FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE
NUMBER: 04-2-CL01 -X

SUBSYSTEM NAME: AUXILIARY POWER (APUS)

REVISION: 1 09/17/98

PART DATA

	PART NAME	**PART NUMBER**
	VENDOR NAME	**VENDOR NUMBER**
	: FUEL SUPPLY	
SRU	: COLLECTOR	V070-465232-007

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
COLLECTOR

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 3
ONE PER APU

FUNCTION:
500 CC COLLECTOR IS USED TO COLLECT SMALL ALLOWABLE LEAKAGE FROM THE APU FUEL PUMP SEAL

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SUBSYSTEM NAME: AUXILIARY POWER UNIT (APU)
LRU: COLLECTOR
ITEM NAME: COLLECTOR

CRITICALITY OF THIS FAILURE MODE: 1/1

FAILURE MODE:
EXTERNAL LEAKAGE

MISSION PHASE:

PL	PRE-LAUNCH
LO	LIFT-OFF
OO	ON-ORBIT
DO	DE-ORBIT
LS	LANDING/SAFING

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:
CORROSION, POOR HANDLING, CRACKED WELDS

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN
A) N/A
B) N/A
C) N/A

PASS/FAIL RATIONALE:
A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

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POSSIBLE LOSS OF ONE APU SYSTEM BEFORE MISSION COMPLETION IF EXTERNAL LEAKAGE OCCURS. POSSIBLE LOSS OF ADJACENT AND/OR REDUNDANT APU HARDWARE DUE TO FIRE OR CHEMICAL ATTACK.

(B) INTERFACING SUBSYSTEM(S):
POSSIBLE LOSS OF SHAFT POWER TO ONE HYDRAULIC PUMP. POSSIBLE LOSS OF ADJACENT AND/OR REDUNDANT HARDWARE DUE TO FIRE OR CHEMICAL ATTACK.

(C) MISSION:
ABORT DECISION REQUIRED IF FAILURE OCCURS DURING ASCENT, MINIMUM DURATION FLIGHT REQUIRED IF LEAK OCCURS ON ORBIT.

(D) CREW, VEHICLE, AND ELEMENT(S):
POSSIBLE LOSS OF CREW/VEHICLE IF LEAKING FUEL IS IGNITED OR IF ADJACENT AND/OR REDUNDANT HARDWARE IS LOST DUE TO FIRE OR CHEMICAL ATTACK.

(E) FUNCTIONAL CRITICALITY EFFECTS:
POSSIBLE LOSS OF VEHICLE IF RELEASED HYDRAZINE IS IGNITED.

-DISPOSITION RATIONALE-

(A) DESIGN:
IT IS A PROVEN DESIGN. DYNATUBE/DUAL-SEAL FITTINGS 17-4 ATTACHED WITH WELDED SLEEVE AND WITH DUAL-SEALING SURFACES. THE WELDED CONSTRUCTION ELIMINATES JOINTS AND POSSIBLE LEAK PATHS. FASTENING CLAMPS ALLOW FREEDOM OF MOVEMENT.

THE -002 AND -009 TUBE AND -010 GUSSET ARE 304L CRES TUBING PER MB0106-007 CONDITION B. THE -003, -004, -005, AND -008 BOSSES ARE 304L CRES STEEL BAR PER MB0160-037. THE -006 SHEET IS 321 CRES STEEL SHEET PER QQ-S-766. THE MS24404J6 PLUG IS 304 CRES STEEL BAR PER QQ-S-763. THE -003 & -005 BOSSES, AND THE -009 AND -010 GUSSETS ARE FUSION FILLET-WELDED TO THE -002 TUBE.

THE -004 AND -008 BOSSES AND THE -006 SHEET ARE FUSION BUTT-WELDED TO THE -002 TUBE. THE -010 TUBE IS ALSO FUSION FILLET-WELDED TO THE -009 TUBE. THE MS24404J6 PLUG IS THREADED INTO AND FUSION FILLET-WELDED TO THE -008 BOSS.

