

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3C -0223 -5 REV:08/29/88

ASSEMBLY : FREON THERMAL LOOP CRIT. FUNC: 2  
P/N RI : MC250-0001-0120 CRIT. HP: 2  
P/N VENDOR: SV755512 VEHICLE 102 103 104  
QUANTITY : 1 EFFECTIVITY: X X X  
: ONE WITH DUAL LOOP PHASE(S): PL X LO X OO X DO X LS X  
: OPERATION

PREPARED BY: DES O. TRAN DES APPROVED BY: A- B- C-  
REL D. RISINGOR REL APPROVED BY (NASA):  
QE W. SMITH JR. QE SSM REL  
QE

ITEM:  
HEAT EXCHANGER, PAYLOAD (FREON/PAYLOAD INTERFACE).

FUNCTION:  
THE PAYLOAD HEAT EXCHANGER TRANSFERS WASTE HEAT FROM TWO PAYLOAD COOLANT LOOPS TO THE TWO FREON COOLANT LOOPS.

FAILURE MODE:  
EXTERNAL LEAKAGE, PAYLOAD COOLANT.

CAUSE(S):  
CORROSION, VIBRATION, MECHANICAL SHOCK, STRUCTURAL DAMAGE.

- EFFECT(S) ON:  
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE  
(A) NO EFFECT ON FREON COOLANT LOOPS.  
(B) POSSIBLE LOSS OF PAYLOAD LOOP FOR PAYLOAD COOLING.  
(C) POSSIBLE LOSS OF MISSION CAUSED BY LOSS OF COOLING TO PAYLOAD.  
(D) NO EFFECT.

DISPOSITION & RATIONALE  
(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN  
THE HEAT EXCHANGER IS MADE FROM STAINLESS STEEL AND NICKEL BRONZE ALLOYS, WHICH ARE CORROSION RESISTANT AND COMPATIBLE WITH FREON 21 AND PAYLOAD COOLANTS (FREON 114 OR WATER), AND CONTAINS NO MOVING PARTS SUBJECT TO WEAR. THE FLOW HEADERS ARE MACHINED FROM A SINGLE PIECE STAINLESS STEEL BAR. THE HEADERS ARE WELDED TO THE CORE, WHICH IS MADE OF STACKED PLATE-FIN STAINLESS STEEL PARTING SHEETS (THICKNESS = 0.005 INCH). DESIGN PROOF PRESSURE OF 1.5 AND BURST PRESSURE OF 2.0 TIMES MAXIMUM OPERATING PRESSURE.

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(B) TEST

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE. THE HEAT EXCHANGER WAS SUBJECTED TO A PROOF/RUPTURE TEST FOR QUALIFICATION. DESIGN PROOF IS 575 PSIG AND UNIT DID NOT RUPTURE UNTIL 2440 PSIG (MAXIMUM PAYLOAD COOLANT OPERATING PRESSURE IS 200 PSIA). VIBRATION TESTED AT 0.075 G<sup>2</sup>/HZ FOR 52 MIN/AXIS, SHOCK TESTED AT +/- 20 G EACH AXIS.

ACCEPTANCE TEST - CORE IS LEAK TESTED PRIOR TO INSTALLING THE HEADERS AND AGAIN IN ATP.

OMRSD - PAYLOAD COOLANT LOOPS ARE LEAK CHECKED PRIOR TO EACH FLIGHT. FLUID USE CONTROLLED TO SE-S-0073.

(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

NO FAILURE HISTORY.

(E) OPERATIONAL USE

FOR LOSS OF PAYLOAD COOLANT LOOP, POWER DOWN PAYLOAD.