

**SSME / A/CIL
REDUNDANCY SCREEN**

Component Group: Combustion Devices
CIL Item: A700-06
Part Number: RS009004
Component: Oxidizer Preburner
FMEA Item: A700
Failure Mode: Oxidizer post cracks.

Prepared: A. Key
Approved: T. Nguyen
Approval Date: 9/9/99
Change #: 1
Directive #: CCBD ME3-01-5233

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Phase	Failure / Effect Description	Criticality
SMC 4 1	A crack allows fuel to flow into the oxidizer post passage resulting in post internal erosion and possible loss of post section into turbine flow stream and subsequent turbine blade failure. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE: N/A	Hazard Reference I ME-66S, ME-B6A.C, ME-66M

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SSMC FIRE/ICE
DESIGN

Component Group: Combustion Devices
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Part Number: R5009004
Component: Oxidizer Preburner
FMEA Item: A700
Failure Mode: Oxidizer post cracks.

Prepared: A. Kay
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Design / Document Reference

FAILURE CAUSE: A: Parent material failure.

THE PREBURNER INJECTION ELEMENT IS FABRICATED FROM 304L CRES MATERIAL (1). THIS MATERIAL WAS SELECTED FOR ITS BRAZABILITY, RESISTANCE TO HYDROGEN EMBRITTLEMENT, OXYGEN FLAMEABILITY, AND STRENGTH (2). ALL MATERIAL IS PROCURED PER SPECIFICATION (3). THE ELEMENTS ARE FORMED BY BRAZING A FUEL SLEEVE TO THE LOX POST WITH A PORTION OF THE LOX POST EXTENDING THROUGH THE CENTER OF THE SLEEVE (1). THIS FORMS THE COAXIAL INJECTION ELEMENT. DURING HOT FIRE TESTING THE INJECTION ELEMENTS MUST BE PERIODICALLY INSPECTED (4). AN EDDY CURRENT INSPECTION (5) MUST BE PERFORMED AT DESIGNATED INTERVALS. IF THE EDDY CURRENT READING IS BELOW THE SPECIFIED RANGE, THE PART IS ACCEPTABLE. IF THE READING IS WITHIN THE SPECIFIED RANGE, SUPPORT PINS ARE INSTALLED. READINGS OVER THE SPECIFIED RANGE REQUIRES POSTS TO BE DEACTIVATED. THE METHOD OF PLUGGING PREBURNER INJECTION ELEMENTS IS TO INSERT A SOLID 316SS ROD INTO THE ID OF THE 304L POST. THE TIP OF THE LOX POST IS SLIGHTLY SWAGED AND FUSION WELDED TO SEAL THE POST AND RETAINS THE PLUGGING PIN. THE PLUGGING OPERATION IS DONE BY WELDERS CERTIFIED FOR THE SPECIFIC ACTIVITY. ANALYSIS INDICATES INFINITE LIFE AND NO NOTED FAILURES OR CRACKS IN THE WELD IN THE HISTORY OF 55 SUCH OPERATIONS. HIGH CYCLE FATIGUE LIFE, LOW CYCLE FATIGUE LIFE AND THE MINIMUM FACTORS OF SAFETY MEET CEI REQUIREMENTS (6). THE PREBURNER ELEMENT PARENT MATERIALS WERE CLEARED FOR FRACTURE MECHANICS/NOE FLAW GROWTH SINCE IT CONTAINS NO FRACTURE CRITICAL PARTS (7). THE PREBURNER WAS DVS TESTED (8). CONTINUED USE WITH ALLOWABLE DISCREPANCIES RESULTING FROM OPERATION IS EVALUATED AND CONTROLLED PER THE REQUIREMENTS OF THE MAINTENANCE CONTROL DOCUMENT (9).

