SSME FA/CIL
REDUNDANCY SCREEN

Component Group:	Pneumatic Controls
CIL Item:	C300-07
Component:	Helium Precharge Valve
Part Number:	RS010180
Failure Mode:	Failure to contain oxidizer.

Prepared:	P. Lowrimore
Approved:	T. Nguyen
Approval Date:	6/2/99
Change #:	1
Directive #:	CCBD ME3-01-5213
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Phase	Failure / Effect Description	Criticality Hazard Reference
PSMC2 4 1	Failure of check valve body provides a flow path for LOX/GOX into orbiter aft bay causing overpressurization of aft bay. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-C3P, ME-C3S, ME-C3M, ME-C3C, ME-C3D, ME-C3A

SSME FMEA/CIL
DESIGN

Component Group:	Pneumatic Controls	Prepared:	P. Lowrimore
CIL Item:	C300-07	Approved:	T. Nguyen
Component:	Helium Precharge Valve	Approval Date:	8/2/99
Part Number:	R5010180	Change #:	1
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Design / Document Reference

FAILURE CAUSE: ALL CAUSES

INCONEL 718 IS USED TO MANUFACTURE THE CHECK VALVE HOUSING (1). IT HAS HIGH STRENGTH AND DUCTILITY (2). IT IS CORROSION RESISTANT AND EXHIBITS HIGH STRESS CORROSION CRACKING RESISTANCE (3). INCONEL 718 HAS A HIGH MODULUS OF ELASTICITY (1). THE ASSEMBLY HAS COMPLETED DESIGN VERIFICATION TESTING (4), INCLUDING VIBRATION AND ENDURANCE TESTING (5). HIGH CYCLE AND LOW CYCLE FATIGUE LIFE, AS WELL AS THE MINIMUM FACTORS OF SAFETY FOR THE HELIUM PRECHARGE VALVE, MEET CEI REQUIREMENTS (6), EXCEPT FOR PROOF PRESSURE FACTOR WHICH IS ACCEPTED PER MAJOR WAIVER (7). THE HPV WAS CLEARED FOR FRACTURE MECHANICS/INDE FLAW GROWTH, SINCE IT CONTAINS NO FRACTURE CRITICAL PARTS (8) AN EXAMINATION OF ENGINE 2010 HPV SHOWED NO EVIDENCE OF HPV CHECK VALVE HOUSING FAILURE. THE VALVE ACCUMULATED OVER 13,300 SECONDS AND 43 STARTS.

(1) RS010182; (2) RSS-8582-5; (3) MSFC-SPEC-522; (4) DVS-SSME-517; (5) RSS-517-53, RSS-517-51. (6) RL00532, CP320R0003B, RSS-8546; (7) DAR 2233; (8) NASA TASK 117

SSME FMI. CIL
INSPECTION AND TEST

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
ALL CAUSES	HOUSING, CHECK VALVE HELIUM PRECHARGE VALVE		RS010182
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS.	
		THE HEAT TREAT IS VERIFIED PER DRAWING AND SPECIFICATION REQUIREMENTS.	RS010182 RA0611-020
		THE HOUSING IS PENETRANT INSPECTED AFTER FINISH MACHINING AND HEAT TREATMENT.	RA0115-115
	PROOF TESTING	THE HPV ASSEMBLY IS PROOF TESTED, OUTLETS AND TOTAL ASSEMBLY.	RS010180 RS010182 RL00459
	PRE-FLIGHT CHECKOUT	CHECK VALVE LEAK TEST IS PERFORMED AFTER 10 STARTS.	OMRSD V41BQ0.100
		FLIGHT READINESS TEST, INCLUDING PNEUMATIC SHUTDOWN, IS PERFORMED EACH FLIGHT.	OMRSD V41AS0.030
		FLIGHT READINESS TESTS AND VALVE CYCLE VERIFICATION ARE PERFORMED EACH FLIGHT.	OMRSD S00FA0.211 OMRSD V41AS0.030
		PNEUMATIC SYSTEM CHECKOUT IS PERFORMED EACH FLIGHT.	OMRSD S00FA0.213 OMRSD V41AS0.020
		A HELIUM SIGNATURE LEAK TEST IS PERFORMED PRIOR TO EACH FLIGHT.	OMRSD S00000.950
		AFT CLOSEOUT INSPECTION IS PERFORMED PRIOR TO FLIGHT. (LAST TEST)	OMRSD V41BU0.070

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.