



STS-132 SSP Flight Readiness Review

MS/Tony Griffith
April 28, 2010



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Agenda

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- **Systems Engineering & Integration**
 - SE&I FRR Roadmap
 - Flight Preparation Readiness
 - Integrated Debris Risk Summary
 - Integrated In-flight Anomalies (IFAs)
 - Integrated Hazard Report Summary
 - Imagery Status
 - Radar Status
 - Flight Software Readiness
 - Payload and General Support Computer Readiness
 - Non-Standard Open Work Summary
 - Alternate/Dissenting Opinions
 - Certificate of Flight Readiness
 - Launch On Need (LON)

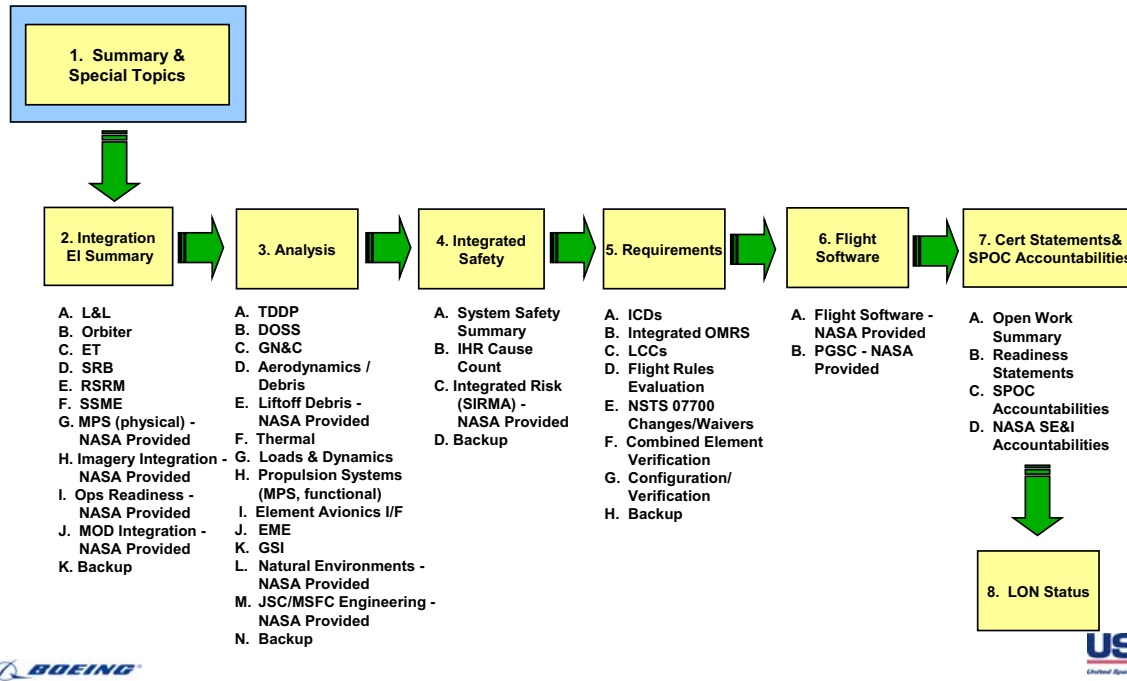




SE&I FRR Roadmap

Presenter MS/Tony Griffith

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Flight Preparation Readiness

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- **All standard Systems Engineering and Integration flight preparation activities have been completed or are planned. Non-standard open work will be addressed.**
 - System requirements verification
 - Design requirements and induced environment updates; verification of element incorporation
 - Integrated vehicle performance evaluation
 - Real-time mission support preparation and certification of personnel as applicable
 - Review and disposition of waivers, deviations, and exceptions
 - Updates to Integrated Hazards baseline
 - Flight Software verification/Payload and General Support Computer (PGSC) Readiness
 - Review of element requirements changes and verifications for integration impacts





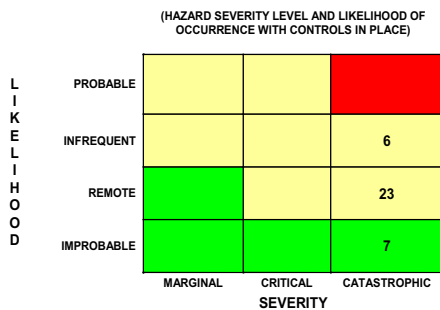
STS-132 SSP FRR	Presenter	MS/Pedro Lopez
	Date	4/28/10

STS-132 Debris Risk Summary

Pedro Lopez, MS2
Systems Engineering & Integration Office
Space Shuttle Program Office



STS-132 Debris Risk Assessment Summary	Presenter	MS/ Pedro Lopez
	Date	4/28/10



- 6 Infrequent Causes:**
- Liftoff Debris (AD)
 - ET Umbilical Ice (V)
 - Orbiter Putty Repair (AK)
 - T-0 Umbilical Ice (AO)
 - LO2 IFR (I)
 - Intertank acreage (G)

Debris Risk Assessment, 4/2010

Six IDBR-01 debris risks remain Infrequent/Catastrophic

- **Liftoff Debris** is expected to remain at this risk level for the life of the Program due to the diversity of potential Debris sources although rigorous controls have been implemented and continuous vigilance is policy.
- **ET Umbilical Ice**: Accepted Risk; Closely monitored during pre-launch
- **Putty Repair**: Windows zero impact allowable keeps any impact in the “catastrophic” category, forward work may be used to reduce the likelihood to “Remote”.
- **T-0 Umbilical Ice**: Accepted Risk; NSTS 08303 Updated to include 0.1 lbm allowable external ice
- **LOX IFR**: Implemented NDE of all IFR ramps to screen for large voids
- **ET Intertank Foam Loss**: Changed to Infrequent Catastrophic for STS-128
 - Continued Tensile Testing of ET high risk debris areas to mitigate risk





