

**SSME FMEA/CIL  
REDUNDANCY SCREEN**

Component Group: Block 1 Ducts and Lines  
CIL Item: K619-01  
Part Number: RS007111  
Component: HPOTP Secondary Turbine Seal Drain Line (ATD Configured Engine)  
FMEA Item: K619  
Failure Mode: Fails to contain hydrogen and helium.

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 and helium leakage into aft compartment. Aft compartment overpressurization. Possible fire or detonation. Loss of vehicle.  Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-FD3S,A,M,C

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**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. 321 CRES TUBING WAS SELECTED BECAUSE OF 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. FLANGE AND MOUNT SECTIONS INCORPORATE RADIUS JOINTS TO REDUCE STRESS CONCENTRATIONS. OFFSET LIMIT REQUIREMENTS ARE ESTABLISHED TO REDUCE STRESS CONCENTRATIONS AND IMPROVE WELD GEOMETRY. INSTALLATION IS CONTROLLED FOR ANGULARITY AND OFFSET PER SPECIFICATION REQUIREMENTS (3). MINIMUM FACTORS OF SAFETY FOR THE LINE MEET CEI REQUIREMENTS (5). HIGH AND LOW CYCLE FATIGUE LIFE MEET CEI REQUIREMENTS (6). THE LINE 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 K619 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) RS007111; (2) RSS-8582; (3) RA1102-006; (4) RSS-8546, CP320R0003B; (5) RL00532, CP320R0003B; (6) RSS-511-43; (7) NASA TASK 117; (8) RSS-8756

**SSME FI /CIL  
INSPECTION AND TEST**

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	TUBE		RS007111
	FLANGE		RS007136
	FITTING		R0019356
	FLANGE		RS007387
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS.	RS007111 RS007136 R0019356 RS007387
	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.	RS007111
	FLIGHT FLOW TESTING	THE EXTERNAL SURFACE IS VISUALLY INSPECTED PRIOR TO EACH LAUNCH.	OMRSD V41BU0.030
		A HELIUM SIGNATURE LEAK TEST IS PERFORMED PRIOR TO EACH LAUNCH. (LAST TEST)	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.

**SSME FMEA/CIL**  
**WELD JOINTS**

Component Group: Block 1 Ducts and Lines  
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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	RS007111	14,17	GTAW	I	X	X		