



STS-124 SSP Flight Readiness Review

MS/Donald S. Noah
May 13, 2008



Pre-decisional. Internal Use Only.



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Agenda

Presenter	MS/D. S. Noah	
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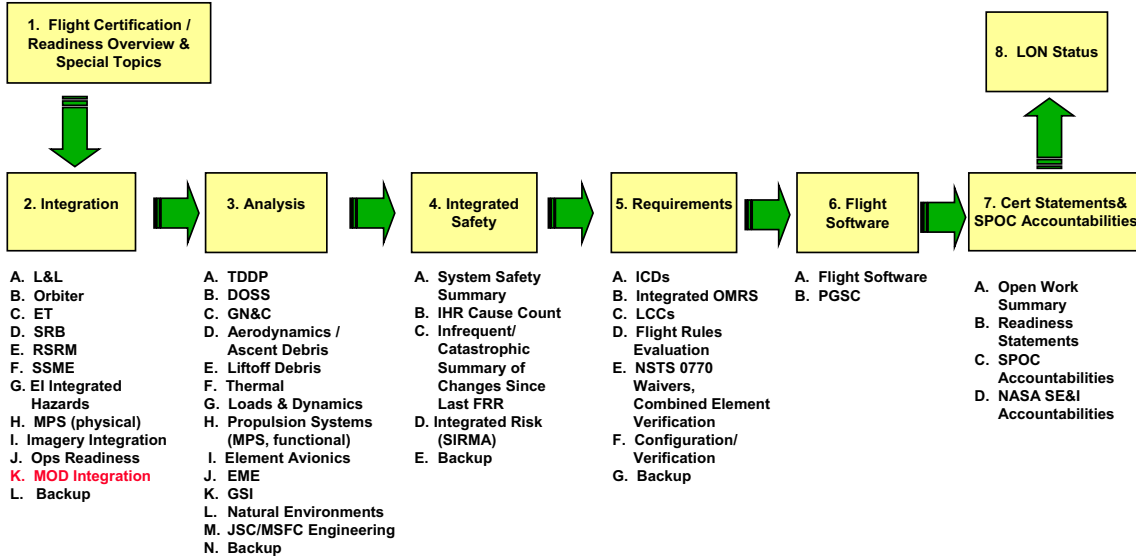
- **Systems Engineering & Integration**
 - SE&I FRR Roadmap
 - Flight Preparation Readiness
 - Imagery/Debris Radar
 - Integrated Debris Risk Assessment
 - Flight Software Readiness
 - Payload and General Support Computer Readiness
 - Integrated Hazard Report Changes Summary
 - Integrated In-flight Anomalies (IFAs)
 - Non-Standard Open Work Summary
 - Launch On Need (LON)
 - Certificate of Flight Readiness





SE&I FRR Roadmap

Presenter	MS/D. S. Noah	
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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





Imagery	Presenter	MS/D.S. Noah	
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Enhanced Launch Vehicle Imaging System (ELVIS)

All vehicle-mounted cameras (ET, SRB, Orbiter) have either been installed or are following their nominal processing flows and are ready to support. Two notes:

- The Port SRB camera that experienced a data loss on STS-123 has been corrected. The failure was due to a timing circuit in the recorder unit. The timing circuit has been replaced.
- First flight of the Digital ET TPS flash unit in the Orbiter LO2 umbilical well experienced some spurious behavior on STS-123 and two FIARS were written by OPO. The cause of the observed intermittent flashing (*i.e.*, flash discharges in between the flashes commanded by the camera) is still under investigation, but is believed that behavior is unique to the 123 flight unit. The behavior could not be repeated with the 124 flight unit.

Ground Cameras

No issues. Ready to support.



STS-123 Lighting and Imagery Assessment	Presenter	MS/D.S. Noah	
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Launch Date (2007 GMT)	Launch	Umbilical Ops (8:46 - 9:30 MET)	Hand-Held Ops (11:43 - 13:43 MET)	Late Hand-Held Ops		
				Time of Sunrise	ET/Orbiter Range	Camera Resolution
May 20 - May 23	DARK	DARK	DARK		+X Maneuver	Pitch-Up Maneuver
May 24	DAYLIGHT	DAYLIGHT *	Partly DAYLIGHT *		N/A	No (β Violation)
May 25 - May 31	DAYLIGHT	DAYLIGHT *	DAYLIGHT *		N/A	Yes
Jun 01 - Jun 16	DAYLIGHT	DAYLIGHT †	DAYLIGHT *		N/A	
Jun 17 - Jun 23	DAYLIGHT	DAYLIGHT †	DAYLIGHT †		N/A	
Jun 24 - Jun 26	DAYLIGHT	DAYLIGHT *	DAYLIGHT †		N/A	
Jun 27 - Jul 02	DARK	DAYLIGHT *	DAYLIGHT †		N/A	
Jul 03	DARK	Partly DAYLIGHT *	DAYLIGHT †		N/A	Yes (β Violation)
Jul 04 - Jul 06	DARK	DARK	DAYLIGHT †		N/A	
Jul 07 - Jul 09	DARK	DARK	Partly DAYLIGHT *		N/A	Maybe (β Violation)
Jul 10	DARK	DARK	DARK	14:22	4900	

