Door 1
18. Mod work LESS internal	44 locations	40	complete	complete
20. Remaining Gap Fillers & Window BRI-18	124	3	2	19

Allocation Breakdown



Example	60 tile Allocation at DLSF
Corrosion Sampling	6
BRI-18 MLGD&ETD	20
Putty Repair	20
9lb on 90 SIP	14

- Orbiter's expectations for the work areas are shown on the pie chart
 - The above table is for reference only – exact #'s are determined by the KSC Team
 - Access/configuration/length of flow
 - Distribution provides data/risk reduction in all areas of the list
 - Does not allocate all the resources in one area

Payload Cargo Engineering Backup Charts

NSTS 60523 Waiver Details:

1) Replace ~~3~~-standard payload bay cables with mission unique

REQUIREMENT: Paragraph 1.3 STANDARDIZATION GROUND RULES. All Space Shuttle flights must comply with the configuration defined in this document. Services can be added on a flight if it does not impact standard wiring, but items can't be deleted if they will impact the ability to swap vehicles. Permanent changes or mission unique exceptions to this document require PRCB/DPRCB approval. This document restricts the use of services defined in the ICD-2-19001, Shuttle Orbiter/Cargo Standard Interface (Core ICD), and NSTS 21000-IDD-ISS, International Space Station Interface Definition Document, and restricts vehicle configuration defined in NSTS 17462-ISS, Flight Requirements Document International Space Station (ISS) Standard, and NSTS 17462-XX, Flight Requirements Document Blank Book.

WAIVER: The above requirement is waived for the following hardware & software deviations:

Remove 1 standard payload bay cable, modify a standard payload bay cable, and install ~~3~~4 mission unique cables to add control and monitoring of Payload Power Switching Unit (PPSU) and monitoring of MRM1 via Standard Switch Panel (SSP) 1553B Data Bus and MDMs. Implement software changes to the standard MDM Command/Monitoring services and to the OIU 1553B Data Bus configuration to accommodate these mission unique requirements.

- a. The PPSU requires monitoring of internal heaters via MDM PF-1 and PF-2.
- b. MRM1 requires monitoring of the Terminal Computer #1 & #2 Health Checks, MRM1 Power #1 & #2-Signals, Fire Alarm system and smoke detector signals via MDM PF-1 and PF-2
- c. MRM1 requires a special configuration of the OIU software and cabling in order to support required 1553B data bus commanding and telemetry.

RATIONALE: The PPSU utilizes redundant 20 watt heaters to meet LRU thermal design requirements. Each heater provides on/off telemetry that must be monitored to verify proper operation of the LRU. A total of two (typically not used) MDM PF-2 AIDs are required to support the PPSU.

MRM1 requires redundant signal monitoring for the terminal computers, power, fire alarm systems, and smoke detectors. The MRM1 will use DIH signals for the terminal computers and power monitoring. Also, MRM1 will use DIL signals for the Fire alarm system and smoke detector monitoring. A total of fourtwo MDM PF-1 & one PF-2 DIHs and eleven MDM PF-1 & PF-2 DILs (5 spare) are required to support MRM1.

MRM1 also requires 1553B bus for all essential command and telemetry signals. Currently the 1553B bus software is only configured for use with the MPLM cargo element.

ELEMENT/PROJECT: Orbiter

EFFECTIVITY: STS-132

AUTHORITY: Space Shuttle PRCBD S0XXXXX, dated XXXXXX

STS-132 LSRR

OMRSD

- **FII V2 Payload (Post-Mate)**

 - Baselined Files

 - None

 - RCNs

 - PP18083 P541 – ULF-4 Integrated OMRS Baseline Baseline
10/06/09

- **FII V4 (Pre-Mate)**

 - RCNs

 - DPS13014 Early Mission-Unique List (MUL) Baseline
09/29/09
 - DPS12985 MUL Update 11/20/09
 - DPS12984 FIII MUL 11/20/09
 - DPS12983 Adjacent Pin Test 11/20/09

- **FII V6 (Shuttle Experiments) – None**

- **Issues / Concerns**

 - MIP U/D Input (Purge and radiator flow) In Work
 - Waiver Requirement for Purge OMRS violation 09/29/09 U/R

STS-132 LSRR

Annex 1: ISS-ULF4-NSTS 21541-A01

<u>Activity</u>	<u>ECD</u>
• Baseline	07/31/09A
• <u>L-4MUpdate</u>	
– Customer Submittal	12/23/09
– CR Approval	01/13/09
• <u>L-1M Update</u>	
– Customer Submittal	03/29/10
– CR Approval	04/13/10
– Final weight Log	04/13/10

