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PRINT DATE: 01/10/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-1C3-1510-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 01/10/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU 01	LINES AND FITTINGS	V070-613130
LRU 02	LINES AND FITTINGS	M072-643300

QUANTITY OF LIKE ITEMS: 1
ONE SET PER SUBSYSTEM

FUNCTION:

PROVIDES FOR THE MOVEMENT OF OXYGEN FROM THE ARPCS N2/O2 CONTROL PANEL TO THE VARIOUS USING STATIONS (LES QUICK DISCONNECTS, DIRECT J2 VALVE, SCU INTERFACE) IN THE CABIN AND AIRLOCK.

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NUMBER: 06-103-1510-02

REVISION# 2 01/10/90

SUBSYSTEM: ARS - ARPCS
LINES AND FITTINGS
ITEM NAME: LINES AND FITTINGS

CRITICALITY OF THIS
FAILURE MODE: 1/1

■ FAILURE MODE:
RESTRICTED FLOW

MISSION PHASE:

PL PRELAUNCH
LO LIFT-OFF
OO ON-ORBIT
DO DE-ORBIT
LS LANDING SAFING

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

CAUSE:
CORROSION, CONTAMINATION, DEFORMED LINE

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN A) N/A
B) N/A
C) N/A

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
EMERGENCY OXYGEN WOULD NOT BE AVAILABLE FOR CREW USAGE WHEN LES ARE
REQUIRED FOR USE.

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(B) INTERFACING SUBSYSTEM(S):

DEGRADED INTERFACE - REDUCED OXYGEN TO SUPPORT CREW, AIRLOCK AND EMERGENCY O2 USE (LES).

(C) MISSION:

UNABLE TO SUPPLY ADEQUATE OXYGEN TO LES IN AN EMERGENCY AND WHEN REQUIRED FOR NORMAL USE (E.G. EVA PREBREATHE, ASCENT AND DESCENT PHASES).

(D) CREW, VEHICLE, AND ELEMENT(S):

POSSIBLE LOSS OF CREW/VEHICLE IF O2 FLOW RATE IS INADEQUATE AND LES ARE REQUIRED (8.0 PSIA HOLE IN CABIN CONTINGENCY. CONTAMINATED CABIN ATMOSPHERE).

(E) FUNCTIONAL CRITICALITY EFFECTS:

- DISPOSITION RATIONALE -

(A) DESIGN:

LINES ARE FABRICATED OF 21-6-9 STAINLESS STEEL WITH A THICKNESS OF 0.016 INCH. FITTINGS ARE DYNATUBES MADE OF 17-4 PH STAINLESS STEEL AND ARE BRAZED INTO THE SYSTEM. 21-6-9 STAINLESS STEEL HAS GOOD CORROSION RESISTANCE, HIGH MECHANICAL PROPERTIES, GOOD IMPACT STRENGTH, AND STRENGTH TO WEIGHT RATIO. 17-4 PH CONDITION A CRES IS PRECIPITATION HARDENED CORROSION RESISTANT STEEL WHICH HAS A HIGH STRENGTH TO WEIGHT RATIO. BOTH MATERIALS ARE COMPATIBLE WITH GO2. SYSTEM IS DESIGNED FOR MINIMAL COLLECTION OF CONTAMINANTS. GAS IS FILTERED THROUGH 10 MICRON FILTERS IN UPSTREAM COMPONENTS. EXTENSIVE FLIGHT EXPERIENCE STS-1 TO PRESENT PROVIDES CONFIDENCE IN DESIGN INTEGRITY.

