

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 06-1B-0563 -X**

SUBSYSTEM NAME: ARS - COOLING

REVISION: 1 11/22/00

PART DATA

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU : HEAT EXCHANGER, AV BAY	MC621-0008-0005
LRU : HEAT EXCHANGER (AVIONICS BAY 3A) HAMILTON STANDARD	MC621-0008-0705 SV755522

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
HEAT EXCHANGER, AVIONICS BAY**

QUANTITY OF LIKE ITEMS: 4
ONE PER BAY
THREE PER SUBSYSTEM

FUNCTION:

REMOVES EXCESS HEAT FROM AVIONICS EQUIPMENT BY COOLING CIRCULATED AIR IN BAY AND TRANSFERRING THE HEAT TO THE WATER COOLANT LOOPS.

MC621-0008-0705: MCR 19393 "AVIONICS BAY 3A FAN MOD - LONG LEAD PROCUREMENT" PROVIDES FLEXIBILITY TO INSTALL EITHER CABIN OR AVIONICS FAN IN AVIONICS BAY 3A BASED ON INDIVIDUAL MISSION CONSUMABLES AND PAYLOAD COOLING NEEDS TO IMPROVE CRYO CONSUMABLES MARGIN.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 06-1B-0563- 02

REVISION#: 1 11/22/00

SUBSYSTEM NAME: ARS - COOLING
LRU: HEAT EXCHANGER, AV BAY
ITEM NAME: HEAT EXCHANGER, AV BAY

CRITICALITY OF THIS FAILURE MODE: 1R2

FAILURE MODE:
EXTERNAL LEAKAGE, WCL

MISSION PHASE: LO LIFT-OFF
 OO ON-ORBIT
 DO DE-ORBIT

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

CAUSE:
VIBRATION, MECHANICAL SHOCK, CORROSION, MATERIAL DEFECT

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:
LOSS OF REDUNDANCY - LOSS OF ONE WATER COOLANT LOOP.

(B) INTERFACING SUBSYSTEM(S):

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REDUCED OR LOST OF COOLING CAPABILITY IN AFFECTED AVIONICS BAY. FREE WATER IN ASSOCIATED AVIONICS BAY.

(C) MISSION:

POSSIBLE EARLY MISSION TERMINATION FOR LOSS OF ONE WATER COOLANT LOOP.

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

POTENTIAL LOSS OF CREW/VEHICLE UPON SUBSEQUENT LOSS OF REDUNDANT WATER COOLANT LOOP.

(E) FUNCTIONAL CRITICALITY EFFECTS:

-DISPOSITION RATIONALE-

(A) DESIGN:

HEAT EXCHANGER IS AN OVEN-BRAZED CRES PLATE-FIN UNIT. HEADER, BOSSES AND FLUID LINES WELDED ON THE PLATE-FIN CORE. THE HEAT TRANSFER FLUID IS HIGH PURITY/LOW OXYGEN CONTENT WATER. HOUSING IS 0.04 INCH THICK.

(B) TEST:

ACCEPTANCE TEST - LEAKAGE: AIR SIDE AT 5 IN OF H2O 0.18 LB/MIN GN2 MAX, WATER SIDE 0.001 CC/HR AT 75 PSIG. PROOF PRESSURE AT 5 IN OF H2O ON AIR SIDE AND 135 PSIG ON H2O SIDE. TUBES INSPECTED. FLOW VS. DELTA-P CHECK PERFORMED.

QUALIFICATION TEST - LEAKAGE: AIR SIDE AT 5 IN OF H2O 0.18 LB/MIN GN2 MAX. PROOF PRESSURE AT 5 IN OF H2O ON AIR SIDE AND 135 PSIG ON H2O SIDE. TUBES INSPECTED. SUBJECTED TO RANDOM VIBRATION SPECTRUM ENVELOPE OF 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.03 G**2/HZ, CONSTANT AT 0.03 G**2/HZ FROM 150 TO 1000 HZ, DECREASING AT 6 DB/OCTAVE FROM 1000 TO 2000 HZ FOR 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES. DESIGN SHOCK - THREE TERMINAL SAWTOOTH PULSES OF 20 G PEAK AMPLITUDE AND 11 MS DURATION APPLIED IN BOTH DIRECTIONS ALONG EACH OF THREE ORTHOGONAL AXES.

IN-VEHICLE TESTING - SYSTEM DECAY TEST IS PERFORMED AT 85 - 95 PSIG, 8 CC/MIN MAX LEAKAGE. PUMP OUT PRESSURE AND ACCUMULATOR QUANTITY ARE CONTINUOUSLY MONITORED WHEN THE VEHICLE IS POWERED UP AND SERVE AS AN INDICATION OF EXTERNAL LEAKAGE.

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

(C) INSPECTION:

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(C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIAL AND PURCHASED COMPONENTS REQUIREMENTS ARE VERIFIED BY INSPECTION. PARTS PROTECTION IS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

SYSTEMS FLUID ANALYSES FOR CONTAMINATION ARE VERIFIED BY INSPECTION. CONTAMINATION CONTROL PLAN IS VERIFIED BY INSPECTION. CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION. SHEET METAL PARTS ARE INSPECTED AND VERIFIED BY INSPECTION. SURFACE FINISHES VERIFIED BY INSPECTION. DIMENSIONS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELDING IS VERIFIED BY INSPECTION. ALL WELDS ARE STRESS RELIEVED AFTER WELDING, VERIFIED BY INSPECTION. BRAZING IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

HEADER WELDS TO THE TUBES ARE PENETRANT AND X-RAY INSPECTED. OTHER WELDS (MOUNTING PADS AND HEADER WELDS TO THE CORES) ARE PENETRANT AND 10X MAGNIFICATION VISUALLY INSPECTED. BRAZES ARE VERIFIED BY PROOF AND LEAK TESTS.

TESTING

INSPECTION VERIFIES THAT RESULTS OF ACCEPTANCE TESTING AND FLOWRATES ARE WITHIN SPECIFIED LIMITS.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS 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:

TBS.

- APPROVALS -

S&RE ENGINEERING
S&RE ENGINEERING ITM
DESIGN ENGINEERING
DESIGN ENGINEERING SSM
MOD

: P. CHAN
: P. STENGER-NGUYEN
: K. DUONG
: S. NGUYEN
: P. HASBROCK

[Handwritten signatures and dates]

John D. ... 1/12/01

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NUMBER: 06-1B-0563-02

USA / SAM :
USA ORBITER ELEMENT :

Paul W. H. H. 1-12-01
Suzanne Little 1-12-01