* Photos are potentially useful, but do not meet established requirements.

† Photos meet established requirements.





Lighting Conditions	Presenter MS/D.S. Noah
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ET Sep – May 31



Debris Radar Readiness	Presenter MS/D. S. Noah
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- 1 MCR C-band radar
- 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 (X4: 155-310 MET, X3: 270-420 MET)
- Mission plan updated accounting for change to 16-bit Analog-to-Digital systems
 - Integration testing currently underway, with signoff planned for 5/12/08
 - System will offer substantially greater C-bd debris insight over existing 12-bit system
- Second C-bd Unit Receiver will be staggered forward as STS-125 test during 124. No debris mission impact
- New debris signature measurements, underway at AFRL, will be available in time for STS-124 use
- Radar systems, team are ready to support STS-124





STS-124 Debris Special Topics Overview

Presented by	MS/Dr. James Peters	
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- **STS-123 Debris Performance Summary**
- **STS-123 Debris IIFA Summary**
 - **Closure of Interim IIFAs**
 - STS-118-I-002 LO2 Feedline Bracket Loss
 - STS-122-I-006 I/T to LH2 Flange Closeout Foam Loss
- **Debris Summit Summary (April 16/17, 2008)**
 - Significant Debris Summit Trend Analysis Results
- **STS-124 Debris Risk Summary**



STS-123 Debris Performance Summary

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- **STS-123 Debris Observation Summary:**
 - No observed LO2 Feedline Bracket Yoke losses
 - The Tyvek covers performed as expected with all releasing before 170 mph
 - Weather conditions for STS-123 were conducive for low icing on the vehicle
 - Minimal damage observed with the BRI-18 Tile around the Umbilical doors
 - No significant TPS or WLE damage was noted during OBSS inspection, RPM or Late Inspection - No focused inspections requested
- **3 STS-123 Debris IIFAs all Dispositioned at the 5/6/08 SICB**
 - STS-123-I-001: Liftoff Debris
 - Additional mitigations implemented
 - No change to the Liftoff Debris risk level
 - STS-123-I-002: Stub Tile Damage During SSME Ignition (Interim Disposition)
 - STS-123-I-003: Tile Coating Loss on Orbiter Stingers During SSME Ignition





STS-123 Debris Performance Summary

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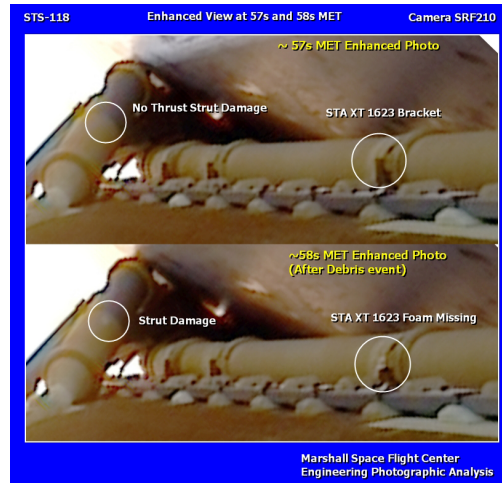
- STS-123-I-002: Stub Tile Damage During SSME Ignition (Interim Disposition)
 - Primary causes being investigated include handling and mechanical loading due interference with the upper body flap
 - Measurement of gaps between the carrier panel tile and upper body flap being performed
 - Root cause findings and mitigations intended to keep classified as "Unexpected"
- STS-123-I-003: Tile Coating Loss on Orbiter Stingers During SSME Ignition
 - Tile coating losses on the base heat shield considered "Expected" liftoff debris
 - Orbit action given to update NSTS60559 with risk assessment mass
 - Losses at the aft location during the liftoff time timeframe are attributed to the high vibro-acoustic exposure and from very small liftoff debris impacts
 - Debris source is "enveloped" by Ceramic Inserts for both Liftoff and Ascent



