

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ORBITAL MANEUVER FMEA NO 03-3 -4551 -1 REV: 12/04/87

ASSEMBLY : ENGINE SUBSYSTEM CRIT. FUNC: 1R
 P/N RI : MC621-0009 CRIT. HW: 3
 P/N VENDOR: 1186825 VEHICLE 102 103 104
 QUANTITY : 2 EFFECTIVITY: X X X
 : ONE FOR EACH ENG SUBSYS PHASE(S): PL LO OO DO X LS
 :

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

ITEM:
 VALVE, CHECK, GN2, PNEUMATIC ACTUATION SYSTEM, (ACCUMULATOR).

FUNCTION:
 THE CHECK VALVE PREVENTS ESCAPE OF GN2 PRESSURANT FROM THE DOWNSTREAM ACCUMULATOR AREA IN EVENT THAT OVERBOARD LEAKAGE SHOULD OCCUR IN THE UPSTREAM GN2 PRESSURIZATION SYSTEM. THIS INSURES THAT ENOUGH GNE PRESSURANT WOULD REMAIN TO ALLOW ONE ADDITIONAL ACTUATION OF THE BI-PROPELLANT VALVE TO ACCOMPLISH ENGINE FIRING.

FAILURE MODE:
 INTERNAL LEAKAGE, FAILS OPEN, FAILS TO CLOSE.

CAUSE(S):
 CONTAMINATION, CORROSION, POPPET OR SPRING BINDS OR COCKS, SHOCK, VIBRATION.

EFFECT(S) ON:
 (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
 (A) NO EFFECT - LOSS OF REDUNDANCY.
 (B,C,D) NO EFFECT
 (E) FUNCTIONAL CRITICALITY EFFECT - POSSIBLE LOSS OF CREW/VEHICLE DUE TO INABILITY TO PERFORM DEORBIT BURN. 1R EFFECT ASSUMES UPSTREAM LEAKAGE SOURCE, FAILURE OF OTHER OMS ENGINE AND INADEQUATE PROPELLANT FOR RCS DEORBIT. NO INSTRUMENTATION AVAILABLE FOR DETECTION OF FAILURE IN FLIGHT.

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DISPOSITION & RATIONALE:

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

(A) DESIGN

18-MICRON FILTERS LOCATED UPSTREAM IN THE SYSTEM REDUCE THE POTENTIAL FOR CONTAMINATION CAUSED LEAKAGE FAILURES. THIS FAILURE IS NOT OF SIGNIFICANCE UNLESS A PRIOR FAILURE RESULTING IN LOSS OF UPSTREAM PRESSURANT HAS OCCURRED. ADDITIONALLY, TWO ENGINE SUBSYSTEMS ARE PROVIDED EITHER OF WHICH IS ADEQUATE FOR DE-ORBIT OPERATIONS.

(B) TEST

QUALIFICATION TESTS

FLOW CYCLES (1200). QUALIFIED AS PART OF ENGINE ASSY - 138 HOT-FIRE TESTS DURING ENGINE QUAL, 498 FIRINGS AT SYSTEM LEVEL AT WSTF, VIBRATION TEST AT ENGINE LEVEL. INCLUDED AS PART OF BI-PROP VALVE QUALIFICATION. PROOF PRESSURE AND LEAKAGE TESTING, CYCLING AND THERMAL TESTING CONDUCTED AT VALVE LEVEL.

ACCEPTANCE TESTS

PROOF AND LEAKAGE, CRACK AND RESEAT.

GROUND TURNAROUND

V43CBO.194 PERFORMS LEAK AND FUNCTIONAL TEST FOR FIRST FLIGHT AND ON 5-FLIGHT INTERVALS.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS AND PROCESSES CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PLAN APPROVED BY QUALITY ENGINEERING. 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 INCLUDING SEALS IS VERIFIED BY INSPECTION DURING FABRICATION.

NONDESTRUCTIVE EVALUATION

PENETRANT AND RADIOGRAPHIC INSPECTION OF WELDS ARE VERIFIED BY INSPECTION.

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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.

HANDLING/PACKAGING

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

(D) FAILURE HISTORY

NO FAILURES ON VEHICLE OR DURING MISSION.

CAR'S AC5873 AND AC5907. TWO INSTANCES OF ACCUMULATOR CHECK VALVE FAILURE TO RESEAT PROPERLY DURING PNEUMATIC PACK ACCEPTANCE TEST. THESE WERE CAUSED BY SETTING THE RESEAT PRESSURE TO THE LOW END OF THE TOLERANCE BAND AND SUBSEQUENT COMPRESSION SET OF THE POPPET O-RING SEAL RESULTING IN A LOW SPRING FORCE. THE REQUIREMENT FOR RESEAT PRESSURE SETTING WAS ADJUSTED TO ACCOMMODATE THE POTENTIAL COMPRESSION SET.

(E) OPERATIONAL USE

NO ACTION FOR FIRST FAILURE - NOT DETECTABLE. IF GN2 PRESSURE IS LOST COMPLETE MISSION REQUIREMENTS USING CROSSFEED FOR PROPELLANT UTILIZATION. REDLINE ADDITIONAL PROPELLANT FOR RCS BACKUP DEORBIT. NEXT PLS DEORBIT IF PROPELLANT NOT AVAILABLE. POSSIBLE MISSION IMPACT. DECREASE IN PROPELLANT AVAILABLE FROM OMS TO RCS FOR INTERCONNECT FOR ON-ORBIT OPERATION.