

SSME FMEA/CIL
REDUNDANCY SCREEN

Component Group: Propellant Valves
 CIL Item: D300-06
 Component: Anti-flood Valve
 Part Number: RS007083
 Failure Mode: Structural failure.

Prepared: P. Lowmore
 Approved: T. Nguyen
 Approval Date: 6/30/99
 Change #: 1
 Directive #: CCBD ME3-01-5226
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Phase	Failure / Effect Description	Criticality Hazard Reference
PSMCD 4.1	Flow to heat exchanger reduced or shutoff; loss of pressurant flow to accumulator and vehicle, collapse and possible cracking of heat exchanger coil; hot-gas flow to vehicle tank and pogo accumulator. Aft compartment overpressurization. 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

Component Group: Propellant Valves
CIL Item: D300-06
Component: Anti-flood Valve
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Design / Document Reference

FAILURE CAUSE: A: Fracture of housing or weld.

THE HOUSING AND LINE IS DESIGNED WITH RADII INCORPORATED AT AREAS WHERE STRESS RISERS MAY OCCUR (1). AN ADAPTER (2) BETWEEN THE LINE AND VALVE HOUSING PROVIDES A SMOOTH TRANSITION FROM THIN-WALLED PRESSURE VESSEL TO THE STIFFER THICK-WALLED HOUSING, REDUCING STRESS CONCENTRATIONS (2). THE AFV HOUSING (1) IS MADE FROM HEAT TREATED INCONEL 718. INCONEL 718 IS USED FOR ITS HIGH STRENGTH, LOW THERMAL EXPANSION-CONTRACTION CHARACTERISTICS, CRYOGENIC DUCTILITY, CORROSION AND STRESS CORROSION RESISTANCE. INCONEL 718 MEETS LOX COMPATIBILITY REQUIREMENTS (3). THE HOUSING-TO-LINE ADAPTER (2) IS MADE FROM INCONEL 625. INCONEL 625 IS USED FOR ITS WELDABILITY, CORROSION RESISTANCE, CRYOGENIC TOUGHNESS, AND RESISTANCE TO STRESS CORROSION CRACKING. INCONEL 625 MEETS STANDARD LOX COMPATIBILITY REQUIREMENTS (3). THE HIGH CYCLE AND LOW CYCLE FATIGUE LIFE OF THE ANTI-FLOOD VALVE MEETS CEI REQUIREMENTS (4). THE MINIMUM FACTORS OF SAFETY FOR THE AFV MEETS CEI REQUIREMENTS (5). THE AFV COMPONENTS WERE CLEARED FOR FRACTURE MECHANICS/INDE FLAW GROWTH, SINCE THEY ARE NOT FRACTURE CRITICAL PARTS (6). TABLE D300 LISTS ALL THE FMEA/CIL WELDS AND IDENTIFIES THOSE WELDS IN WHICH THE ROOT SIDE IS NOT ACCESSIBLE FOR INSPECTION. THESE WELDS HAVE BEEN ASSESSED AS ACCEPTABLE FOR FLIGHT BY RISK ASSESSMENT (7). THE ANTI-FLOOD VALVE SUCCESSFULLY COMPLETED DVS TESTING REQUIREMENTS (8), INCLUDING VIBRATION (9), AND ENDURANCE (10).

(1) R0019121; (2) RS007083; (3) RSS-8582; (4) RL00532, CP320R0003B; (5) RSS-8546, CP320R0003B; (6) NASA TASK 117; (7) RSS-8766; (8) DVS-SSME-508; (9) RSS-508-33, RSS-508-34; (10) RSS-508-32

SSME FMEA/CIL
INSPECTION AND TEST

Component Group: Propellant Valves
 CIL Item: D300-08
 Component: Anti-flood Valve
 Part Number: RSD07083
 Failure Mode: Structural failure.

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	HOUSING LINE ASSEMBLY		R0019121 RSC07083
	HOUSING MATERIAL	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS. HOUSING HEAT TREAT IS VERIFIED PER SPECIFICATION. HOUSING AND ADAPTER ARE PENETRANT INSPECTED PER SPECIFICATION.	R0019121 RA0611-020 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 RA0507-094 RA0115-116 RA0115-006 RA0115-127 RA1115-001
	ASSEMBLY INTEGRITY	VALVE ASSEMBLY IS PROOF-PRESSURE TESTED.	RL00460
	HOT-FIRE ACCEPTANCE TESTING (GREEN RUN)	VALVE OPERATION IS VERIFIED THROUGH HOT-FIRE ACCEPTANCE TESTING.	RL00461
		A SIGNATURE LEAK TEST PERFORMED PRIOR TO EACH FLIGHT VERIFIES THAT THERE IS NO EXTERNAL LEAK OR RUPTURE. (LAST TEST)	OMRSD S00000.950

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Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA)
 Reference: NASA letter SA21/88/308 and Rockeodyne letter 88RC09761.
 Operational Use: Not Applicable.

SSME / TA/CIL
WELD JOINTS

Component Group: Propellant Valves
 CIL Item: D300
 Component: Anti-flood Valve
 Part Number: RS007083

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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	
ANTI-FLOOD VALVE	RS007083	5	EBW	II	X			
ANTI-FLOOD VALVE	RS007083	6	EBW	II	X			