Debris IIFA Closures STS-118-I-002 LO2 Feedline Bracket Loss

Presented by	MS/Dr. James Peters	
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- STS-118-I-002: LO2 Feedline Bracket Loss at 58 Seconds
- Estimated liberation mass: 0.023 lbm (Foam only estimate)
 - 0.01 lbm (foam only) struck the Orbiter after "rebounding" off the Thrust Strut
- The observed TPS damage exceeded the predicted damage for foam only
 - "Mixed" ice/SLA or ice/Foam debris liberated
 - Imagery and tile forensics inconclusive as to "mixed" debris type
- Mitigation/Closure Plan: **Implementation of (ET-128) LO2 Feedline Bracket Yoke modifications (Zero-Gap Design) and reduction of tanking time. Impact testing showed that the foam only damage model was a good estimator for ice/foam mixed debris**



Outboard LO2 Feedline Bracket Loss at Xt1623 on STS-118



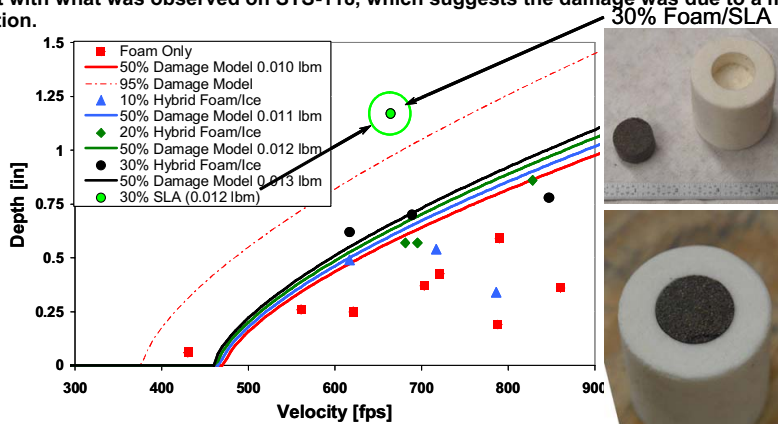


LO2 Feedline Bracket "Mixed" Debris Testing

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- Mixed debris impact testing was completed to assess the effect on PRA and risk level for "mixed" debris
 - The test conditions were design to replicate the STS-118 impact conditions in terms of mass, impact velocity, impact angle and percentage of mixed debris
- Results showed that the foam only damage model was a good estimator for ice/foam mixed debris
- Testing showed that the mixed SLA/foam debris impact penetrated the tile much deeper than what the foam only damage model predicts.
 - This was consistent with what was observed on STS-118, which suggests the damage was due to a mixed SLA/foam combination.

Aerospace Mixed Debris Impact Test Results



Debris IIFA Closures
STS-122-I-006 LH2 IT Flange Foam Loss

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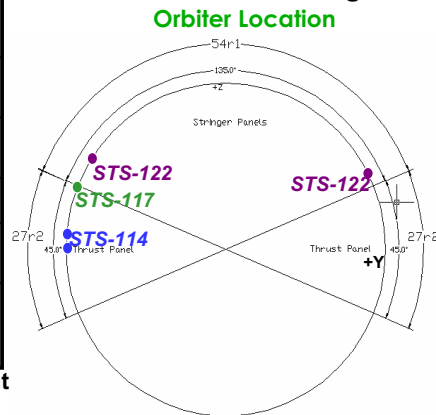
- STS-122-I-006: LH2 IT Flange Losses
 - At ~85 sec, there was a debris release observed on the port side of the vehicle
 - Debris was seen in both the Fwd & Aft SRB cameras at about the 85 second timeframe
 - The LH2 IT Flange loss is the "Best Candidate" for the 85 second event
 - No other debris releases from this location were *observed*



85 Sec. Example of Aft SRB Camera Looking Forward

Flight	Failure Mechanism	Phi	Xt	Mass (lbm)	Release Time
STS-114	Cryoingestion	-83	Xt1120	0.034	Post SRB Sep.
STS-114	Cryoingestion	-90	Xt1121	0.014	Post SRB Sep.
STS-117	Cryoingestion	-68	Xt1121	0.006	Unknown
STS-122	Cryoingestion	-55	Xt1120	0.023	Possible 85 sec
STS-122	Cryoingestion	62.5	Xt1121	0.012	Unknown, Post SRB Sep. Likely