ALL WELDING IS PER MA0107-307, EXCEPT THAT RADIOGRAPHIC INSPECTION IS NOT REQUIRED (WELDS ARE VERIFIED BY PROOF AND LEAKAGE TESTING).

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MACHINED TOLERANCES ARE PER MA0103-304, DIMENSIONED AND TOLERANCED PER ANSI Y14.5 - 1966, FINISHED PER MA0608-301 CODE 00-SA-20-XX (CLEANED AND PASSIVATED PER M0110-302), IDENTIFIED PER MA0104-301 CODE AA-08-NG-20 (ELECTROCHEMICAL ETCHED), AND CLEANED TO MA0110-301 LEVEL 100A USING ISOPROPYL ALCOHOL.

(B) TEST:
INITIAL TUBING PROOF PRESSURE AT 1.5 TIMES OPERATING PRESSURE. SUBSYSTEM FUNCTIONAL AND LEAK TESTS AFTER INSTALLATION.

DYNATUBE FITTING QUALIFIED BY RESISTOFLEX FOR 200,000 IMPULSE CYCLES UP TO 4500 PSI AT 400 DEG F TO -65 DEG F, 12,000 PSI BURST PLUS SINE VIBRATION AT +/- 0.41 G TO +/- 10 G FOR 3 HOURS IN 20 MINUTE SWEEPS FROM 5 TO 2,000 CPS.

ROCKWELL PERFORMED TUBING CERTIFICATION TESTS PER ORBITER TUBING VERIFICATION PLAN (SD 75-SH-205). THIS TESTING INCLUDED WORST-CASE USAGE, PRESSURE CYCLING, FATIGUE AND OFF LIMIT TESTING FOR LINES, JOINTS AND PANELS. SYSTEM EVALUATION TESTS ON OV-101 AND AT SUNDSTRAND ALLOWED EVALUATION OF THE INSTALLED SYSTEM CONDITION

INITIAL TUBING PROOF PRESSURE AT 1.5 TIMES OPERATING PRESSURE SUBSYSTEM FUNCTIONAL AND LEAK TESTS AFTER INSTALLATION.

GROUND TURNAROUND TEST
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
MATERIAL AND PROCESSES CERTIFICATIONS ARE VERIFIED.

CONTAMINATION CONTROL
CLEANLINESS TO LEVEL 100A IS VERIFIED BY INSPECTION. PASSIVATION AND PASSIVATION VERIFICATION IS PER MA0608-301.

ASSEMBLY/INSTALLATION
CONFIGURATION OF DETAIL PARTS AND THE COMPLETED ASSEMBLY TO DRAWING REQUIREMENTS IS VERIFIED BY INSPECTION. TUBES ARE ASSEMBLED PER DRAWING REQUIREMENTS, VERIFIED BY INSPECTION

NONDESTRUCTIVE EVALUATION
PENETRANT INSPECTION OF WELDS PER MA0107-307 IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
FUSION WELDING PER DRAWING REQUIREMENTS IS VERIFIED BY INSPECTION.

TESTING

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COMPLETED ASSEMBLY IS LEAK TESTED TO 50 +/- 3 PSIG PER MF0001-003 WHICH IN TURN REQUIRES A PROOF PRESSURE TEST TO 100 PSIG PRIOR TO LEAK TESTING (MAXIMUM OPERATING PRESSURE FOR THE COMPONENT IS 42 PSIA).

HANDLING/PACKAGING
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATA BASE.

(E) OPERATIONAL USE:
POST MECO, CLOSE ISOLATION VALVES.

- APPROVALS -

SS & PAE MANAGER	: D. F. MIKULA	: K. L Proth for 9/18/98
SS & PAE ENGINEER	: G.T.TATE	: 9/18/98
VEHICLE & SYSTEMS DESIGN	: M. A. WEISER	: 9/18/98
BNA SSM	: T. FARKAS, JR.	: 9/18/98
JSC MOD	: MEL FRIANT	: 9/21/98
JSC ~~NASA~~ SR&QA	: D. BEAUGH	: David Beaugh 9/21/98
USA/SAM	: M. S. BURNAGOT	: 9/21/98