1) CIL ITEM : A150-03
2) FMEA CODE : A150
3) COMPONENT : HEAT EXCHANGER
4) PART NUMBER : RS008801
5) SYSTEM/SUBSYSTEM : COMBUSTION DEVICES/AXXX
6) FAILURE MODE : BYPASS LINE ORIFICE RESTRICTION

7) PREPARED : SSME RELIABILITY
8) APPROVED : [signature]
9) DATE : 07-31 94
10) REVISION/CHANGE : -003/0
11) EFFECTIVITY : -451
12) HAZARD REFERENCE : SEE LISTINGS BELOW
13) CCBD #: : me3-01-1679

PHASE	FAILURE DESCRIPTION/EFFECT	CRITICALITY
SMC	HIGH TEMPERATURE GOX WOULD BE DELIVERED TO THE POGO ACCUMULATOR AND ORBITER TANK PRESSURIZATION SYSTEM CAUSING ENGINE AND VEHICLE HARDWARE FAILURE. LOSS OF VEHICLE. REDUNDANCY SCREENS: SINGLE POINT FAILURE: N/A	1 HAZARD REF: ME-055

CIL ITEM: A150-03	DESIGN	DOCUMENT REF.
	FAILURE CAUSE A: CONTAMINATION, FOREIGN MATERIAL A MULTIPLE INLET SINGLE OUTLET (MISO) HEAT EXCHANGER BYPASS ORIFICE CONTROLS THE AMOUNT OF LOX THAT COMBINES WITH THE LOX LEAVING THE HEAT EXCHANGER (1). THE MISO BYPASS ORIFICE IS DESIGNED FOR MINIMUM SUSCEPTABILITY TO FLOW BLOCKAGE BY PROVIDING REDUNDANT FLUID ENTRANCE PATHS. THIS FEATURE ALLOWS THE ORIFICE TO TOLERATE GROSS CONTAMINATION WITHOUT SIGNIFICANT FLOW RESTRICTION. THE ORIFICE IS DESIGNED TO ALLOW PARTICLES LESS THAN OR EQUAL TO 1500 MICRONS TO PASS THROUGH. THE LOX SUPPLY SYSTEM IS DESIGNED TO FILTER LOX IN TWO STEPS, AN 800 MICRON FILTER AT THE E.T. INTERFACE (2) AND A 100 MICRON FILTER AT THE ANTI FLOOD VALVE (3). THE FILTER IS CONICAL SHAPED TO GIVE MORE SURFACE AREA TO PREVENT BLOCKAGE (4). THE FILTER DESIGN ALLOWS FOR TRAPPED PARTICLES TO SETTLE OFF OF THE FILTERING AREA. THE FILTERS ARE CERTIFIED TO FILTERING ABILITY (5).	(1) R035519 (2) ICD 13M15080 (3) RS007083 (4) 286-5008 (5) RC286-5009

CIL ITEM: A150-03	INSPECTION AND TEST		
POSSIBLE CAUSES	SIGNIFICANT CHARACTERISTICS	INSPECTION(S)/TEST(S)	DOCUMENT REF.
FAILURE CAUSE A:	R035519 - BYPASS ORIFICE 286-5008-001 - FILTER		RC15519 286-5008
	LOX FILTERING	UPSTREAM COMPONENTS ARE CLEANED TO OXYGEN SERVICE OR BETTER REQUIREMENTS.	RL10001
		BYPASS LINES AND ASSEMBLIES ARE CLEANED AND INSPECTED TO LOX SERVICE SPECIFICATIONS.	RL10001
		ANTI-FLOOD VALVE FILTER REPLACEMENT IS VERIFIED PRIOR TO EVERY FLIGHT. (LAST TEST)	OMRSD V41BL0.220
	ASSEMBLY INTEGRITY	THE HOT FIRE TESTING AND 2ND E & M VERIFIES PASSAGES ARE CLEAR.	RL00050-04 RL00056-06 RL00056-07
	DATA REVIEW	ALL CONTROLLER DATA FROM THE PREVIOUS FLIGHT OR HOT-FIRE IS REVIEWED. ANY ANOMALOUS CONDITION NOTED REQUIRES FURTHER TESTING OR HARDWARE REPLACEMENT PRIOR TO NEXT FLIGHT.	MSFC PLN 1220

FAILURE HISTORY: NONE

OPERATIONAL USE: NOT APPLICABLE

SSME [illegible]
WELD JOINTS

Component Group: Combustion Devices
CIL Item: A150
Component: RS006801
Part Number: Heat Exchanger A150

