

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1B -0561 -3 REV: 08/19/83
 ASSEMBLY : WATER COOLANT LOOPS CRIT. FUNC: 1
 P/N RI : V070-613XXX CRIT. HDW: 1
 P/N VENDOR: VEHICLE 102 103 104
 QUANTITY : 51 EFFECTIVITY: X X X
 : PER SUBSYSTEM PHASE(S): PL LO X OO X DO X LS

PREPARED BY: DES N. K. DUONG APPROVED BY: *[Signature]* REDUNDANCY SCREEN: A-PASS B-PASS C-PAS
 REL N. L. STEISSLINGER *[Signature]* REL *[Signature]* APPROVED BY (NASA):
 QE D. STOICA *[Signature]* QE *[Signature]* SSM *[Signature]*
[Signature] *[Signature]* *[Signature]*
[Signature] *[Signature]* *[Signature]*

ITEM:
COLDPLATES

FUNCTION:
PROVIDES HEAT DISSIPATION OF AVIONICS BAY EQUIPMENT BY MEANS OF CONDUCTION TO THE WATER COOLANT LOOPS. FORTY-NINE COLDPLATES PER SET.

| COLDPLATE P/N | QUANTITY | EQUIPMENT COOLED |
|---------------|----------|------------------------------|
| V070-613207 | 2 | RJDF'S |
| V070-613208 | 3 | PWR CONT ASSY'S |
| V070-613210 | 1 | GCILU |
| V070-613211 | 1 | COMSEC'S |
| V070-613212 | 1 | CCUA, EVLSS, P/L DATA INTLVR |
| V070-613213 | 2 | S-BAND XPDR'S, N/W S/P'S |
| V070-613214 | 2 | P/L INTERR'S, P/L SIG PROC'S |
| V070-613215 | 1 | MCA 3, EVA/ATC XCVR |
| V070-613220 | 1 | FM XMT'S |
| V070-613226 | 3 | KU BAND EA-1A & EA-2A, HUD'S |
| V070-613228 | 1 | KU BAND SP |
| V070-613231 | 1 | S/B PRE AMP, S/B PWR AMP |
| V070-613232 | 3 | MSS PCM RCRDR, OP RCDR'S |
| V070-613233 | 3 | INVERTERS |
| V070-613234 | 2 | PCM MSTR'S |
| V070-613237 | 3 | INVERTERS |
| V070-613241 | 1 | MTU |
| V070-613242 | 3 | LOAD CONT ASSY'S |
| V070-613243 | 3 | MDM & SIG COND'S |
| V070-613371 | 5 | MDM'S |
| V070-613373 | 2 | MASS MEM'S |
| V070-613374 | 2 | RAD ALT & MDM'S |
| V070-613596 | 1 | TEXT GRAPHICS |
| V070-613597 | 1 | GPS 4 |
| V070-613598 | 1 | GPS 3 |

TWO ADDITIONAL COLDPLATES PROVIDE HEAT DISSIPATION FOR MDM OF4 (FLIGHT DECK) AND FLOODLIGHT (PAYLOAD BAY); P/N'S V070-613010, V070-613180.

FAILURE MODE:
INTERLOOP LEAKAGE

CAUSE(S):
MECHANICAL SHOCK, VIBRATION, CORROSION

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EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) TRANSFER OF COOLANT FROM ONE WATER LOOP TO THE OTHER UNTIL PRESSURE IN BOTH LOOPS IS EQUALIZED.

(B) NO EFFECT.

(C) POSSIBLE EARLY MISSION TERMINATION FOR FIRST FAILURE.

(D) SECOND ASSOCIATED FAILURE (LEAKAGE OF ONE WATER COOLANT LOOP) WILL CAUSE LOSS OF ALL CABIN COOLING AND MAY RESULT IN LOSS OF CREW/VEHICLE.

