

SSME EA/CIL
REDUNDANCY SCREEN

Component Group: Ducts and Lines
 CIL Item: N400-01
 Part Number: RS007280
 Component: POGO Suppressor Accumulator
 FMEA Item: N400
 Failure Mode: Fails to contain helium/oxidizer.

Prepared: D. Early
 Approved: T. Nguyen
 Approval Date: 7/25/00
 Change #: 1
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Phase	Failure / Effect Description	Criticality Hazard Reference
PSMCD 4.1	Leakage of liquid/gaseous oxygen into aft compartment and overpressurization of the aft compartment. HPOTP cavitation and overspeed. Loss of Pogo suppression during operational phases. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-C3P,D, 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 of accumulator.
B: Parent material failure of plate.

THE ACCUMULATOR (1) IS MANUFACTURED UTILIZING INCONEL 718. INCONEL 718 WAS SELECTED FOR ITS STRENGTH, RESISTANCE TO STRESS CORROSION, CORROSION RESISTANCE, HIGH/LOW CYCLE FATIGUE CHARACTERISTICS, AND WELDABILITY (2). THE COVER PLATE (3) IS MANUFACTURED FROM 321 CRES BAR. THIS MATERIAL WAS SELECTED FOR ITS STRENGTH, FABRICABILITY, GENERAL CORROSION RESISTANCE, AND STRESS CORROSION RESISTANCE (2). MATERIALS ARE HEAT TREATED TO DEVELOP FULL MATERIAL STRENGTH AND HARDNESS. MATERIALS USED IN THE ACCUMULATOR FABRICATION ARE LOX COMPATIBLE (2). WEBS ARE USED IN THE BASE OF THE ACCUMULATOR TO DISTRIBUTE THE PRESSURE ALONG THE FLANGE AND REDUCE STRESS. MINIMUM MACHINING RADII REDUCE STRESS RISERS THAT MAY CAUSE EXCESSIVE STRAINS. SURFACE STEPS ARE USED IN AREAS WHERE INSTRUMENT PARTS AND DUCT OPENINGS ARE LOCATED TO DISTRIBUTE LOADS. A TRANSITION COLLAR BETWEEN THE INLET AND THE BALL SUPPORTS THE MOUNTING FLANGE LOADS AND PREVENTS THE NECK FROM EXPANDING UNDER INTERNAL PRESSURE. HEAT SINKS ARE USED AT THE HALF CONNECTING WELDS TO REDUCE WELD DISTORTION AND IMPROVE WELD QUALITY. MINIMUM FACTORS OF SAFETY MEET CEI REQUIREMENTS (4). HIGH AND LOW CYCLE FATIGUE LIFE FOR THE POGO ACCUMULATOR MEET CEI REQUIREMENTS (5). THE POGO ACCUMULATOR HAS COMPLETED PRESSURE CYCLING AND BURST PRESSURE DVS TESTING (6). THE ACCUMULATOR PARENT MATERIAL WAS CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH, SINCE THEY ARE NOT FRACTURE CRITICAL PARTS (7). TABLE N400 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) RS007280; (2) RSS-8582, RSS-8575; (3) RS007167; (4) RSS-8546, CP320R0003B; (5) RL00532, CP320R0003B; (6) RSS-106-23; (7) NASA TASK 117; (8) RSS-8756

**SSME FME CIL
INSPECTION AND TEST**

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A, B	POGO ACCUMULATOR PLATE		RS007280 RS007167
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS.	RS007280 RS007167
		FORGING IS PENETRANT AND ULTRASONIC INSPECTED PER SPECIFICATION REQUIREMENTS.	RA0115-116 RA0115-012
		THE FORGING TENSILE TESTS ARE VERIFIED PER SPECIFICATION REQUIREMENTS.	RB0170-153
	HEAT TREAT	HEAT TREAT IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RA0611-020
	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	ACCUMULATOR ASSEMBLY IS PROOF PRESSURE TESTED PER DRAWING REQUIREMENTS.	RS007280
		EXTERIOR WELD IS PENETRANT INSPECTED PER SPECIFICATION REQUIREMENTS AFTER PROOF PRESSURE TEST.	RA0115-116
	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 I A/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	
ACCUMULATOR	RS007280	1 (OPT)	GTAW	I		X	X	
ACCUMULATOR	RS007280	2-108	GTAW	II	X			