

SSME FMEA/CIL
REDUNDANCY SCREEN

Component Group: Ducts and Lines
CIL Item: K547-01
Part Number: RS007371
Component: Remote Mount MCC Pc Transducer Line
FMEA Item: K547, K549
Failure Mode: Fails to contain hot gas.

Prepared: D. Early
Approved: T. Nguyen
Approval Date: 7/25/00
Change #: 2
Directive #: CCBD ME3-01-5638

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Phase	Failure / Effect Description	Criticality Hazard Reference
SMC 4.1	Leakage of hot-gas into the aft compartment and overpressurization of the aft compartment. Extensive engine damage. Erosion of Pc port. Loss of vehicle.	1 ME-D3S,A,M,C
Redundancy Screens: SINGLE POINT FAILURE: N/A		

SSME E/A/CIL
DESIGN

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Design / Document Reference

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

THE LINE ASSEMBLY (1) IS MANUFACTURED UTILIZING INCONEL 625. 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). PLATE 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. INSTALLATION IS CONTROLLED FOR ANGULARITY AND OFFSET PER SPECIFICATION REQUIREMENTS (3). MINIMUM FACTORS OF SAFETY FOR THE MOUNT MEET CEI REQUIREMENTS (4). HIGH AND LOW CYCLE FATIGUE LIFE MEET CEI REQUIREMENTS (5). THE MOUNT ASSEMBLY HAS COMPLETED PRESSURE CYCLING AND ULTIMATE PRESSURE DVS TESTING (6). THE LINE ASSEMBLY PARENT MATERIALS WERE CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH, SINCE THEY ARE NOT FRACTURE CRITICAL PARTS (7). TABLE K547 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 (8).

(1) RS007371; (2) RSS-8582; (3) RA1102-006; (4) RSS-8546, CP320R0003B; (5) RL00532, CP320R0003B; (6) RSS-203-14; (7) NASA TASK 117; (8) RSS-8756

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INSPECTION AND TEST

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	MOUNT PLATE PLATE		RS007371 RS007342 R0015352
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS.	RS007371 RS007342 R0015352
		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 SPECIFICATION REQUIREMENTS.	RS007371
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.

FIELD CONFIGURATION VARIANCES FROM CIL RATIONALE

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Base Line Rationale	Variance	Change Rationale	Variant Dash Number
1. K547-01 NEW TUBE MATERIAL IS INCONEL 625. CHOSEN TO INCREASE STRUCTURAL MARGIN	BLOCK I AND PHASE II ENGINES USE 321 CRES TUBE MATERIAL	321 CRES WAS ORIGINALLY CHOSEN FOR ITS STRENGTH, FABRICABILITY, GENERAL CORROSION RESISTANCE AND STRESS CORROSION RESISTANCE. USE AS IS RATIONALE: 321 CRES MEETS ALL CEI REQUIREMENTS	RS007371- 021
2. K547-01 MOUNTS ARE REDESIGNED TO ELIMINATE AXIAL DRILLED HOLE IN LINE WITH THE LEE JET	SOME MOUNTS HAVE A PLUG WELDED INTO EXISTING HOLE	DYNAMIC PRESSURE FROM HIGH FLOW LEE JET WAS BEING RECOVERED AND SENSED BY PC TRANSDUCER CAUSING UNACCEPTABLE VARIATIONS BETWEEN A & B PC MEASUREMENTS. USE AS IS RATIONALE: WELDED ASSEMBLIES MEET ALL CEI REQUIREMENTS	RS007371-071

SSME FMEA/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	RS007371	1,2	GTAW	I	X	X		