

SSME FMEA/CIL
REDUNDANCY SCREEN

Component Group: Igniters and Sensors
CIL Item: J309-03
Component: MCC Coolant Outlet Temperature Transducer (F7.1)
Part Number: RES7004
Failure Mode: Leakage into sensor housing.

Prepared: M. Oliver
Approved: T. Nguyen
Approval Date: 3/30/99
Change #: 2
Directive #: CCBD ME3-01-4994
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Phase	Failure / Effect Description	Criticality Hazard Reference
SMC 4.1	Leakage results in housing failure. Overpressurization of aft compartment. Loss of vehicle Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-03S A,M,C

SSME EA/CIL
DESIGN

Component Group: Igniters and Sensors
CIL Item: J109-03
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Design / Document Reference

FAILURE CAUSE: A: Parent material or braze failure.

THE CRYOGENIC TEMPERATURE SENSOR PROBE HOUSING IS MADE FROM INCONEL 625. INCONEL 625 WAS SELECTED FOR ITS TENSILE STRENGTH, RESISTANCE TO GENERAL CORROSION, WELDABILITY TO 300 SERIES CRES, AND RESISTANCE TO STRESS CORROSION CRACKING (1), (2). THE REAR HOUSING IS MANUFACTURED FROM 321 CRES. THIS MATERIAL WAS SELECTED FOR ITS STRENGTH, WELDABILITY, CORROSION RESISTANCE, AND RESISTANCE TO STRESS CORROSION CRACKING (1), (2). HYDROGEN ENVIRONMENT EFFECTS ARE NOT CONSIDERED A PROBLEM UNDER THESE CONDITIONS OF USE (1). THE SHIELD IS GAS TUNGSTEN ARC WELDED TO THE PROBE HOUSING (3). PROCESSES USED FOR INTERNAL PROBE BRAZING AND HOUSING WELDING ARE CONTROLLED BY SPECIFICATION (3).

THE SENSORS ARE A VENDOR ITEM, DRAWING SPECIFICATION AND MANUFACTURING PROCESSES ARE CONTROLLED BY ROCKETDYNE (3). ALL SENSOR DESIGNS ARE SUBJECTED TO A CRITICAL DESIGN REVIEW. ANY DESIGN CHANGES ARE RE-REVIEWED (3). SENSORS HAVE COMPLETED DESIGN VERIFICATION TESTING (4), INCLUDING VIBRATION TESTING (5). THE MINIMUM FACTORS OF SAFETY MEET CEI REQUIREMENTS (6). THE SENSORS WERE ANALYZED FOR HIGH CYCLE FATIGUE AND LOW CYCLE FATIGUE LIFE AND MEET CEI REQUIREMENTS (7).

(1) RSS-8562; (2) MSFC-SPEC-522; (3) RC7004; (4) DVS-SSME-203, RSS-8660 (5) RSS-203-11; (6) RSS-8546, CP320R0003B; (7) RLD0532, CP320R0003B

**SSME FMEA/CIL
INSPECTION AND TEST**

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	TEMPERATURE TRANSDUCER		RES7004
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RC7004
	BRAZE INTEGRITY	BRAZING IS INSPECTED PER SPECIFICATION REQUIREMENTS	
	WELD INTEGRITY	ALL WELDS ARE INSPECTED TO DRAWING AND SPECIFICATION REQUIREMENTS PER WELD CLASS. INSPECTIONS INCLUDE: VISUAL, DIMENSIONAL, PENETRANT, RADIOGRAPHIC, ULTRASONIC, AND FILLER MATERIAL, AS APPLICABLE.	
	ASSEMBLY INTEGRITY	AFTER THE CASE IS WELDED, HELIUM LEAK TESTS ARE PERFORMED TO VERIFY HERMETIC SEAL. ALL VENDOR INSPECTION AND TEST CRITERIA IS UNDER ROCKETDYNE APPROVAL AND CONTROL.	
	HOT FIRE ACCEPTANCE TESTING (GREEN RUN)	SENSOR OPERATION IS VERIFIED THROUGH HOT FIRE ACCEPTANCE TESTING.	RL00461
	DATA REVIEW	ALL CONTROLLER DATA FROM THE PREVIOUS FLIGHT OR HOT FIRE IS REVIEWED. ANY ANOMALOUS CONDITION NOTED REQUIRES FURTHER TESTING OR HARDWARE REPLACEMENT PRIOR TO THE NEXT FLIGHT.	MSFC PLN 1228
	PRE-FLIGHT CHECKOUT	SENSORS ARE VISUALLY INSPECTED.	OMRSD V41BU0.030
		SENSOR OPERATION IS VERIFIED EVERY MISSION FLOW BY SUCCESSFUL COMPLETION OF THE CONTROLLER SENSOR ELECTRICAL CHECKOUT. (LAST TEST)	OMRSD V41AQ0.010 OMRSD S00FA0.213

J-155

Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA)
 Reference: NASA letter SA21/88/308 and Rockelodyne letter 88RC09761.
 Operational Use: Not Applicable.