

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ORBITAL MANEUVER

FMEA NO 03-3 -1009 -1

REV: 2/30/88

(B) POSSIBLE INABILITY TO UTILIZE PROPELLANT FOR DEORBIT OR POSSIBLE ENTRY/LANDING HAZARD DUE TO EXCESS PROPELLANT WEIGHT AND/OR DAMAGE TO POD STRUCTURE.

(C) POSSIBLE EARLY MISSION TERMINATION.

(D) POSSIBLE LOSS OF CREW AND VEHICLE. INADEQUATE PROPELLANT TO DEORBIT OR POSSIBLE LANDING HAZARD DUE TO EXCESS PROPELLANT WEIGHT AND/OR POD STRUCTURE DAMAGE.

DISPOSITION & RATIONALE:

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

(A) DESIGN

PROOF 510 PSIG. BURST 680 PSIG. 36,000 PRESSURE CYCLES (240-271 PSIG REQUIRED). INCONEL G25 (AMS 5599) WHICH IS PROPELLANT COMPATIBLE IS USED. PRE-FORMED CYLINDRICAL DUAL PLYS BELLOWS (.006 THICK) ARE UTILIZED TO PREVENT EXTERNAL LEAKAGE. THE PLYS ARE WELDED TOGETHER AT THE ENDS, TRIMMED AND THEN WELDED INTO THE VALVE HOUSING. SHOULD FRACTURE OF THE BELLOWS OCCUR LEAKAGE WOULD BE RESTRICTED BY THE STACKED BELLEVILLE ASSEMBLY. THE MAX FLOW IS CALCULATED TO BE 27-87 SCFM (BETWEEN 1 & 3 HOURS REQUIRED FOR DEPLETION OF GHE FROM THE HELIUM TANK. BASED ON .001 TO .003 RADIAL CLEARANCE AROUND THE STACKED BELLEVILLE DISC ASSY.) THE GHE ISOLATION VALVE IS CLOSED DURING STATIC PERIODS. THIS WOULD PREVENT CONTINUING LOSS OF HELIUM SOURCE PRESSURE.

B) TEST

QUALIFICATION TESTS

QUAL TEST (4 UNITS). RANDOM VIBRATION, SHOCK - MIL-STD-810, 20 G PEAK, THERMAL CYCLE (- 20 TO 150 DEG F.), ENDURANCE - 260 CYCLES (RELIEF VALVE), 36,500 CYCLES (BURST DISC), PROPELLANT COMPATIBILITY. ALSO QUALIFIED AS PART OF POD ASSY. VIBRO-ACOUSTIC TESTING AT JSC - 131 EQUIVALENT MISSIONS, HOT-FIRE TEST PROGRAM AT WSTF - 517 TESTS (24 EQUIVALENT MISSION DUTY CYCLES). APPROX 7 YEARS PROPELLANT EXPOSURE.

ACCEPTANCE TEST

PROOF PRESSURE, EXTERNAL LEAKAGE, INTERNAL LEAKAGE, CRACK & RESEAT, FLOW CAPACITY, CLEANLINESS & DRYING.

GROUND TURNAROUND

V43CBO.210 PERFORMS EXTERNAL LEAK CHECK FIRST FLIGHT.
V43CBO.221 PERFORMS LOW PRESSURE HELIUM SYSTEM PRESSURE DECAY CHECK EVERY FLIGHT.
ANY SIGNIFICANT LEAKAGE THROUGH THE BELLOWS WOULD BE DETECTED AS PROPELLANT TANK PRESSURE DECAY.

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(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESSES CERTIFICATIONS AND VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS TO LEVEL 100A FOR RELIEF VALVE INTERNAL FLOW CAVITY AND LEVEL V.C. FOR EXTERNAL SURFACES AND OTHER INTERNAL PARTS IS VERIFIED BY INSPECTION. CORROSION PROTECTION (PASSIVATION AND ECONOCHROME) IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, ASSEMBLY AND INSTALLATION PROCEDURES ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION. SEAT INSPECTION FOR SURFACE DEFECTS IS VERIFIED BY INSPECTION. TEFLON GUIDE RINGS INSTALLATION AND VERIFICATION OF NO GUIDE STEM BINDING ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

RADIOGRAPHIC INSPECTION OF WELD #W8 (PER EPS5760009) PER MIL-STD-453 IS VERIFIED BY INSPECTION. PENETRANT INSPECTION PER MIL-I-6866 (TYPE I METHOD A OR C), OF WELDS #'S W3, W5, W8, W9 AND W11 IS VERIFIED BY INSPECTION.

CRITICAL PROCESS

THE WELD PROCESS PER EPS5760009 IS VERIFIED BY INSPECTION. VISUAL OR 10X MAGNIFICATION INSPECTION OF ALL WELDS IS VERIFIED BY INSPECTION. PROOF PRESSURE TEST AND LEAK TEST OF CERTAIN WELDS IS VERIFIED BY INSPECTION.

TESTING

TEST EQUIPMENT AND TOOL CALIBRATION ARE VERIFIED BY INSPECTION. ACCEPTANCE TEST INCLUDING CLEANLINESS TEST, INTERNAL LEAKAGE TEST TO VERIFY SEAT INTEGRITY, PROPER POPPET OPERATION, PROPER SET POINT OPERATION OF BELLEVILLE WASHER SPRING AND PRESSURE SETTING IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING PACKAGING; STORAGE AND SHIPPING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO FAILURES HAVE OCCURRED ON THE BELLOWS ASSY.

(E) OPERATIONAL USE

USE PERIGEE ADJUST BURN TO DEplete PROPELLANT FROM LEAKING POD (OUT-OF-PLANE COMPONENT IF NECESSARY) AND REDUCE DELTA-V REQUIREMENT FOR DEORBIT. AFTER LEAKED PROPELLANT HAS DISPERSED, PERFORM DEORBIT WITH GOOD POD.