SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ORBITAL MANEUVER FMEA NO 03-3 -4552 -1 REV: 3/30/88

ASSEMBLY :ENGINE SUBSYSTEM
P/N RI :MC621-0009
P/N VENDOR:1186828
QUANTITY :2
:ONE FOR EACH ENG SUBSYS
:

ABORT:
RTLS, ATO, TAL

VEHICLE	102	103	104
EFFECTIVITY:	X	X	X

PHASE(S): PL LO OO DO X LS

CRIT. FUNC: 1R
CRIT. HDW: 2

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

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

ITEM:
TANK, ACCUMULATOR, TITANIUM.(6AL4V), GN2 PRESSURANT FOR PNEUMATIC ACTUATION.

FUNCTION:
STORES GN2 PRESSURE SUCH THAT ONE ENGINE FIRING CAN STILL BE ACCOMPLISHED EVEN THOUGH AN OVERBOARD LEAK SHOULD OCCUR FROM THE PRESSURIZATION SYSTEM UPSTREAM OF THE ACCUMULATOR CHECK VALVE AND ALSO IN EVENT THE ENGINE ARMING VALVE, PRESSURE REGULATOR,OR CHECK VALUE SHOULD FAIL IN THE CLOSED POSITION.

FAILURE MODE:
STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE.

CAUSE(S):
MATERIAL DEFICIENCY, WELD CRACK/DEFECT, FAULTY FABRICATION, STRESS RISER, TEST DAMAGE, STRESS CORROSION, SHOCK, VIBRATION.

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

(A) 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 PLS DEORBIT IF SUFFICIENT PROPELLANT NOT AVAILABLE. POSSIBLE MISSION IMPACT (DECREASED PROPELLANT AVAILABLE FROM OMS TO RCS THROUGH INTERCONNECT FOR ON-ORBIT OPERATIONS).

(D) NO EFFECT. CRITICALITY 1 FOR ABORT. ONE ENGINE CANNOT DEPLETE PROPELLANT WITHIN TIME REQUIRED. REDUCED FLOWRATE DURING DUMP COULD CAUSE LANDING WEIGHT, C.G.PROBLEMS.

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(E) FUNCTIONAL CRITICALITY EFFECT - POSSIBLE LOSS OF CREW/VEHICLE. 1R EFFECT ASSUMES LOSS OF OTHER OMS ENGINE AND INADEQUATE PROPELLANT FOR RCS DEORBIT.

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

(A) DESIGN
THE FACTOR OF SAFETY (PROOF) IS 2.0 X WORKING PRESSURE AND THE FACTOR SAFETY (BURST) IS 4.0. BURST PRESSURE WAS 7600 PSI. TANKS ARE OF LOW CAPACITY (3.4 IN DIAMETER. COMPLETE STRESS ANALYSIS FOR EACH TANK SEGMENT WAS PERFORMED. FRACTURE CONTROL REQUIREMENTS ARE IMPOSED. SHRAPNEL NOT PRODUCED IN RUPTURE FAILURE DUE TO LOW STRESS LEVELS. DESIGN PRESSURE IS 1080 PSI. REDUNDANT ENGINES ARE PROVIDED EITHER OF WHICH IS ADEQUATE FOR DEORBIT.

(B) TEST

QUALIFICATION TESTS
1000 PRESSURE CYCLES PERFORMED. ITEM IS ALSO QUALIFIED AS PART OF ENGINE SUB-ASSEMBLY WHICH INCLUDES VIBRATION AND ENGINE FIRING TESTS. 138 HOTFIRE TESTS ACCOMPLISHED DURING ENGINE QUALIFICATION AND 498 TESTS COMPLETED AT SYSTEM LEVEL AT WSTF.

ACCEPTANCE TESTS
PROOF PRESSURE AND LEAKAGE TESTS ARE PERFORMED DURING ATP. RADIOGRAPHIC AND X-RAY TESTS ARE PERFORMED TO VERIFY NO PERMANENT DEFORMATION OR FLAW GROWTH. WELDS ARE VISUALLY INSPECTED FOR EVIDENCE OF STRESS RISER OR OTHER FLAWS.

GROUND TURNAROUND
V43GB0.280 PERFORMS LEAKAGE AND PRESSURE DECAY TESTS FOR EACH FLIGHT.
V43CB0.210 PERFORMS EXTERNAL LEAK VERIFICATION FIRST FLIGHT.
S00FJ0.040 PERFORMS POST ACTUATION PNEUMATIC LEAK/FUNCTIONAL TEST EVERY FLIGHT.
PNEUMATIC SYSTEM PRESSURE IS MONITORED IN FLIGHT TO VERIFY NO EXCESSIVE PRESSURE LOSS.

(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.

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NONDESTRUCTIVE EVALUATION
PENETRANT AND RADIOGRAPHIC INSPECTION OF WELDS ARE VERIFIED BY INSPECTION. ULTRASONIC INSPECTION OF RAW MATERIAL IS VERIFIED BY INSPECTION. PENETRANT INSPECTION OF FINISHED TANK HALVES IS 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. PRESSURIZATION CYCLE HISTORY LOG IS VERIFIED BY INSPECTION. MICROETCH OF HEMISPHERES FOR ALPHA SEGREGATION IS VERIFIED BY INSPECTION.

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

(D) FAILURE HISTORY
NONE.

(E) OPERATIONAL USE
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.