

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 06-3D-0510 -X

SUBSYSTEM NAME: ATCS - RADIATORS AND FLOW CONTROL
REVISION: 0 12/05/97

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: PRESSURE SENSOR GULTON STATHAM INST.	ME449-0177-6173M PA8102-250-22169

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
PRESSURE SENSOR, RADIATOR LOOP.

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 2
ONE PER COOLANT LOOP.

FUNCTION:
PROVIDES POSITIVE MEANS FOR LEAK DETECTION AFTER ISOLATION VALVE
CLOSURE.

FAILURE MODES EFFECTS ANALYSIS FMEA - CIL FAILURE MODE

NUMBER: 06-3D-0510- 01

REVISION#: 0 12/02/97

SUBSYSTEM NAME: ATCS RADIATORS AND FLOW CONTROL

LRU: PRESSURE SENSOR

ITEM NAME: PRESSURE SENSOR

CRITICALITY OF THIS FAILURE MODE: 1R2

**FAILURE MODE:
EXTERNAL LEAKAGE**

**MISSION PHASE: LO LIFT-OFF
 OO ON-ORBIT**

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

**CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, POROSITY.**

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

**REDUNDANCY SCREEN A) PASS
 B) PASS
 C) PASS**

**PASS/FAIL RATIONALE:
A)**

B)

C)

- FAILURE EFFECTS -

**(A) SUBSYSTEM:
POSSIBLE LOSS OF MISSION FOR FIRST FAILURE.**

**(B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE MAY CAUSE SHUTDOWN OF SOME SUBSYSTEMS DUE TO LACK OF COOLING CAPACITY.**

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE
NUMBER: 06-3D-0510-01**

(C) MISSION:

POSSIBLE LOSS OF MISSION AFTER FIRST FAILURE, EXTERNAL LEAK PRESSURE SENSOR.

(D) CREW, VEHICLE, AND ELEMENT(S):

POSSIBLE LOSS OF CREW/VEHICLE AFTER TWO FAILURES:

- (1) MASSIVE EXTERNAL LEAK PRESSURE SENSOR
- (2) LOSS OF REDUNDANT COOLANT LOOP.

(E) FUNCTIONAL CRITICALITY EFFECTS:

PROBABLE LOSS OF MISSION AFTER ONE FAILURE:

- (1) EXTERNAL LEAK PRESSURE SENSOR CAUSES LOSS OF RADIATOR COOLING FOR THAT LOOP WITH ASSOCIATED LOSS OF VEHICLE COOLING

POSSIBLE LOSS OF VEHICLE OF CREW/VEHICLE AFTER TWO FAILURES

- (1) MASSIVE EXTERNAL LEAK PRESSURE SENSOR FOR WHICH 5 SECOND ISOLATION TIME WOULD NOT BE SUFFICIENT TO SAVE COOLANT LOOP.
- (2) LOSS OF REDUNDANT COOLANT LOOP CAUSES LOSS OF ALL VEHICLE COOLING AND POSSIBLE LOSS OF CREW/VEHICLE.

-DISPOSITION RATIONALE-

(A) DESIGN:

THE SENSOR IS THREADED INTO THE SENSOR PORT AND IS PRESSURE TESTED WITH A 1.5 FACTOR. THE SENSOR PORT IS BRAZED INTO THE COOLING LOOP. ALL THESE MATERIALS ARE CORROSION RESISTANT STAINLESS STEEL AND COMPATIBLE WITH FREON 21. THE SENSOR IS LOCATED BELOW THE PAYLOAD BAY LINER IN THE VICINITY OF THE FLOW CONTROL ASSEMBLY.

(B) TEST:

SENSOR IS QUALIFICATION TESTED FOR 100 MISSION LIFE, VIBRATION TESTED AT 0.4 G²/HZ FOR 34 MINUTES THEN 0.2 G²/HZ FOR 12 MINUTES AND SHOCK TESTED AT 20 G/AXIS. THE RESULTS OF THE QUALIFICATION TEST ON THE SENSOR VERIFIED OPERATING LIFE OF AT LEAST 100,000 PRESSURE CYCLES.

ACCEPTANCE TESTS VERIFY INSULATION RESISTANCE, CALIBRATION, AND PROOF PRESSURE.

GROUND TURNAROUND TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD DURING WHICH THE FCL'S ARE LEAKED CHECKED PRIOR TO EACH FLIGHT.

VEHICLE INSTRUMENTATION WILL DETECT FAILURE. FREON CHEMICAL ANALYSIS PER SE-S-0073 DURING SERVICING.

(C) INSPECTION:

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE
NUMBER: 06-3D-0510-01

RECEIVING INSPECTION

RAW MATERIAL IS VERIFIED BY INSPECTION. VISUAL INSPECTION/ID PERFORMED. PARTS PROTECTION, COATING AND PLATING PROCESSES ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

SYSTEM FLUID SAMPLES PERIODICALLY ANALYZED FOR CONTAMINATION AND VERIFIED BY INSPECTION. FORMAL CONTAMINATION CONTROL PLAN IS VERIFIED BY INSPECTION. CONTAMINATION CONTROL PROCESSES AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION. CLEANLINESS TO LEVEL 190 PER SPECIFICATION IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION ON SHOP TRAVELER MIPS. PROCESSING EQUIPMENT CONTROLS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELDING IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

X-RAY EXAMINATION OF WELDS IS VERIFIED BY INSPECTION.

TESTING

ATP IS VERIFIED BY INSPECTION, INCLUDING PROOF TEST.

HANDLING/PACKAGING

PROPERLY MONITORED HANDLING AND STORAGE ENVIRONMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

NO FAILURE HISTORY.

(E) OPERATIONAL USE:

ON-BOARD ALARMS, FREON INLET PRESSURE AND ACCUMULATOR QUANTITY, WILL PROVIDE INDICATION OF HARDWARE FAILURE. FREON PUMP WILL BE TURNED OFF AND LOSS OF ONE FREON LOOP POWERDOWN WILL BE PERFORMED. ENTRY AT NEXT PRIMARY LANDING SITE.

- APPROVALS -

SS & PAE MANAGER
 SS & PAE ENGINEER
 ECLSS-ATCS
 BNA SSM
 JSC MOD
 JSC DOE

USA/Rsheter

: D.F. MIKULA
 : K.E. RYAN
 : L. T. HARPER
 : S. N. NGUYEN
 :

: *D.F. Mikula* 16 APR 98
 : *K.E. Ryan* 7/1/97
 : *L.T. Harper* 3/10/98
 : *S.N. Nguyen* 4-16-98
 : *John P. ...* 4-20-98
 : *IPAT*
 : *Newton C. ...* 11-24-98

Supreme State 1-4-
OPD 1/18/99