STS-132 LSRR

Time-Critical Ground Handling Requirements

Activity

- Customer Submittal
- Release for Review
- Baseline

ECD

01/13/10
02/12/10
03/14/10

Issues / Concerns

- None

STS-132 LSRR

Payload ICDs/PIRNs

- All Payload-Unique ICDs are baselined
- PIRNS that impact Flight Products:

<u>PIRN #</u>	<u>ICD/Payload</u>	<u>Title</u>	<u>ECD</u>
A05781	ICD-A-21541-VLD2	Update Mechanical Figures	11/09/09

- Issues / Concerns
 - None

STS-132 LSRR

Cargo Integration Hardware Status

- Open Work

- None

- New Build Hardware

ECD

- Camera Bracket – V787-340035-003 (Mod) 12/04/09
 - AFD Harness – V845-773990-001 (New) 12/04/09
 - PLB Harness – V845-774984-001 (New) 12/04/09
 - PLB Harness – V845-774985-001 (New) 12/04/09
 - PLB Harness – V845-774986-001 (New) 12/04/09 (U/R)
 - PLB Harness – V845-774784-005 (Mod)
 - New Build Harness Leg – V845-774787-001 12/10/09

- Issues/Concerns

- None



STS-132 Integrated Launch Site Requirements Review

Presenter	Kenneth Nowak	
Date	09-24-09	

Overview

- SSP System Drawings **No Issues***
- SSP Authorized Modifications/Non-Standard Work **No Issues***
- SSP OMRS Changes (RCNs) **No Issues***

* Backup material included

STS-132

Launch Site Requirements Review

Flight Software Overview

Tom Stansel

USA FSW

PRCB 09/24/09

STS-132 LSRR (FSW)

- **STS-132/OV-104 Flight Software (FSW) Versions**
 - Fifth scheduled flight of Operational Increment (OI) 34 Flight Software (SASCB SCR 98107A documents PASS and BFS OI-34 content)
 - Fifth scheduled flight of MEDS IDP VI 07.00/MDUF VI 06.00 (SASCB SCR 98113 documents content)
 - Sixth scheduled flight of MAGRS-3S Link 613-996-008 Software (Link-008) (SASCB SCR 98115 documents content)
- **STS-132/OV-104 Flight Software Payload Support:**
 - ISS ULF4
 - Orbiter Interface Unit (OIU)
 - Sequential Still Video (SSV)
 - Payload Power Switching Unit (PPSU)
 - Trajectory Control System (TCS)
 - ISS Caution and Warning (ISSCW)
 - Assembly Power Converter Units (APCUs) & Station to Shuttle Power Transfer System (SSPTS) (generic support for both configurations)
 - Mini Research Module 1 (MRM1)
- **Major New Flight Software Support Items:**
 - None

STS-132 LSRR (FSW)

- **STS-132 Source Changes/Edits for Primary Flight Software (Base)**
 - SCR 93211A Update of SSMEC Vehicle Data Table (VDT) for Enhanced Accelerometer Operations
 - SCR 93262A Film ET Camera
 - SCR 93267A Removal of the Set and Reset to False Cmds For the RCS Tank Iso Valves
 - SCR 93284 Update PASS HUD Body Flap Warning Limit K-Load
 - DR 126366 SM GPC Failure to Send GCIL Commands
- **STS-132 Patch Implementation for Primary Flight Software**
 - None.
- **STS-132 Patch/Edit Implementation for Backup Flight Software (Base) (included on delivered Mass Memory)**
 - SCR 93282 Update PASS/BFS HUD Body Flap Warning Limit K-Loads
- **Potential MEDS IDP SW VI 07.01 Point Release applicable to STS-132 (pending SASCB approval)**
 - DR 121432A Corrupted DK Bus Message Causes IDP Software to Halt

STS-132 LSRR (FSW)

- **Products**

- **STS-132/OV-104 Base delivery schedule (available to field)**

FPSB

- **Shuttle Data Tape**
 - **Mass Memory Unit**

October 16, 2009

October 30, 2009

- **An STS-132/OV104 ADTL SDT/Mass Memory may be required**

- **Decision to generate these products will be made in November, 2009**

FPSB

- **ADTL Shuttle Data Tape**
 - **ADTL Mass Memory Unit**

February 05, 2010

February 15, 2010

- **Open Items**

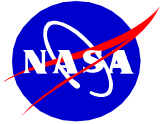
- **None**

- **Concerns/Issues**

- **No issues or concerns with STS-132 at this time**



SPACE SHUTTLE PROGRAM
Space Shuttle Orbiter Project Office
NASA Johnson Space Center, Houston, Texas



