SSME FMEA/CIL
REDUNDANCY SCREEN

Component Group:	Combustion Devices	Prepared:	A. Kay
CIL Item:	A600-02	Approved:	T. Nguyen
Part Number:	RS009020	Approval Date:	9/9/99
Component:	Fuel Preburner	Change #:	1
FMEA Item:	A600	Directive #:	CCBD ME3-01-5239
Failure Mode:	Loss of fuel to ASI.	Page:	1 of 1

Phase	Failure / Effect Description	Criticality Hazard Reference
SMC 4.1	Loss of fuel to ASI causes high mixture ratio erosion of the ASI combustion chamber walls, injector burnout, loss of turbine, and engine failure. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-B2S ME-B2A,C, ME-B2M

SSME FMEA/CIL DESIGN

Component Group:	Combustion Devices	Prepared:	A. Kay
CIL Item:	A600-02	Approved:	T. Nguyen
Part Number:	RS009020	Approval Date:	9/9/99
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Design / Document Reference

FAILURE CAUSE: A: Contamination of the ASI fuel orifices or passageways.

THE FUEL ASI DELIVERY SYSTEM IS DESIGNED TO REMOVE ANY PARTICLES THAT MAY CAUSE CUTOFF OR PARTIAL BLOCKAGE OF THE PASSAGES. A FILTER IS LOCATED AT THE HEAD OF THE DELIVERY SYSTEM THAT REMOVES PARTICLES FROM THE FUEL THAT MAY BE LARGE ENOUGH TO CAUSE A REDUCTION IN FUEL FLOW (1). THE FILTER IS DESIGNED TO STOP PARTICLES IN THE FUEL AND ALLOW THEM TO SETTLE OFF THE FILTER FACE (2). THIS ALLOWS FOR PARTICLE REMOVAL WITHOUT FILTER FLOW REDUCTION, SHOULD GROSS CONTAMINATION OCCUR. THE FILTER CAN WITHSTAND PLUGGING OF OVER HALF OF ITS SURFACE AREA PRIOR TO A REDUCTION IN ASI CHAMBER FUEL DELIVERY. THE ASI CAN OPERATE OVER A VERY WIDE MIXTURE RATIO RANGE AND PARTIAL BLOCKAGE CAN STILL ALLOW TIMELY IGNITION OF THE PROPELLANTS. THE FUEL SUPPLY IS FILTERED TO 400-MICRONS AT THE EXTERNAL TANK PRIOR TO USE BY THE MAIN ENGINES (3). THE ASI FUEL FILTER IS FABRICATED FROM INCONEL 625 ALLOY WHICH WAS SELECTED BECAUSE OF ITS BRAZEABILITY, WELDABILITY, MACHINABILITY AND MATERIAL PROPERTIES (4). INCONEL CAN BE BRAZED WITHOUT PLATING IN A CONTROLLED ATMOSPHERE. THE FUEL FILTER IS BRAZED IN EITHER HYDROGEN, ARGON AND HELIUM, HELIUM, OR VACUUM (5). THE ASI FUEL FILTER HAS BEEN ANALYZED FOR FLOW INDUCED LOADS, DYNAMIC LOADS, AND PRESSURE LOADS AND MEET THE HIGH CYCLE AND LOW CYCLE FATIGUE LIFE CRI REQUIREMENTS (6). THE MINIMUM FACTORS OF SAFETY FOR THE ASI FUEL FILTER MEET CRI REQUIREMENTS (7). THE ASI IGNITION SYSTEM HAS BEEN DESIGNED AND VERIFICATION TESTED FOR LOW PRESSURE IGNITION AND LOW MIXTURE RATIOS (8). DESIGN TESTING OF THE FILTER WITH INDUCED CONTAMINATION SHOWED THE FLOW WASHES THE FILTER. THE FLEET LEADER ASI FUEL FILTER HAS BEEN REMOVED FROM SERVICE FOR MICROSCOPIC AND PENETRANT INSPECTION ON TWO OCCASIONS WITHOUT DETECTING ANY ANOMALIES (9).

