SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ORBITAL MANEUVER — FMEA NO 03-3 -4551 -2 — REV:11/14/97

ASSEMBLY :ENGINE SUBSYSTEM
P/N RI :MC621-0009
P/N VENDOR:1186825
QUANTITY :2
:ONE FOR EACH ENG SUBSYS
:

ABORT: TAL, ATO — CRIT. FUNC: 1R — CRIT. HDW: 2

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

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

PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):
DES	V F ROZNOS	DES	SSM
REL	C M AKERS	REL	REL
QE	W J SMITH	QE	QE

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 GN2 PRESSURANT WOULD REMAIN TO ALLOW ONE ADDITIONAL ACTUATION OF THE BI-PROPELLANT VALVE TO ACCOMPLISH ENGINE FIRING.

FAILURE MODE:
FAILS CLOSED, FAILS TO OPEN, RESTRICTED FLOW.

CAUSE(S):
SEAL DETERIORATES & STICKS TO SEAT, POPPET BINDS IN GUIDE, CORROSION, CONTAMINATION.

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

(A) LOSS OF REDUNDANCY - LOSS OF ONE OMS ENGINE.

(B) LOSS OF INTERFACE REDUNDANCY - LOSS OF ONE OMS ENGINE.

(C) POSSIBLE EARLY MISSION TERMINATION. REDLINE ADDITIONAL PROPELLANT FOR RCS BACKUP DEORBIT. NEXT PRIMARY LANDING SITE DEORBIT IF SUFFICIENT PROPELLANT NOT AVAILABLE.

(D) NO EFFECT - CRIT 1 FOR ABORTS REQUIRING POST-MECO OMS DUMP. IF ENGINE RESTARTED WITH NO PURGE, HARD START COULD DAMAGE ENGINE AND VEHICLE. INABILITY TO RESTART ENGINE COULD RESULT IN EXCESSIVE PROPELLANT REMAINING - LANDING WEIGHT, C.G. ISSUES.

(E) FUNCTIONAL CRITICALITY EFFECT - POSSIBLE LOSS OF CREW/VEHICLE DUE TO INABILITY TO PERFORM DEORBIT BURN. FAILURE OF BOTH OMS ENGINES AND INADEQUATE PROPELLANT FOR RCS DEORBIT. FAILURE NOT DETECTABLE UNTIL AFTER OMS BURN. (ACCUMULATOR PRESSURE DEPLETED).

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

(A) DESIGN

DESIGN FACTOR OF SAFETY IS 1.5. BURST- 1080 PSI (DESIGN), 7600 PSI(ACTUAL). 18 MICRON UPSTREAM FILTERS LIMIT CONTAMINATION POTENTIAL. REDUNDANT ENGINES ARE PROVIDED, EITHER OF WHICH IS ADEQUATE FOR DEORBIT.

(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. PROOF PRESSURE TESTING, CYCLING AND THERMAL TESTING CONDUCTED AT VALVE LEVEL. DESIGN BURST PRESSURE IS 1080 PSI. ACTUAL BURST PRESSURE WAS 7600 PSI.

ACCEPTANCE TESTS
PROOF PRESSURE AND LEAKAGE, CRACK AND RESEAT.

GROUND TURNAROUND
V43CB0.194 PERFORMS LEAK AND FUNCTIONAL TEST FOR FIRST FLIGHT AND ON 5-FLIGHT INTERVALS.
V43CE0.055 PERFORMS PNEUMATIC SYSTEM VENT EVERY FLIGHT.
S00FJ0.040 PERFORMS POST ACTUATION PNEUMATIC LEAK/FUNCTIONAL TEST EVERY FLIGHT.
PRESSURE DROP FOR EACH PURGE MONITORED IN FLIGHT TO VERIFY PROPER FLOWRATE.

(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. SUPPLIER CONTAMINATION CONTROL PLAN REVIEWED AND APPROVED.

ASSEMBLY/INSTALLATION
MANUFACTURING, ASSEMBLY AND INSTALLATION PROCEDURES ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE 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.

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

(D) FAILURE HISTORY
NONE.

(E) OPERATIONAL USE
IF OMS BURN DEPLETION ALLOWS SUFFICIENT REACTION TIME, PLACE ARM/PRESS SWITCH IN "ARM" POSITION TO SAVE ACCUMULATOR OR PRESSURE FOR DEORBIT BURN START. IF ENGINE NOT AVAILABLE COMPLETE MISSION REQUIREMENTS USING CROSSFEED FOR PROPELLANT UTILIZATION. REDLINE ADDITIONAL PROPELLANT FOR RCS BACKUP DEORBIT. NEXT PLS DEORBIT IF PROPELLANT FOR RCS BACKUP NOT AVAILABLE. POSSIBLE MISSION IMPACT." DECREASED PROPELLANT AVAILABLE FROM OMS TO RCS THROUGH INTERCONNECT FOR ON-ORBIT OPERATION.