STS-132 LSRR Flight Crew Equipment/GFE		Presenter MV6/Bill Lane	
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STS-132 LSRR FCE/GFE Status

Kenneth Brown
Manager, GFE & Flight Crew Equipment Office
Johnson Space Center



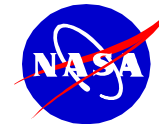
STS-132 LSRR
Flight Crew Equipment/GFE

Presenter MV6/Bill Lane	
Date Sep 24, 2009	Page 2

- **All GFE hardware delivery dates were partnered at CIR**
- **Tech orders and hardware list noted in backup charts, reference only**
- **No modifications planned for STS-132**
- **Starboard TSA manifested to contain OFK items but exact configuration TBD (likely will fill to max capacity)**
- **Based on DSR-25 clock reset issues experienced in flight (FIAR JSCEV1676F), the VTR may be replaced**



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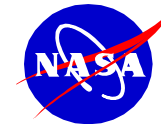
STS-132 LSRR
Flight Crew Equipment/GFE

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BACKUP



SPACE SHUTTLE PROGRAM
Space Shuttle Orbiter Project Office
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STS-132 LSRR
Flight Crew Equipment/GFE

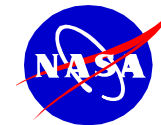
Presenter MV6/Bill Lane	
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Tech Order numbers are identified for reference only. Report generated Sep 9, 2009.

Hardware	Tech Order	KSC Eng Need	Eng(TO) Release	In MEC	Cert O/C	HDW Need	HDW Planned	Comments	JSC Contact
A (port forward)	M072-750025-076	1/26/10	1/17/07	7/1/09	C	2/26/10	2/26/10	Camera/PTU from STS-130 which lands 2/16/10. Plan for assy ready for installation 5 days after removed from OV-105 (if expedite required).	Randall Moore
B (port aft)	M072-750025-077	1/26/10	1/17/07	7/1/09	C	2/26/10	2/26/10	Camera/PTU from STS-130 which lands 2/16/10. Plan for assy ready for installation 5 days after removed from OV-105 (if expedite required).	Randall Moore
C (starboard aft)	M072-750025-078	1/26/10	1/17/07	7/1/09	C	2/26/10	2/26/10	Camera/PTU from STS-130 which lands 2/16/10. Plan for assy ready for installation 5 days after removed from OV-105 (if expedite required).	Randall Moore
D (starboard forward)	M072-750025-079	1/26/10	1/17/07	7/1/09	C	2/26/10	2/26/10	Camera/PTU from STS-130 which lands 2/16/10. Plan for assy ready for installation 5 days after removed from OV-105 (if expedite required).	Randall Moore
Payload Ops camera	M072-340109-TBD	12/8/09		7/1/09	O	1/8/10	1/8/10	Keel Camera from STS-127/OV-105. 6 month life limit on camera pressurization. JSC requests a later delivery date to allow margin on the life limit.	Randall Moore
SRMS elbow camera	M072-544504-014	1/26/10	8/4/08	7/1/09	C	2/26/10	2/26/10	Camera/PTU from STS-130 which lands 2/16/10. Plan for assy ready for installation 5 days after removed from OV-105 (if expedite required).	Randall Moore
SRMS wrist camera	M072-544504-008	1/26/10	8/4/08	7/1/09	C	2/26/10	2/26/10	Camera/PTU from STS-130 which lands 2/16/10. Plan for assy ready for installation 5 days after removed from OV-105 (if expedite required).	Randall Moore
Centerline Airlock Camera (stowed)	M072-660828-002, plus CCCD stow		3/17/99	7/1/09	C				Randall Moore
Lefthand Umbilical Camera (aft)	M072-705001-016	2/26/10	10/28/04	7/1/09	C	3/29/10	3/29/10	Ready to Roll out of OPF planned for 04/02/2010	Randall Moore
Righthand Umbilical Camera	M072-705001-028 M072-705001-027	2/26/10	10/28/04 10/28/04	7/1/09	C	3/29/10	3/29/10	Ready to Roll out of OPF planned for 04/02/2010	Randall Moore
Digital Television (DTV)	M072-710570-007		11/15/07		C				Larry Schmidt
MCIU/RMS Situational Awareness Display (RSAD)	M072-710543-001		3/7/00	7/1/09	C				Larry Schmidt



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STS-132 LSRR
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Tech Order numbers are identified for reference only. Report generated Sep 9, 2009.

