

PRINT DATE: 02/17/89

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1B3-0570-X

SUBSYSTEM NAME: ARS - COOLING

REVISION : 0 02/17/89 W

| | PART NAME VENDOR NAME | PART NUMBER VENDOR NUMBER |
|-------|-----------------------------|------------------------------|
| LRU : | LINES, BULKHEAD PENETRATION | MC271-0085-0022 |
| LRU : | LINES, BULKHEAD PENETRATION | MC271-0085-0023 |
| LRU : | LINES, BULKHEAD PENETRATION | MC271-0085-1022 |
| LRU : | LINES, BULKHEAD PENETRATION | MC271-0085-1023 |

QUANTITY OF LIKE ITEMS: 4
TWO PER COOLANT LOOP
FOUR PER SUBSYSTEM

DESCRIPTION/FUNCTION:
FLEX LINE ASSEMBLIES

PROVIDE FLEXIBILITY IN THE CREW MODULE/MID FUSELAGE WATER COOLANT LOOP
MATING INSTALLATION.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1B3-0570-01

REVISION: 0 02/17/89 W

SUBSYSTEM: ARS - COOLING
LRU LINES, BULKHEAD PENETRATION
ITEM NAME: LINES, BULKHEAD PENETRATION

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, HANDLING FLEXURE, CORROSION

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 (ICE) IN
PAYLOAD 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.

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(E) FUNCTIONAL CRITICALITY EFFECTS

- DISPOSITION RATIONALE -

(A) DESIGN:

HOSES HAVE A CONVOLUTED CORROSION RESISTANT STEEL (321 CRES) INNER LINER WITH 5/8 INCH O.D. AND 0.030 INCH WALL THICKNESS. EXTERNAL 321 CRES WIRE BRAID SUPPORTS INNER HOSE. DESIGNED TO WITHSTAND 800 FLEXURE CYCLES.

(B) TEST:

ACCEPTANCE TEST - PROOF PRESSURE TESTED TO 180 PSIG. LEAKAGE, PRESSURE DROP AND LENGTH VARIATION TESTED.

QUALIFICATION TEST/CERTIFICATION - PROOF PRESSURE TEST FOR >180 PSI AND BURST PRESSURE BY SIMILARITY TO OXYGEN FLEXLINES WHICH ARE GOOD FOR 5200 PSIG. RANDOM VIBRATION TEST - 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.09 G**2/HZ, CONSTANT AT 0.09 G**2/HZ FROM 150 TO 900 HZ, DECREASING AT 9 DB/OCTAVE FROM 900 TO 2000 HZ FOR 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES. LIFE FLEXURE TEST FOR 800 CYCLES. HUMIDITY CERTIFIED BY SIMILARITY IN CONSTRUCTION TO THE AFT BULKHEAD PENETRATION LINES FROM 0 TO 100% RELATIVE HUMIDITY. SAND AND DUST CERTIFIED BY TEST PER MIL-STD-810, METHOD 510 FOR A DURATION OF 28 HOURS. SALT FOG CERTIFIED BY TEST PER MIL-STD-810, METHOD 509 PROCEDURE I FOR A DURATION OF 48 HOURS. FLUID COMPATIBILITY - CERTIFIED BY SIMILARITY TO THE APOLLO/SKYLAB BULKHEAD PENETRATION LINES. TEMPERATURE - CERTIFIED TO TEMPERATURES FROM -65 TO 250 F BY TEST. THE LINES ARE NOT SENSITIVE TO PRESSURE CYCLING.

IN-VEHICLE TESTING - SYSTEM DECAY TEST IS PERFORMED USING GN2 AT 85 - 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

INCOMING PARTS ARE VERIFIED FOR MATERIAL AND PROCESS CERTIFICATION. RECEIVING RECORDS ARE MAINTAINED FOR VERIFICATION.

CONTAMINATION CONTROL

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CLEANLINESS IS MAINTAINED AND VERIFIED BY INSPECTION. CORROSION PROTECTION IS VERIFIED PER DRAWING REQUIREMENT.

ASSEMBLY/INSTALLATION

SURFACE FINISH AND DIMENSIONS ARE VERIFIED BY INSPECTION. PROOF PRESSURE TEST WITH NITROGEN IS VERIFIED. INSPECTION POINTS ARE INCLUDED IN ASSEMBLY PROCEDURE.

NONDESTRUCTIVE EVALUATION

HELIUM LEAK TEST IS VERIFIED BY INSPECTION. DYE PENETRANT AND RADIOGRAPHIC INSPECTION ARE VERIFIED.

CRITICAL PROCESSES

TIG WELD ON ALL JOINTS ARE VERIFIED BY INSPECTION PER REQUIREMENT. PARTS PASSIVATION AND ELECTRO POLISHED EXTERNAL SURFACE ARE VERIFIED. INSPECTION VERIFIES ELECTRO-ETCHED MARKING PER REQUIREMENT. HEAT TREATMENT OF DYNATUBE FITTING IS VERIFIED.

TESTING

ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGING FOR SHIPMENT IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

NO FAILURE HISTORY APPLICABLE TO EXTERNAL LEAKAGE FAILURE MODE. THE FLEX LINES HAVE SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE:

TBS.

- APPROVALS -

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

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