

SSME / FA/CIL
REDUNDANCY / SCREEN

Component Group: Propellant Valves
CIL Item: D220-08
Component: Oxidizer Bleed Valve
Part Number: RS008056
Failure Mode: Frattling of internal parts.

Prepared: P. Lowmore
Approved: T. Nguyen
Approval Date: 6/30/99
Change #: 1
Directive #: CCBD ME3-01-5228
Page: 1 of 1

Phase	Failure / Effect Description	Criticality Hazard Reference
PSMCD 4.1	Fire from ignition of internal parts. 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: D220-08
Component: Oxidizer Bleed Valve
Part Number: RS008056
Failure Mode: Fretting of internal parts.

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

Design / Document Reference

FAILURE CAUSE: A: Relative motion of: Poppet/Piston, Piston/Spring/Poppet.

THE POPPET (1), PISTON (2), AND RETAINER (3) ARE HEATED TREATED INCONEL 718. THE MATERIAL WAS SELECTED FOR ITS STRENGTH, DUCTILITY, AND WEAR RESISTANCE (5). THE POPPET SPRING (4) IS 302 CRES. 302 CRES WAS SELECTED FOR ITS SPRING PROPERTIES. BOTH MATERIALS ARE CORROSION AND STRESS-CORROSION RESISTANT (4). DURING PROPELLANT CONDITIONING, THE BLEED VALVE (6) IS IN THE OPEN POSITION. THE POPPET SPRING LOADS THE SPHERICAL SURFACES OF THE POPPET AND PISTON TO PREVENT POPPET FLUTTER AND RELATIVE MOTION BETWEEN THE POPPET AND THE PISTON AND BETWEEN THE POPPET SPRING AND THE RETAINER AND PISTON. DURING HOT FIRE, THE BLEED VALVE IS CLOSED. THE CLOSING LOAD IS THE DIFFERENCE BETWEEN THE BELLOWS (7) FORCE AND THE PISTON SPRING (8) FORCE. THIS LOAD IS APPLIED TO PREVENT PISTON MOVEMENT UNDER ENGINE VIBRATION AND RELATIVE MOTION OF THE PISTON, POPPET, AND POPPET SPRING. THE BLEED VALVE HAS COMPLETED DESIGN VERIFICATION TESTING (9), INCLUDING VIBRATION (10), AND ENDURANCE (11). THE MATERIALS HAVE BEEN VERIFIED TO BE LOX COMPATIBLE IN THEIR OPERATING ENVIRONMENTS (12).

(1) RS008282; (2) RS009503; (3) RS008286; (4) RSS-8582; (5) RS008287; (6) RS008056; (7) RS008285; (8) RS008288; (9) DVS-SSME-516; (10) RSS-516-21; (11) RSS-516-17; (12) RL10017

**SSME FM² CIL
INSPECTION AND TEST**

Component Group: Propellant Valves
 CIL Item: D220-06
 Component: Oxidizer Bleed Valve
 Part Number: RS008056
 Failure Mode: Fretting of internal parts.

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

Page: 1 of 1

Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	POPPET BELLOWS RETAINER SPRING-POPPET SPRING-PISTON PISTON		RS008282 RS008285 RS008286 RS008287 RS008288 RS009500
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS. HEAT TREAT IS VERIFIED PER DRAWING REQUIREMENTS.	RS008282 RS008285 RS008286 RS009500
	POPPET AND PISTON SPHERICAL RADII	THE SPHERICAL RADII AND SURFACE FINISH ARE VERIFIED PER DRAWING REQUIREMENTS	RS008282 RS009500
	SPRINGS AND BELLOWS LOADS	SPRING AND BELLOWS LOADS ARE VERIFIED PER DRAWING REQUIREMENTS.	RS008287 RS008288 RS008285
	ASSEMBLY INTEGRITY	THE VALVE ACTUATION AND RESEAT PRESSURES ARE VERIFIED PER DRAWING REQUIREMENTS.	RS008056

D-137

Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA)

Reference: NASA letter SA21/88/308 and Rockaldyne letter 88RC09761.

Operational Use: Not Applicable.

**SSME FTA/CIL
WELD JOINTS**

Component Group: Propellant Valves
 CIL Item: D220
 Component: Oxidizer Bleed Valve
 Part Number: RS008058

Prepared: P. Lowrmore
 Approved: T. Nguyen
 Approval Date: 6/30/99
 Change #: 1
 Directive #: CCBD MEJ-01-5225
 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	
OXIDIZER BLEED VALVE	RS008058	1	EBW	II	X	X	X	
OXIDIZER BLEED VALVE	RS008058	2	EBW	II	X			
OXIDIZER BLEED VALVE	RS008058	4	EBW	1A	X			
BELLOWS	RS008285	3,4	GTAW	II	X	X		

SSME FMEA/CIL
FIELD CONFIGURATION VARIANCES FROM CIL RATIONALE

Component Group: Propellant Valves
 Item Name: Oxidizer Bleed Valve
 Item Number: D220
 Part Number: RS008058

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

Page: 1 of 1

Base Line Rationale	Variance	Change Rationale	Variant Dash Number
1. D220-04 ARMATURE EXTENSION MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS (INCONEL 625, ECP 1088).	SOME ARMATURE EXTENSIONS ARE FABRICATED FROM INCONEL 718.	INCONEL 718 CAN BECOME FERROMAGNETIC AT LIQUID HYDROGEN TEMPERATURES RESULTING IN ERRONEOUS POSITION FEEDBACK SIGNAL. INCONEL 625 DOES NOT EXHIBIT THIS TENDENCY. USE AS IS RATIONALE: 1. ENGINEERING ANALYSIS HAS DETERMINED THAT ALL ARMATURE EXTENSIONS FABRICATED FROM INCO 718 WILL NOT EXPERIENCE LOW ENOUGH TEMPERATURES ON OXIDIZER BLEED VALVES TO INDUCE FERROMAGNETIVITY AND ARE THEREFORE ACCEPTABLE FOR USE. (ECP 1088)	-02f, -04f, -05f, -06f, -07f, -10f