Hardware	Tech Order	KSC Eng Need	Eng(TO) Release	In MEC	Cert O/C	HDW Need	HDW Planned	Comments	JSC Contact
Tools for Rendezvous and Docking (TRAD)	M072-730021-019		7/20/07	7/1/09	C				Larry Schmidt
Video Processing Unit (VPU)	M072-710338-007		3/2/08		C				Larry Schmidt
Wireless Video System (WVS)	M072-744007-001 UHF M072-344828-001 mount M072-744004-012 S-BAND M072-744004-013 S-BAND M072-744004-015 S-BAND M072-744004-016 S-BAND M072-744004-017 S-BAND M072-744004-018 S-BAND		6/2/04 8/24/04 3/21/08 3/21/08 3/21/08 3/21/08 3/21/08 3/21/08	7/1/09	C				Randall Moore
Space to Space Orbiter Radio (SSOR)	M072-344828-002 M072-740828-002 Harness		9/24/04	7/1/09	O				Larry Schmidt
RMS Sideview Camera (RSC)	M072-710281-002 M072-000416-006 camera	3/12/10	11/24/04	7/1/09	C	4/12/10	4/12/10	Camera from STS-130/OV-105 after repressurization.	Randall Moore
Wing Leading Edge (WLE) Instrumentation - Left Wing	M072-756111-007		8/21/07	7/1/09	C				Micheal Wright
Wing Leading Edge (WLE) Instrumentation - Right Wing	M072-756111-008		8/21/07	7/1/09	C				Micheal Wright
OBSS Sensor Package 2 *** (OPF)	M072-710282-006	1/26/10	4/18/08	7/1/09	C	2/26/10	2/26/10	SP2 from STS-129/OV-104	Larry Schmidt
OBSS SENSOR PACKAGE 1 ** (OPF)	M072-710282-008	1/26/10	4/18/08	7/1/09	C	2/26/10	2/26/10	SP1/PTU from STS-130/OV-105	Russell Yates



EVA Status STS-132/ULF-4 Launch Site Readiness Review

**Bridget Ziegelaar
EVA Office
Johnson Space Center
September 24, 2009**

- **Forward Bulkhead PFR**
 - Portable Foot Restraint, SED33105308-307 installed on forward bulkhead
 - Released T.O. M072-661568-029
 - Required to protect for contingency EVA TPS inspection
- **Lightweight Port TSA**
 - Port LWTSA installation – Tech Order: M072-660850-005
 - Port LWTSA Tools installation – Tech Order: M072-660853-002
- **Starboard TSA – contains OFK (not EVA hardware)**
 - Starboard LWTSA installation – Tech Order: M072-660850-006
 - Starboard LWTSA Cushion installation – Tech Order: M072-660859-001
- **Winches**
 - Winch P/N SED33101570-327 on Forward Bulkhead
 - Winch P/N SED33101570-325 on Aft Bulkhead
- **Forward work to determine location of High Strength Bridge Clamps (HSBC) to support MRM-1 contingency operations**
 - In work with MOD and Cargo Engineering



STS-132 Integrated Launch Site Requirements Review

Presenter **Kenneth Nowak**

Date **09-24-09**

Backup Material

- **SSP Systems Drawings** Attachment 1
- **SSP Authorized Modifications/Non-Standard Work** Attachment 2
- **SSP OMRS Waivers and Exceptions** Attachment 3
- **Launch Window** Attachment 4
- **Open Configuration Waivers** Attachment 5



STS-132 Launch Site Requirements Review	Presenter MK-SIO / A. Swift	
	Date 09-24-09	Page 1

Mandatory RCNs:

NONE

Non-Mandatory Value Added RCNs:

NONE



STS-132 Integrated Launch Site Requirements Review

Presenter **Kenneth Nowak**

Date **09-24-09**

SSP System Drawings

The Drawings Baseline Was Released By PRCB S0115132 on 08-20-09

- **V072-000001-288** (Rev. WC01) Space Shuttle System (Rel. 09-02-09)
 - **V072-200212-001** (Rev. NEW) Mission Equipment Cargo Support (Rel. 06-30-09)
 - **SGD32104455-401** (Rev. TBD) Crew Compartment Configuration (Rel. TBD)
 - 402** Descent
 - **V070-000001-004** Orbiter General Assembly
 - **V070-410100-018** SSME Installation
 - **10100-0061-180** Integrated SRB General Assembly (BI-143)
 - **80901000000-530** External Tank Assembly (ET-136)

- **STS-132 LSRR + 18 days Mission Configuration Product Plan (MCPP) will be published on 10-12-09 and will be republished at ORR -14 days on TBD.**



