FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE
NUMBER: 06-3A-0615 -X

SUBSYSTEM NAME: ACTIVE THERMAL CONTROL

REVISION: 0 02/04/88

PART DATA

	PART NAME	**PART NUMBER**
	VENDOR NAME	**VENDOR NUMBER**
	: WATER SPRAY BOILER	
LRU	: DISCONNECT, NITROGEN FILL	ME276-0032-0013

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
DISCONNECT, NITROGEN FILL

QUANTITY OF LIKE ITEMS: 3
ONE EACH BOILER ASSEMBLY

FUNCTION:
PROVIDES CAPABILITY TO FILL NITROGEN TANK DURING TANK FILLING OPERATIONS. A CAP, WHICH PROVIDES A DUAL SEAL, IS INSTALLED DURING WSB OPERATION.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 06-3A-0615- 02

REVISION#: 2 08/25/98

SUBSYSTEM NAME: ATCS - WATER SPRAY BOILER
LRU: DISCONNECT, NITROGEN FILL
ITEM NAME: DISCONNECT, NITROGEN FILL

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
INTERNAL LEAKAGE, PAST POPPET

MISSION PHASE:
LO LIFT-OFF
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:
102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:
CORROSION, VIBRATION, MECHANICAL SHOCK, CONTAMINATION, DAMAGED SEAL/POPPET

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN
A) PASS
B) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)
"A" SCREEN IS PASSED SINCE SEALING CAP CAN BE REMOVED AND POPPET CAN BE INSPECTED DURING GROUND TURNAROUND.

B)
"B" SCREEN IS FAILURE SINCE SEALING CAP WOULD MASK POPPET FAILURE DURING FLIGHT.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
NO EFFECT - CAP ON DISCONNECT PREVENTS EXTERNAL LEAKAGE OF GN2.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 06-3A-0615- 02

(B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE: NO EFFECT. SECOND FAILURE (FAILURE OF SEALING CAP): POSSIBLE LOSS OR LIMITED RUN TIME OF ONE APU/HYD SYSTEM. LIMITED RUN TIME MAY NOT ALLOW APU/HYD SYSTEM TO SUPPORT ENTIRE POWERED FLIGHT OR ENTRY PHASE. LOSS OF HYDRAULIC CAPABILITY TO THROTTLE ONE MAIN ENGINE. LOSS OF HYDRAULIC LANDING GEAR DEPLOY AND NOSEWHEEL STEERING IF SYSTEM ONE IS LOST. AND LOSS OF ONE OF THREE ET UMBILICAL RETRACT ACTUATORS FOR EACH UMBILICAL PLATE. LOSS OF REDUNDANT HYDRAULIC POWER SYSTEM FOR FOUR TVC ACTUATORS. LOSS OF ONE OF THREE HYDRAULIC POWER SYSTEMS TO FLIGHT CONTROL SURFACES AND BRAKES.

(C) MISSION:
NO EFFECT

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT

(E) FUNCTIONAL CRITICALITY EFFECTS:
FUNCTIONAL CRITICALITY EFFECTS-POSSIBLE LOSS OF CREW/VEHICLE WITH THREE FAILURES: THIS FAILURE, LEAKAGE OF ASSOCIATED FLIGHT CAP AND LOSS OF AN ADDITIONAL APU/HYD SYSTEM.

-DISPOSITION RATIONALE-

(A) DESIGN:
DISCONNECT IS 17-7 PH STAINLESS STEEL WITH KYNAR SEALS. CAP IS 17-7 PH STAINLESS STEEL WITH A PRIMARY KYNAR SEAL AND A SECONDARY TEFLON SEAL. THE PRIMARY KYNAR SEAL IS ATTACHED TO THE HOUSING. THE CAP IS INSTALLED BEFORE FLIGHT AND PROVIDES A SECONDARY SEAL TO DISCONNECT POPPET. POPPET IS SPRING LOADED CLOSED AND SYSTEM PRESSURE AIDS IN MAINTAINING IT CLOSED.

(B) TEST:
QUALIFICATION:

- SAND AND DUST - MALE COUPLING WITH CAP INSTALLED SHALL WITHSTAND A SAND/DUST ENVIRONMENT EQUIVALENT TO 140 MESH SILICA FLOUR WITH A PARTICLE VELOCITY UP TO 500 FEET PER MINUTE AND A PARTICLE DENSITY OF 0.25

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: 06-3A-0615- 02

GRAM PER CUBIC FOOT. PASS/FAIL CRITERIA: SHALL PASS SUBSEQUENT PERFORMANCE RECORD TEST AND CAP/PLUG PROOF/PERFORMANCE TEST.