Release rate since RTF (5 release in 8 missions) = 0.625/flight

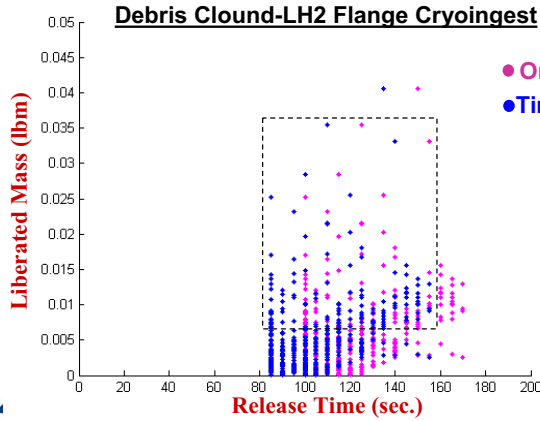




MAF Updated Debris Table Adjustments

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- Assessment of MAF Debris Table for Cryoingest debris using the following Groundrules and Foam Debris Model Version 2.0
 - Incorporates a -15 sec Time of Release Shift to capture 85 seconds
 - Increased the release rate to produce a flight representative frequency 0.625/flight (Of most expected masses 0.006-0.034 lbm)
 - Release locations applied uniformly over the flange
 - No debris breakup is considered



PRA Results indicate the following risk levels:

- Tile: 1/3,330
- RCC: 1/2,500
- Tile Shear: <1/10,000
- Special Tile: 1/10,000 based on standard debris cloud

The updated ET Project Cryoingestion release timing and thermal environment showed 85 seconds losses would be outside of a 3-sigma type event



STS-123 Debris Summary

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- Debris Integrated In-Flight Anomalies IIFAs

Flight	STS-114	STS-121	STS-115	STS-116	STS-117	STS-118	STS-120	STS-122	STS-123
Total Debris IIFAs	25	9	7	9	6	5	5	8	3
Ascent	10	3	6	8	5	4	4	7	2
Liftoff	9	6	1	1	1	1	1	1	1

- Key TPS Hit Counts

Flight	STS-114	STS-121	STS-115	STS-116	STS-117	STS-118	STS-120	STS-122	STS-123*	Avg.
Total Hit Count	176	117	199	172	292	218	311	208	98	192
Total Hits >1.0"	29	12	18	22	17	31	15	21	13	17.7
Total Bottom TPS Hits	125	86	104	121	247	188	247	158	45	146.8
Number >1"	17	10	5	17	15	28	12	16	8	14.2
Largest Length	4.5"	1.5"	2"	3"	1.7"	3.5"	2.5"	1.5	3.0	2.6"
TPS Vol. Loss (in ³)	5.120	1.251	1.894	3.827	1.980	7.537	1.973	*TBD	*TBD	3.37
Window Hits	12	21	17	20	12	12	6	25	9	14.9
Number >1"	3	1	1	2	0	0	0	2	0	0.67

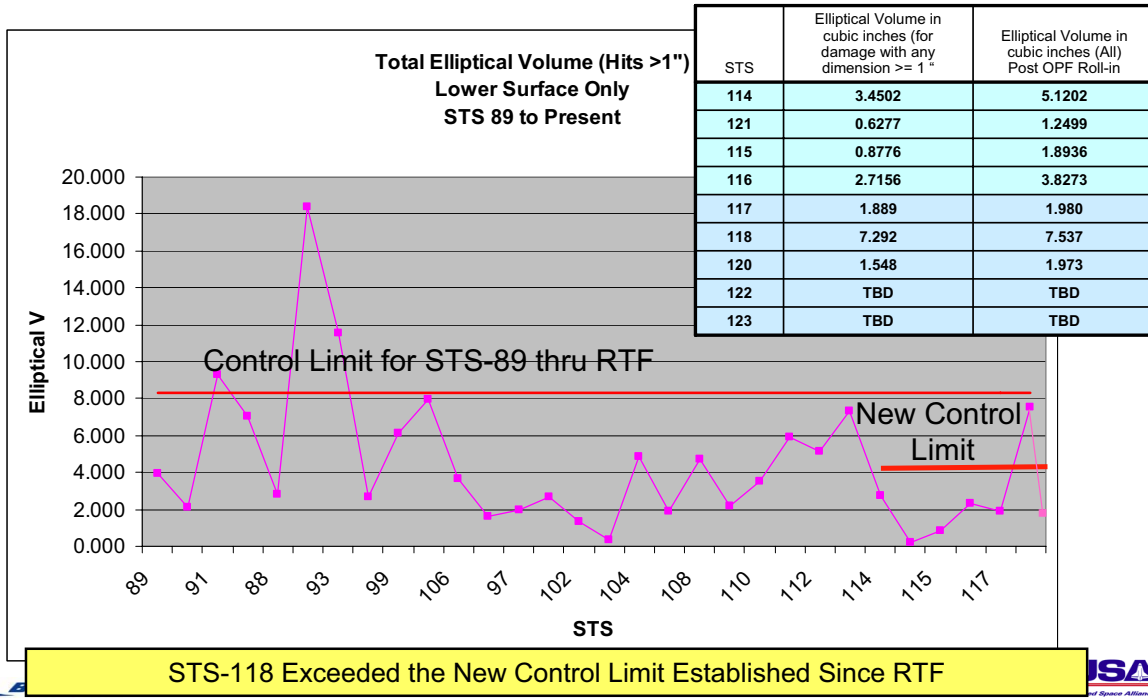
* Pending Completion of Final Volume Loss Analysis





