

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SYSTEM : MAIN PROPULSION FMEA NO 03-1 -0735 -2 REV: 04/29/88F

ASSEMBLY : STATHAM CRIT. FUNC: 1  
 RI : ME449-0190-0001 CRIT. HDW: 1  
 VENDOR: VEHICLE 102 103 104  
 EFFECTIVITY: X  
 QUANTITY : 3 PHASE(S): PL X LO X OC DO LS  
 : ONE PER ENGINE

PREPARED BY: REDUNDANCY SCREEN: A- B- C-  
 APPROVED BY: APPROVED BY (NASA):  
 DES H.P. Ballard SSM [Signature]  
 REL L.A. Scott REL [Signature]  
 QE G. Williams QE [Signature]

ITEM: TRANSDUCER, LO2 ENGINE INLET PRESSURE (V41P9195A, V41P9295A, V41P9395A).

ACTION: MEASURES LO2 ENGINE FEEDLINE PRESSURE NEAR THE ENGINE INLET. DEVELOPMENT FLIGHT INSTRUMENTATION (DFI). INSTRUMENTS ARE NOT ACTIVE. OV-102 ONLY.

FAILURE MODE: RUPTURE/LEAKAGE OF THE TRANSDUCER BODY DURING LOADING, ASCENT, AND DUMP/INERT.

FAILURE(S): FATIGUE, MATERIAL DEFECT.

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

(A,B) LO2 LEAKAGE INTO THE AFT COMPARTMENT. GN2 PURGE OF THE AFT COMPARTMENT MAY LOWER THE GO2 CONCENTRATION. POSSIBLE OVERPRESSURIZATION OF THE AFT COMPARTMENT. POSSIBLE LOSS OF ADJACENT CRITICAL FUNCTIONS DUE TO CRYO EXPOSURE. LEAKAGE DETECTABLE ON GROUND USING HAZARDOUS GAS DETECTION SYSTEM (HGDS).

ALSO RESULTS IN POSSIBLE LOSS OF HELIUM SUPPLY DURING MANIFOLD REPRESSURIZATION CAUSING LOSS OF AFT COMPARTMENT PURGE (RTLS AND TAL ABORT CRITICAL).

(C) ON GROUND, VIOLATION OF HGDS LCC WILL RESULT IN LAUNCH SCRUB.

(D) POSSIBLE LOSS OF CREW/VEHICLE.

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DISPOSITION & RATIONALE:

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

(A) DESIGN

A HERMETIC SEAL IS PROVIDED BY THE WELDED CONSTRUCTION. A SECONDARY BARRIER IS PROVIDED TO CONTAIN PRESSURE MEDIA UP TO AND INCLUDING THE BURST PRESSURE AT THREE TIMES THE PRESSURE RANGE. MATERIALS AND PROCESSES USED ARE COMPATIBLE WITH THE ENVIRONMENTAL CONDITIONS, FLUIDS, AND GASES AS SPECIFIED. THE TRANSDUCER IS CAPABLE OF WITHSTANDING A PROOF PRESSURE OF 1.5 TIMES THE FULL RANGE PRESSURE OR 20,000 PSI, WHICHEVER IS SMALLER, APPLIED TO THE PRESSURE CAVITY WITHOUT CHANGING THE CALIBRATION. THE TRANSDUCER IS CAPABLE OF WITHSTANDING A BURST PRESSURE OF 3 TIMES THE FULL RANGE PRESSURE OR 20,000 PSI, WHICHEVER IS SMALLER, APPLIED TO THE PRESSURE CAVITY WITHOUT RUPTURING OR LEAKING.

(B) TEST

ATP

EXAMINATION OF PRODUCT

PERFORMANCE TESTS

INSULATION RESISTANCE

CAPACITANCE TEST

CALIBRATION

0, 20, 40, 60, 80, 100, 80, 60, 40, 20 AND 0 PERCENT OF FULL SCALE PRESSURE AT +30 DEG F, AND +315 DEG F. RECORD ERROR DUE TO TEMPERATURE EFFECTS, LINEARITY, RESIDUAL IMBALANCE, REPEATABILITY, SENSITIVITY, AND VIBRATION.

