

SHUTTLE CRITICAL ITEMS LIST - GREITER

SUBSYSTEM : AUXILIARY POWER (APUS) FMEA NO 04-2 -L3 -11 REV:09/11/81

ASSEMBLY : FUEL SUPPLY ABORT CRIT. FUNC: 13

P/N RI : V070-465203 RTLS, AOA, ATO, TAL CRIT. HDW: :

P/N VENDOR: VEHICLE 102 103 104

QUANTITY : 3 EFFECTIVITY: X X X

: 1 SET PER APU PHASE(S): PL X LO X OO X DO X LS :

PREPARED BY: DES M HAMMEL DES T R BOLTZ REL W J SMITH

REDUNDANCY SCREEN: A-PASS B-PASS C-PASS

APPROVED BY: APPROVED BY (NASA):

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REL 10/26/81

QE 11-27-81

ITEM:
LINES, FUEL PRESSURIZATION

FUNCTION:
TO CARRY PRESSURANT TO FUEL TANK.

FAILURE MODE:
LEAKAGE (GROSS EXTERNAL).

CAUSE(S):
RUPTURE, CRACKS, SEAL OR FITTING FAILURES.

- EFFECT(S) ON:
- (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
 - (A) POSSIBLE LOSS OF ONE APU SYSTEM BEFORE MISSION COMPLETION.
 - (B) POSSIBLE LOSS OF SHAFT POWER TO ONE HYDRAULIC PUMP.
 - (C) ABORT DECISION IS REQUIRED, IF FAILURE OCCURS PRIOR TO ENTRY COMMITMENT.
 - (D) NO EFFECT UNTIL SECOND SYSTEM LOSS. CRITICALITY 1 FOR SSME-INDUCED RTLS, ATO, AOA, OR TAL DUE TO THE POSSIBLE ADDITIONAL LOSS OF ASSOCIATED APU/HYD AND MAIN ENGINE. EXTERNAL LEAK OF HYDRAZINE ACCUMULATED ON GAS SIDE OF TANK DIAPHRAGM POSSIBLE.
 - (E) FUNCTIONAL CRITICALITY EFFECT - POSSIBLE LOSS OF VEHICLE IF TWO OUT OF THREE APU'S ARE LOST.

DISPOSITION & RATIONALE:
(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN
PROVEN DESIGN. LINES UNDER 1 IN., 304L WELDED IN PLACE. DESIGN BURST PRESSURE 4 TIMES OPERATING PRESSURE MINIMUM.

DYNATUBE/DUAL SEAL FITTINGS 17-4 ATTACHED WITH WELDED SLEEVE & WITH DUA SEALING SURFACES. THE WELDED CONSTRUCTION ELIMINATES JOINTS AND POSSIBLE LEAK PATHS.

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FASTENING CLAMPS ALLOW FREEDOM OF MOVEMENT. TUBING BENDS ARE CONTROLLED BETWEEN FIXED POINTS TO FACILITATE INSTALLATION AND TO ACCOMMODATE VEHICLE GROWTH AND MOVEMENT.

(B) TEST

INITIAL TUBING PROOF PRESSURE AT 1.5 TIMES OPERATING PRESSURE. SUBSYSTEM FUNCTIONAL AND LEAK TESTS AFTER INSTALLATION.

DYNATUBE FITTING QUALIFIED BY RESISTOFLEX FOR 200,000 IMPULSE CYCLES UP TO 4500 PSI AT 400 DEG F TO -65 DEG F, 12,000 PSI BURST PLUS SINE VIBRATION AT PLUS/MINUS .41G TO PLUS/MINUS 10G FOR 3 HR IN 20 MIN SWEEPS FROM 5 TO 2000 CPS.

ROCKWELL PERFORMED TUBING CERTIFICATION TESTS PER "ORBITER TUBING VERIFICATION PLAN (SD 75-SH-205), THIS TESTING INCLUDED WORST CASE USAGE, PRESSURE CYCLING, FATIGUE AND OFF LIMIT TESTING FOR LINES, JOINTS AND PANELS. SYSTEM EVALUATION TESTS ON OV101 AND AT SUNDSTRAND ALLOWED EVALUATION OF THE INSTALLED SYSTEM CONDITION.

OMRSD: PRESSURE DECAY LEAK TEST IS PERFORMED AFTER EACH SERVICING.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESSES CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS TO LEVEL 100 IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, ASSEMBLY, AND INSTALLATION PROCEDURES ARE VERIFIED BY INSPECTION. INSTALLATION OF LINE SUPPORT ISOLATORS IS VERIFIED BY INSPECTION. TUBE AND AXIAL ALIGNMENT OF DYNATUBE FITTINGS IS VERIFIED BY INSPECTION. GREASE AND TORQUE ARE VERIFIED BY INSPECTION. NO TUBE PRELOADS PRESENT DURING INSTALLATION IS VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION. ELECTRICAL BOND IS VERIFIED BY INSPECTION. CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT AND RADIOGRAPHIC INSPECTION OF WELDS IS VERIFIED BY INSPECTION.

TESTING

TEST EQUIPMENT AND TOOL CALIBRATION ARE VERIFIED BY INSPECTION. ATP IS WITNESSED AND VERIFIED BY INSPECTION. PROOF AND LEAK TESTS ARE VERIFIED BY INSPECTION.

HANDLING/PACKAGING

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

(D) FAILURE HISTORY

NONE.

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(D) FAILURE HISTORY
NONE.

(E) OPERATIONAL USE

IF ANY LEAKAGE IS DETECTED, THE WORST CASE (FUEL LEAKAGE) IS ASSUMED,
THE CREW HAS THE OPTION TO RUN THE APU TO DEPLETION.