Total Elliptical Volume (Hits >1") Lower Surface (STS-89 to STS-120)

Presented by MS/Dr. James Peters
 Date **05/13/08** Page 17



STS-118 Exceeded the New Control Limit Established Since RTF



Liftoff Debris Trends

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- **STS-122 and STS-123 have a decreasing Liftoff Debris Trend**
 - Indicates the effectiveness of Liftoff debris controls and mitigations

	K-IFAs	Outside time and location concern	Mitigation through Removal (non-Recurrent)	Mitigation through New (Additional) Inspection and Repair	On-going Mitigations (FOD, rust abatement)	On-going Mitigation: Inspection, Repair, Removal	Risk Assessment
STS-114	31	3	5	6	11	6	0
STS-121	24	5	3	4	6	4	2
STS-115	15	6	1	3	5	0	0
STS-116	19	3	3	3	8	0	2
STS-117	23	2	2	4	9	7	1
STS-118	23	2	3	8	5	4	1
STS-120	31	1	1	6	15*	6	2
STS-122	16	2	1	1	6	6	0
STS-123	14	0	2	6	3	3	0

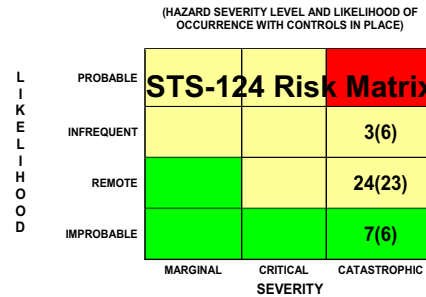




Debris Risk Summary from the April 16/17, 2008 Debris Summit

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- The numerous vehicle debris design modifications and mitigations have significantly reduced the debris risk
 - Only remaining mods: Aerovent (ET-135) and LO2 Feedline Bracket Acreage Closeouts (ET-130)
- The numerous model updates have enhanced the ability to characterize the debris risk
 - Despite the model updates, "Uncharacterized" debris events such as mixed debris impacts, rebound, secondary debris impacts, combined failure modes and unknown failure modes are not currently modeled and considered accepted risk by the Program
- Expect to baseline IDBR-01 for the remainder of the Shuttle missions with three remaining "Infrequent" risk – Liftoff Debris, Putty Repair and Umbilical Ice
- The tremendous amount of debris assessment work since the STS-116 Debris DVR has increased the understanding of the debris risk
- Element Process and Design changes have made the Space Shuttle Vehicle safer to fly



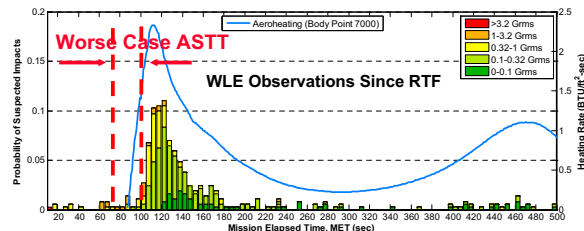
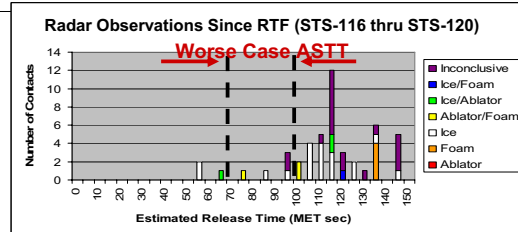
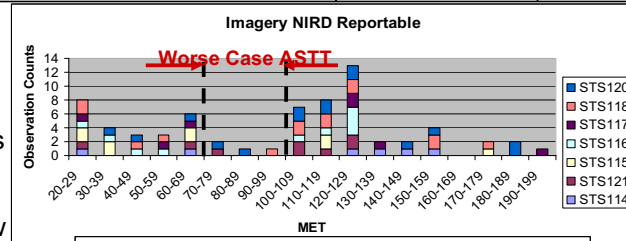
The STS-123 risk numbers are in parentheses;
 STS-124 risk numbers are to the left



