

SSME FMEA/CIL
REDUNDANCY SCREEN

Component Group: Combustion Devices
CIL Item: A205-05
Part Number: RS059122
Component: Baffleless Main Injector (Phase II+)
FMEA Item: A205
Failure Mode: Partial blockage of an oxidizer orifice.

Prepared: A. Kay
Approved: T. Nguyen
Approval Date: 9/9/99
Change #: 2
Directive #: CCBD ME2-01-8238

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Phase
SMC
4.1

Failure / Effect Description:

Partial blockage allows combustion gas backflow into the post causing combustion within the post and post burn-through. Extensive subsequent erosion results in aft compartment overpressurization and fire. Loss of vehicle.

Redundancy Screens: SINGLE POINT FAILURE: N/A

Criticality
Hazard Reference
↓
ME-FB4S,
ME-FB4M,
ME-FB4A,C

**SSME / A/CIL
DESIGN**

Component Group: Combustion Devices
CIL Item: A205-05
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Design / Document Reference

FAILURE CAUSE: A: Local contamination in oxidizer manifold.

THE OXIDIZER IS FILTERED TO 800-MICRONS AT THE EXTERNAL TANK (1). A PRE-START PURGE MINIMIZES THE POSSIBILITY OF RESTRICTION IN THE OXIDIZER SYSTEM DUE TO ICE FORMATION. HOT FIRING HAS BEEN PERFORMED ON THE PHASE II CONFIGURATION WITH PARTIAL POST BLOCKAGE AND THERE WAS NO EFFECT ON POST OR PERFORMANCE. THIS PARTIALLY PLUGGED POST ACCUMULATED OVER 4000 SECONDS AND 45 STARTS.

(1) ICD 13M 5000

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**SSME FMEA/CIL
INSPECTION AND TEST**

Component Group: Combustion Devices
 CIL Item: A205-05
 Part Number: R5009122
 Component: Baffleless Main Injector (Phase II+)
 FMEA Item: A205
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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	MAIN INJECTOR ASSEMBLY		RS009122
	OXIDIZER SYSTEM CLEANLINESS	INJECTOR ASSEMBLY IS VAPOR DEGREASED. ALL SURFACES FLUSHED AND INSPECTED TO INSURE NO ADHERING PARTICLES. INJECTOR FLOW TESTING VERIFIES ORIFICES ARE FREE FROM OBSTRUCTIONS. MAIN INJECTOR IS ALTERNATELY FORWARD AND BACKWARD FLUSHED. MAIN INJECTOR ASSEMBLY UNDERGOES A FINAL INSPECTION FOR CLEANLINESS AND MUST BE IN ACCORDANCE WITH THE REQUIREMENTS FOR OXYGEN SYSTEM SERVICE. ALL UPSTREAM COMPONENTS ARE INSPECTED FOR CLEANING TO LOX SERVICE OR BETTER REQUIREMENTS. INJECTOR IS INSPECTED FOR WATER AND CONTAMINATION AFTER EACH FLIGHT.	RS009237 RA0110-048 RSC09237 RL00527 R00180C1 RA*610-01C RS009122 RA1610-005 RL10001 RL10001
	PROPELLANT SYSTEM CLEANLINESS	SSME PROPELLANT SYSTEM IS DRIED AND VERIFIED DRY PRIOR TO EACH FLIGHT.	OMRSD V41CB0.030 OMRSD V41CB0.032 OMRSD V41CB0.033
	ASSEMBLY INTEGRITY	HOT FIRE TESTING AND 2ND E & M INSPECTIONS VERIFY ORIFICE INTEGRITY. THE MAIN INJECTOR FACEPLATE AND LOX POSTS ARE INSPECTED FOR DAMAGE OR EVIDENCE OF OVERHEATING SUBSEQUENT TO EACH FLIGHT (LAST TEST).	RL00050-04 RL00056-05 RL00056-07 OMRSD V41P00.029

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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 I A/CIL
WELD JOINTS**

Component Group: Combustion Devices
 CIL Item: A205
 Component: RS009122
 Part Number: Baffleless Main Injector (Phase II+)
 A205

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Component	Basic Part Number	Weld Number	Weld Type	Class	Root Side Not Access	Critical Initial Flaw Size Not Detectable		Comments
						HCF	LCF	
MAIN INJECTOR ASI LINE	RS009061	3	GTAW	I		X	X	
MAIN INJECTOR ASI LINE	RS009061	5	GTAW	I		X	X	
MAIN INJECTOR	RS009126	1	EBW	I				
MAIN INJECTOR	RS009126	6-7,52-53	GTAW	I	X	X	X	
MAIN INJECTOR	RS009126	9	EBW	I				
MAIN INJECTOR	RS009126	3	CBW	I	X			
MAIN INJECTOR	RS009126	10	EBW	II	X	X	X	
MAIN INJECTOR	RS009126	12-13	GTAW	I	X			
MAIN INJECTOR BODY	RS009126	14-15	GTAW	I	X	X	X	
MAIN INJECTOR BODY	RS009126	16	GTAW	I	X	X	X	
MAIN INJECTOR BODY	RS009126	17	GTAW	I	X	X	X	
MAIN INJECTOR	RS009126	20	GTAW	I	X			
MAIN INJECTOR	RS009126	21	GTAW	I	X			
MAIN INJECTOR	RS009126	22	GTAW	I	X			
MAIN INJECTOR	RS009126	23-29,54	GTAW	I	X			
MAIN INJECTOR	RS009126	44-45	EBW	I	X	X	X	
MAIN INJECTOR	RS009126	50-51	CBW	Ia	X	X	X	
MAIN INJECTOR	RS009126	59	EBW	I,II	X			
MAIN INJECTOR	RS009126	60-61	GTAW	II	X			
MAIN INJECTOR BODY	RS009237	600 FLCS	FRW	I		X	X	
MAIN INJECTOR LOX SUPPLY LINE	RC018C15	1	GTAW	I	X	X		

SSWIE FIVEA/CIL

FIELD CONFIGURATION VARIANCES FROM CIL RATIONALE

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Base Line Rationale	Variance	Change Rationale	Variant Case Number
1. NO RATIONALE EFFECTED	REWORKED BAFFLE POSTS EXIST ON 2 DASH NUMBERS.	INLINE REWORK OF COMPLETED BAFFLE MAIN INJECTOR IS AN ALLOWABLE ALTERNATE TO THE BAFFLELESS MAIN INJECTOR	RS009122-1571, RS009122-1581
2. NO RATIONALE EFFECTED.	BLOCK I Isp IMPROVEMENTS DO NOT EXIST ON 2 POWERHEADS	BLOCK I FLIGHT ENGINES MEET CEI REQUIREMENTS FOR Isp. HOWEVER, CERTAIN FLIGHT MANIFESTS REQUIRE AN INCREASE IN Isp FROM THE BLOCK I FLIGHT ENGINES. THE MAIN INJECTOR PRIMARY AND SECONDARY FACEPLATES WERE MODIFIED TO ENHANCE THE COMBUSTION PROCESS.	RS009122-1671
3. A205-12 AND A205-13, BLOCK III Isp IMPROVEMENTS.	THE BLOCK I FLIGHT ENGINES DO NOT HAVE THE MODIFIED MAIN INJECTOR PRIMARY AND SECONDARY FACEPLATES, ROW 13, FUEL SLEEVES AND NEW V-SEAL	BLOCK I FLIGHT ENGINES MEET CEI REQUIREMENTS FOR Isp	RS009122-1681

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