

SR&QA



SPACE SHUTTLE PROGRAM

Space Shuttle SR&QA Office

NASA Johnson Space Center, Houston, Texas



Space Shuttle SR&QA Assessment

Presenter **M. D. Erminger**

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STS-103

Flight Readiness Review



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Approach and General Description

SR&QA held reviews in preparation for the STS-103 Flight Readiness Review on 10 November and 16 November, 1999.

FRR Briefing Overview

- **Significant assessments - *discuss***
- **Special topics**
 - **NASA Safety reporting System (NSRS) - *discuss***
 - **Hazard Analysis - *discuss***
 - **Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL) - *discuss***
- Significant Open work - *none*
- CoFR Exceptions - *none*
- Open Action Items - *none*



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Significant Assessments

Orbiter

- **STS-93 AC1 Electrical Short**
 - **Member of the initial team formed at KSC**
 - **Helped define inspection criteria and inspection areas**
 - **Searched the PRACA database for wiring damage trends and summarized for the Project**
 - **Validated data that other team members contributed**
 - **Performed an independent assessment on arc tracking in the commercial aircraft industry**
- **Nose Landing Gear Bungee Crank Failure**
 - **Developed Finite Element Analysis to identify stress points in the design**
- **RCS Manifold 5 Oxidizer Isolation Valve**
- **SSME Shutdown Pushbutton**



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Significant Assessments

EVA

- **Manipulator Foot Restraint Latch Failure**
 - **Member of the secondary restraint mechanism (Velcro "Wedge") design team**
- **Winch Hook Failure**

SSME

- **STS-93 Low Level Cutoff/Nozzle Leak**



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NSRS Summary

There are no NASA Safety Reporting System reports open that are applicable to STS-103.



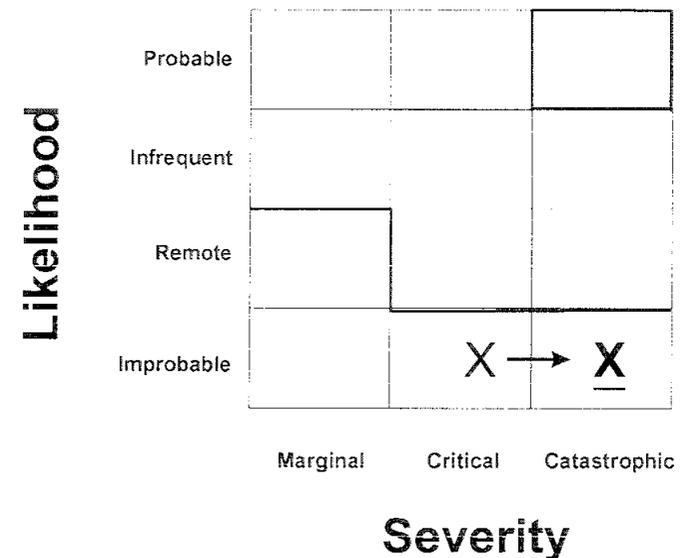
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Hazard Analysis Summary

STS-103 has one Hazard change documenting an increase in risk.

Launch & Landing

- The controlled Hazard Report for the ET Hydrogen Vent Umbilical changed from Critical risk to Catastrophic risk.
 - KSC re-evaluated this Hazard and determined there is the potential for loss of life for the Final Inspection Team, Red Crew, Closeout Crew and/or Astronauts if the ET H2 vent line has a fire. There is also the potential for damage to the vehicle and ground support equipment.
- The Hydrogen Leak Detection System monitors the Liquid Hydrogen GSE and Vehicle Interfaces during cryogenic servicing and de-servicing
- KSC checks the hydrogen leak detectors located around the pad during each flow





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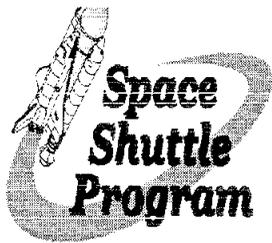
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FMEA/CIL Summary

STS-103 has three CIL changes documenting an increase in risk.

