

**SSME FMEA/CHL
REDUNDANCY SCREEN**

Component Group: Propellant Valves
 CIL Item: D500-02
 Component: GOX Control Valve
 Part Number: RS010141
 Failure Mode: Check valve fails to open.

Prepared: P. Lowrimore
 Approved: T. Nguyen
 Approval Date: 6/30/99
 Change #: 1
 Directive #: CCBD ME3-01-5226
 Page: 1 of 1

Phase	Failure / Effect Description	Criticality Hazard Reference
S 4.1	Loss of pogo suppression capability; controller pogo GOX flow check results in MCF and vehicle commanded shutdown. Mission scrub Loss of vehicle due to pogo may result if GCV failure is not detected. Redundancy Screens: VALVE SYSTEM - SENSOR SYSTEM: UNLIKE REDUNDANCY A: Pass - Redundant hardware items are capable of checkout during normal ground turnaround B: Pass - Loss of a redundant hardware items is detectable during flight C: Pass - Loss of redundant hardware items could not result from a single credible event.	1R ME-B3A,M,C, ME-GBM

SSME / EA/CIL
DESIGN

Component Group: Propellant Valves
CIL Item: D500-02
Component: GOX Control Valve
Part Number: RS010141
Failure Mode: Check valve fails to open.

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

Design / Document Reference

FAILURE CAUSE: A: Poppet seizure.

THE CHECK VALVE POPPET (1) IS HEAT TREATED 440C. THE MATERIAL WAS SELECTED FOR ITS STRENGTH, HARDNESS, AND WEAR RESISTANCE. 440C IS CORROSION RESISTANT (2). THE RETAINER (3) MATERIAL IS HEAT TREATED INCONEL 718. THE MATERIAL WAS SELECTED FOR ITS STRENGTH AND CORROSION RESISTANCE. THE POPPET IS MACHINED WITH A SPHERICAL SURFACE ON THE OUTSIDE DIAMETER. THIS CONFIGURATION ELIMINATES SEIZURE CAUSED BY POPPET COCKING. THE DIFFERENTIAL HARDNESS OF THE POPPET AND RETAINER AND THE CLEARANCE BETWEEN THE PARTS PREVENTS GALLING AND PROVIDES ADDITIONAL PROTECTION AGAINST SEIZURE. THE GOX CONTROL VALVE HAS COMPLETED DVS TESTS REQUIREMENTS (4), INCLUDING VIBRATION (5), AND ENDURANCE (6). POGO SYSTEM PRECHARGE PRESSURE AND ANCILLARY LIMITS WILL CAUSE REDLINE ENGINE SHUTDOWN PRIOR TO CRITICAL 1 EFFECTS (7).

(1) RS010155; (2) RSS-8582; (3) RS010156; (4) DVS-SSME-517; (5) RSS-517-40, RSS-517-60; (6) RSS-517-50; (7) CP406RC002 PT 1 3 2 3 6.4

**SSME FMEA/CIL
INSPECTION AND TEST**

Component Group: Propellant Valves
 CIL Item: D500-02
 Component: GOX Control Valve
 Part Number: RS010141
 Failure Mode: Check valve fails to open.

Prepared: P. Lowrimore
 Approved: T. Nguyen
 Approval Date: 6/30/99
 Change #: 1
 Directive #: CCBO ME3-01-5226

Page: 1 of 1

Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	POPPET RETAINER		RS010155 RS010156
	MATERIAL INTEGRITY	MATERIAL INTEGRITY AND HEAT TREAT ARE VERIFIED PER DRAWING REQUIREMENTS. POPPET OUTSIDE DIAMETER, SPHERICAL RADIUS, AND SURFACE FINISH ARE VERIFIED PER DRAWING REQUIREMENTS. RETAINER PILOT DIAMETER FOR POPPET IS VERIFIED PER DRAWING REQUIREMENTS.	RS010155 RS010156
	ASSEMBLY INTEGRITY	PROPER ASSEMBLY IS VERIFIED DURING ASSEMBLY AND FUNCTIONAL TEST.	RL00490
	HOT-FIRE ACCEPTANCE TESTING (GREEN RUN)	VALVE OPERATION IS VERIFIED THROUGH HOT-FIRE ACCEPTANCE TESTING. GCV CHECK VALVE IS LEAK TESTED PRIOR TO EACH FLIGHT. THIS WOULD DETECT POPPET SEIZURE EXCEPT IN THE MOST EXTREME CASE WHERE SEIZURE OCCURRED WHEN VALVE WAS FULLY CLOSED (LAST TEST)	RL00461 OMRSD V41BQ0.150

D-173

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 FMEA/CIL
WELD JOINTS

Component Group: Propellant Valves
 CIL Item: D500
 Component: GOX Control Valve
 Part Number: RS010141

Prepared: P. Lowmore
 Approved: T. Nguyen
 Approval Date: 6/30/99
 Change #: 1
 Directive #: CCBD ME3-01-5226
 Page: 1 of 1

Component	Basic Part Number	Weld Number	Weld Type	Class	Root Side Not Access	Critical Initial Flaw Size Not Detectable		Comments
						HCF	LCF	
GOX CONTROL VALVE	RS010141	1	EBW	II	X	X		
GOX CONTROL VALVE	RS010141	2	EBW	II	X			
GOX CONTROL VALVE	RS010141	3,4	EBW	II	X	X		
BELLOWS	RS010143	3,4	GTAW	II	X			
BELLOWS	RS010143	5,6	EBW	II	X	X		