STS-132 Integrated Launch Site Requirements Review

Presenter **Kenneth Nowak**

Date **09-24-09**

SSP System Drawings – (Continued)

Ferry Configuration

- **V072-000001-289** (Rev. WC01) Space Shuttle System Drawing (Rel. 09-02-09)
 - **V072-200212-002** (Rev. NEW) Mission Equipment Cargo Support (Rel. 06-30-09)
 - **SGD321004455-001** (Rev. TBD) Crew Compartment Configuration (Rel. TBD)
 - **V072-300055-025** (Rev. BU) Ferry Flight Configuration (Rel. 05-11-09)

SCA 911



STS-132 Integrated Launch Site Requirements Review

Presenter **Kenneth Nowak**

Date **09-24-09**

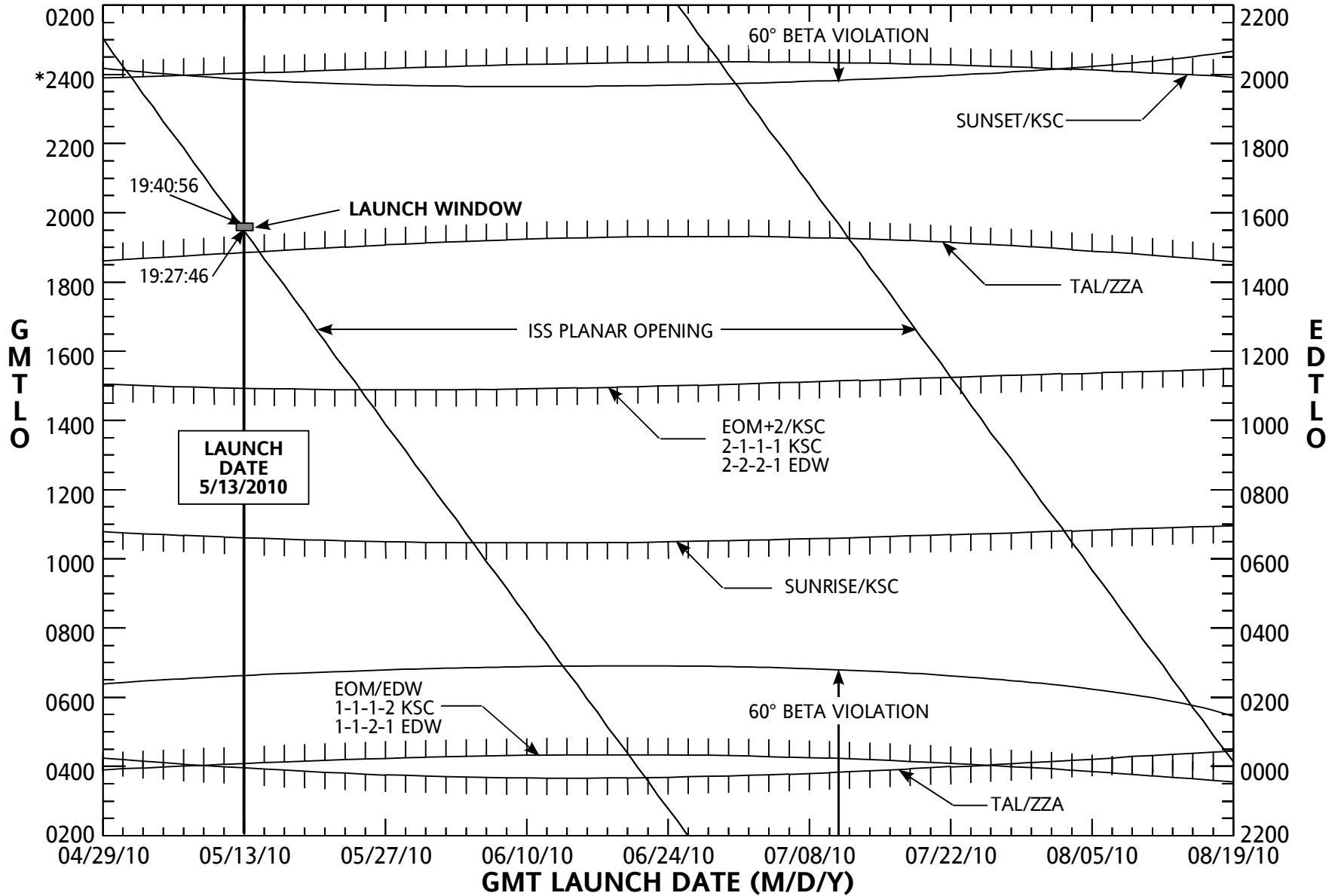
Modification Impact Report

- **Mission Equipment Modifications and Orbiter Modifications analyzed for impacts to OMRSD, LCC, ICD, EMI, Software, and GSE.**
- **A total of 3 MCRs have been approved and/or pending mods**
- **Current MCR impact status:**
 - **No impacts for all six disciplines** **3**
 - **One or more disciplines with impacts, documentation approved and/or pending approval** **0**
 - **Possible impacts still under review** **0**

Mission Duration = 11+1+2
 Inclination = 51.6°
 OMS2 ha/hp = 124 x 85 nmi.
 Target ha/hp = 203 x 198 nmi.

