

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ORBITAL MANEUVER FMEA NO 03-3 -4503 -1 REV: 12/04/87

ASSEMBLY : ENGINE SUBSYSTEM

P/N RI : MC621-0009

P/N VENDOR: 1186803

QUANTITY : 2

: 1 FOR EACH ENG SUB-SYS

VEHICLE	102	103	104
EFFECTIVITY:	X	X	X
PHASE(S):	PL	LO	OO DO X LS

CRIT. FUNC: 1R

CRIT. HDW: 3

PREPARED BY:

DES V F ROZNOS
REL C M AKERS
QE W J SMITH

REDUNDANCY SCREEN: A-PASS B-FAIL C-PASS

APPROVED BY:

DES *[Signature]*
REL *[Signature]*
QE *[Signature]*

APPROVED BY (NASA):

SSM *[Signature]*
REL *[Signature]*
QE *[Signature]*

ITEM:

VALVE, ENGINE PRESSURIZATION, GN2 ISOLATION, SOLENOID, N.C. SPRING LOADED.

FUNCTION:

VALVE IS USED TO LIMIT DOWNSTREAM LEAKAGE FROM REGULATOR, RELIEF VALVE, CONTROL VALVES, PURGE VALVES, LINES AND FITTINGS DURING STATIC PERIODS. VALVES ARE NORMALLY CLOSED AND ARE OPENED BY MANUAL SWITCH PRIOR TO EACH ENGINE FIRING. VALVES UTILIZE DUAL COILS AND REDUNDANT POWER SOURCES AND LEADS. (SWITCH ALSO ENABLES ENGINE CONTROL VALVES AND CAN ALSO BE USED TO MANUALLY TERMINATE ENGINE FIRING IF REQ'D.) VALVES ARE OPENED PRIOR TO LAUNCH.

FAILURE MODE:

INTERNAL LEAKAGE, FAILS OPEN, FAILS TO CLOSE, FAILS TO REMAIN CLOSED.

CAUSE(S):

CONTAMINATION, CORROSION, MATERIAL DEFECT, SPRING BREAKS, PILOT POPPET LEAKS, SEAT CRACKS, VIBRATION.

EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) NO EFFECT - LOSS OF REDUNDANCY.

(B) LOSS OF REDUNDANCY.

(C) NO EFFECT.

(D) NO EFFECT.

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(E) FUNCTIONAL CRITICALITY EFFECT - POSSIBLE LOSS OF CREW/VEHICLE DUE TO INABILITY TO PERFORM DEORBIT BURN. 1R EFFECT ASSUMES FAILURE OF DOWNSTREAM REGULATOR, ACCUMULATOR, OTHER OMS ENGINE AND INADEQUATE PROPELLANT FOR RCS DEORBIT. FAILURE NOT DETECTABLE IN FLIGHT SINCE REGULATOR GOES TO LOCKUP AFTER EVERY BURN.

DISPOSITION & RATIONALE:

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

A) DESIGN

DESIGN FACTOR OF SAFETY IS 4.0 (BURST). REDUNDANT ENGINES ARE PROVIDED EITHER OF WHICH IS ADEQUATE FOR DEORBIT. THE ACCUMULATOR STORES PRESSURANT WHICH IS ADEQUATE FOR 1 ENGINE FIRING.

B) TEST

QUALIFICATION TESTS

INCLUDED ENDURANCE, THERMAL, SHOCK, VIBRATION, FUNCTIONAL TESTING, BURST. ALSO QUALIFIED AS PART OF ENGINE ASSEMBLY - 138 HOT-FIRE TESTS DURING ENGINE QUAL, 498 TESTS AT SYSTEM LEVEL AT WSTP, VIBRATION TEST AT ENGINE LEVEL.

ACCEPTANCE TESTS

(EACH UNIT), VISUAL INSPECTIONS, PROOF PRESSURE, ELECTRICAL CHECKS, PULL-IN AND DROP-OUT VOLTAGE, LEAKAGE, FLOW, FUNCTIONAL AND CLEANLINESS.

GROUND TURNAROUND

V43CHO.191 PERFORMS LEAK TEST FOR FIRST FLIGHT AND ON 5-FLIGHT INTERVALS. SOOFJO.040 PERFORMS POST ACTUATION PNEUMATIC LEAK/FUNCTIONAL TEST EVERY FLIGHT.

V43CFO.030 PERFORMS PNEUMATIC SYSTEM SERVICING AND VERIFIES CONFORMANCE WITH SE-5-0073.

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 INSPECTIONS OF VALVE BODY AND COMPONENT DURING FABRICATION IS VERIFIED BY INSPECTION.

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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.

HANDLING/PACKAGING

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

(D) FAILURE HISTORY

CAR'S AC6174 AND AD0249 RECORD TWO INTERNAL LEAKAGE FAILURES OF THE OME ENGINE ARM VALVE DURING VEHICLE USAGE. NEITHER COULD BE VERIFIED AFTER REMOVAL. AC6174 OCCURRED DURING OV-099 POST STS-7 CHECKOUT. THIS VALVE HAD BEEN INADVERTENTLY ENERGIZED FOR A LONG PERIOD. HOWEVER TESTING INDICATED THAT TRANSIENT CONTAMINATION RATHER THAN HIGH TEMPERATURE WAS THE MOST PROBABLE CAUSE. AD0249 INDICATED THAT THE VALVE LEAKED EXCESSIVELY. THE PROBABLE CAUSES ARE A PIECE OF TRANSIENT CONTAMINATION OR DISCREPANT STATIC O-RING SEALS BETWEEN THE INLET AND OUTLET. (TEMPORARILY UNSEATED).

(E) OPERATIONAL USE

NO ACTION FIRST FAILURE - NOT DETECTABLE (INTERNAL LEAKAGE). NO ACTION FOR FAIL OPEN - NO EFFECT. FOR PRESSURANT LOSS RESERVE ACCUMULATOR PRESSURANT FOR DEORBIT BURN.