

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ORBITAL MANEUVER FMEA NO 03-3 -4511 -1 REV: 12/04/87

ASSEMBLY : ENGINE SUBSYSTEM CRIT. FUNC: 1R
 P/N RI : MC621-0009 CRIT. HDW: 3
 P/N VENDOR: 1186813-49 VEHICLE 102 103 104
 QUANTITY : 2 EFFECTIVITY: X X X
 : PHASE(S): PL - LO X OO DO X LS
 : ONE FOR EACH ENG SUB-SYS

PREPARED BY: REDUNDANCY SCREEN: A-PASS B-FAIL C-PASS
 DES V F ROZDOS APPROVED BY: APPROVED BY (NASA):
 REL C M AKERS REL *[Signature]* SSM *[Signature]*
 QE W J SMITH QE *[Signature]* REL *[Signature]* 12-8-87
 QE *[Signature]* 12-8-87

ITEM: VALVE, GN2 FILL AND VENT

FUNCTION: GN2 TANK FILLED OR VENTED THROUGH THIS VALVE. THE VALVE HAS A SINGLE SOLENOID ACTUATED POPPET, SPRING-LOADED CLOSED.

FAILURE MODE: INTERNAL LEAKAGE, FAILS OPEN, FAILS TO REMAIN CLOSED.

CAUSE(S): CONTAMINATION, CORROSION, PLATING OR MATERIAL DEFECT, SPRING BREAKS, O-RING SEAT SPLITS OR IS EXTRUDED, VIBRATION.

EFFECT(S) ON:
 (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
 (A) NO EFFECT. LOSS OF REDUNDANCY FOR OVERBOARD LEAKAGE
 (B,C,D) NO EFFECT.
 (E) FUNCTIONAL CRITICALITY EFFECT - LOSS OF CREW/VEHICLE DUE TO INABILITY TO PERFORM DEORBIT BURN. 1R EFFECT ASSUMES FAILURE OF REDUNDANT VALVES, COUPLINGS, CAP, ACCUMULATOR, AND OTHER ENGINE; AND THAT ADEQUATE PROPELLANT DOES NOT EXIST FOR RCS BACK-UP DEORBIT. FAILURE IS NOT DETECTABLE IN FLIGHT DUE TO LACK OF INSTRUMENTATION.

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

(A) DESIGN
 FLANGE MOUNTED TO HIGH PRESSURE TANK INLET. AN 18 MICRON INLET AND OUTLET FILTER LIMIT CONTAMINATION POTENTIAL. NO COMMAND CAPABILITY TO VALVE IN FLIGHT. REDUNDANCY IS PROVIDED BY THE FILL COUPLING AND CAP, THE ACCUMULATOR AND THE REDUNDANT ENGINE SYSTEM. VALVE HAS NO FUNCTION DURING FLIGHT.

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(B) TEST -

QUALIFICATION TESTS

2 UNITS - FILL AND VENT OPERATION (500 CYCLES). THERMAL (0 TO -160 DEGREES F). VIBRATION AT ENGINE LEVEL. ALSO QUALIFIED AS PART OF ENGINE ASSEMBLY - ENGINE QUAL (138 FIRINGS), SYSTEM TEST (498 FIRINGS).

ACCEPTANCE TESTS

PROOF PRESSURE, LEAKAGE, FUNCTIONAL.

GROUND TURNAROUND

V43CBO.280 PERFORMS EACH FLIGHT PRESSURE DECAY CHECKS OF PNEUMATIC SYSTEM.

V43CBO.190 PERFORMS GN2 FILL AND VENT VALVE LEAK CHECK FOR FIRST FLIGHT AND EVERY 5TH FLIGHT.

V43CFO.030 PERFORMS PNEUMATIC SYSTEM SERVICING EVERY FLIGHT AND VERIFIES FLUID CONFORMANCE WITH SE-S-0073.

V43CFO.030 ALSO PERFORMS FILL VALVE LEAK CHECK AFTER SERVICING. GN2 TANK PRESSURE MONITORED EACH FLIGHT FOR LEAKAGE.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESSES CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS TO LEVEL 200 AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, ASSEMBLY AND INSTALLATION PROCEDURES ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION. VISUAL AND DIMENSIONAL INSPECTION OF VALVE BODY AND COMPONENTS DURING FABRICATION IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT AND RADIOGRAPHIC INSPECTION OF WELDS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

THE WELDING PROCESS AND VERIFICATION THAT WELDS MEET SPECIFICATION REQUIREMENTS ARE VERIFIED BY INSPECTION.

TESTING

TEST EQUIPMENT AND TOOL CALIBRATION ARE VERIFIED BY INSPECTION. ACCEPTANCE TEST IS VERIFIED BY INSPECTION.

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HANDLING/PACKAGING

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

(D) FAILURE HISTORY

CAR'S AB3078, AB9392 AND AC1618 RECORD ENGINE ATF LEAKAGE FAILURES CAUSED BY EXTRUDED O-RING SEAL. DESIGN CHANGES (BUNA-N SEAL, POPPET TRAVEL, VENT PROVISION FOR BOBBIN) AND TEST CHANGES (ELIMINATE CYCLING DURING PROOF PRESSURE) WERE INCORPORATED.

CAR AC 4806 RECORDS AN INTERNAL LEAKAGE FAILURE CAUSED BY CONTAMINATION (EVIDENCED ON FILTER). VALVES ON DELIVERED ENGINES ACCEPTABLE BASED ON SUCCESSFUL LEAK CHECK.

(E) OPERATIONAL USE

NO ACTION FIRST FAILURE - NOT DETECTABLE. IF GN2 TANK PRESSURE IS LOST (MULTIPLE FAILURES), AFFECTED ENGINE WILL NOT BE USED FOR ON-ORBIT BURNS. SAVE ACCUMULATOR PRESSURE FOR DEORBIT BURN START.