Issues & Integrated In Flight Anomalies

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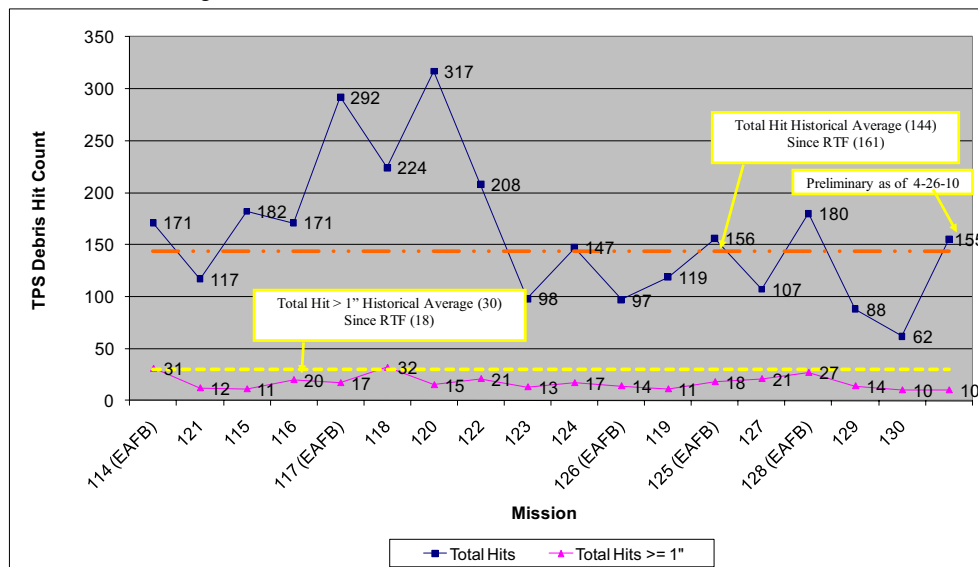
- **STS-131-I-001 – Unexpected Debris/Expected Debris Exceeding Mass Allowable Prior to Pad Clearance (Liftoff Debris)**
 - Associated Hazard Report: IDBR-01 Cause AD - Infrequent Catastrophic
- **STS-131-I-002 – Rudder Speed Brake TPS Liberation**
 - Partial tile released from aft edge of rudder speed brake during ascent
- **STS-131-I-003 – Windows 5, 6 Missing/Protruding Ceramic Plugs**
 - One missing ceramic plug at Window 6, and two protruding ceramic plugs at windows 5 and 6



**Orbiter Debris Impact summary
 STS-131, OV-103**

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- TPS Hits w/damage > 1" = 10 (8 lower surface, 1 L OMS, 1 R OMS, 0 windows) (Total # of Hits = 155)
 - Prior to RTF Average for Lower Surface Hits >1" = 30; Since RTF = 18



STS-131 elliptical volume Hits>1" = 0.792 in³; RTF Average = 2.388 in³
STS-131 Total elliptical volume ALL Hits = 1.33 in³; RTF Average = 3.461 in³

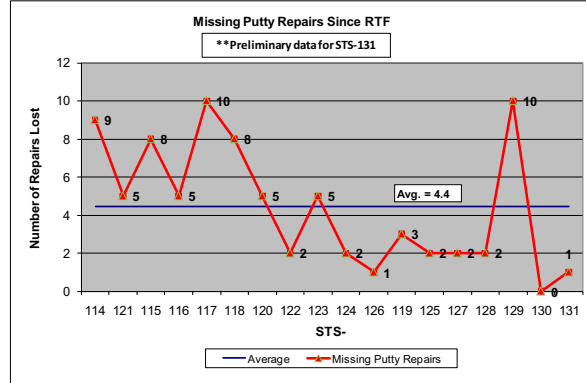




STS-131 Putty Repair Debris Summary		Presenter	MS/ Pedro Lopez
		Date	4/28/10

- TPS putty repairs are listed as expected debris in NSTS 60559
- Putty Repair loss is listed in IDBR-01 as cause AK and carried as an Infrequent/Catastrophic Risk primarily because Windows have zero capability for impacts
- STS-131 Putty repair preliminary look shows one loss
 - Missing putty repair on RH chine tile

- **OPO/TPS PRT continues risk reduction steps**
 - Allowable Repair filler volume was reduced to limit putty repair masses
 - Tile Undercut revised for new repairs
 - Process/tooling/Training enhanced
 - Tiles with large repairs are being removed in critical areas FWD of the RCC and windows
 - Inspections continue (Tactile Test & Minimum gap inspections) and Tiles to be removed are ranked by size/location/repair type
 - CHIT's will be initiated and a subset of tiles removed every flow until EOP



