

SSME EA/CIL
REDUNDANCY SCREEN

Component Group: Combustion Devices
CIL Item: A705-10
Part Number: R0017440
Component: Oxidizer Preburner (Phase II+)
FMEA Item: A705
Failure Mode: External rupture.

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

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Phase	Failure / Effect Description	Criticality Hazard Reference
S/C 4.	Leakage into the aft compartment will cause overpressurization/fire. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE N/A	ME-FBGS, ME-FREM, ME-FBGA,C

SSME FMEA/CIL
DESIGN

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Design / Document Reference

FAILURE CAUSE: A: Weld or parent material failure.

THE OXIDIZER PREBURNER DOME IS FABRICATED FROM INCONEL 718. THE STRENGTH OF INCONEL 718 AFTER HEAT TREATMENT IS THE PRIMARY REASON FOR ITS SELECTION. OTHER DESIRABLE PROPERTIES OF INCONEL 718 ARE ITS CRYOGENIC DUCTILITY AND OXYGEN COMPATIBILITY (1). PRIMARY STRESS FACTORS OF SAFETY MEET CEI REQUIREMENTS (2). HIGH CYCLE FATIGUE AND LOW CYCLE FATIGUE LIFE MEET CEI REQUIREMENTS (3). THE PREBURNER PARENT MATERIAL WAS CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH SINCE IT CONTAINS NO FRACTURE CRITICAL PARTS (4). THE FMEA/CIL WELDS ARE CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH BY THE WELD ASSESSMENT (5). TABLE A705 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 (5). THE PHASE II+ PREBURNER WAS DVR TESTED (5).

(1) RSS-5671-10 (2) RSS-8516, CP32CR0003B; (3) RL00532, CP32CR0003B; (4) NASA TASK 117 (5) RSS-8756 (6) RSS-8879-1

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**SSME FMECA CIL
INSPECTION AND TEST**

Component Group: Combustion Devices
 CIL Item: A705-10
 Part Number: R0017440
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 FMEA Item: A705
 Failure Mode: External rupture.

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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	DOME INTERPROPELLANT PLATE OXIDIZER INLET ASSY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RS009C05 RS009C06 RS009C14
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RB017C-153 RB017C-213
		ULTRASONIC INSPECTION IS PERFORMED ON THE FORGINGS PER SPECIFICATION REQUIREMENTS.	RA0115-012
		PENETRANT INSPECTION OF THE MACHINED DOME AFTER HEAT TREAT PRIOR TO FINAL MACHINING VERIFIES NO CRACKS.	RA0115-116
	HEAT TREAT	HEAT TREAT IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RA0611-020
	WELD INTEGRITY	ALL WELDS ARE INSPECTED TO DRAWING AND SPECIFICATION REQUIREMENTS PER WELD CLASS INSPECTIONS INCLUDE: VISUAL, DIMENSIONAL, PENETRANT, RADIOGRAPHIC, ULTRASONIC AND FILLER MATERIAL, AS APPLICABLE.	RL10211 RA1607-071 RA0115-116 RA0115-006 RA0115-127 RA1115-001
		LOX INLET ELBOW WELD FACE AND ROOTSIDE GEOMETRY IS VERIFIED PER DRAWING REQUIREMENTS.	R0018020
		A SPECIAL INSPECTION OF BOTH THE INNER AND EXTERIOR CIRCUMFERENTIAL DOME WELDS IS PERFORMED (INCLUDING: BORING, ETCH, VISUAL, AND PLUG WELDING) PER DRAWING AND SPECIFICATION REQUIREMENTS.	R0017440 RL00256 R0018020 RL00756
	ASSEMBLY INTEGRITY	AN ASSEMBLY LEAK CHECK AND PROOF PRESSURE TEST ARE PERFORMED PER DRAWING AND SPECIFICATION REQUIREMENTS.	R0017440 RL0094E
		A PENETRANT INSPECTION AFTER PRESSURE TEST VERIFIES NO CRACKS.	RA0115-116
		THE HOT FIRE TESTING AND 2ND S & M INSPECTIONS VERIFY PREBURNER INTEGRITY.	RL0025C-04 RL0025C-06 RL0025C-07
		THE HELIUM SIGNATURE LEAK TEST PERFORMED PRIOR TO EACH LAUNCH VERIFIES DOME INTEGRITY (LAST TEST).	OMRSD S0000 950

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CIL Item: A705.10
Part Number: R0017440
Component: Oxidizer Preburner (Phase II+)
FMEA Item: A705
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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 88RC09751.		
Operational Use:	Not Applicable.		

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**SSME EA/CIL
WELD JOINTS**

Component Group: Combustion Devices
 CIL Item: A706
 Component: R0017440
 Part Number: Oxidizer Preburner (Phase II*)
 A706

Prepared: A. Kay
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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	
OPB FUEL CHAMBER	R0017425	1	GTAW	I,II	X	X	X	
OPB FUEL CHAMBER	R0017425	2	GTAW	II	X	X	X	
OPB INJECTOR	R0017440	1	FRW	Ib	X	X	X	
OPB INJECTOR	R0017440	2	EBW	II	X	X	X	
OPB INJECTOR	R0017440	3	GTAW	II	X	X	X	
OPB INJECTOR	R0017440	9	EBW	II	X	N/A	N/A	
OPB INJECTOR	R0017440	28	EBW	II	X	N/A	N/A	
OPB INJECTOR	R0017440	29	EBW	II	X	X	X	
OPB INJECTOR	R0017440	31	GTAW	II	X			
OPB BODY	R0018067	1	GTAW	II	X	X	X	
OPB BODY	R0018067	2	EBW	I	X			
OPB BODY	R0018067	6	GTAW	II	X			
OPB BODY	R0018067	7	GTAW	II	X			
OPB FUEL MANIFOLD	RS009013	9(OPT), 10(OPT)	GTAW	I		X	X	
OPB FUEL MANIFOLD	RS009013	11(OPT)	GTAW	I		X	X	
OPB FUEL MANIFOLD	RS009013	13(OPT)	GTAW	I	X			
OPB OXID INLET	RS009014	6-8	GTAW	I		X		
OPB ASI FUEL LINE	RS009024	1	GTAW	I	X	X	X	

SSME FMEA/CIL

FIELD CONFIGURATION VARIANCES FROM CIL RATIONALE

Component Group: Combustion Devices
Item Name: Oxidizer Preburner (Phase II+)
Item Number: A705
Part Number: R0017449

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Base Line Rationale	Variance	Change Rationale	Variation Dash Number
1. A705-09, -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.	R0012001-691, -701, 731, 991, -1051.

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