(B) TEST:

QUALIFICATION TEST - TESTING OF 21-6-9 STAINLESS TUBING AS FOLLOWS: PROOF TEST (2X OPERATING PRESSURE) AND EXTERNAL LEAK TEST (1 X 10 EXP -6 SCCS HE MAX), BURST TEST (BURST AT GREATER THAN OR EQUAL TO 4X OPERATING PRESSURE), IMPULSE FATIGUE TEST (TWO HUNDRED THOUSAND CYCLES OF IMPULSE WAVES), FLEXURE FATIGUE TEST (TEN MILLION CYCLES OF FLEXURE), RANDOM VIBRATION, POST TEST LEAK TEST (1 X 10 EXP -6 SCCS HE MAX). DYNATUBE COUPLINGS ARE AUTHORIZED BY RI SPEC MF0004-0100 "MECHANICAL - ORBITER PROJECT PARTS LIST."

IN-VEHICLE TESTING - AFTER INSTALLATION, LES SYSTEM CHECKOUT IS PERFORMED. THIS INCLUDES MEASUREMENT OF FLOW FROM EACH LES STATION AT 790-810 PSIG GN2 INLET PRESSURE, FLOW RATE 22.4 LB/HR PER LES, AND AN OBSTRUCTION FLOW TEST AT 850-900 PSIG INLET PRESSURE, 38 LB/HR MINIMUM EACH LES AND 75 LB/HR MINIMUM AT AIRLOCK AND DIRECT O2.

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CMRSD - LES MANUAL VALVES CHECKOUT VERIFIES FLOW TO ALL LES STATIONS PRIOR TO FIRST REFLIGHT OF EACH ORBITER AND EVERY FIVE FLIGHTS. MAX FLOW REQUIRE OF 5.6 LB/HR TO EACH LES STATION VERIFIED AS A CONTINGENCY FOR LRU REPLACEMENT. EACH CREWMAN'S VALVE IS OPEN FOR LAUNCH; FLOW IS VERIFIED AT CREW INGRESS AND AT APPROXIMATELY T-2 MINUTES IN EACH COUNTDOWN WHEN VISORS ARE CLOSED.

(C) INSPECTION:

RECEIVING INSPECTION

MATERIAL CERTIFICATION MAINTAINED AND VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS LEVEL 200A PER MA0110-301 VERIFIED BY INSPECTION PRIOR TO AND DURING OPERATIONS. 100 ML RINSE TEST VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

FABRICATION OF PARTS/COMPONENTS PER DRAWING, SPECS VERIFIED BY INSPECTION. SYSTEM ASSEMBLY AND INSTALLATION VERIFIED BY INSPECTION. RIGID TUBING INSTALLATION PER SPEC, INCLUDING LUBRICANTS AND TORQUES, VERIFIED BY INSPECTION.

CRITICAL PROCESSES

BRAZING OF TUBING AND COMPONENTS VERIFIED BY INSPECTION. ELECTRICAL BONDING AND PARTS PASSIVATION VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

RADIOGRAPHIC INSPECTION OF INDUCTION BRAZES VERIFIED BY INSPECTION.

TESTING

FLOW MEASUREMENT TEST VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING, PACKAGING, STORAGE AND SHIPPING PROCEDURES VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

NO FAILURE HISTORY APPLICABLE TO RESTRICTED FLOW FAILURE MODE. THE LINES AND FITTINGS OF THE EMERGENCY BREATHING SYSTEM HAVE SUCCESSFULLY PERFORMED THROUGH THE SHUTTLE PROGRAM CONSIDERING THIS FAILURE MODE.

(E) OPERATIONAL USE:

1. CREW ACTION

SYSTEMS PERFORMANCE TROUBLE SHOOTING.

2. TRAINING

NONE.

3. OPERATIONAL CONSIDERATION

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REDUCED OR BLOCKED FLOW TO ONE OR MORE LES.

- APPROVALS -

RELIABILITY ENGINEERING: O. R. RISING
 DESIGN ENGINEERING : K. KELLY
 QUALITY ENGINEERING : M. SAVALA
 NASA RELIABILITY :
 NASA SUBSYSTEM MANAGER :
 NASA QUALITY ASSURANCE :

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E. Ochoa
3/16/90
5/10/90
5/11/90
 4-3-90

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