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PRINT DATE: 02/17/89

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1B3-0557-X

SUBSYSTEM NAME: ARS - COOLING

REVISION : 0 02/17/89 W

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	HEAT EXCHANGER, IMU HAMILTON STANDARD	MC621-0008-0017 SV767215

QUANTITY OF LIKE ITEMS: 1

DESCRIPTION/FUNCTION:

HEAT EXCHANGER, INERTIAL MEASUREMENT UNITS (IMU)

PROVIDES FOR REMOVAL OF IMU HEAT. BY MEANS OF COOLING THE CIRCULATION
~~AIR THAT PASSES OVER THE EQUIPMENT~~ *THIS HEAT EXCHANGER COOLS THE IMU'S*
AFTER PASSING *BEFORE RETURNING*
TO THE CABIN. HEAT EXCHANGER TRANSFERS THE
HEAT TO THE WATER COOLANT LOPS.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1B3-0557-01

SUBSYSTEM: ARS - COOLING
LRU HEAT EXCHANGER, IMU
ITEM NAME: HEAT EXCHANGER, IMU

REVISION: 0 02/17/89 W

CRITICALITY OF THIS
FAILURE MODE: 1R2

FAILURE MODE:
EXTERNAL LEAKAGE, WATER

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

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

CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, MATERIAL DEFECT

CRITICALITY 1/1 DURING INTACT ABORT ONLY? N

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):
LOSS OF COOLING OF AFFECTED WATER COOLANT LOOP. FREE WATER IN CABIN.

(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.

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(E) FUNCTIONAL CRITICALITY EFFECTS

- DISPOSITION RATIONALE -

(A) DESIGN:

HEAT EXCHANGER IS AN OVEN-BRAZED CRES PLATE-FIN UNIT. HEADER, BOSSER AND FLUID LINES WELDED ON THE PLATE-FIN CORE. THE HEAT TRANSFER FLUID IS HIGH PURITY/LOW OXYGEN CONTENT WATER. HOUSING IS 0.09 INCH THICK. WATER FINS ARE 0.05 INCH HIGH X 0.002 INCH THICK. AIR FINS ARE 0.2 INCH HIGH X 0.002 INCH THICK. PARTING SHEETS ARE 0.005 INCH THICK.

(B) TEST:

ACCEPTANCE TEST - PERFORMANCE TEST, INCLUDING FLOW VS. DELTA-P, PERFORMED. NET Q (BTU/HR) OF 1553 AT OPERATING FLOW CONDITIONS. PROOF PRESSURE TEST AT 135 PSID. LEAKAGE TEST: INTERNAL AT 90 PSID, 3.2 X 10 EXP -5 SCCS GHE MAX; EXTERNAL AT 90 PSID, 3.2 X 10 EXP -4 SCCS GHE MAX. VISUAL INSPECTION OF AIR AND COOLANT CIRCUITS PERFORMED.

CERTIFICATION - CERTIFIED BY ANALYSIS AND BY SIMILARITY TO AVIONICS BAY HEAT EXCHANGER: VIBRATION CERTIFIED TO A LEVEL OF 20 - 150 HZ, INCREASING AT 6 DB/OCTAVE; 150 - 1000 HZ CONSTANT AT 0.03 G**2/HZ; 1000 - 2000 HZ DECREASING AT 6 DB/OCTAVE FOR 48 MINUTES PER AXIS. SHOCK CERTIFIED TO 20 G TERMINAL SAWTOOTH PULSE OF 11 MS DURATION IN EACH OF THREE ORTHOGONAL AXES. BURST PRESSURE - CERTIFIED BY ANALYSIS TO 180 PSI. HUMIDITY - CERTIFIED BY ANALYSIS TO 200,000 HOURS AT 100% RELATIVE HUMIDITY.

IN-VEHICLE TESTING - SYSTEM DECAY TEST IS PERFORMED USING GN2 AT 85 - 9 PSIG, 0.25 PSI/HR 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.

OMRSD - PUMP ACCUMULATOR QUANTITY AND OUTLET PRESSURE ARE CONTINUOUSLY MONITORED WHILE THE VEHICLE IS POWERED UP DURING EACH TURNAROUND, AND SERVE AS AN INDICATION OF EXTERNAL LEAKAGE. WATER IS SAMPLED PER SPEC SE-S-0073 DURING SERVICING.

(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

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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.

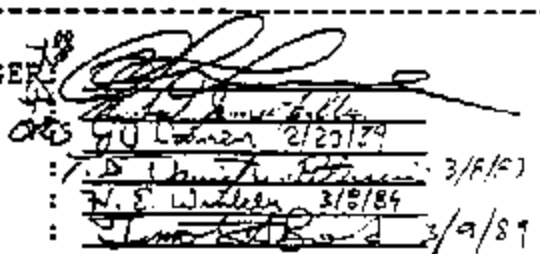
(D) FAILURE HISTORY:

NO FAILURE HISTORY APPLICABLE TO EXTERNAL LEAKAGE FAILURE MODE. THE IMU HEAT EXCHANGER HAS SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE:

TBS.

- APPROVALS -

RELIABILITY ENGINEERING: N. L. STEISLINGER
DESIGN ENGINEERING : N. K. DUONG
QUALITY ENGINEERING : D. R. STOICA
NASA RELIABILITY :
NASA SUBSYSTEM MANAGER :
NASA QUALITY ASSURANCE :

: T. D. [Signature] 3/8/89
: N. S. [Signature] 3/8/89
: [Signature] 3/9/89