SSME / A/C/L
REDUNDANCY SCREEN

Component Group:	Combustion Devices	Prepared:	A. Kay
CIL Item:	A705-11	Approved:	T. Nguyen
Part Number:	R0912440	Approval Date:	9/9/99
Component:	Oxidizer Preburner (Phase II+)	Change #:	2
FMEA Item:	A705	Directive #:	CCBD ME3-01-5208
Failure Mode:	External rupture.	Page:	1 of 1

Phase	Failure / Effect Description	Criticality Hazard Reference
SMC 4.1	Leakage into aft compartment will cause overpressurization and/or fire. Loss of vehicle	1 ME-FB6S ME-FB6M, ME-FB6A C
	Redundancy Screens: SINGLE POINT FAILURE: N/A	

DESIGN

Component Group:	Combustion Devices	**Prepared:**	A. Kay
CIL Item:	A705-11	**Approved:**	T. Nguyen
Part Number:	R0017440	**Approval Date:**	9/8/99
Component:	Oxidizer Preburner (Phase II+)	**Change #:**	2
FMEA Item:	A705	**Directive #:**	CCBD ME3-01-5238
Failure Mode:	External rupture.	**Page:**	1 of 1

Design / Document Reference

FAILURE CAUSE: A: Weld or parent material failure.

THE OPB FUEL MANIFOLD AND OPB BODY ARE FABRICATED FROM INCONEL 718 ALLOY AND INCOLOY 903 ALLOY (1). THE INCONEL 718 WAS CHOSEN FOR ITS STRENGTH AND RESULTING WEIGHT SAVINGS ALONG WITH ITS CRYOGENIC DUCTILITY AND OXYGEN COMPATIBILITY (2). INCOLOY 903 WAS CHOSEN ON THE BASIS OF ITS STRENGTH AND RESISTANCE TO HIGH-PRESSURE HYDROGEN ENVIRONMENTAL EFFECTS (2). HIGH CYCLE FATIGUE, LOW CYCLE FATIGUE LIFE, AND MINIMUM FACTORS OF SAFETY FOR THE PREBURNER ASSEMBLY MEET CEI REQUIREMENTS (3). THE PREBURNER PARENT MATERIALS WERE 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+ OXIDIZER PREBURNER WAS DVR TESTED (6).

(1) R0018057, RS009009, RS009013 (2) RSS-8571-10 (3) RL00532, CP320R0003B, RSS-8546; (4) NASA TASK 117; (5) RSS-8756 (6) RSS-8678-1

SSME FMEA/CIL
INSPECTION AND TEST

Component Group:	Combustion Devices	Prepared:	A. Kay
CIL Item:	A705-11	Approved:	T. Nguyen
Part Number:	R0017440	Approval Date:	9/9/99
Component:	Oxidizer Preburner (Phase II+)	Change #:	2
FMEA Item:	A705	Directive #:	CCBD ME3-01-5238
Failure Mode:	External rupture.	Page:	1 of 2

Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	OXIDIZER PRESBURNER BODY OXIDIZER PREBURNER CHAMBER MANIFOLD FUEL INLET ASSEMBLY		R0018067 R0017425 RS009013 RS009524
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RB0170-153 RB0170-186 RB0170-213
		ULTRASONIC INSPECTION IS PERFORMED ON THE FORGINGS PER SPECIFICATION REQUIREMENTS	RA0115-012
	HEAT TREAT	HEAT TREAT IS VERIFIED PER DRAWING AND SPECIFICATION REQUIREMENTS.	R0018067 R0017425 RS009013 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.	RL10011 RA1607-071 RA0115-116 RA0115-006 RA0115-127 RA1115 001 RF0001-120
	ASSEMBLY INTEGRITY	ASSEMBLY IS PROOF PRESSURE TESTED PER DRAWING AND SPECIFICATION REQUIREMENTS	R0018031 RL00045
		PENETRANT INSPECTION IS PERFORMED ON THE ASSEMBLY AFTER PROOF PRESSURE TEST	RA0115-116 RF0001-120
		THE HOT FIRE TESTING AND 2ND E & M INSPECTIONS VERIFY INJECTOR INTEGRITY	RLC0050-04 RLC0056-06 RLC0056-07
		HELIUM SIGNATURE LEAK TEST PERFORMED PRIOR TO EACH LAUNCH VERIFIES WELD AND PARENT MATERIAL INTEGRITY (LAST TEST)	OMRSD SC0030.959

Component Group:	Combustion Devices	Approved:	T. Nguyen
CIL Item:	A705-11	Approval Date:	9/9/99
Part Number:	R0017440	Change #:	2
Component:	Oxidizer Preburner (Phase II+)	Directive #:	CCBD ME3-01-5235
FMEA Item:	A705		
Failure Mode:	External rupture.	Page:	2 of 2

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 SA21/85/306 and Rocketdyne letter 89RC09751.

Operational Use: Not Applicable

SSME EA/CIL
WELD JOINTS

Component Group: Combustion Devices
CIL Item: A705
Component: R0017440
Part Number: Oxidizer Preburner (Phase II+)
A706

Prepared: A. Kay
Approved: T. Nguyen
Approval Date: 9/9/99
Change #: 1
Directive #: CCBD ME3-01-5238

Component	Basic Part Number	Weld Number	Weld Type	Class	Root Side Not Access	Critical nitial Flaw Size Not Detectable HCF	LCF	Comments
OPB FUEL CHAMBER	R0017425	1	GTAW	I,II	X	X	X	
OPB FUEL CHAMBER	R0017425	2	GTAW	I,II	X	X	X	
OPB INJECTOR	R0017440	1	EBW	IIb	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	RS009524	1	GTAW	I	X	X	X	

SSME FMEA/CIL
FIELD CONFIGURATION VARIANCES FROM CIL RATIONALE

Component Group:	Combustion Devices	**Prepared:**	A. Kay
Item Name:	Oxidizer Preburner (Phase II+)	**Approved:**	T. Nguyen
Item Number:	A705	**Approval Date:**	9/9/99
Part Number:	R0017449	**Change #:**	2
		Directive #:	CCBD ME3 01-5238
		Page:	1 of 1

Base Line Rationale	Variance	Change Rationale	Variant 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.	R0018001-691, -701, 731, 991, -1051.