- SALT AND FOG - MALE COUPLING WITH CAP INSTALLED SHALL WITHSTAND 30 DAYS OF REQUIRED SALT/FOG ENVIRONMENT. PASS/FAIL CRITERIA: SHALL PASS SUBSEQUENT PERFORMANCE RECORD TEST AND CAP/PLUG PROOF/PERFORMANCE TEST

- BENCH SHOCK TEST - DROP MALE COUPLING HALF WITH CAP INSTALLED 4 TIMES ON EACH END FOUR INCHES FROM BENCH TOP PER MIL-STD-810, METHOD 516.1, PROCEDURE V. PASS/FAIL CRITERIA: SHALL PASS SUBSEQUENT PERFORMANCE RECORD TEST AND CAP/PLUG PROOF/PERFORMANCE TEST.

- BASIC DESIGN SHOCK TEST - MALE COUPLING HALF WITH CAP INSTALLED, TESTED AT 20 G PEAK FOR 11 MS DURATION PER MIL-STD-810, METHOD 516.1, PROCEDURE I. PASS/FAIL CRITERIA: SHALL PASS SUBSEQUENT PERFORMANCE RECORD TEST AND CAP/PLUG PROOF/PERFORMANCE TEST.

- LANDING SHOCK TEST - MALE COUPLING HALF WITH CAP INSTALLED SHALL WITHSTAND SPECIFIED LANDING SHOCK PEAKS FOR REQUIRED DURATIONS. PASS/FAIL CRITERIA: SHALL PASS SUBSEQUENT PERFORMANCE RECORD TEST AND CAP/PLUG PROOF/PERFORMANCE TEST.

- BURST TESTS - COUPLING ASSEMBLY SHALL WITHSTAND 10,000 PSIG. (SIMILAR COMPONENT WAS ACTUALLY TESTED TO 16,550 PSIG DURING CERTIFICATION FOR APOLLO USE. ANALYSIS OF THE ORBITER COUPLING INDICATES BURST WILL OCCUR AT APPROXIMATELY 13,000 PSIG.)

- PERFORMANCE RECORD TESTS INCLUDES: PROOF PRESSURE TEST, FUNCTIONAL TEST, LEAKAGE TEST AND CLEANLINESS TEST.

- WSB ASSEMBLY QUALIFICATION - INCLUDES RANDOM VIBRATION, SHOCK TEST, AND PERFORMANCE RECORD TEST (INCLUDING GN2 CIRCUIT HIGH PRESSURE PROOF AND LEAK TESTS, AND DESIGN POINT CHECK).

ACCEPTANCE:

- EXAMINATION OF PRODUCT - VERIFICATION OF WORKMANSHIP, FINISH, DIMENSIONS, CONSTRUCTION, CLEANLINESS, IDENTIFICATION, TRACEABILITY LEVEL AND PROCESSES PER DRAWINGS AND MC276-0032 (WATER BOILER GN2 FILL QUICK DISCONNECT PROCUREMENT SPEC).

- QD PROOF TEST - TESTED AT 5400 PSIG FOR 5 MINUTES MINIMUM IN EACH OF THE FOLLOWING CONFIGURATIONS: MALE COUPLING HALF ALONE, FEMALE COUPLING HALF ALONE, MALE AND FEMALE COUPLED, AND PRESSURE CAP ALONE. PASS/FAIL CRITERIA: NO EVIDENCE OF PERMANENT DEFORMATION.

- CLEANLINESS - LEVEL 200 PER MAQ110-301.

- PERFORMANCE RECORD TESTS INCLUDES: PROOF PRESURE TEST, FUNCTIONAL TEST, LEAKAGE TEST AND CLEANLINESS TEST.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 06-3A-0615- 02

- WSB ASSEMBLY ATP - INCLUDES HIGH SIDE GN2 PROOF AND LEAK TESTS AND DESIGN POINT TEST.

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

(C) INSPECTION:
RECEIVING INSPECTION
RAW MATERIALS ARE SENT TO A TEST LAB FOR MATERIAL AND CHEMICAL ANALYSIS AND CERTIFICATION, SHOP TRAVELER INSPECTION IS PERFORMED FOR CORRECT RAW MATERIAL PRIOR TO MACHINING.

CONTAMINATION CONTROL
INSPECTION VERIFIES CONTAMINATION CONTROL ON SHOP TRAVELERS. CLEANLINESS TO LEVEL 100 IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
MANUFACTURING PROCESSES, INSTALLATION AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION. IN-PROCESS INSPECTION IS REQUIRED FOR SEALING SURFACE AND CRITICAL DIMENSIONS. FLUID CONNECTION TORQUE REQUIREMENTS ARE VERIFIED FOR PHYSICAL AND SEALING DAMAGE.

CRITICAL PROCESSES
ELECTRON BEAM WELDING IS PERFORMED BY OUTSIDE VENDOR AND CERTIFICATION IS VERIFIED BY INSPECTION. HEAT TREATMENT IS VERIFIED BY INSPECTION.

TESTING
LEAKAGE IS VERIFIED BY PROOF PRESSURE AND HELIUM LEAK TESTS.

HANDLING/PACKAGING
PACKAGING FOR SHIPMENT IS 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:
NONE

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 06-3A-0615- 02

- APPROVALS -

EDITORIALLY APPROVED	. BNA	: J. Kimura 8-25-98
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 95-CIL-009_06-3A