(1) R5009009; (2) RSS-8571-9 (3) QQ-5-763 (4) RLC0050-04 OMRSD V41BU0.095; (5) RLC00549; (6) RL00532, CP320R0003B, RSS-8546; (7) NASA TASK 117; (8) DVS-306; (9) RSS 8763

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~~SOME FIRE~~ ~~IL~~
INSPECTION AND TEST

Component Group: Combustion Devices
 CIL Item: A700-06
 Part Number: RS009004
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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	ELEMENT		RS009008
	LOX POST MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS	
		ALL PARTS ARE PROCURED ONLY FROM APPROVED SOURCES WHICH HAVE PROVEN CAPABILITY TO MANUFACTURE ACCEPTABLE PARTS	
	LOX POST BRAZE INTEGRITY	THE LOX POST TO FUEL SLEEVE FURNACE BRAZING IS INSPECTED FOR BRAZE FLOW AND DEFECTS PER SPECIFICATION	RA1507-004
		THE LOX POST TO INTERPROPELLANT PLATE BRAZING IS INSPECTED PER SPECIFICATION FOR BRAZE FLOW AND DEFECTS.	RA1507-007
ALL CAUSES	ASSEMBLY INTEGRITY	THE HOT FIRE TESTING AND 2ND E & M INSPECTIONS VERIFY LOX POST INTEGRITY.	RL0050-04 RL0056-05 RL0056-07
		THE PREBURNER INJECTION ELEMENTS ARE EDDY CURRENT INSPECTED FOR TIME CYCLE REQUIREMENTS.	OMRSD V418U0 032C OMRSD V418U0 035 OMRSD C0CBA0 015
		SUPPORT PINS ARE INSPECTED EACH TIME HPOTP IS REMOVED.	OMRSD V418U0 032C OMRSD V418U0 105

Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA)
 Reference: NASA letter SA2158/308 and Rockwell letter 88RC09761.

Operational Use: Not Applicable.

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**SSME FMEA/CIL
WELD JOINTS**

Component Group: Combustion Devices
 CIL Item: A700
 Component: RS009004
 Part Number: Oxidizer Preburner
 A700

Prepared: A. Kay
 Approved: T. Nguyen
 Approval Date: 9/9/99
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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 CHAMBER	RS009003	1,2	GTAW	I	X	X	X	(A050)
OPB CHAMBER	RS009003	1(60DEG)	GTAW	II	X	X	X	(A050)
OPB INJECTOR	RS009004	1	EBW	II	X	X	X	
OPB INJECTOR	RS009004	2	EBW	I	X			
OPB INJECTOR	RS009004	3	GTAW	I	X			
OPB INJECTOR	RS009004	9	EBW	II	X			
OPB INJECTOR	RS009004	28	FBW	II	X			
OPB INJECTOR	RS009004	29	EBW	II	X			
OPB BODY	RS009007	1	GTAW	II	X			(A050)
OPB BODY	RS009007	2	EBW	II	X			(A050)
OPB BODY	RS009007	3	EBW	I				(A050)
OPB BODY	RS009007	4 (OPT)	GTAW	I	X			(A050)
OPB BODY	RS009007	10,11	GTAW	I	X	X	X	(A050)
OPB BODY	RS009007	12	GTAW	I	X		X	(A050)
OPB BODY	RS009007	13	GTAW	I	X	X	X	(A050)
OPB BODY	RS009007	14	GTAW	I	X	X	X	(A050)
OPB BODY	R0018067	1	GTAW	II	X	X	X	
OPB BODY	R0018067	2	EBW	I	X			
OPB BODY	R0018067	6	GTAW	I	X			
OPB BODY	R0018067	7	GTAW	I	X			
OPB FUEL MANIFOLD	RS009013	9(OPT)10 (OPT)	GTAW	I		X	X	(A050)
OPB FUEL MANIFOLD	RS009013	11 (OPT)	GTAW	I		X	X	(A050)
OPB FUEL MANIFOLD	RS009013	13 (OPT)	GTAW	I	X			(A050)
OPB OXID INLET	RS009014	6-E	GTAW	I		X		
OPB LINER	RS009015	2-17	GTAW	II	X			(A050)
OPB ASI FUEL LINE	RS009024	1	GTAW	I	X	X	X	(A050)
OPB CHAMBER	RS009003	3 (OPT) 4 (OPT)	GTAW	I		X	X	(A050)
OPB CHAMBER	RS009003	5 (OPT)	GTAW	I		X	X	(A050)
OPB CHAMBER	RS009003	6 (OPT)	GTAW	I	X			