Significant Debris Summit Trend Analysis Results

Presented by MS/Dr. James Peters
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- Debris Trend Analysis was presented for flights since RTF:
 - Worse case ASTT is 70-100 sec
 - ~80% of the risk occurs during this timeframe - Primarily driven by Void DeltaP losses
 - Imagery, Radar and WLE have very few recorded observations during the 70-100 second timeframe
 - The same trend was seen on STS-122 and STS-123
 - The debris cloud model predicts Void DeltaP losses (~35% of Total) during this timeframe, which are not supported by flight observations since RTF
 - Consistent with Aerospace sensitivity testing of angle influence on voids
 - This trend analysis suggests the Void DeltaP foam debris risk and integrated debris risk are overstated





Significant Debris Summit Trend Analysis Results

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- Trend Analysis Findings:
 - Pre- and Post- RTF Comparison
 - Statistically more Debris impacts after RTF than before
 - Attributed to more vigilance and documentation given to debris impacts and due to venting of the Intertank Foam (higher popcorn foam release)
 - Statistically about the same number of debris impact >1.0"
 - Statistically less TPS damage volume after RTF than before
 - Landing Site Comparison: No Statistical difference in TPS damage counts of KSC and Edwards
 - The single landing at White Sands was not compared
 - Cryopumping losses on the LH2 acreage where consistently occurring past what the Cryopumping release timing model predicted
 - Led to an updated Cryopumping release timing model
 - Key to Umbilical Door Damage
 - The TPS tile on the door and the TPS tile covered by the umbilical door during ascent is not typically damaged except along the hinged edge
 - Eliminates most all debris sources except the baggie
 - Difficult for Umbilical ice transport except for the hinged edge
 - Very little damage observed on STS-120, STS-122 and STS-123 and only a single instance of tile damage on the BRI-18 tiles
 - Nylon Baggie Chord (STS-118 IFA for "Ropey" Material) fixed STS-120



Significant Debris Summit Trend Analysis Results

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- Any Correlation between TPS Bottom Hits and ET Thrust Panel Popcorn Foam?
- It was assumed that the ET Thrust Panel popcorn foam environment would be indicative of the Popcorn foam environment for the entire vehicle
- The ET Thrust Panel Popcorn foam data shows no Correlation to hit count
 - The highest TPS Bottom hit count flights (STS-117 & STS-120) are also the lowest ET Thrust Panel foam count flights
 - The highest Popcorn Foam flights (STS-114 & STS-116) correspond to only moderate TPS bottom damage

Flight	TPS Bottom Hits	ET Thrust Panel Popcorn Foam	Port**	Starboard**
STS-114	108	620	300	320
STS-115*	99	340	215	125
STS-116	108	877	404	473
STS-117	232	258	124	134
STS-118	138	409	177	232
STS-120	235	148	36	112
STS-121	76	435	185	250
STS-122	139	Not Counted		

* This represents the imagery data at 103-109 sec MET, the data for 124 sec MET is not available

** Popcorn totals are from the ET Thrust Panel Video Analysis (<10% of Thrust Panel) at 124 sec MET





Significant Debris Summit Trend Analysis Results

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- Causes of Variation in Orbiter Debris Hit Counts:
 - Variation in the popcorn foam environment
 - Most TPS impacts can be attributed to Popcorn Foam
 - Multiple impacts from a single debris source “skipping” across the TPS
 - Secondary debris impacts from the breakup of a single debris sources
 - Abundance of impacts and variation around the umbilical doors due to baggie strikes
 - Much better correlation if the Umbilical door impacts are not considered
 - Suggests a “separate” population/phenomena
 - ET Cross-bar effects and recirculation impacts
 - Easily seen on STS-117
 - Variations in the general debris environment in terms of release and impacts



Key Debris Forward Work

Presented by	MS/Dr. James Peters	
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- Completion of Initial Putty Repair PRA
 - Highest tile risk 1/400,000 (preliminary result)
 - Highest RCC risk 1/25,000 (preliminary result)
 - Preliminary Putty Repair PRA has limitations and forward work that needs to be addressed before results are entered into IDBR-01
 - The large file sizes have limited the number of Monte Carlos runs from 1,000 to 500
 - Initial assessments have shown the Monte Carlos runs to converge at 500 runs
 - “Remote/Catastrophic” risk level will be recommended after PRA forward work
- NSTS60559 CR063545W Approval expected at the 6/3/08 SICB
 - Initial Release of Volume II (Expected Debris Environment Risk Assessment Methodology)
- NSTS08303 Umbilical Ice update to incorporate implementation of PRA results
 - “Remote/Catastrophic” risk level will be recommended after NSTS08303 Update
- Radar Debris Characterization Testing and Completion of ARDENT (Automated software assessment tool) at Wright-Patterson
- Aerospace Iceball testing to evaluate Iceball PRA input assumptions
- NSTS07700 CR063853: Update Volume X to reflect the most current debris liberation requirements of the SSV
- Liftoff Debris Summit to include forward plan for risk reduction from “Infrequent” to “Remote/Catastrophic”
- DEBRIS model trend analysis and model validation

