FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL HARDWARE
NUMBER: 06-1C-0191-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION: 3 01/12/94

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	LINES AND FITTINGS	V070-613130
LRU	:	LINES AND FITTINGS	V070-634460
LRU	:	LINES AND FITTINGS	V070-634465
SRU	:	LINES AND FITTINGS MULTIPLE SOURCES	2720-0001-3

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
LINES AND FITTING, OXYGEN

QUANTITY OF LIKE ITEMS: 1
ONE SET PER SUBSYSTEM

FUNCTION:
PROVIDES FOR THE MOVEMENT OF OXYGEN BETWEEN THE VARIOUS COMPONENTS IN THE ATMOSPHERIC MAKEUP CONTROL SUBSYSTEM. SYSTEMS ONE AND TWO ARE MADE UP BY PARALLEL TUBE RUNS BETWEEN REDUNDANT EQUIPMENT. INCLUDES ALL LINES & FITTINGS IN THE CRYO O2 FROM THE PRSD VALVES TO THE 8.0 & 14.7 REGULATORS.

PRINT DATE: 01/12/94

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL FAILURE MODE
NUMBER: 06-1C-0191-02

REVISION# 3 01/12/94

SUBSYSTEM NAME: ARS - ARPCS
LRU: LINES AND FITTING
ITEM NAME: LINES AND FITTING

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:
CONTAMINATION, CORROSION, MECHANICAL SHOCK

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:
LOSS OF REDUNDANCY - RESTRICTED FLOW PATH CANNOT BE USED TO SUPPLY OXYGEN TO CABIN.

(B) INTERFACING SUBSYSTEM(S):
REDUCED OXYGEN FLOW PATHS AVAILABLE.

(C) MISSION:
POSSIBLE EARLY MISSION TERMINATION FOR LOSS OF ONE O2 SOURCE TO AIRLOCK AND LES.

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

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LOSS OF ONE O2 SUPPLY SYSTEM RESULTS IN INSUFFICIENT OXYGEN FLOW TO LES SYSTEM. LOSS OF THIS EMERGENCY SYSTEM MAY RESULT IN LOSS OF CREW/ VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
NONE.

-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 HIGH 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. 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: PRETEST PROOF (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 - FLOW LIMITER (RESTRICTOR) TEST VERIFIES THE REQUIRED FLOWRATE FROM THE PRSD CRYO O2 SYSTEM.

OMRSD - O2 REGULATOR ASSEMBLY CHECKS, PERFORMED BEFORE THE FIRST REFLIGHT OF EACH ORBITER AND AT INTERVALS OF FIVE FLIGHTS, VERIFY REQUIRED FLOW FROM THE PRSD SYSTEM. THE PRSD SYSTEM IS SERVICED WITH GO2 PER SE-S-0073 AND THE GROUND HALF QUICK DISCONNECTS CONTAIN FILTERS.

(C) INSPECTION:
RECEIVING INSPECTION
RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION AND MAINTAINED BY INSPECTION.

CONTAMINATION CONTROL
CLEANLINESS LEVEL 200A PER MA0110-301 VERIFIED BY INSPECTION PRIOR TO AND DURING OPERATIONS.

ASSEMBLY/INSTALLATION
FABRICATION OF PARTS/COMPONENTS PER DRAWING VERIFIED BY INSPECTION. DIMENSIONAL INSPECTIONS ARE PERFORMED AND VERIFIED BY INSPECTION. RIGID TUBING INSTALLATION PER DRAWING INCLUDING LUBRICANTS AND TORQUES VERIFIED BY INSPECTION.

CRITICAL PROCESSES

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

NONDESTRUCTIVE EVALUATION
RADIOGRAPHIC INSPECTION OF INDUCTION BRAZES VERIFIED BY INSPECTION.

TESTING
LEAK TEST VERIFIED BY INSPECTION.

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

(D) FAILURE HISTORY:
NO FAILURE HISTORY.

(E) OPERATIONAL USE:
CONSIDERATION WILL BE GIVEN TO DEPRESSURIZING THE CABIN TO 10.2 PSIA FOR CREW SIZES FIVE OR MORE (REDUCED PRESSURE REDUCES O2 FLOW RATE REQUIREMENT TO ACCEPTABLE LEVELS)..

- APPROVALS -

EDITORIALLY APPROVED : RI
EDITORIALLY APPROVED : JSC
TECHNICAL APPROVAL : VIA CR