DISPOSITION & RATIONALE:

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

(A) DESIGN

COLDPLATES ARE CONSTRUCTED OF TWO TYPE 347 CRES FACE SHEETS (LOOP 1 SIDE 0.012 IN THICK AND LOOP 2 SIDE 0.016 IN THICK) BRAZED TO A CORE ϕ 113 I THICK. THE COLDPLATE CORE HAS PIN FINS ON BOTH SIDES AND BAFFLES TO MAKE UP FLOW PATHS FOR WCL 1 & 2. PIN FINS ARE 0.048 INCH IN DIAMETER AND 0.047 IN HIGH, AND ARE ARRANGED IN A STAGGERED EQUILATERAL TRIANGLE FORMATION WITH A PITCH DISTANCE OF 0.190 IN. THERE ARE NICKEL PLATED PADS AROUND PORTS, AND ETHYLENE PROPYLENE RUBBER (EPR) O-RING SEALS AT MANIFOLDS. THERE ARE NO MOVING PARTS. WATER COOLANT LOOPS CONTAIN 10 MICRON HIGH HOLDING CAPACITY SYSTEM FILTER AT THE PUMP PACKAGE INLET AND 61 MICRON FILTERS AT PUMP INLET AND OUTLET. COOLANT IS HIGH PURITY/LOW OXYGEN CONTENT WATER. MATERIAL COMPATIBILITY WITH WATER AND ALCOHOL BASED ON MATERIALS AND PROCESSES CERTIFICATION ANALYSIS (REF CAR 01A-22-610001-FCF-A).

(B) TEST

QUALIFICATION TEST - COLDPLATES CERTIFIED BY SIMILARITY TO APOLLO COLDPLATES (VIBRATION, SHOCK, AND ACCELERATION). COLDPLATES WERE SUBJECTED TO PRESSURE CYCLING, BURST PRESSURE, FLOW VS PRESSURE DROP AND THERMAL PERFORMANCE TESTS.

ACCEPTANCE TEST - FLOW AND DELTA-P ARE VERIFIED. COLDPLATES ARE ULTRASONICALLY CLEANED, FLUSHED WITH WATER AND FREON TF, VERIFIED TO LEVEL 300 CLEANLINESS AND DRIED PRIOR TO STORAGE.

IN-VEHICLE TESTING - SYSTEM LEAK TEST IS PERFORMED AT 85 - 95 PSIG, 8 CC/MIN MAX LEAKAGE. LOOPS ARE SERVICED WITH A DELTA OF APPROXIMATELY 10% BETWEEN THEIR ACCUMULATOR QUANTITIES TO ENABLE DETECTION OF INTERLOOP LEAKAGE.

OMRSD - LOOPS ARE SERVICED WITH A DELTA OF APPROXIMATELY 10% BETWEEN THEIR ACCUMULATOR QUANTITIES TO ENABLE DETECTION OF INTERLOOP LEAKAGE. PUMP OUT PRESSURE AND ACCUMULATOR QUANTITY ARE MONITORED CONTINUOUSLY WHEN THE VEHICLE IS POWERED UP DURING EACH TURNAROUND. WATER IS SAMPLED PER SPEC SE-S-0073 DURING SERVICING.

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(C) INSPECTION

RECEIVING INSPECTION

MATERIAL ISSUED FOR FABRICATION IS VERIFIED BY INSPECTION ON MANUFACTURING ORDERS (CHECK MATERIAL FOR SCRATCHES).

CONTAMINATION CONTROL

CLEANLINESS LEVEL 300 IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MACHINE TOLERANCES AND DETAIL PARTS ARE PER DRAWING, AND ARE VERIFIED BY INSPECTION. SEALING SURFACES PROTECTION IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

COLDPLATES ARE BRAZED PER DRAWING, AND ARE VERIFIED BY INSPECTION. ELECTRO-DEPOSIT IS VERIFIED BY INSPECTION.

TESTING

PROOF PRESSURE AND LEAK CHECK ARE VERIFIED BY INSPECTION. ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO FAILURE HISTORY APPLICABLE TO INTERLOOP LEAKAGE FAILURE MODE. THE COLDPLATES HAVE SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE

TBS.