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PRINT DATE: 01/08/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1B²-0543-X

SUBSYSTEM NAME: ARS - COOLING

REVISION : 2 01/08/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	PRI COOL PUMP AND ACCUM HAMILTON STANDARD	MC621-0008-0455 SV755509
LRU :	SEC COOL PUMP AND ACCUM HAMILTON STANDARD	MC621-0008-0456 SV755509
SRU :	ACCUMULATOR	SV755538-5

QUANTITY OF LIKE ITEMS: 2

FUNCTION:

MAINTAINS POSITIVE PRESSURE AT PUMP INLET AND COMPENSATES FOR THERMAL EXPANSION AND CONTRACTION OF WATER BY MEANS OF EXPANSION AND CONTRACTION OF A GN2 LOADED BELLOWS.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-1B²-0543-02

REVISION# 2 01/08/90

SUBSYSTEM: ARS - COOLING
LRU :PRI COOL PUMP AND ACCUM
ITEM NAME: ACCUMULATOR

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:
CORROSION, MECHANICAL SHOCK, VIBRATION, 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):
LOSS OF COOLING ON AFFECTED WATER COOLANT LOOP. FREE WATER IN CABIN.

(C) MISSION:
POSSIBLE EARLY MISSION TERMINATION FOR LOSS OF ONE WATER COOLANT LOOP.

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(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:

BELLOWS ARE MADE OF INCONEL 718 AND THE HOUSING IS MADE OF 6061-T6 ALUMINUM. THE DESIGN PRECLUDES ANY WETTED BIMETAL JOINTS TO PREVENT GALVANIC CORROSION. THE BELLOWS IS DESIGNED TO WITHSTAND 65 PSID PROOF PRESSURE LIQUID TO GAS, 33 PSID GAS TO LIQUID. THE TANK IS DESIGNED TO WITHSTAND A BURST PRESSURE OF 180 PSID.

(B) TEST:

ACCEPTANCE TEST - MAXIMUM ALLOWABLE LEAKAGE OF 0.01 CC/HR WATER AT 90 PSID. PROOF PRESSURE OF 135 PSID.

QUALIFICATION TEST - PROOF PRESSURE 135 PSID. BURST PRESSURE 180 PSID ON TANK. BURST OF 2 TIMES GAS PRESSURE ON BELLOWS. MAXIMUM ALLOWABLE LEAKAGE OF 0.01 CC/HR WATER AT 90 PSID. 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 USING GN2 AT 85 - 95 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 MATERIALS AND PROCESS CERTIFICATION.

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CONTAMINATION CONTROL
ASSEMBLY IS VERIFIED TO CLEANLINESS LEVEL 300 PER SPECIFICATION.
CORROSION PROTECTION PROVISIONS ARE CHECKED.

ASSEMBLY/INSTALLATION
DIMENSIONS AND SURFACE FINISHES VERIFIED BY INSPECTION. APPLICATION OF SUPER KOROPON AND POLYURETHANE TO ACCUMULATOR AND SENSOR, VERIFIED BY INSPECTION. PROOF PRESSURE TEST IS VERIFIED.

NONDESTRUCTIVE EVALUATION
INTERNAL METAL BELLOWS ARE RADIOGRAPHICALLY INSPECTED TO ENSURE THE PARTS ARE FREE FROM DAMAGE. HELIUM LEAK DETECTION IS VERIFIED PER SPECIFICATION.

CRITICAL PROCESSES
ELECTRICAL BONDING IS VERIFIED BY INSPECTION. WELDS ARE VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
NO FAILURE HISTORY APPLICABLE TO EXTERNAL LEAKAGE, WATER FAILURE MODE. THE ACCUMULATOR HAS SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE:

BS. NONE

- APPROVALS -

RELIABILITY ENGINEERING:	D. R. RISING	<i>[Signature]</i>	:	<i>[Signature]</i>
DESIGN ENGINEERING	: N. K. JUONG	<i>[Signature]</i>	:	<i>[Signature]</i>
QUALITY ENGINEERING	: D. R. STOICA	<i>[Signature]</i>	:	<i>[Signature]</i>
NASA RELIABILITY	:	<i>[Signature]</i>	:	<i>[Signature]</i>
NASA SUBSYSTEM MANAGER	:	<i>[Signature]</i>	:	<i>[Signature]</i>
NASA QUALITY ASSURANCE	:	<i>[Signature]</i>	:	<i>[Signature]</i>