(1) RS007004; (2) R0018225; (3) ICD 13M15000; (4) RSS-8571-9 (5) RA0007-010; (6) RL00532, CP320R0003B; (7) RSS-8546, CP320R0003B; (8) DVS-306; (9) I.L. MPR-85-0809, I.L. MPR-85-0859

SSME FMEA/CIL
INSPECTION AND TEST

Component Group:	Combustion Devices	Prepared:	A. Kay
CIL Item:	A600-02	Approved:	T. Nguyen
Part Number:	RS009020	Approval Date:	9/9/99
Component:	Fuel Preburner	Change #:	1
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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	FILTER		R0018225
	FILTER INTEGRITY	FILTER BRAZE JOINTS ARE INSPECTED TO VERIFY COMPLETE COVERAGE.	
	ASI SYSTEM CLEANLINESS	ASI SUBASSEMBLIES ARE CLEANED DURING MANUFACTURING AND PRIOR TO FINAL ASSEMBLY.	RL10001 RA1610-005
		AFTER BRAZING, THE PASSAGE PORTS AND ORIFICES ARE INSPECTED FOR BLOCKAGE DUE TO BRAZING MATERIAL.	RA1607-009
		DURING THE PROPELLANT CONDITIONING THE FUEL ASI SYSTEM IS PURGED TO MAINTAIN IT FREE OF MOISTURE AND ICE.	OMRSD S00FBC.310 OMRSD S00FBC.320
	PROPELLANT SYSTEM CLEANLINESS	SSME PROPELLANT SYSTEM IS DRIED AND VERIFIED DRY PRIOR TO EACH FLIGHT.	OMRSD V41CB0.060 OMRSD V41CR0.061
	ASSEMBLY INTEGRITY	THE HOT FIRE TESTING AND 2ND E & M INSPECTIONS VERIFY ASI INTEGRITY.	RL00050-04 RL00056-06 RL00056-07
		INSPECTION OF INJECTOR ASI CHAMBER AFTER EACH FLIGHT VERIFIES NO BLOCKAGE HAS OCCURRED DURING PREVIOUS OPERATION. (LAST TEST)	OMRSD V41BL0.040

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 F A/CIL
WELD JOINTS

Component Group: Combustion Devices
CIL Item: A600
Component: RS009020
Part Number: Fuel Preburner A600

Prepared: A. Kay
Approved: T. Nguyen
Approval Date: 9/9/99
Change #: 1
Directive #: CCBD ME1-01-5238

Component	Basic Part Number	Weld Number	Weld Type	Class	Root Side Not Access	Critical Initial Flaw Size Not Detectable HCF	LCF		Comments
FPB CHAMBER	RS009019	1,2	GTAW	I	X	X	X		
FPB INJECTOR	RS009020	1	EBW	Ib	X	X	X		
FPB INJECTOR	RS009020	2	EBW	II	X				
FPB INJECTOR	RS009020	3	GTAW	I	X	X	X		
FPB INJECTOR	RS009020	9	EBW	II	X				
FPB INJECTOR	RS009020	38	EBW	II	X				
FPB INJECTOR	RS009020	39	EBW	II	X				
FPB BODY	RS009023	1 (OPT)	GTAW	I	X			(AC50)	
FPB BODY	RS009023	5	EBW	I	X			(AC50)	
FPB FUEL MANIFOLD	RS009029	7 (OPT), 8 (OPT)	GTAW	I		X	X	(AC50)	
FPB FUEL MANIFOLD	RS009029	11 (OPT)	GTAW	I		X		(AC50)	
FPB FUEL MANIFOLD	RS009029	13 (OPT)	GTAW	I		X		(AC50)	
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				
FPB CHAMBER	RS009019	3 (OPT), 4 (OPT)	GTAW	I		X	X	(AC50)	
FPB CHAMBER	RS009019	5 (OPT)	GTAW	I		X		(AC50)	
FPB CHAMBER	RS009019	6 (OPT)	GTAW	I		X		(AC50)	

SSME FMEA/CIL
FIELD CONFIGURATION VARIANCES FROM CIL RATIONALE

Component Group: Combustion Devices
Item Name: Fuel Preburner
Item Number: A603
Part Number: RS009920

Prepared: A. Kay
Approved: T. Nguyen
Approval Date: 9/9/99
Change #: 1
Directive #: CCBD ME3-01-5235

Base Line Rationale	Variance	Change Rationale	Variant Dash Number
1. A603- NO RATIONALE EFFECTED.	MOLY LINER IS INSTALLED IN VARIOUS PREBURNER ASSEMBLIES.	LINER MAY BECOME DAMAGED. USE AS IS RATIONALE: DEBONDED LINER HAS BEEN DETERMINED TO BE A CRITICALITY THREE.	RS007051-1441 RS007051-1457