

**SSME FMEA/CIL**  
**REDUNDANCY SCREEN**

Component Group: Block 1 Ducts and Lines  
CIL Item: K652-01  
Part Number: R0018031  
Component: Remote Mount FPB Pc Transducer Line (Phase II+)  
FMEA Item: K652  
Failure Mode: Fails to contain hot gas.

Prepared: D. Early  
Approved: T. Nguyen  
Approval Date: 7/25/00  
Change #: 1  
Directive #: CCBD ME3-01-5638

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Phase	Failure / Effect Description	Criticality Hazard Reference
SMC 4.1	Hydrogen rich hot-gas leakage into aft compartment and overpressurization of the aft compartment. Extensive engine damage. Erosion of Pc port. Loss of vehicle.  Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-FD3S,A,M,C

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**INSPECTION AND TEST**

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	MOUNT		R0018031
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS.	R0018031
		DETAILS ARE PENETRANT INSPECTED PER SPECIFICATION REQUIREMENTS.	RA0115-116
	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.	RL10011 RA0607-094 RA0115-116 RA0115-006 RA1115-001 RA0115-127
	ASSEMBLY INTEGRITY	THE ASSEMBLY IS PROOF PRESSURE TESTED PER DRAWING REQUIREMENTS.	R0018031
	FLIGHT FLOW TESTING	THE EXTERNAL SURFACE IS VISUALLY INSPECTED PRIOR TO EACH LAUNCH. A HELIUM SIGNATURE LEAK TEST IS PERFORMED PRIOR TO EACH LAUNCH. (LAST TEST)	OMRSD V41BU0.030 OMRSD S00000.950

Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA)  
 Reference: NASA letter SA21/88/308 and Rocketdyne letter 88RC09761.

Operational Use: Not Applicable.

**SSM/ IEA/CIL**  
**DESIGN**

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Design / Document Reference

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**FAILURE CAUSE: A: Parent material failure or weld failure.**

THE LINE ASSEMBLY (1) IS MANUFACTURED UTILIZING 321 CRES TUBE AND INCONEL 625 BAR. 321 CRES TUBING WAS SELECTED FOR ITS STRENGTH, FABRICABILITY, GENERAL CORROSION RESISTANCE, AND STRESS CORROSION RESISTANCE (2). INCONEL 625 WAS SELECTED FOR ITS WELDABILITY, FORMABILITY, RESISTANCE TO STRESS CORROSION CRACKING, AND CORROSION RESISTANCE (2). INCONEL 625 POSSESSES THE REQUIRED STRENGTH WITHOUT REQUIRING HEAT TREAT. INCONEL 625 IS NOT SIGNIFICANTLY EFFECTED BY HYDROGEN IN THIS ENVIRONMENT (2). MOUNT AND SUPPORT SECTIONS INCORPORATE RADIUS JOINTS TO REDUCE STRESS CONCENTRATIONS. OFFSET LIMIT REQUIREMENTS ARE ESTABLISHED TO REDUCED STRESS CONCENTRATIONS AND IMPROVE WELD GEOMETRY. TUBING STOCK IS DRAWN TO MAINTAIN SURFACE REGULARITY. MINIMUM FACTORS OF SAFETY FOR THE LINE MEET CEI REQUIREMENTS (3). HIGH AND LOW CYCLE FATIGUE LIFE MEET CEI REQUIREMENTS (4). THE LINE ASSEMBLY HAS COMPLETED CERTIFICATION TESTING BY ANALYSIS, SIMILARITY AND HOT FIRE TESTING (5). THE LINE ASSEMBLY PARENT MATERIALS WERE CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH, SINCE THEY ARE NOT FRACTURE CRITICAL PARTS (6). TABLE K652 LISTS ALL THE FMEA/CIL WELDS AND IDENTIFIES THOSE WELDS IN WHICH THE CRITICAL INITIAL FLAW SIZE IS NOT DETECTABLE, AND THOSE WELDS IN WHICH THE ROOT SIDE IS NOT ACCESSIBLE FOR INSPECTION. THESE WELDS HAVE BEEN ASSESSED AS ACCEPTABLE FOR FLIGHT BY RISK ASSESSMENT (7).

(1) R0018031; (2) RSS-8582; (3) CP320R0003B; (4) RL00532, CP320R0003B; (5) VRS-0487; (6) NASA TASK 117; (7) RSS-8756

**SSME EA/CIL**  
**WELD JOINTS**

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Component	Basic Part Number	Weld Number	Weld Type	Class	Root Side Not Access	Critical Initial Flaw Size Not Detectable		Comments
						HCF	LCF	
LINE	R0018031	1,2	GTAW	I	X	X		