STS-132 OCF LAUNCH WINDOW

N. Wortham/USH-483L
 P. Gentry/USH-483L
 May 14, 2009



Note: EOM lighting lines, based on an OMS2 phase angle of 178 deg, are representative only.

The ISS beta angle ($|\beta| < 60^\circ$) for mated operation is beginning ~ 1/20:43:08 MET (FD3 Rendezvous) and ending ~ 9/15:22:00 MET.

* Indicates the dateline. Launch times above this point are on subsequent days from the date indicated on the corresponding date axis

1MRC5 REPT. 4650-1
PAGE NO. 1

SSP SUMMARY MOD ITEMS - PRCBD MOD BASE LINE STS-0132

ORB

ECP-MCR/KIT SEQUENCE

RUN TIME

17:48 DATE 09/16/2009

PRCB	STAT	ITEM/KIT NUMBER	SEQ	
MCR/ECP	PRIO	TCTI NUMBER	EISN NO.	DESCRIPTION / GENERAL REMARKS
AUTHDATE	SITE			
	FLT			
S-J6275A	AUTH MAND KSC 032	J6275A	0104 002	ORBITER STRUCTURE IML SURFACE CORROSION SAMPLING INSPECTION CORROSION SAMPLING CAPABILITIES WILL BE PROJECTED AT THE LSFR, AND FINALIZED AT DLSFR FOR EACH FLOW.
2008-02-26				
S-J6341A	COMP MAND KSC 032	J6341A	0104 001	EVALUATION OF OMS POD LI-900 TILE INSTALLED ON 0.090" SIP TILES REMOVED AND REPLACED DURING FLT 30 PROCESS.
2008-04-09				
S-J6399	AUTH MAND KSC 032	J6399	0104 001	0-GAUGE PROTECTION FOR OV-104, FLIGHTS 31-35
2008-10-03				
S-J6410	AUTH MAND KSC 032	J6410	0104 001	AFT STUB CRACKED TILE INSPECTION
2008-09-18				
S-J6414A	AUTH MAND KSC 038	J6414A	0103 000	RUDDER SPEED BRAKE THERMAL TAB INSPECTION
2008-12-19				
S-J6501	AUTH MAND KSC 032	J6501	0104 001	STS-129 CIH CLOSE CLEARANCE MEASUREMENTS POST FLIGHT WORK
2009-04-28				

S-J6516A	AUTH J6516A	0104 001	WLE JOGGLE REGION IR THERMOGRAPHY REQUEST FOR HIGH LINE SCAN
	MAND		
	KSC	SPAR	WF PANELS
2009-06-16	032		
S-J6527	AUTH J6527	0104 001	FRCS THRUSTER CANISTER STUD INSPECTIONS - F5R AND F5L
	MAND		
	KSC	SPAR	OV-104 (FRC4) FLT 32
2009-07-02	032		
S-J6528	AUTH J6528	0104 001	PUTTY REPAIR TILE REPLACEMENT FOR RISK REDUCTION
	MAND		
	KSC	SPAR	OV-104 FLT. 32
2009-07-06	032		
TOTAL MODS =			9

1MRCS REPT. 4650-1
PAGE NO. 2

SSP SUMMARY MOD ITEMS - PRCBD MOD BASE LINE STS-0132

PIH

ECP-MCR/KIT SEQUENCE

RUN TIME

17:48 DATE 09/16/2009

PRCB	STAT	ITEM/KIT NUMBER	SEQ	
MCR/ECP	PRIOR	TCTI NUMBER	EISN NO.	DESCRIPTION / GENERAL REMARKS
AUTHDATE	SITE			
	FLT			
008851	APPD	TCTIM0008851REF	0001 000	ADD HARDWARE REQUIREMENTS IN SUPPORT OF STS-132
NOT REQD	MAND			
032	KSC			ADDED PER THE RELEASE OF EO V787-340035 A02