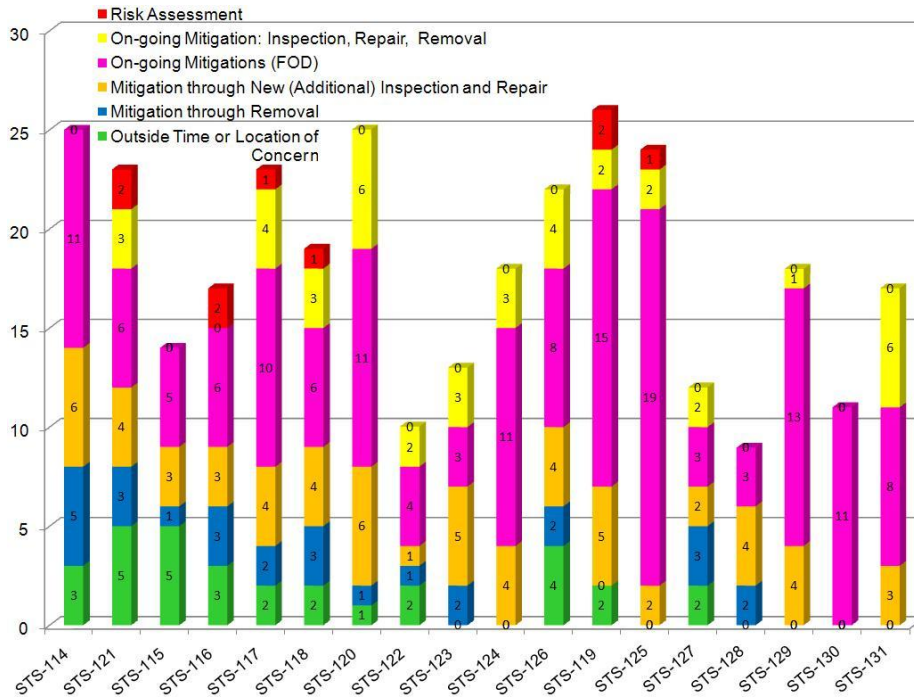
STS-131-I-001 Liftoff Debris		Presenter	MS/ Pedro Lopez
		Date	4/28/10

- Several pieces of debris were found on pad post-launch or were captured in imagery observations.
- Liftoff debris risk is currently characterized as infrequent, catastrophic due to significant uncertainties in controls and significant limitations in analysis.
- Debris release has been mitigated for identified potential sources of critical debris by performing repairs and adding inspections for system-level components. Ongoing mitigations include FOD awareness, attrition-based hardware removal, routine inspections and monitoring for facility corrosion.
- Preliminary Risk Assessment indicates that given the proposed and anticipated mitigations, observed debris poses no appreciable increase in risk.
 - No changes to NSTS 60559 are anticipated as result of IIFA closure
- IIFA STS-131-I-001 was closed at the 4/27/10 SICB



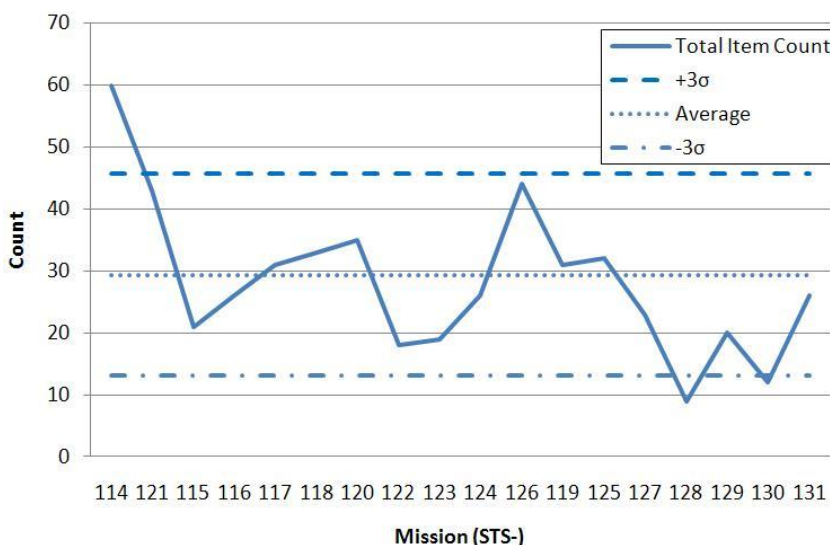


Summary of Liftoff Debris Categories		Presenter	MS/ Pedro Lopez
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STS-114 through STS-131: Liftoff Debris Instance Chronology		Presenter	MS/ Pedro Lopez
		Date	4/28/10

Total Item Count Trend



	Total
+3σ	45.65
μ	29.38
-3σ	13.12
STS-131	26

Baseline established with data from STS-114 through STS-127.

STS-131 debris count is slightly below the baselined IIFA average.



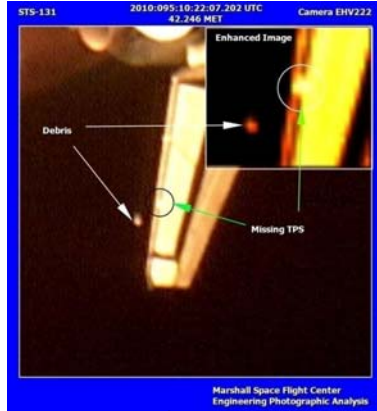


STS-131-I-002: Rudder Speed Brake TPS Liberation

Presenter **MS/ Pedro Lopez**

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- A single piece of debris was observed at 42.232 sec MET near the vertical stabilizer, aft of the trailing edge of the port speed brake. A residual feature was visible on the speed brake, indicating material loss
- Upon further review, additional debris events were identified possibly originating from this area
 - Events observed at -3.1 and 33.2 sec MET
- RSB Tile currently classified as unexpected debris
 - Inspection performed on OV-104 RSB tiles to date might not preclude similar event as STS-131
 - DTA in work to support IIFA closure rationale
- ECD: 05/04/10 SICB



