

**SSME CREWMIL
REDUNDANCY SCREEN**

Component Group: Combustion Devices
CIL Item: A605-11
Part Number: R0017438
Component: Fuel Preburner (Phase II*)
FMEA Item: A605
Failure Mode: External rupture.

Prepared: A. Kay
Approved: T. Nguyen
Approval Date: 9/9/99
Change #: 2
Directive #: CC80 ME3-01-5238

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Phase	Failure / Effect Description	Criticality
SMC 4.1	Leakage into aft compartment will cause overpressurization and/or fire. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE. N/A	Hazard Reference 1 ME-FB2S, ME-FB2M ME-FB2A,C

**SSME / A/CIL
DESIGN**

Component Group: Combustion Devices
CIL Item: A605-11
Part Number: R0017436
Component: Fuel Preburner (Phase II+)
FMEA Item: A605
Failure Mode: External rupture.

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Design / Document Reference

FAILURE CAUSE: A: Weld or parent material failure.

THE FPB FUEL MANIFOLD AND FPB BODY ARE FABRICATED FROM INCONEL 718. INCONEL 718 WAS SELECTED ON THE BASIS OF ITS STRENGTH AFTER HEAT TREAT AND ITS SATISFACTORY PERFORMANCE ON THE THREE DUCT POWERHEAD. OTHER DESIRABLE PROPERTIES OF INCONEL 718 ARE ITS CRYOGENIC DUCTILITY AND OXYGEN COMPATIBILITY (1). PRIMARY FACTORS OF SAFETY MEET CEI REQUIREMENTS (2). HIGH CYCLE FATIGUE AND LOW CYCLE FATIGUE LIFE MEET CEI REQUIREMENTS (3). OFFSET LIMIT REQUIREMENTS ARE ESTABLISHED TO REDUCE STRESS CONCENTRATIONS AND IMPROVE WELD GEOMETRY (4). CRITICAL WELD BEADS ARE MACHINED FLUSH TO REDUCE STRESS CONCENTRATIONS. THE PREBURNER PARENT MATERIALS WERE CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH SINCE THEY CONTAIN NO FRACTURE CRITICAL PARTS (5). THE FMEA/CIL WELDS ARE CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH BY THE WELD ASSESSMENT (6). TABLE A605 LISTS ALL 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. THOSE WELDS IN WHICH THE CRITICAL INITIAL FLAW SIZE IS NOT DETECTABLE ARE ACCEPTABLE FOR FLIGHT BY RISK ASSESSMENT (6). THE PREBURNER WAS DFR TESTED (7).

(1) RSS-8571-0; (2) RSS-8546, CP320RC03B; (3) RL00532, CP320RC03B; (4) RL10011; (5) NASA TASK 117; (6) RSS 8756; (7) RSS 9879-1

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**SSME FMEA/CIL
INSPECTION AND TEST**

Component Group: Combustion Devices
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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	FUEL PREBURNER CHAMBER FUEL PREBURNER BODY MANIFOLD FUEL INLET ASSEMBLY		R0017438 R0017426 RS009029 RS009525
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS	RB0170-153 RB0170-186 RB0170-196 RB0170-213
		ULTRASONIC INSPECTION IS PERFORMED ON THE FORGINGS PER SPECIFICATION REQUIREMENTS.	RA0115-012
	HEAT TREAT	HEAT TREAT IS VERIFIED PER DRAWING AND SPECIFICATION REQUIREMENTS	RS009029 R0017435 R0017426 RA0611-020
	WELD INTEGRITY	ALL WELDS ARE INSPECTED TO DRAWING AND SPECIFICATION REQUIREMENTS PER WELD CLASS. INSPECTIONS INCLUDE: VISUAL, DIMENSIONAL, PENETRANT, RADIOGRAPHIC III, TRASONIC, AND FILLER MATERIAL, AS APPLICABLE.	RL10011 RA1507-071 RA0115-116 RA0115-006 RA0115-127 RA1115-001 RF001-12C
	ASSEMBLY INTEGRITY	AN ASSEMBLY PROOF PRESSURE TEST IS PERFORMED PER DRAWING AND SPECIFICATION REQUIREMENTS. A PENETRANT INSPECTION IS PERFORMED ON THE ASSEMBLY AFTER PRESSURE TEST. THE HOT FIRE TESTING AND 2ND E & M INSPECTIONS VERIFY INTEGRITY OF PREBURNER.	R0012001 RL00846 RA0115-115 RF0001-120
		HELIUM SIGNATURE LEAK TEST PERFORMED PRIOR TO EACH LAUNCH VERIFIES WELD AND PARENT MATERIAL INTEGRITY (LAST TEST).	RL00050-04 RL00050-06 RL00050-07 CMRSD S00000-550

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Component ID: Combustion Devices
CLC Item: A605-11
Part Number: R0017438
Component: Fuel Preburner (Phase II+)
FMEA Item: A605
Failure Mode: External rupture.