TOTAL MODS = 1

Approved STS-132 OMRS Waivers and Exceptions

WVR EXC	ELEMENT PROJECT	PRCBD NUMBER WAIVER# (STAT) (INITIAL STS)	ABSTRACT RAS REQUIREMENTS	EISN PAYLOAD	STS BEG END	
+	E	ORB	S053298ZC EK10572R1 (A)	OMRSD EXCEPTION REQUEST - MISSION LIFE ASSESSMENT OF WING LEADING EDGEINSULATORS (EK10572R1)	104	029 033
			S053298ZD EK10574R1 (A)	OMRSD EXCEPTION REQUEST - WING LEADING EDGE INSULATORS (EK10574R1)	104	029 036
			S053299AQ EK10592 (A)	OMRSD EXCEPTION REQUEST - DRAG CHUTE DEPLOY SYSTEM 2 LIGHT FAILU RE(EK10592)	104	029 032
			S053299AT EK10593 (A)	OMRSD EXCEPTION REQUEST - DRAG CHUTE DEPLOY SYSTEM 2 LIGHT FAILU RE(EK10593)	104	029 032
	W	ET	S053293FZ WK03850R1 (A) (STS-093)	L02/LH2 TANK PRESSURE MONITOR FOR MOVE	ET	099 999
		OMS	S053298NV WK10522 (A)	OMRSD WAIVER REQUEST - RIGHT OMS SECONDARY REGULATOR CREEP RATE(W K10522)	0021	035 043
			S053299YG WK10723 (A)	OMRSD WAIVER REQUEST - RIGHT OMS FUEL CV501 ELEMENT 4 LEAK CHECK FAIL(WK10723)	0021	038 040
		ORB	S053299BLR1 WK10600R2 (A)	OMRSD WAIVER REQUEST - OXYGEN SYSTEM 1 RELIEF VALVE FAILED RESEA	104	029 032

		TLEAKAGE (WK10600R3)		
RCS	S053296GY WK10188R1 (A)	OMRSD WAIVER REQUEST - LRCS OXIDIZER GHE ISOLATION VALVE LEAK(WK 10188R1)	0014	025 032
	S053296YG WK10318R1 (A)	OMRSD WAIVER REQUEST - RIGHT RCS OXIDIZER GHE SYSTEM INTERNAL LEA KAGE(WK10318R1)	0021	034 042
	S053298JF WK10503 (A)	OMRSD WAIVER REQUEST - RRCS OX TANKOUTLET TRANSDUCER ACCURACY (WK 10503)	0021	034 042

Approved STS-132 OMRS Waivers and Exceptions

WVR EXC	ELEMENT PROJECT	PRCBD NUMBER WAIVER# (STAT) (INITIAL STS)	ABSTRACT RAS REQUIREMENTS	EISN PAYLOAD	STS BEG END
W	RCS	S053299GW WK10634 (A)	OMRSD WAIVER REQUEST - LEFT REACTION CONTROL SYSTEM FUEL GHE ISO LATIONVALVE LEAKAGE (WK10634)	0014	030 032
SRB		S053293WA WK03886 (A) (STS-103)	LH FWD AND RH MID SRB JOINT TEMP SENSORS	BI	099 999

	Waivers	Except	Deviat	Cannib	Total
Total Extracted	9	4	0	0	13

VEHICLE LIMITED LIFE STATUS REPORT

PRELIMINARY SUBMITTED 09/17/2009

NO.	SYS	REQT / PART DESC / PART NO	TOP / SEPAR	ANTICIPATED ACTION	CONSTR	ELE
1	PYRO	C00AA0.110.032 NASA STANDARD DET. SEB26100094-201	V5032.004 V5029.001	REMOVE/INSTALL	2	O
2	PYRO	C00AA0.110.033 CARTRIDGE SKD26100098-301	V5032.004 V5127	REMOVE/INSTALL	2	O
3	PYRO	C00AA0.110.034 AFT ATTACH BSTR CART. SKD26100099-401	V5032.004 V5029.001	REMOVE/INSTALL	4	O
4	PYRO	C00AA0.110.035 NLG THRUSTER CART. SKD26100100-301	V5032.004 V5127	REMOVE/INSTALL	2	O
5	PYRO	C00AA0.110.043 GAS PRESS CTG. SEB26100001-25X	V5056	INSTALL	4	O
6	PYRO	C00AA0.115.001 GAS SAMPLER BATTERY SED33101116-321	V5012.001 V5029.004	REMOVE/INSTALL	4	O
7	INS	C00AA0.140.004 MADS TAPE RECORDER ME435-0055-0003 THRU 0005	S0007 V1200 V1248	TEST	4	O
8	COM	C00AA0.160.001 GPS RECEIVER (GPS MAGR'S) MC478-0153-0001	V5A71 SEPAR-TBD	R/R BATTERIES EVERY 12 MONTHS	4	O
9	MEQLG	C00AB0.010.003 NLG TIRE MC194-0007-0006 (2)	V1165.003 V1165.004	REMOVE/INSTALL	2	O
10	MEQLG	C00AB0.010.004 MLG TIE BOLTS & NUTS MC621-0051-0038 (4 WHEELS)	V1165.001 V1165.002	REMOVE/INSTALL	2	O
11	MEQLG	C00AB0.010.005 MAIN WHEEL ASSEMBLY MC621-0051-0038 (4)	V1165.001 V1165.002	REMOVE/INSTALL	2	O