Release of largest piece



On-Orbit Image showing loss dimensions

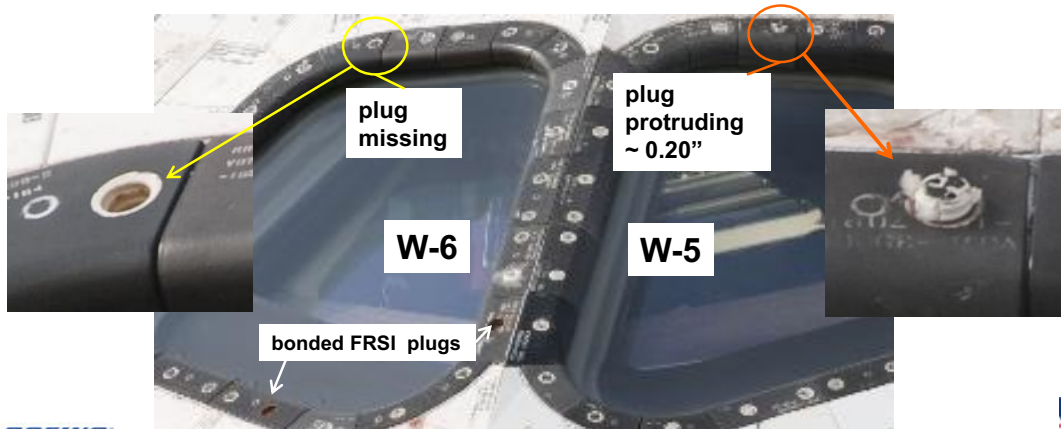


STS-131-I-003: Windows 5, 6 Missing/Protruding Ceramic Plugs

Presenter **MS/ Pedro Lopez**

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- During post-landing inspection, several ceramic plugs were found protruding or missing
 - Protruding ceramic plugs at Windows 5 and 6
 - Missing ceramic plug at Window 6
 - Re-review of RPM imagery showed this plug was present on-orbit, thus released during entry
- Orbiter window ceramic plugs currently classified as unexpected debris
 - OPO assessing possible rework at pad for accessible short plug locations
 - DTA in work to support IIFA closure rationale
- ECD: 05/04/10 SICB





STS-132 SSP Flight Readiness Review

Integrated Hazard Report and Integrated In-flight Anomalies Summary

MS3/JJ Hill
April 28, 2010



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Integrated Hazard Report Changes Since STS-131

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- There were no STS-131 unique IHR updates required.





**Integrated In-flight Anomalies(IFAs)
 Summary**

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- STS-131-I-001 “Unexpected Debris/Expected Debris Exceeding Mass Allowable Prior to Pad Clearance (Liftoff Debris)”
 - Status – Dispositioned
- STS-131-I-002 “Rudder Speedbrake TPS Liberation”
 - Status – ECD 05/04/10
- STS-131-I-003 “Windows 5, 6 Missing/Protruding Ceramic Plugs”
 - Status – ECD 05/04/10
- STS-130-I-005 “SSME #2 Nozzle Heating Indications”
 - Status – ECD 04/30/10



Integrated In Flight Anomalies (IIFAs)

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IFA Number : Title Description	STS-132 Status and Rationale
<p>▪STS-131-I-001: Unexpected Debris/Expected Debris Exceeding Mass Allowable Prior to Pad Clearance (Liftoff Debris)</p> <p>▪Multiple pieces of debris were found on pad post-launch that include corrosion, liberated pad hardware, and foreign object debris or were captured in imagery observations</p>	<ul style="list-style-type: none"> • Risk Assessment indicates that given the proposed mitigations, observed debris poses no appreciable increase in risk. • Liftoff debris risk is currently characterized as infrequent, catastrophic due to significant uncertainties in controls and significant limitations in analysis. • Debris release has been mitigated for identified potential sources of critical debris by performing repairs and adding inspections for system-level components. Ongoing mitigations include FOD awareness, attrition-based hardware removal, routine inspections and monitoring for facility corrosion. <p>•Status – Dispositioned</p>





Integrated In Flight Anomalies (IIFAs)



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IFA Number : Title Description	STS-132 Status and Rationale
<p>▪STS-131-I-002: Rudder Speedbrake TPS Liberation</p> <p>▪A single piece of debris was observed near the vertical stabilizer, aft of the trailing edge of the port speed brake.</p> <p>▪Debris was confirmed to be tile from the RPM Imagery. No impacting debris was identified in this area. No out-of-experience motion from the Speed Brake or Vertical Stabilizer was identified.</p> <p>▪Post-flight imagery confirmed partial tile released.</p> 	<p>•Debris Transport Analysis and Risk Assessment in work</p> <p>Status – ECD 05/04/10</p>



Integrated In Flight Anomalies (IIFAs)

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IFA Number : Title Description	STS-132 Status and Rationale
<p>▪STS-131-I-003: Windows 5, 6 Missing/Protruding Ceramic Plugs</p> <p>•During post-landing inspection, several ceramic plugs were found protruding or missing.</p> <ul style="list-style-type: none"> •Protruding ceramic plugs at Window 5 (~ 7mm and at Window 6 (~ 245mm) •Missing ceramic plug at Window 6. Re-review of RPM imagery showed this plug was installed and visible.  	<p>•Debris Transport Analysis and Risk Assessment in work</p> <p>•Status – ECD 05/04/10</p>





