

~~SINGLE POINT FAILURE~~
REDUNDANCY SCREEN

Component Group: Combustion Devices
CIL Item: A605-03
Part Number: R0017438
Component: Fuel Preburner (Phase II+)
FMEA Item: A605
Failure Mode: Blockage of one LOX ASI passage.

Prepared: A. Kay
Approved: T. Nguyen
Approval Date: 9/9/99
Change #: 2
Directive #: CCBD ME3-01-5239

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Phase	Failure / Effect Description	Criticality Hazard Reference
SMC 4.1	Blockage of one LOX ASI injection passage causes localized LOX-rich operation, erosion of the ASI combustion chamber walls, manifold invasion, injector burnout and aft compartment overpressurization and fire. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE. N/A	1 ME-FB2S, ME-FB2M ME-FB2A,C

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SSME / A/CIL
DESIGN

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Design / Document Reference

FAILURE CAUSE: A: Contamination of the ASI LOX Injection passage.

THE SMALLEST SECTION OF THE ASI OXIDIZER PASSAGEWAY IS LARGER THAN THE ASI ORIFICE WHICH IS INSTALLED APPROXIMATELY 5 INCHES UPSTREAM (1). ANY CONTAMINANT THAT COULD CAUSE PASSAGE BLOCKAGE WOULD HAVE TO COME FROM THIS SHORT LENGTH OF LINE. HOT FIRE TESTING OF THE ENGINE WILL REVEAL BLOCKAGE PROBLEMS PRIOR TO FLIGHT USE (2). THE ASI ORIFICE IS ASSEMBLED IN A CONTAMINATION CONTROLLED ENVIRONMENT (3).

(1) R0017438, RS009018; (2) RL00050 04; (3) R00711-600

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**SSME FMEA/CIL
INSPECTION AND TEST**

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	ASI ASSEMBLY HOT-GAS MANIFOLD		R0017438 R018020
	ASI SYSTEM CLEANLINESS	ASI SUBASSEMBLIES AND THE MOV ARE CLEANED DURING FABRICATION TO OXYGEN SERVICE REQUIREMENTS. AFTER BRAZING, THE PASSAGE PORTS AND ORIFICES ARE INSPECTED FOR BLOCKAGE DUE TO BRAZING MATERIAL. THE OXIDIZER ASI SYSTEM IS PURGED DURING PROPELLANT CONDITIONING TO MAINTAIN IT FREE OF MOISTURE AND ICE.	RL0001 RA0110-018 RA1607-C17 RA1607-C18 OMRSD S0CFB0 300
	PROPELLANT SYSTEM CLEANLINESS	SSME PROPELLANT SYSTEM IS DRIED AND VERIFIED DRY PRIOR TO EACH FLIGHT	OMRSD V41CB0.082 OMRSD V41CB0.083
	ASSEMBLY INTEGRITY	THE HOT FIRE TESTING AND 2ND E & M INSPECTIONS VERIFY ASI INTEGRITY. THE ASI CHAMBER IS INSPECTED FOR DAMAGE PRIOR TO EACH LAUNCH (LAST TEST).	RL00058-04 RL00058-06 RL00058-07 OMRSD V41BUC 040

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Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRAQA)
 Reference: NASA letter SA21/BB/308 and Rocketdyne letter 88RC09761.
 Operational Use: Not Applicable.

**SSME FMEA/CIL
WELD JOINTS**

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

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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

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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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