Constraints

1=ET/SRB MATE 3=VAB ROLL
2=OPF ROLL 4=LAUNCH

Elements

O=ORBITER
M=MISSION EQUIP.

VEHICLE LIMITED LIFE STATUS REPORT

PRELIMINARY SUBMITTED 09/17/2009

12	MEQLG	C00AB0.010.006 NOSE WHEEL ASSEMBLY MC621-0050-0004 (2)	V1165.003 V1165.004	REMOVE/INSTALL	2	O
13	PYRO	C00AB0.015.004 DRAG CHUTE DOOR FRAME V070-524153-005	TPS-TBD SEPAR-TBD	REMOVE & REPLACE	2	O
14	PLM	C00AB0.160.020A VIDEOSPECTION CAMERA ASSY SED39125120-310	TPS-TBD	REMOVE/REFURB/INSTALL	4	O
15	TPS	C00AB0.170.001 RCC ARROWHEAD PLATE MC621-0007-7009	V5139.001 V5139.002	REMOVE/INSTALL	2	O
16	TPS	C00AB0.170.002 RCC ARROWHEAD PLATE MC621-0007-7010	V5139.001 V5139.002	REMOVE/INSTALL	2	O
17	STR	C00AB0.180.527A LOWER GAP SEAL INSULATOR V070-199843-002	TPS-TBD SEPAR-TBD	REMOVE & REPLACE EXCEPTED (EK10575R1) THRU 104/31	2	O
18	MEQ	C00AD0.025.001 ET PURGE CURTAIN NUT PLATES ME114-0035-0400	TPS-TBD SEPAR-TBD	REMOVE & REPLACE	4	O
19	PYRO	C00AD0.030.009 SPHERICAL BEARING ASSY V070-562036-002	V5032.004 V5127	REMOVE/INSTALL	2	O
20	PYRO	C00AD0.030.012 PYRO CENTERING MECHANISM SKD26100098-501	V5032.004 V5127	REMOVE/INSTALL	2	O
21	MPS	C00BA0.010.009 SSME ATTACH NUTS MD114-3007-0014	V5005 SEPAR-TBD	REMOVE & REPLACE	2	O
22	PLM	JSC24937.30 PORTABLE FOOT RESTRAINT ASSY SED33105308-307	V5L44.001 TC09-081	REMOVE/REFURBISH/INSTALL	2	M

Constraints

1=ET/SRB MATE 3=VAB ROLL
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Elements

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VEHICLE LIMITED LIFE STATUS REPORT

PRELIMINARY SUBMITTED 09/17/2009

23	FCS	JSC24937.56 EMER EGRESS SLIDE SYS MC623-0015-0023	TPS-TBD	REMOVE/INSTALL	4	M
24	ECLSS	V61AIL.010-C LIOH CANNISTER MC621-0008-0409	TPS-TBD	INSTALL AT PAD	4	O
25	ECLSS	V61AIL.015-C HYDRAZINE (CO RMVL CART.) MC621-0008-0060	TPS-TBD	INSTALL AT PAD	4	O
26	ECLSS	V61AIL.016-C ATCO CARTRIDGE MC250-0024-0001	TPS-TBD	INSTALL AT PAD	4	O
27	ECLSS	V61AJ0.141 PPO2 SENSOR MC250-0002-3165	V1053.010	RECALIBRATE SENSORS AT PAD	4	O
28	FCS	V66AIL.060 POLE CREW ESCAPE SYS ASSY SED27101375-322	TPS-TBD	REMOVE/INSTALL	4	O
29	COM	V74AD0.130 MSBLS RF #1, 2 & 3 MC409-0017-0007	OMI-TBD SEPAR-TBD	PERFORM 15 MINUTE TEST	4	O

Constraints

1=ET/SRB MATE 3=VAB ROLL
2=OPF ROLL 4=LAUNCH

Elements

O=ORBITER
M=MISSION EQUIP.