Integrated In Flight Anomalies (IIFAs)

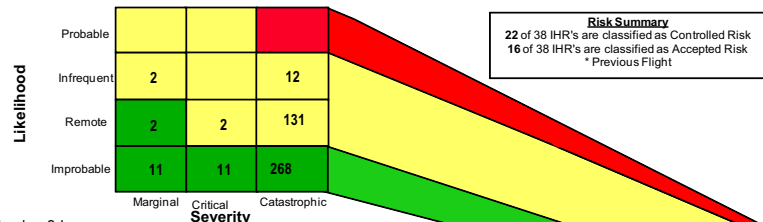
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IFA Number : Title	Description	STS-132 Status and Rationale
<p>•STS-130-I-005: SSME #2 Nozzle Heating Indications</p> <p>•Post flight inspections of nozzle 5014 (SSME 2061) showed multiple discrepancies that appear to be related to thermal exposure (discoloration on hotwall coolant tubes, external TPS, and paint; damaged TPS screen).</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Damaged Screen on "top" of drain line #4 at hat band (HB) 5</p>  </div> <div style="text-align: center;"> <p>SSME 2 Eng 2061</p>  </div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Discolored Paint at HB 6</p>  </div> <div style="text-align: center;"> <p>Bluing at HB 5 & 6</p>  </div> </div>	<p>•Considered liftoff environment including Hydrogen Burn-Off Igniter (HBOI) and free-burning H2 as potential source of heating, but imagery assessment showed not in area of concern.</p> <ul style="list-style-type: none"> • Free-burning H2 would not cause critical damage to nozzle <p>•Considered ascent thermal & RSRB vectoring due to STS-130 Wind Shear Event.</p> <ul style="list-style-type: none"> •Thermal Panel reviewed ascent heating; no indications of any abnormal aerothermal heating. •Low incident angle from RSRB plume to SSME nozzle area of concern <p>•Investigating heating sources during on-orbit and re-entry regimes. Still in work.</p> <ul style="list-style-type: none"> •Plan to do interim disposition for STS-132 <p>•Status – ECD 04/30/10</p>	



Integrated Hazard Risk Matrix

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Hazard Report #	Integrated Hazard Titles	Controlled				Accepted Risk						
		Controlled Risk	remote-marginal	improbable-marginal	improbable-critical	Accepted Risk	probable-marginal	infrequent-marginal	remote-catastrophic	probable-critical	infrequent-critical	probable-catastrophic
"Accepted Risk" Hazard Reports												
DBR-01	Ascent Debris Impact to SSV	7		7	29				23		6	
ICOM-01	Adverse Effects due to Intentional RF Environment	2		2	1				1			
EME-01	Adverse Electromagnetic Effects (EME)	0			18				18			
IGNC-01	Ascent Trajectory Event Anomaly	13		13	1						1	
IMEO-01	Hazardous Environment in the Aft Compartment	0			4				1		3	
IMPS-01	Contamination in the Integrated MPS H2 System	0			1				1			
IMPS-02	Contamination in the Integrated MPS O2 System	0			1				1			
IMPS-03	Improper IMPS configuration during SSME Operation	11			11				3			
IMPS-04	Off-Nominal Purges	11			11				1			
IMPS-09	Hazardous Environment due to H2 External to SSV	4			4				5		1	
INEV-01	Exposure to Natural Environment Exceeds Capability of the Space Shuttle SSV Elements	17	1	1	15	45	1	1	42		1	
ISPR-04	SRB Hold Down Post (HDP) System Malfunction	1			1				1			
ISPR-05	SRB Umbilical System Malfunction	3			3				1			
ITHM-01	Exposure to Thermal Environment Exceed Capability of SSV	15	1	5	2	7	3	1	1	1		
IVLD-01	Exposure to Induced Environments Exceed Structural Capability of SSV	22			22				26		26	
ILIT-01	Adverse Effects of Lightning	0							6		6	
Accepted Risk Distribution Totals		(see next page)				147	0	2	2	131	0	12





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Integrated Hazard Risk Matrix

"Controlled Risk" Hazard Reports															
IARO-01	Aerodynamics Environment not per Specified Design	1				1	0								
IEPD-01	Inability to Power Critical Functions	8			3	5									
IFSI-01	ET/SRB System Interface Failure	6				6	0								
IFSI-02	ET/Orbiter System Interface Failure	10				10	0								
IFSI-03	SSME/Orbiter System Interface Failure	14				14	0								
IFSI-04	Outer Mold Line Configuration Error	3				3	0								
IFSW-01	Flight Software Generic Problems can cause loss of vehicle command and control	1				1	0								
IFSW-02	Erroneous Inputs to Flight Software can cause loss of vehicle command and control	9				9	0								
IMEO-02	Malfunction of Integrated Hydraulic System (Systems 1, 2 and 3)	4				4	0								
IMEO-03	SSME Nozzle/OMS Pod/ Body Flap Interference	2				2	0								
IMPS-05	Over pressurization of the Integrated MPS H2 System	7				7	0								
IMPS-06	Under pressurization of the Integrated MPS H2 System	7				7	0								
IMPS-07	Over pressurization of the Integrated MPS O2 System	7				7	0								
IMPS-08	Under pressurization of the Integrated MPS O2 System	7				7	0								
IMPS-12	Excessive O2 from ET/Orbiter/SSME External to SSV	7				7	0								
IMPS-15	LO2 Geyser Event during Cryo Loading	8				8	0								
IMPS-16	Loss of MPS He System	4				4	0								
IMPS-17	Inadvertent SSME Shutdown	3				3	0								
IPYR-01	Pyrotechnic System Malfunction	11				11	0								
ISPR-02	ET Vent Arm System (ETVAS) Umbilical System Malfunction	14				14	0								
ISPR-03	Tail Service Mast (TSM) T-0 Umbilical System Malfunction	40		5	6	29	0								
IVLD-02	System Instability Results In Structural Failure of SSV	13				13	0								
Controlled Risk Distribution Totals		292	2	11	11	268	147	0	2	2	131	0	0	12	0



