

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : AUXILIARY POWER (APUS) FMEA NO C4-2 -MD13 -13 REV:02/86/

ASSEMBLY : FUEL SUPPLY
 P/N RI : ME276-C032-0027
 P/N VENDOR: LEAR SIEG. P/N RR42950-27
 QUANTITY : 3
 : 1 PER FUEL FEEDLINE
 :
 VEHICLE 103 103 104
 EFFECTIVITY: X X X
 PHASE(S): PL X LO X CO X DO X LS :

PREPARED BY: DES J R MUNROE
 REL T R BOLTZ
 QE W J SMITH
 REDUNDANCY SCREEN: A-FAIL B-FAIL C-PAS
 APPROVED BY: DES [Signature]
 REL [Signature]
 QE [Signature]
 APPROVED BY (NASA): SSM [Signature]
 REL [Signature]
 QE [Signature]

ITEM:
 COUPLING, FUEL FEEDLINE HIGH POINT BLEED.

FUNCTION:
 (1) TO PROVIDE HIGH POINT BLEED TO FACILITATE TANK AND FEEDLINE PURGE OPERATIONS. (2) TO MAINTAIN PROPER SEAL AFTER SERVICING OPERATIONS.

FAILURE MODE:
 EXTERNAL LEAKAGE

CAUSE(S):
 SEAL FAILURES, PIECE-PART FAILURES, CORROSION, CONTAMINATION.

EFFECT(S) ON:
 (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
 (A) LOSS OF REDUNDANT SEALS THEN POSSIBLE LOSS OF ONE APU SYSTEM BEFORE MISSION COMPLETION.
 (B) LOSS OF REDUNDANT SEALS THEN POSSIBLE LOSS OF SHAFT POWER TO ONE HYDRAULIC PUMP AND POSSIBLE DAMAGE TO EQUIPMENT DUE TO RAW FUEL IN AFT COMPARTMENT.
 (C) ABORT DECISION IS REQUIRED, IF FAILURE OCCURS PRIOR TO ENTRY COMMITMENT.
 (D) NO EFFECT UNLESS FUEL IS IGNITED OR SECOND SYSTEM LOST.
 (E) FUNCTIONAL CRITICALITY EFFECT - POSSIBLE LOSS OF VEHICLE IF BOTH SEALS ARE LOST, RESULTING IN EXTERNAL LEAKAGE. QD CAP SEALS ARE NOT CAPABLE OF CHECKOUT BECAUSE NO TEST PORT OR EQUIPMENT PROVIDED. NOT DETECTABLE IN FLIGHT BECAUSE NO MEASUREMENT BETWEEN POPPET AND CAP SEAL EXISTS.

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

(A) DESIGN
 THE COUPLING IS BASICALLY THE SAME DESIGN AS USED ON APOLLO CSM RCS FUEL AND OXIDIZER SYSTEMS. THE PORTION OF THE BODY THAT MATES WITH THE GROUND HALF IS MADE OF 17-7 PH CRES.

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THE PRIMARY AND SECONDARY POPPET SEALS ARE TEFLON (TFE). THE SECONDARY CAP SEAL IS TFE. THE PRIMARY CAP SEAL HAS BEEN CHANGED FROM KYMAR TO TEFLON FEP.

THE PORTION OF THE BODY THAT MATES WITH THE ORBITER TUBING IS 17-7 PH (HEAT TREAT TO 150 KSI TENSILE) DYNATUBE MALE FITTING.

THE FILTER SCREEN HAS BEEN DELETED FROM THIS COUPLING BECAUSE OF EXTREME VIBRATION OF SURGE PRESSURE LEVELS AT THIS POINT ON THE APU.

(B) TEST

THE COUPLING WAS TESTED TO BURST OF 16,550 PSIG DURING CERTIFICATION FOR APOLLO USE. ANALYSIS OF THE ORBITER COUPLING INDICATED BURST WILL OCCUR AT APPROXIMATELY 13 K PSIG. (F.S. = 36).

DYNATUBE FITTINGS WERE QUALIFIED BY RESISTOFLEX FOR 200,000 IMPULSE CYCLES UP TO 45,00 PSIG AT 400 DEG F TO -65 F, 12,000 PSI BURST PLUS SINE VIBRATION AT +/- 0.41G TO +/- 10 G FOR 3 HR (20 MIN SWEEPS FOR 5 TO 2,000 CPS).

COUPLING ACCEPTANCE TESTED TO 825 PSIG (PROOF AND LEAKAGE) AT THE SUPPLIER WITH CAPS ON AND OFF. PROOF OF 7,500 PSI AND LEAKAGE TESTS AT OPERATING PRESSURE ARE CONDUCTED ON THE COUPLING AND DYNATUBE FITTING AFTER INSTALLATION. MAXIMUM ALLOWABLE LEAKAGE IS 1×10^{-4} SCC/SEC. THE DYNATUBE FITTINGS ARE ALIGNED AND TORQUED TO MAXIMUM 180 INCH POUNDS PER MA0102-306.

OMRSD: TOXIC VAPOR CHECKS, POST-FLIGHT SYSTEM INSPECTION, FUEL TANK SERVICING, AND QD CAP VISUAL CHECKS ARE PERFORMED EVERY FLOW.

(C) INSPECTION

RECEIVING INSPECTION

MATERIAL AND PROCESSES CERTIFICATIONS ARE VERIFIED.

CONTAMINATION CONTROL

CLEANLINESS TO LEVEL 100 IS VERIFIED BY INSPECTION. PARTS PASSIVATION AND OTHER CORROSION PROTECTION REQUIREMENTS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, ASSEMBLY, AND INSTALLATION REQUIREMENTS ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

LIP SEALS INSPECTED UNDER MAGNIFICATION IS VERIFIED.

CRITICAL PROCESSES

WELDING PER SPECIFICATION REQUIREMENTS IS VERIFIED BY INSPECTION. SAMPLE WELDS ARE SECTIONED AND CHECKED FOR WELD PENETRATION ON A PLAN OF ONE SAMPLE PER 20 WELDS.

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TESTING

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

HANDLING/PACKAGING

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

(D) FAILURE HISTORY

NO FAILURE MODES OF THIS TYPE RECORDED DURING CV-101 ALT OR INTEGRATED SYSTEMS TESTS.

(CAR 09F023) STS-9 APU FIRE QD WELD FAILED DUE TO OVERPRESSURE AND INSUFFICIENT WELD PENETRATION. CORRECTIVE ACTION WAS TO PROOF ALL QD'S AT 7,500 PSI.

(E) OPERATIONAL USE

SHUT DOWN APU AND CLOSE ISOLATION VALVES, IF DETECTED BY ADJACENT TEMPERATURE SENSORS ON GGVM OR FUEL PUMP.