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 Initial Flaw Size Not Detectable HCF	LCF	Comments
HEX BYPASS LINE	RS009695	1,2	GTAW	I		X		
HEX OUTLET MANIFOLD	RS009695	1,2	GTAW	I		X		
HEX OUTLET MANIFOLD	RS009695	3,4	GTAW	I				
HEX OXIDIZER TANK	RS006801	1	GTAW	II	X			
HEX OXIDIZER TANK	RS006801	2	GTAW	II				
HEX OXIDIZER TANK	RS006801	3	GTAW	I	X	X	X	(AC50)
HEX OXIDIZER TANK	RS006801	4	GTAW	I	X	X		
HEX OXIDIZER TANK	RS006801	5	GTAW	I	X	X		
HEX OXIDIZER TANK	RS006801	6,7	GTAW	I	X			
HEX OXIDIZER TANK	RS006801	8(OPT)	GTAW	I				
HEX OXIDIZER TANK	RS006801	8(OPT)	EBW	I				
HEX OUTER SHELL	RS006802	6(OPT)	EBW	I				(A050)
HEX OUTER SHELL	RS006802	6(OPT)	GTAW	I				(A050)
HEX OXIDIZER TANK LINER	RS006806	1-9	GTAW	II	X			
HEX OXIDIZER TANK LINER	RS006806	20-23,25-68,72-87	GTAW	II	X			
HEX OXIDIZER TANK LINER	RS006806	24,70	GTAW	I	X			
HEX OXIDIZER TANK LINER	RS006806	68,71	GTAW	I				
HEX OXIDIZER TANK LINER	RS006806	88-95	GTAW	II	X			
HEX OXIDIZER TANK LINER	RS006806	96-106	GTAW	II	X	X		
BRACKET	RS006810	1,2	GTAW	II	X			
BRACKET	RS006810	3,4	EBW	II				
BRACKET	RS006810	9,10	GTAW	II				
HEX INNER SHELL	RS006811	1	GTAW	I				
HEX INNER SHELL	RS006811	2,3	GTAW	I				
HEX COIL	RS006812	1,2	GTAW	I				
HEX COIL	RS006812	3	GTAW	I				
HEX COIL	RS006812	4	GTAW	I				

SSME [illegible]/CIL
FIELD CONFIGURATION VARIANCES FROM CIL RATIONALE

Component Group: Combustion Devices
Item Name: Heat Exchanger
Item Number: A150
Part Number: RS008801

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

Base Line Rationale	Variance	Change Rationale	Variant Dash Number
1. A150-01 TUBE WELDS MEASURED TO VERIFY WELD WIDTH AND CENTERED ON JOINT (QE-96-229)	NO WELD POSITION MEASUREMENT.	MEASUREMENT ASSURED THAT WELDER COMPLETELY FUSED JOINT. WHICH PROVIDES HIGH CONFIDENCE THAT NO SIGNIFICANT WELD DEFECTS EXIST. USE AS IS RATIONALE: 1. WELD WIDTHS READ FROM ORIGINAL X-RAYS ADD CONFIDENCE THAT JOINT WAS COMPLETELY FUSED. 2. THIN WALL ALLOWS HIGH RESOLUTION X-RAYS, AND X-RAY ENHANCEMENT AND INTERPRETATION BY LEVEL 3 NDE GIVES ADDED ASSURANCE OF NO SIGNIFICANT DEFECTS. 3. ETCH AND TYPE IVC PENETRANT AFTER PROOF AND HOT FIRE OF RS008811 WELD 1 ASSURES NO SIGNIFICANT I.D. DEFECTS. 4. HIGH RESOLUTION I.D. BORESCOPE INSPECTION AFTER PROOF AND HOT FIRE OF RS008811 WELD 1 AND RS008812 WELD 3 PROVIDES ADDITIONAL CONFIDENCE THAT NO SIGNIFICANT I.D. DEFECTS EXISTS. 5. X-RAY AFTER PROOF AND HOT FIRE OF RS008812 WELDS 1, 2, AND 3 ADDS CONFIDENCE THAT NO SIGNIFICANT DEFECTS EXIST.	401, -441
2. A150-01 TUBE WELDS ARE PENETRANT INSPECTED BEFORE REAMING (QE-96-229)	NO PENETRANT BEFORE REAM OF PRIMARY TUBE WELD I.D.s.	PROVIDED ADDITIONAL CONFIDENCE THAT I.D. SURFACE DEFECTS DO NOT EXIT. USE AS IS RATIONALE: 1. THIN WALL ALLOWS HIGH RESOLUTION X-RAYS, AND X-RAY ENHANCEMENT AND INTERPRETATION BY LEVEL 3 NDE GIVES ADDED ASSURANCE OF NO SIGNIFICANT DEFECTS 2. ETCH AND TYPE IVC PENETRANT AFTER PROOF AND HOT FIRE OF RS008811 WELD 1 ASSURES NO SIGNIFICANT I.D. EFFECTS 3. HIGH RESOLUTION I.D. BORESCOPE INSPECTION AFTER PROOF AND HOT FIRE OF RS008811 WELD 1 AND RS008812 WELD 3 PROVIDES ADDITIONAL CONFIDENCE THAT NO SIGNIFICANT I.D. DEFECTS EXIST. 4. X-RAY AFTER PROOF AND HOT FIRE OF RS008812 WELD 3 ADDS CONFIDENCE THAT NO SIGNIFICANT DEFECTS EXIST. 5. LEAK TEST PRIOR TO EACH FLIGHT WILL DETECT THROUGH CRACKS. 6. RS008811 WELD 3 I.D. IS PENETRANT INSPECTED AFTER REAMING, BUT WITHOUT ETCHING	-401 -441