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Integrated Hazard Risk Matrix Count Changes

- Infrequent Catastrophic
 - None
- Remote Catastrophic
 - None
- Improbable Catastrophic
 - None





STS-132 SSP Flight Readiness Review

April 28, 2010



MS3/Beth St.Peter

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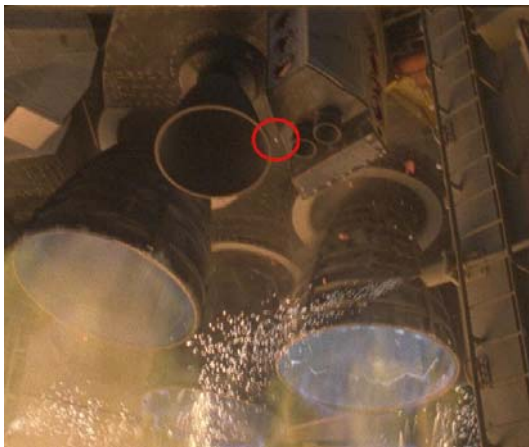
Open STS-131 NIRD Reportable Events

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Two NIRD Reportables are still Open (CoFR Exception), pending evaluation:

131-015 (-3.364 sec MET): Debris Falls Inboard of Orbiter Right OMS Pod Stinger

Small piece of debris observed falling aft inboard of the RH OMS pod stinger during SSME ignition (left image). RPM imagery was heavily shadowed in this area. Post landing inspection revealed tile loss from the RH OME Base Heat Shield (right image).



Camera E019



Tile loss from RH OME Base Heat Shield as seen post landing





Open STS-131 NIRD Reportable Events (cont.)

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New Reportable (**CoFR Exception**), pending evaluation:

131-022 (~527 sec MET): Possible Ice Spray From EO-2 Spherical Bearing

Possible spray of ice debris observed from the EO-2 spherical bearing bore hole. The spray lasts several seconds.



Imagery Hardware
ELVIS

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ET LO2 Feedline Camera (ET-136)

- Camera system installed and on schedule with nominal checkouts
- Ready to support. No open issues.

Ground Network & TV

- Nominal ISS trajectory ground station coverage
- Ready to support. No open issues.

SRB Cameras (BI-143)

- STS-131 Hardware Anomaly:
 - RH DAS VCR tape jammed and recording stopped at water impact
 - Unit shared between the ELVIS ET Obs camera & SRB parachute deployment camera
 - Required ET Obs & parachute deployment videos were recorded nominally prior to anomaly (reqmt: operate thru L+300sec)
 - Unit not planned for future use (no plans to repair)
- STS-132 Status:
 - Hardware installation and closeouts on schedule with nominal checkouts
 - Ready to support. No open issues.

Crew Handheld Digital Still Camera

- Ready to support. No open issues.

Crew Handheld High Definition (HD) Video Camera

- Ready to support. No open issues.





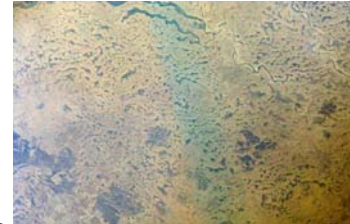
Imagery Hardware
ELVIS (cont.)

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Digital ET Thermal Protection System (DETTPS)

- No anomalies from STS-131 camera or flash hardware
- STS-132 camera configured for Daylight settings through June 9th
- STS-132 camera previously used as Crew HH camera on ISS Increment 16 (see images on right)
 - Images exhibited a faint blue-green streak from top to bottom, middle of FOV (same location on each image)
 - Same blue-green streak exhibited in Pre-Delivery Acceptance (PDA) test images
 - Plenty of overlap in images so not expected to be an issue
 - Another camera will not be ready in time to install
 - This unit was best available replacement given limited inventory, download speed, and bad pixel count
- Functional test performed in VAB on April 17th:
 - No issues with camera operation or download
 - Extra partial flash event between #18 and #19
 - Potentially related to a similar flash event seen during STS-123 (different flash module) where master flash module erroneously commands slave flash to discharge (due to unknown cause in Master flash)
 - If anomaly recurs, results in weaker flash on following flash event
 - No safety impact
- **Ready to support. No open issues.**

DETTPS Camera Settings	
• Daylight:	
• f/8, ISO 100, 1/250	
• Bracketing: 0EV=f/8, +1EV= f/5.6	
• Night	
• f/2.8, ISO 200, 1/250	
• Bracketing 0EV=f/2.8, +1EV= f/2.0	



