

SSME FMEA/CIL
REDUNDANCY SCREEN

Component Group: Ducts and Lines
CIL Item: N400-02
Part Number: RS007280
Component: POGO Suppressor Accumulator
FMEA Item: N400
Failure Mode: Internal structural failure.

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	Fire from LOX impact or rubbing. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-C3S, ME-C3M, ME-C3A,C

**SSME E/A/CIL
DESIGN**

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Design / Document Reference

FAILURE CAUSE: A: Structural failure of: Plate(s), Brace(s), Inlet Baffle.

THE ACCUMULATOR (1) IS MANUFACTURED UTILIZING INCONEL 718. THE INLET BAFFLE ASSEMBLY (2) IS A WELDED ASSEMBLY COMPOSED OF THE Z-BAFFLE (3) WELDED TO AN INTERMEDIATE PLATE (4) AND AN EXIT PLATE (5). THE Z-BAFFLE IS CAST FROM INCONEL 718 AND THE PLATES ARE FABRICATED FROM INCONEL 625 BAR. INCONEL 718 WAS SELECTED FOR ITS STRENGTH, RESISTANCE TO STRESS CORROSION, CORROSION RESISTANCE, HIGH/LOW CYCLE FATIGUE CHARACTERISTICS, AND WELDABILITY (6). MATERIALS ARE HEAT TREATED TO DEVELOP FULL MATERIAL STRENGTH AND HARDNESS. INCONEL 625 WAS SELECTED FOR ITS HIGH STRENGTH PROPERTIES, MACHINABILITY, WELDABILITY, CRYOGENIC TOUGHNESS AND HIGH RESISTANCE TO CORROSION AND STRESS-CORROSION CRACKING (6). ALL MATERIALS USED IN THE ACCUMULATOR FABRICATION ARE LOX COMPATIBLE (6). MINIMUM WELD RADII ARE ESTABLISHED TO REDUCE STRESS CONCENTRATIONS AND IMPROVE WELD QUALITY. THE ACCUMULATOR INTERNAL BAFFLE SYSTEM IS WELDED TO THE ACCUMULATOR IN SEPARATE WELD SEGMENTS. THE WELD SEGMENTS PREVENT MOVEMENT THAT MAY CAUSE GALLING AND FRETTING AND CRACK PROPAGATION THAT COULD ENCIRCLE THE PLATE. THE REDESIGNED INLET BAFFLE ASSEMBLY DESIGN INCORPORATES ELLIPTICAL FILLET RADII TO REDUCE STRESS CONCENTRATIONS AND ELIMINATE CRACKING PROBLEMS OF EARLIER CONFIGURATIONS. MINIMUM FACTORS OF SAFETY MEET CEI REQUIREMENTS (7). HIGH AND LOW CYCLE FATIGUE LIFE OF THE ACCUMULATOR MEET CEI REQUIREMENTS (8). LOW CYCLE FATIGUE LIFE OF THE INLET BAFFLE ASSEMBLY MEETS CEI REQUIREMENTS. HIGH CYCLE FATIGUE LIFE FOR THE INLET BAFFLE ASSEMBLY IS LIMITED BY MAJOR WAIVER (9). THE ACCUMULATOR AND INLET BAFFLE ASSEMBLY PARENT MATERIAL WAS CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH, SINCE THEY ARE NOT FRACTURE CRITICAL PARTS (10). 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 (11).

(1) RS007280; (2) R0012666; (3) RS007245; (4) R0012836; (5) R0012837; (6) RSS-8582, RSS-8575; (7) RSS-8546, CP320R0003B; (8) RL00532, CP320R0003B; (9) DAR 2599; (10) NASA TASK 117; (11) RSS-8756

**SSME FMEA/CIL
INSPECTION AND TEST**

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	POGO ACCUMULATOR INTERNAL PLATES & BRACES		RS007280
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS	RS007280
	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. (LAST TEST)	RL10011 RA0607-094 RA0115-116 RA0115-006 RA1115-001 RA0115-127
	ACCUMULATOR INLET BAFFLE ASSEMBLY	MINIMUM WELD FILLET IS VERIFIED PER DRAWING REQUIREMENTS.	RS007280 R0012666
		MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS	RS007245 R0012836 R0012837
	PENETRANT INSPECTION	Z-BAFFLE IS PENETRANT INSPECTED PER SPECIFICATION REQUIREMENTS.	RA0115-116
	HEAT TREAT	Z-BAFFLE IS HEAT TREATED PER SPECIFICATION REQUIREMENTS.	RB0170-007

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			