Approved: T. Ngiye
Approval Date: 9/9/99
Change #: 2
Directive #: CGBD MEJ-01-5238

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
Failure History	Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA) Reference: NASA letter SA21/88/306 and Rocketdyne letter 88RCC5761		
Operational Use:	Not Applicable.		

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**SSME FMEA/CIL
WELD JOINTS**

Component Group: Combustion Devices
 CIL Item: A605
 Component: R0017438
 Part Number: Fuel Preburner (Phase II-)
 A605

Prepared: A. Kay
 Approved: T. Nguyen
 Approval Date: 9/9/99
 Change #: 1
 Directive #: CCBD ME3-01-5238
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Component	Basic Part Number	Weld Number	Weld Type	Class	Root Side No: Access	Critical Initial Flaw Size Not Detectable		Comments
						HCF	LCF	
FPB BODY	R0017426	1	EBW	I		X		
FPB BODY	R0017426	2	EBW	I	X			
FPB BODY	R0017426	3	EBW	I	X			
FPB FUEL CHAMBER	R0017435	1	GTAW	I	X	X	X	
FPB FUEL CHAMBER	R0017435	2	GTAW	I	X	X	X	
FPB INJECTOR	R0017438	1	EBW	II	X	X	X	
FPB INJECTOR	R0017438	2	EBW	II	X	X	X	
FPB INJECTOR	R0017438	3	GTAW	II	X			
FPB INJECTOR	R0017438	5	EBW	II	X	N/A	N/A	
FPB INJECTOR	R0017438	39	EBW	II	X	N/A	N/A	
FPB INJECTOR	R0017438	39	EBW	II	X	X	X	
FPB FUEL MANIFOLD	RS009029	7(OPT), 8(OPT)	GTAW	I		X	X	
FPB FUEL MANIFOLD	RS009029	11(OPT)	GTAW	I		X		
FPB FUEL MANIFOLD	RS009029	13(OPT)	GTAW	I		X		
FPB OXID INLET	RS009030	1	GTAW	I		X		
FPB OXID INLET	RS009030	2	GTAW	I	X	X	X	
FPB OXID INLET	RS009030	4	GTAW	I				
PREBURNER EXPANSION JOINT	RS009032	1	GTAW	I				
PREBURNER EXPANSION JOINT	RS009032	2,3	GTAW	II	X			
FPB ASI FUEL LINE	RS009525	1 PLC	GTAW	I	X			

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SSME F A/CIL
FIELD CONFIGURATION VARIANCES FROM CIL RATIONALE

Component Group: Combustion Devices
 Item Name: Fuel Preburner (Phase II+)
 Item Number: A605
 Part Number: R0317438

Prepared: A. Kay
 Approved: T. Nguyen
 Approval Date: 9/8/99
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Base Line Rationale	Variance	Change Rationale	Variant Dash Number
1. A605 NO RATIONALE EFFECTED	902 WELD OVERLAY EXISTS ON ONE PREBURNER ASSEMBLY.	OVERLAY WAS APPLIED TO PROVIDE HYDROGEN EMBRITTELEMENT PROTECTION. USE AS IS RATIONALE: ANALYSIS SHOWED NO HEE PROTECTION REQUIRED.	R0317438-51
2. A605-9,-10,-11. NO RATIONALE EFFECTED	POWERHEADS EXIST UTILIZING THE COMBINED FOUR ZONE PROOF PRESSURE TEST FROM THE HOT GAS MANIFOLD. CEI REQUIREMENTS ARE MAINTAINED.	HOT GAS MANIFOLD PROOF PRESSURE TEST ACCOMPLISHED SEPARATELY PRIOR TO COOLANT DUCT AND MAIN INJECTOR INSTALLATION.	R0019201-681, -701, -731 -991, 1051.

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