Imagery Hardware
non-ELVIS

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Orbiter MiniCam

- STS-131 W4 imagery very dark prior to roll to heads up mnvr with non-optimal lighting (as expected)
- STS-132 configuration to optimize for daylight:
 - 12 mm lens – First use on STS-132 (4" clearance from window)
 - Fixed shutter speed (1/1000 sec)
 - Auto gain OFF
- STS-132 FRD includes requirement for crew downlink as time allows
- Analysis for bracket reconfiguration (to accommodate the 12mm lens) has been completed and approved and the Hazard Report has been updated
- **Ready to support. No open issues.**



6mm FOV
 (STS-130 imagery)



12mm FOV Simulation
 (Actual view will vary slightly,
 this is an approximation)





Imagery Hardware
Airborne and Ground

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Airborne Cameras (N/A)

- HYTHIRM currently not scheduled to support STS-132

Ground Cameras

- STS-132 cameras configured nominally per Launch & Landing PRD
- Multi-function experiment using High Speed Digital (HSD) cameras on FSS for STS-132
 - 2 HSD cameras placed on the 275ft level to generate a 3D product of liftoff
 - Camera E040 will be moved by ~5 feet (toward the North) to support experiment
 - E040 image reqmt: ET twang, ET Ogive, SRB Nose Cone & Orbiter Tiled Surfaces at Tower Clear
 - No impact to imagery objectives
 - E040 will move back to its standard location post STS-132
- Ready to support.



Typical
E040 FOV



STS-132 Expected
E040 FOV

Photo Targets

- Nominal performance for STS-131 Photo Targets
 - Some heating effects on ET/IT Haunch (215' level; FE05) and MLP targets
- 19 targets (MLP and FSS combined) will be in place (repaired/replaced as necessary) for STS-132
- Ready to support.



Before/After
Target FE05
(STS-131)



Lighting Predicts, May 14 – June 30

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Launch

- May 14 – June 2: DAYLIGHT
- June 3 – June 27: DARK
- June 28 – June 30: DAYLIGHT

Post ET-Sep Mnvrs

- May 14 – June 15: Nominal +X, Nominal Pitch
- June 16 – June 27: Nominal +X**, No Pitch
- June 28 – June 30: Nominal +X, Nominal Pitch

ET Sep Imagery

- May 14 – June 8: DAYLIGHT
- June 9: DAYLIGHT, Non-Optimal
- June 10 – June 26: DARK**
- June 27 – June 30: DAYLIGHT

**For launch dates of June 16th – June 26th : MOD could execute modified +X (20sec) vs. the nominal (11 sec) burn; however this timeframe is during β constraint

Handheld ET (post-pitcharound) Imagery

- May 14 – June 12: DAYLIGHT
- June 13 – June 15: DAYLIGHT, Non-Optimal
- June 16 – June 27: DARK
- June 28 – June 30: DAYLIGHT

MOD, SE&I Agreements for Crew HH ET Photography

1. Pitch mnvr for handheld ET photography will not be attempted if nominal photography time is dark.
2. Pitch mnvr will not be performed "late"
3. Pitch mnvr and ET handheld photography will not be attempted on LON mission





CoFR Products & Readiness

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STS-132 Imagery Readiness Review was held with the IATs and hardware teams on 4/15/10.

Area of Responsibility	Statement	Status
Operations Integration Plan	NSTS 60540, Operations Integration Plan, Rev B approved at 06/27/06 SICB. End-to-end readiness level of hardware, procedures, tools, and facilities have been assessed to ensure Open Work and issues will be resolved prior to flight.	Ready
Engineering Image Analysis Products, Training, and Staffing	Imagery engineering analysis, and "I-Squared" SE&I personnel and tools are ready to support STS-132.	Ready
Imagery Laboratory Readiness	Imagery labs at JSC, KSC, and MSFC have the required capabilities and configurations to support anticipated and unexpected analysis.	Ready
Camera Hardware Readiness	All ground and vehicle requirements for imagery and other data collection assets have been implemented for flight and associated operational readiness has been demonstrated.	Ready



**STS-132
 SSP Flight Readiness Review
 Radar Status**

MS/Joe Hamilton





Debris Radar Configuration for STS-132:

Presenter	MS/J.A. Hamilton	
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- **STS-132 NDR Configuration:**
 - 1 MCR C-band radar
 - Scheduled replacement of Low Noise Amplifiers (LNA's)
 - 2 NASA X-band radars
 - NASA #1 on SRB vessel *Liberty Star*
 - NASA #2 on *Runnymede-Class* ARMY LCU
- Operational SRB tracking, following ASTT, by both X-bd radars
- No planned changes in operations from STS-131
 - New LNA's expected to improve c-band dynamic range.
- NDR Readiness will be reviewed on 04/30/10.



NDR Issues During STS-131:

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NDR-C1 Radar:

Problem: Late to acquire track(102 seconds MET). Missed initial acquisition due to confusion over 2 second discrepancy in countdown clock. Inadvertent operator input delayed acquisition using backup method.

Resolution: Crew Resource Management (CRM) review and emphasis training.

Problem: Minor noise problem prevented the use of Phase Compensation Tables (PCTs) which are intended to improve data quality (Same status since STS-125).

Resolution: Possible resolution under evaluation. Will review at NDR CoFR.

NDR-X3 Radar:

Problem: Sensitivity reduced. Incorrectly attributed to operator input.

Resolution: Troubleshooting to find and repair the problem.

NDR-X4 Radar:

Problem: None.





