SSME FMEA/CIL
REDUNDANCY SCREEN

Component Group:	**Propellant Valves**	**Prepared:**	**P. Lowrimore**
CIL Item:	**D300-07**	**Approved:**	**T. Nguyen**
Component:	**Anti-flood Valve**	**Approval Date:**	**6/30/99**
Part Number:	**RS007083**	**Change #:**	**1**
Failure Mode:	**Piece part structural failure.**	**Directive #:**	**CCBD ME3-01-5226**
		Page:	**1 of 1**

Phase	Failure / Effect Description	Criticality Hazard Reference
SMC 4.1	Fire from LOX impact, or rubbing, or blockage of heat exchanger bypass orifice. Loss of vehicle. Redundancy Screens: **SINGLE POINT FAILURE:** N/A.	1 ME-C3S, ME-C3M, ME-C3A,C

SSME FMEA/CIL
DESIGN

Component Group:	**Propellant Valves**	**Prepared:**	**P. Lowrimore**
CIL Item:	**D300-07**	**Approved:**	**T. Nguyen**
Component:	**Anti-flood Valve**	**Approval Date:**	**6/30/99**
Part Number:	**RS007033**	**Change #:**	**1**
Failure Mode:	**Place part structural failure.**	**Directive #:**	**CCBD ME3-01-5226**
		Page:	**1 of 1**

Design / Document Reference

FAILURE CAUSE: **A: Internal structural failure of: Poppet, Retainer, Seat.**

THE ANTI-FLOOD VALVE POPPET (1) IS MADE FROM TUNGSTEN CARBIDE. TUNGSTEN CARBIDE WAS SELECTED FOR ITS RESISTANCE TO WEAR, HIGH HARDNESS, AND ITS VIRTUALLY POROSITY FREE STRUCTURE. THE MATERIAL IS CORROSION RESISTANT AND, WHERE USED IS NOT SUBJECT TO STRESS CORROSION CRACKING (2). TUNGSTEN CARBIDE MEETS THE STANDARD LOX COMPATIBILITY REQUIREMENTS (2). THE RETAINER (3), AND SEAT (4), ARE MADE FROM HEAT TREATED INCONEL 718. INCONEL 718 IS USED FOR ITS HIGH STRENGTH, CORROSION RESISTANCE, STRESS CORROSION RESISTANCE, AND CRYOGENIC DUCTILITY. INCONEL 718 MEETS THE STANDARD LOX COMPATIBILITY REQUIREMENTS (2). THE AFV SEAT IS HARDFACED FOR ADDITIONAL WEAR RESISTANCE. AFTER HARDFACING, THE SEAT IS SOLUTION HEAT TREATED AND AGED. THE SEAT IS NOT LOADED DURING ENGINE OPERATION, THUS, REDUCING FAILURE POTENTIAL. THE HIGH CYCLE AND LOW CYCLE FATIGUE LIFE OF THE ANTI-FLOOD VALVE MEETS CEI REQUIREMENTS (5). THE MINIMUM FACTORS OF SAFETY FOR THE AFV MEETS CEI REQUIREMENTS (6). THE AFV COMPONENTS WERE CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH, SINCE THEY ARE NOT FRACTURE CRITICAL PARTS (7). TABLE D300 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). THE ANTI-FLOOD VALVE SUCCESSFULLY COMPLETED DVS TESTING REQUIREMENTS (9), INCLUDING VIBRATION (10), AND ENDURANCE (11).

(1) RS008226; (2) RSS-8582; (3) RS008228; (4) R0019127; (5) RL00532, CP320R0003B; (6) RSS-8646, CP320R0003B; (7) NASA TASK 117; (8) RSS-8756; (9) DVS-SSME-508; (10 RSS-508-33, RSS-508-34; (11) RSS-508-32

SSME FMEA/CIL
INSPECTION AND TEST

Component Group: Propellant Valves
CIL Item: D300-07
Component: Anti-flood Valve
Part Number: RS007083
Failure Mode: Piece part structural failure.

Prepared: P. Lowrimore
Approved: T. Nguyen
Approval Date: 5/30/99
Change #: 1
Directive #: CCBD ME3-01-5228

Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	POPPET RETAINER SEAT		RS008225 RS008226 R0019127
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS.	
		THE POPPET IS PENETRANT INSPECTED AFTER FINAL MACHINING	RA0115-116
		THE SEAT IS PENETRANT INSPECTED AFTER FINAL MACHINING.	
		THE SEAT HARDFACE AND AGE IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RA1609 049 RA0611-020
		THE RETAINER IS PENETRANT INSPECTED IN THE WELDED AREA AFTER E.B. WELDING	RA0115-116
		PRIOR TO INSTALLATION, THE SEAT IS EXAMINED FOR DEFECTS.	RL00460
	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 RA1609-049 RA0115-116 RA0115-006 RA0115-127 RA1115-001
		WELD SAMPLES RUN PRIOR TO PRODUCTION WELDS VERIFY E.B. WELD PARAMETERS.	RA0507-094
	ASSEMBLY INTEGRITY	THE ASSEMBLY, FUNCTIONAL, AND PROOF PRESSURE TESTS ARE VERIFIED PER SPECIFICATION.	RL00460
	HOT-FIRE ACCEPTANCE TESTING (GREEN RUN)	VALVE OPERATION IS VERIFIED THROUGH HOT-FIRE ACCEPTANCE TESTING.	RL00461
		THE POPPET AND SEAT INTEGRITY IS VERIFIED BY LEAK TEST AFTER LAST ACTUATION	OMRSD V41BQ0.100
		THE VALVE OPERATION IS VERIFIED BY VALVE CRACKING, FULL OPEN, AND RESEAT PRESSURE TEST AFTER EVERY START.	OMRSD V41BR0.030

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 / EA/CIL
WELD JOINTS

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

Prepared: P. Lowrimore
Approved: T. Nguyen
Approval Date: 6/30/89
Change #: 1
Directive #: CCBD ME3-01-5226
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Component	Basic Part Number	Weld Number	Weld Type	Class	Root Side Not Access	Critical Initial Flaw Size Not Detectable HCF	Critical Initial Flaw Size Not Detectable LCF	Comments
ANTI-FLOOD VALVE	RS007083	5	EBW	II	X			
ANTI-FLOOD VALVE	RS007083	6	EBW	II	X			