

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1C -0192 -1 REV:08/10/
ASSEMBLY : ATMOS MAKEUP CONTROL CRIT. FUNC: 1R
P/N RI : V070-634465 CRIT. HDW: 2
P/N VENDOR: 2720(21)-0001-3 CARLETON VEHICLE 102 103 104
QUANTITY : 1 EFFECTIVITY: X X X
: ONE SET PER VEHICLE PHASE(S): PL LO X OO X DO X LS

PREPARED BY: DES M. PRICE
REL M. L. STEISSLINGER
QE S. MOR
REDAUNDANCY SCREEN: A-PASS B-PASS C-PASS
APPROVED BY: DES [Signature] SSM [Signature]
REL [Signature] REL [Signature]
QE [Signature] QE [Signature]

ITEM:
LINES AND FITTINGS

FUNCTION:
PROVIDES N2 FLOW PATH FROM THE GSE INTERFACE DISCONNECT TO THE JUNCTION OF THE 1.24 & 1.29 VALVES INCLUDING THE CROSS TIE BETWEEN SYSTEM 1 AND SYSTEM 2.

FAILURE MODE:
EXTERNAL LEAKAGE

CAUSE(S):
MECHANICAL SHOCK, VIBRATION, CORROSION

EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) LOSS OF NITROGEN FROM SUPPLY TANKS.

(B) LOSS OF NORMAL ATMOSPHERE MAKEUP BY CLOSING BOTH 1.24 & 1.29 VALVES TO ISOLATE THE LEAK. SUBSEQUENT USEFULNESS OF ANY REMAINING N2 WOULD DEPEND ON LEAK RATE.

(C) POSSIBLE EARLY MISSION TERMINATION. LEAK CANNOT BE ISOLATED WITH EITHER N2 SYSTEM IN USE.

(D) NO EFFECT. ONE CABIN VOLUME IS ADEQUATE FOR SAFE RETURN.

(E) FUNCTIONAL CRITICALITY EFFECT - LOSS OF N2 MAKE-UP CAPABILITY RESULTS IN LOSS OF ABILITY TO SUPPORT AN 8.0 PSIA CONTINGENCY AND LOSS OF ABILITY TO PURGE CABIN IN CASE OF A CONTAMINATED CABIN.

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DISPOSITION & RATIONALE:

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

(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 - 3300 PSI N2 MANIFOLD LINES ARE PROOF PRESSURED AT 4125 - 4325 PSIG AND JOINTS ARE LEAK TESTED AT 2900 - 3000 PSIG, 1 X 10 EXP -7 SCCS GHE MAX LEAKAGE. 200 PSI N2 MANIFOLD LINES ARE PROOF PRESSURED AT 370 - 385 PSIG, AND OVERPRESSURED AT 245 - 295 PSIG WITH COMPONENTS INSTALLED. JOINTS ARE LEAK TESTED AT 190 - 240 PSIG, 1 X 10 EXP -7 SCCS GHE MAX LEAKAGE.

OMRSD - LONG TERM SYSTEM LEAK TEST (PRESSURE DECAY) IS PERFORMED AFTER SYSTEM SERVICING, AT FLIGHT LOAD PRESSURE. A THREE DAY MINIMUM DECAY TEST IS PERFORMED, WITH 5 PSI/DAY MAX LEAKAGE.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

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. ASSEMBLY AND INSTALLATION OF SYSTEM VERIFIED BY INSPECTION. RIGID TUBING INSTALLATION PER DRAWING, INCLUDING LUBRICANTS AND TORQUES, VERIFIED BY INSPECTION.

CRITICAL PROCESSES

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

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NONDESTRUCTIVE EVALUATION
RADIOGRAPHIC INSPECTION OF INDUCTION BRAZES VERIFIED BY INSPECTION.

TESTING
HELIUM LEAK TEST VERIFIED BY INSPECTION.

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

(D) FAILURE HISTORY

TWO FAILURES HAVE OCCURRED:
AB2397-000, 12/1/78 AT PALMDALE. N2/AUX O2 SUPPLY PANEL EXHIBITED EXCESSIVE EXTERNAL LEAKAGE FROM THE 3300 PSI N2 SYSTEM. THE PANEL WAS REWORKED AT PALMDALE BY THE SUPPLIER; DAMAGED DYNATUBE FITTINGS WERE REPLACED. NO CORRECTIVE ACTION WAS TAKEN.

AC4061-000, 9/27/82. DURING THERMAL TESTING OF THE N2/AUX O2 SUPPLY PANEL AT -65 F, EXTERNAL LEAKAGE WAS 16.5 SCCM. MAX ALLOWABLE LEAK RATE WAS 5.8 SCCM. THE LEAKAGE WAS CONSIDERED ACCEPTABLE, AND THE ALLOWABLE LEAK RATE AT -65 F WAS INCREASED TO 17.4 SCCM.

(E) OPERATIONAL USE

TBS.