<u>Readiness for STS-132:</u>		Presenter MS/J.A. Hamilton	
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- **Team Readiness**
 - Complete, both ascent and analysis teams ready
- **Facility Readiness**
 - Complete
- **Radar Readiness**
 - NDR-C1 – GREEN
 - NDR-X3 – GREEN*
 - NDR-X4 – GREEN

*Reduced sensitivity to be repaired during pre-launch maintenance campaign



STS-132 SSP Flight Readiness Review Flight Software Summary



STS-132 FLIGHT SOFTWARE SUMMARY

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- **Fifth flight of PASS and BFS Operational Increment 34 (OI-34)**
 - No logic changes from the STS-131 software systems

- **Fifth flight of MEDS Multifunction Display Unit Function (MDUF) VI 6.00 and third flight of MEDS Integrated Display Processor (IDP) VI 7.01**
 - No changes from STS-131 software

- **Sixth flight of MAGRS-3S Link 613-9966-008 GPS FSW**
 - No changes from STS-131 software



FSW READINESS SUMMARY

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- **Integrated Avionics Verification (IAV) is complete**
 - A total of 14 cases were executed and analyzed in support of STS-132
 - Included testing of full flight system (PASS/BFS STS-132/OI-34 with flight-specific I-Loads; MEDS VI 7.01/6.00 (IDP/MDUF); MAGRS-3S Link 8; and SSME AD08/DA05 software)
 - Testing included the use of updated Orbiter Interface Unit (OIU) Reconfiguration Tables (V113) supporting the Mini Research Module 1 (MRM1) and Alpha Magnetic Spectrometer – 02 (AMS)

- **SAIL facility will be in a condition of readiness for mission support**

- **Formal Software Readiness Review (SRR) was conducted on 04/15/10**
 - No known constraints

- **With the completion of planned open work, FSW will be ready to support STS-132 launch**





LAUNCH ON NEED STATUS

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- In the event of call-up, the STS-133 flight software products would be flown on OV-103
 - OI-34 STS-133 Base Load and associated products
 - Flight specific I-Load patches for STS-133 (full payload bay)
 - OI-34 compatible MEDS IDP and MDUF software (VI 7.01/6.00)
 - MAGRS-3S Link 8
- Completion of the development and verification of flight-specific FSW products for STS-133 will be performed in time to support the 09/16/10 target launch date
- Formal Software Readiness Review to be conducted after call-up



**STS-132 FLIGHT SOFTWARE
 FLIGHT READINESS STATEMENT**

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Full compliance with SPOC Flight Software CoFR requirements is documented in the STS-132 Software Readiness Review packages along with signed readiness statements and identification of open work.

Pending completion of standard open work and identified non-standard open work, Flight Software is ready to support flight.

/s/ Patti A. French *04/16/2010*

Patti A. French **Date**
Associate Program Manager
USA Flight Software





STS-132 SSP Flight Readiness Review PGSC



Pre-decisional. Internal Use Only.

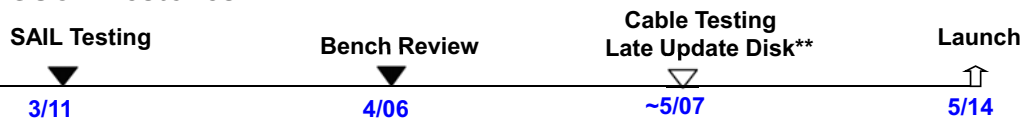


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Payload and General Support Computer Readiness – STS-132

Presenter	MS4/E. Jones	
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- **Hardware and Software Summary**
 - STS-132 will be the nineteenth flight of the IBM ThinkPad A31p PGSC
 - 6 PGSC units (None currently planned for ISS transfer)
 - Thirteenth flight of the A31p Docking Station (OCA and WinDecom)
 - Eleventh flight of Netgear Wireless Access Point.
 - Note: No network issues observed during STS-131
 - New software
 - None
- **IFA Summary**
 - None
- **PGSC Milestones**



**FD1 Late Update to be performed on ground





STS-132 Non Standard Open Work	Presenter MS/Tony Griffith	
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	ECD
Systems Safety	
- Disposition of STS-131-I-002, "Rudder Speedbrake TPS Liberation"	05/04/10
- Disposition of STS-131-I-003, "Windows 5, 6 Missing/Protruding Ceramic Plugs"	05/04/10
- Disposition of STS-130-I-005, "SSME #2 Nozzle Heating Indications"	04/30/10
- Disposition of NIRD reportables	04/30/10



Alternate/Dissenting Opinions	Presenter MS/Tony Griffith	
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- **Alternate/dissenting opinions were actively solicited at the SE&I STS-132 Pre-FRR.**
 - No dissenting opinions were identified.





CoFR Endorsement	Presenter	MS/Tony Griffith
	Date	04/28/10

The Space Shuttle Program, Systems Engineering and Integration Office's Flight Preparation Process Plan, documented in NSTS 08117, Requirements and Procedures for Certification of Flight Readiness have been satisfied. Required products and other responsibilities identified in NSTS 08117, paragraph 8.5.12 and Appendix M, have been or will be scheduled for completion. All technical functions and responsibilities are ready and the Systems Engineering and Integration Office is prepared to sign the Certificate of Flight Readiness for STS-132, pending completion of open work.

/s/Donald S. Noah

Donald S. Noah
 Manager Systems Engineering and Integration Office



LON Status	Presenter	MS/Tony Griffith
	Date	04/28/10

- SE&I has identified no technical or schedule constraints to the support of LON requirements for STS-132 using the SSP baseline "Fly the Next Flight" approach