Orbiter

- **Two new criticality 1R CILs associated with the Light Weight Middeck Stowage Locker Assembly**
 - **Failure of a door latch assembly under flight load results in contents being free to move following a second latch failure (1R/2).**
 - **Could cause damage to Orbiter subsystems and/or injury or loss of life to a crewmember**
 - **Failure of a door hinge assembly under flight load results in contents being free to move following a second hinge and one latch failure (1R/3).**
 - **Could cause damage to Orbiter subsystems and/or injury or loss of life to a crewmember**
- **Acceptance rationale is based on system design, testing and inspection.**



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FMEA/CIL Summary

RSRM

- One new 1R CIL associated with nozzle joint #2 due to gas penetration past the leak check port seal and joint secondary seal
 - Thiokol completed a thermal analysis which verifies no detrimental thermal conditions as a result of the newly identified failure mode.
 - Post-fire disassembly confirms analysis predictions with no metal part or seal heat effects observed.
 - Analysis and extensive test and flight history demonstrate the joint design precludes the possibility of hot gas reaching the seals.



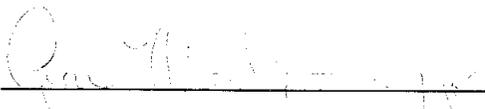
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STS-103 READINESS STATEMENT

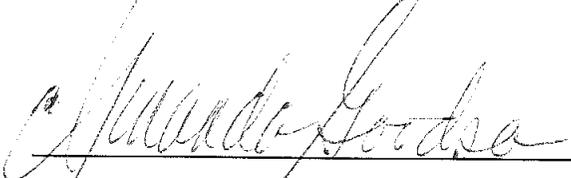
WITH THE SATISFACTORY COMPLETION OF IDENTIFIED OPEN WORK, SAFETY, RELIABILITY, MAINTAINABILITY, AND QUALITY ASSURANCE HAS NO RECOMMENDED CONSTRAINTS TO STS-103.



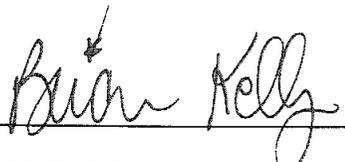
SR&QA DIRECTOR, JSC



S&MA DIRECTOR, KSC



S&MA DIRECTOR, MSFC



HEDS IA DIRECTOR



SS SR&QA MANAGER



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Flight Readiness Review

Backup Package



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Additional Assessments

Orbiter

- First Flight
 - Advanced Air Data Transducer
 - Light Weight Locker Assembly
- ODS Hatch Assessment
- Certification on RMS Camera Bracket
- Ammonia Boiler Corrosion on OV-104
- Hydraulic Pump Flown on STS-89
- APU GGVM Injector Tube not Boroscoped
- GO2 Two Inch Disconnect Failure at MAF

EVA

- ODS Hatch Ingress/Egress



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Additional Assessments

ET

- Intertank Thrust Panel Foam Venting
- Weld Instruction Card Certification
- Heat Treat Deviation

SRB

- STS-93 Right Hand Tilt Hydraulic Pressure Measurement IFA
- Booster Separation Motor Liner Hot Spots
- SRB Range Safety Systems Crossover Checkout Failure

SSME

- First Flight/Critical Process Changes
 - Main Fuel Valve Block II Redesign
 - HPOTP/AT G-3 Seal
- HPOTP/AT Eddy Current Inspection Issue
- HPFTP 1st Stage Blade Firtree Lobe Cracks
- HPFTP KEL-F Lock Tab Crack
- LPOTP Bearing Cage Ply Separation



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Additional Assessments

RSRM

- **First Flight/Critical Process Changes**
 - **Spray in Air Cleaning of Nozzle Metal Parts**
 - **Grit Blast System & Media Replacement on Stiffener Rings**
 - **Addition of Tooling Spools to Case Hydroproof Fixture**
 - **Block Update model**
 - **Joint Heater Set Point/Heater Pre-launch Checkout**
- **RPSF Crane Noise Investigation**
- **STS-93 Mislabeled Aft-center Segment GEI Sensor Cables**
- **STS-93 Unbonded and Displaced Igniter Initiator Nozzle Inserts**
- **Nozzle Joint 2 Failure Mode Update**
- **Field Joint Heater LCC Deviation**

Launch and Landing

- **STS-103 S&MA Launch Support Activities**
- **KSC Wire Process Changes**
- **HAZ Gas LCC Changes**