PROOF PRESSURE

1.5 TIMES FULL RANGE (-10 TO +10 PSIA)

CERTIFICATION

SALT FOG (BY ANALYSIS)

ELECTROMAGNETIC COMPATIBILITY TEST (BY ANALYSIS)

HUMIDITY (BY ANALYSIS)

SAND AND DUST (BY ANALYSIS)

THERMAL CYCLE

5 CYCLES: FROM AMBIENT TO +30 TO +315 TO +30 TO AMBIENT DEG F.

VIBRATION

1.3 HOURS OF RANDOM VIBRATION ON ALL 3 AXES.

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ACCELERATION (BY ANALYSIS)

THERMAL VACUUM (BY ANALYSIS)

LIFE (BY ANALYSIS)

EXPLOSIVE ATMOSPHERE (BY ANALYSIS)

LIGHTNING (BY ANALYSIS)

SHOCK

BENCH HANDLING

LANDING

DESIGN

BURST PRESSURE TEST

3 TIMES THE RATED FULL RANGE PRESSURE (-10 TO +10 PSI).

BIAS PRESSURE TEST

50 PSIA, 150 PSIA, 300 PSIA

FREQUENCY RESPONSE TEST

OMRSD

V41AYO.010 LO2 PROPELLANT SYSTEM EXTERNAL LEAKAGE (IS)

V41AYO.221 HELIUM SIGNATURE LEAK TEST (EVERY FLIGHT)

V41BUC.010 ORBITER MPS COMPONENT INSPECTION (EVERY FLIGHT)

(C) INSPECTION

RECEIVING INSPECTION

RECEIVING INSPECTION PERFORMS VISUAL AND DIMENSIONAL EXAMINATION OF ALL INCOMING PARTS. CERTIFICATION RECORDS/TEST REPORTS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES. CORROSION PROTECTION FINISH IS CHECKED IN ACCORDANCE WITH REQUIREMENT.

CONTAMINATION CONTROL

INSPECTION VERIFIES REQUIRED PROCEDURES/SHOP PRACTICES ARE UTILIZED FOR CONTAMINATION CONTROL. CLEANLINESS LEVEL 100A IS MAINTAINED AND VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

PARTS ARE INSPECTED VISUALLY, DIMENSIONALLY AND INCREMENTALLY PER REQUIREMENTS. TOOL CALIBRATION IS VERIFIED BY INSPECTION. MANDATORY INSPECTION POINTS ARE INCLUDED IN ASSEMBLY PROCESS.

CRITICAL PROCESSES

WELDING IS MONITORED AND VERIFIED BY INSPECTION. SOLDERING, HEAT TREATING, AND PASSIVATING ARE ALSO VERIFIED BY INSPECTION.

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TESTING

ATF, INCLUDING PROOF PRESSURE TEST, IS OBSERVED AND VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

HELIUM LEAK TEST IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGING AND PROTECTION ARE VERIFIED BY INSPECTION TO APPLICABLE REQUIREMENTS. SPECIAL HANDLING PER DOCUMENTED INSTRUCTIONS IS VERIFIED, TO PRECLUDE DAMAGE, SHOCK, AND CONTAMINATION DURING COMPONENT HANDLING/TRANSPORTING/PACKAGING BETWEEN WORK STATIONS.

(D) FAILURE HISTORY

THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.

(E) OPERATIONAL USE

FLIGHT: N/A

GROUND: OMI S1003 SEQUENCE TITLED "EMERGENCY PROCEDURE FOR MAJOR LEAK OR FIRE IN THE ORBITER AFT FUSELAGE" CONTAINS SAFING SEQUENCE OF EVENTS FOR MAJOR LEAKS IN THE OXYGEN SYSTEM.