

SSME EA/CIL
REDUNDANCY SCREEN

Component Group: Ducts and Lines
 CIL Item: K207-01
 Part Number: RS007083
 Component: Heat Exchanger Supply Duct
 FMEA Item: K207, K215
 Failure Mode: Fails to contain oxidizer.

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	Oxidizer leakage into aft compartment and overpressurization of the aft compartment. Loss of GOX source to the Pogo accumulator. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-C3S, ME-C3M, ME-C3A,C

SSME FMEA/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 TUBE AND BAR. INCONEL 625 WAS SELECTED FOR ITS WELDABILITY, FORMABILITY, RESISTANCE TO STRESS CORROSION CRACKING, AND CORROSION RESISTANCE (2). ALL MATERIALS USED IN THE LINE FABRICATION ARE LOX COMPATIBLE (2). FLANGE SECTIONS INCORPORATE RADIUS JOINTS TO REDUCE STRESS CONCENTRATIONS. OFFSET LIMIT REQUIREMENTS ARE ESTABLISHED TO REDUCE 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 LINE MEET CEI REQUIREMENTS (4). LOW CYCLE FATIGUE LIFE MEET CEI REQUIREMENTS (5). THE LINE IS HIGH CYCLE FATIGUE LIFE LIMITED BY MAJOR WAIVER (6). THE LINE ASSEMBLY HAS COMPLETED PRESSURE CYCLING AND ULTIMATE PRESSURE DVS TESTING (7). THE LINE ASSEMBLY PARENT MATERIAL WAS CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH, SINCE THEY ARE NOT FRACTURE CRITICAL PARTS (8). TABLE K207 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 (9).

(1) RS007083; (2) RSS-8582; (3) RA1102-006; (4) RSS-8546, CP320R0003B; (5) RL00532, CP320R0003B; (6) DAR 2076; (7) RSS-511-43; (8) NASA TASK 117; (9) RSS-8756

SSME FM CIL
INSPECTION AND TEST

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	LINE		RS007083
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS.	RS007083
		DETAILS ARE PENETRANT INSPECTED PER SPECIFICATION REQUIREMENTS.	RA0115-116
	WELD INTEGRITY	ALL WELDS ARE INSPECTED TO DRAWING AND SPECIFICATION REQUIREMENTS PER WELD CLASS.	RL10011
		INSPECTIONS INCLUDE: VISUAL, DIMENSIONAL, PENETRANT, RADIOGRAPHIC, ULTRASONIC, AND FILLER MATERIAL, AS APPLICABLE.	RA0607-094
			RA0115-116
			RA0115-006
			RA1115-001
			RA0115-127
	ASSEMBLY INTEGRITY	THE ASSEMBLY IS PROOF PRESSURE TESTED PER SPECIFICATION REQUIREMENTS.	RL00460
		THE PART IS ASSEMBLED AND TESTED PER SPECIFICATION REQUIREMENTS.	RL00460
	HOT-FIRE ACCEPTANCE TESTING (GREEN RUN)	ASSEMBLY STRUCTURAL INTEGRITY IS VERIFIED THROUGH HOT-FIRE ACCEPTANCE TESTING.	RL00461
	FLIGHT FLOW TESTING	THE EXTERNAL SURFACE IS VISUALLY INSPECTED PRIOR TO EACH LAUNCH.	OMRSD V41BU.030
		THE LINE IS VACUUM TESTED PRIOR TO EACH FLIGHT. (LAST TEST)	OMRSD V41BP0.020

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

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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	RS007083	1	GTAW	I	X	X		
LINE	RS007083	2	GTAW	I	X	X		
LINE	RS007083	3	GTAW	I	X			
LINE	RS007083	4	GTAW	I	X			