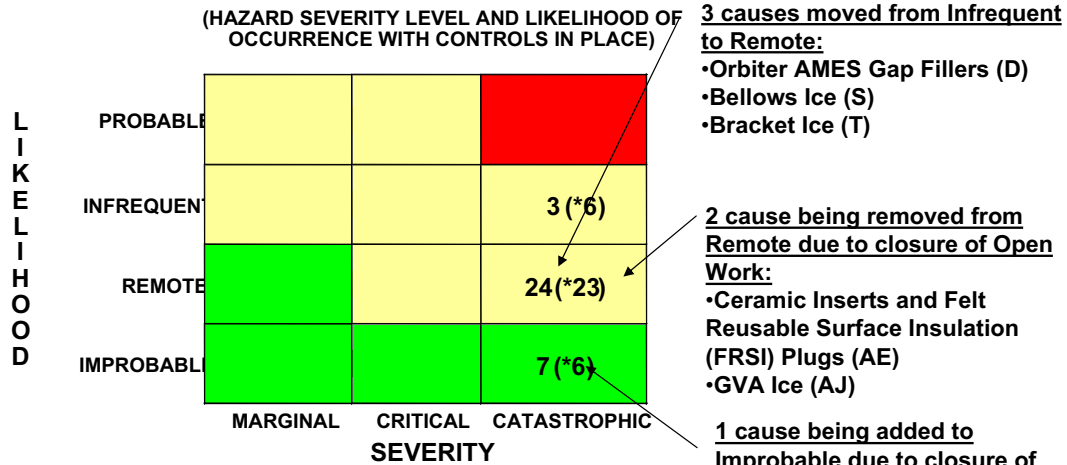




**STS-124 IDBR-01 Risk Matrix
 Existing Cause Updates**

Presenter	MS/Dr. James Peters
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- IDBR-01 has been baselined with a status of 'Closed with a classification of 'Accepted Risk' for the remainder of the Program



*The STS-123 risk numbers are in parentheses;
 STS-124 risk numbers are to the left

- All debris hazards are assessed at the worst case severity



STS-124 FLIGHT SOFTWARE SUMMARY

Presenter	USA/Chris Hickey
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- Fourth flight of Primary Avionics Software System (PASS) and Backup Flight System (BFS) Operational Increment 32 (OI-32)
 - One new PASS data patch for STS-124
 - Raise RCS forward tank temperature upper limit to avoid nuisance alarms
 - No BFS changes
- Fourth Flight of Multifunction Electronic Display Subsystem (MEDS) Integrated Display Processor (IDP) / Multifunction Display Unit Function (MDUF) combination (VI 5.00/5.00)
 - No changes for STS-124
- Eighth flight of Miniature Airborne Global Positioning System (GPS) Receiver Shuttle - 3 String (MAGRS-3S) Link 7
 - No changes for STS-124





STS-124 FLIGHT SOFTWARE READINESS SUMMARY

Presenter USA/Chris Hickey

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- **Integrated Avionics Verification (IAV) is complete**
 - A total of 15 test cases were performed in the Shuttle Avionics Integration Laboratory (SAIL) and successfully analyzed in support of STS-124
- **SAIL facility will be in a condition of readiness for mission support**
- **Formal Software Readiness Review (SRR) was conducted on 04/24/08**
 - No known constraints
- **With the successful completion of scheduled open work, FSW is in a condition of readiness for flight**



STS-326 (STS-124 Rescue Mission)

Presenter USA/Chris Hickey

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- **In the event of call-up by the SSP, STS-326 would be flown on OV-105 using the STS-123 Base Load as well as the flight specific I-Load patch released for the STS-323 Rescue LON**
 - **Pre Callup work**
 - Patch for flight specific I-Loads that was generated and released for STS-323 training
 - Two PASS code patches and one standard GMEM that were originally released for STS-123 were re-released for STS-326
 - **Post Call-up work**
 - **Development/Verification/Release of**
 - 1 BFS Patch (Incorrect Bit Set for BFS HUD Velocity Scaling Indicator)
 - 1 On-Orbit I-Load patch (SCR 93256)
 - Re-release of STS-400 data patch (Raise RCS Fwd Tank Temperature Limit)
 - Level 8 Testing and Integrated Avionics Verification
 - No changes required for MEDS or MAGRS-3S
- **Formal Software Readiness Review will be conducted after call-up**
- **Based on expected content, FSW can support a rescue LON launch NET 30 days after STS-326 call-up**





Payload and General Support Computer Readiness

Presenter **MS/D.S. Noah**

Date **05/13/08**

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- **Hardware and Software Summary**
 - The Payload and General Support Computers (PGSC) were developed to enhance crew situational awareness.
 - STS-124 will be the tenth Space Shuttle flight of the IBM ThinkPad A31p PGSC and associated 28V DC Power Supply
 - Fourth flight of the A31p Docking Station
 - Second flight of new Netgear Wireless Access Point.
 - No network issues observed during STS-123
 - STS-124 planned transferred items to ISS
 - 1 A31p (STS4 World Map)
- **PGSC Integrated Test Milestones**

SAIL Testing ▼	Bench Review ▼	Cable testing Late Update Disk ▼	Launch ▼
03/27	04/24	05/21	05/31



INTEGRATED HAZARD REPORT SUMMARY

Presenter **MS/D. S. Noah**

Date **05/13/08**

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- **Two Integrated Hazard Report changes since STS-123**
 - **IDBR-01, "External debris Impacts the SSV"**
 - Details in Debris Presentation
 - Risk Classification unchanged – Accepted Risk
 - Report Closed – All-Flights Effectivity
 - **ILIT-01, "Failure to Avoid Lightning"**
 - Downgraded four causes from Infrequent Catastrophic to Remote Catastrophic
 - Community produced guidelines to better estimate risk at the programmatic level, given the uncertainties associated with the weather
 - Significant improvement to understanding lightning likelihood
 - Removed one Remote Catastrophic from Risk Matrix
 - Transfers to Launch and Landing
 - Risk Classification Unchanged – Accepted Risk
 - Report Closed – All-Flights Effectivity





Integrated In Flight Anomalies Summary

Presenter **MS/D. S. Noah**
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IIFA / MSFC PRACA Record	Integrated In Flight Anomaly Title	Integrated Hazard Report	STS-124 Closure Status
STS-123-I-001 I00125	Unexpected Debris/Expected Debris Exceeding Mass Allowable Prior to Pad Clearance (Liftoff Debris)	IDBR-01	Closed
STS-123-I-002 I00126	Stub Tile Damage During SSME Ignition	IDBR-01	Closed
STS-123-I-003 I00127	Tile Coating Loss on Orbiter Stingers During SSME Ignition	IDBR-01	Closed
IIFAs from previous flights			
STS-118-I-002 I00103	LO2 Feedline Bracket Loss	IDBR-01	Closed
STS-118-I-008 I00112	Contamination in SSME LOX Dome	IMPS-02	Closed
STS-122-I-001 I00115	Stinger tile observed falling after SSME startup	IDBR-01	Closed
STS-122-I-002 I00116	Ku Band radiated in Hi power	ICOM-01	Closed
STS-122-I-006 I00118	I/T to LH2 Flange Closeout Foam Loss	IDBR-01	Closed



Non-Standard Open Work Summary

Presenter **MS/D. S. Noah**
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Open Work	Completion Date
Systems ICDs - Approval of IRN TC-3109, ET LO2 Feedline Bracket	05/13/08
PGSC - Update Docking Station Hazard Report DKST-004 and DKST-014	05/13/08





LON Status

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- **Flight Readiness Verification**
 - No updates to process, methods, or databases
- **Mission Unique Open Work (Post call-up for Launch NET 08/29/08)**
 - **Loads & Dynamics**
 - **Liftoff Loads Flight Margins Assessment (FMA)** ECD: L-3 Wks
 - **Integrated Propulsion**
 - **ET Pressurization Assessment** ECD: L-2.5 Wks
 - **RSRM Preflight Assessment** ECD: L-2.5 Wks
- **Standard Open Work (Post call-up for Launch NET 08/29/08)**
 - **Uplink (Update) FRV Assessment** ECD: L-1 Wk
 - **Normal Pre-launch Configuration and Testing** ECD: L-1 Wk

No technical and/or schedule constraints to STS-124 or STS-326 call-up



CoFR Endorsement

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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-124, pending completion of open work.

/s/ Donald S. Noah

Donald S. Noah
 Manager Systems Engineering and Integration Office



