SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :P/L RETEN & DEPLOY-MPM PYRO FMEA NO P2-5A-J01-2 REV:08/12/98

ASSEMBLY :MPM SHOULDER AND PEDESTALS
P/N RI :SKD26100104-301
:MC325-0021-0002
QUANTITY :8

CRIT. FUNC: 1
CRIT. HDW: 1

VEHICLE	102	103	104
EFFECTIVITY:	X	X	X

PHASE(S): PL LO X OO X DO X LS

REDUNDANCY SCREEN: A- B- C-

PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):
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ITEM:
PRESSURE CARTRIDGE, RETRACTOR, MANIPULATOR POSITIONING MECHANISM (MPM) JETTISON

FUNCTION:
PROVIDES PYROTECHNIC PRESSURE OUTPUT FROM EITHER OR BOTH (REDUNDANT) PRESSURE CARTRIDGES TO OPERATE RETRACTOR, IF MANIPULATOR ARM MUST BE JETTISONED.

FAILURE MODE:
INADVERTENT OPERATION

CAUSE(S):
ERRONEOUS SIGNAL, THERMAL ENVIRONMENT, SHOCK/VIBRATION

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

(A) PREMATURE RELEASE OF UPPER MPM WITH RETENTION LATCHES.

(B) LOSS OF FUNCTIONAL CAPABILITY OF REMOTE MANIPULATOR SYSTEM (RMS) IF FAILURE OCCURS WHILE STOWED.

(C) LOSS OF RMS CAPABILITY AND/OR MISSION IF UPPER MPM SEPARATES PREMATURELY. (RESULTS IN JETTISON OF RMS BECAUSE THE RMS CANNOT BE SECURED TO A LOOSE MPM CRADLE).

(D) POSSIBLE DAMAGE TO VEHICLE, IF ONE MPM FAILS DURING ASCENT/ENTRY. (RMS IS LOOSE IN PAYLOAD BAY AT ONE MPM). IF FAILURE OCCURS ON ORBIT AT THE SHOULDER MPM AND RMS IS DEPLOYED, ARM COULD DAMAGE ORBITER WITH POSSIBLE LOSS OF CREW/VEHICLE DURING ENTRY.

SUBSYSTEM :P/L RETEN & DEPLOY-MPM PYRO FMEA NO P2-5A-J01-2 REV:08/12/8

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

(A) DESIGN
PRESSURE CARTRIDGE FIRING CIRCUITRY CONSISTS OF TWISTED SHIELDED PAIRS WIRE FOR PROTECTION AGAINST ELECTROMAGNETIC INTERFERENCE (EMI) AND RADIO FREQUENCY INTERFERENCE (RFI). NSI MEETS EMI COMPATIBILITY PER MC999-00(AND RFI PER AFETRM 127-1. PYRO INITIATOR CONTROLLER (PIC) IS TWO FAILU TOLERANT FOR PROTECTION AGAINST AN ERRONEOUS OUTPUT. EXPLOSIVE MIX IS POTASSIUM PERCHLORATE HIGH-TEMPERATURE FOR PROTECTION AGAINST EXCESSIVE THERMAL ENVIRONMENT (AUTOIGNITION AT APPROXIMATELY +500 DEG F).

(B) TEST
QUALIFICATION TESTS: 8 FOOT DROP, RANDOM VIBRATION, +180 DEG F FIRINGS; MIX AUTOIGNITION TEST VERIFIED NO-FIRE WHEN EXPOSED TO +430 DEG F FOR O1 HOUR (MAXIMUM EXPECTED FLIGHT ENVIRONMENT IS +180 DEG F. NSI HAS BEEN QUALIFIED TO A NO-FIRE CONDITION WHEN SUBJECTED TO 1 WATT/1 AMP FOR 5 MINUTES. REF. CERTIFICATION REQUIREMENTS (CR) 44-325-0021-0001, SCOT QT 6004-201; TR (SOS INC) 6068; HSTC TR2-323.

DESIGN VERIFICATION TEST: NSI AND WIRING WAS TESTED FOR CLOSE PROXIMITY RFI SUSCEPTIBILITY PRIOR TO APOLLO-SOYUZ TEST PROJECT (ASTP). JSC REPOR #EMC-R-PH-002, 2/74.

ACCEPTANCE TESTS: 100% CARTRIDGE HOUSING INTERNAL PROOF PRESSURE TEST, TENSILE TEST (3 COUPONS FROM SAME HEAT TREAT), EXAMINATION OF PRODUCT (WEIGHT, WORKMANSHIP, FINISH, DIMENSIONS, CONSTRUCTION, CERTIFIED MATERIALS AND PROCESSES). BRIDGEWIRE RESISTANCE TEST FOR NSI, NEUTRON AND X-RAY (PRESENCE OF EXPLOSIVE MIX, NO FOREIGN MATERIAL, AND PROPER ASSEMBLY), LEAKAGE (0.000001 CC/SEC HELIUM), AND WEIGHT (PYRO CHARGE AN ALL OTHER CARTRIDGE PARTS WEIGHTED PRE- AND POST- ASSEMBLY. TOTALS MUST BE WITHIN SPECIFIED TOLERANCE). CR-44-325-0021-0001; SCOT ATP 6004-301.

OMRSD: GROUND TURNAROUND INCLUDES PYRO INITIATOR CONTROLLER (PIC) RESISTANCE TEST (POST-HOOKUP), PIC GO/NO-GO RESISTANCE TEST (PRE-HOOKUP) POWER-OFF STRAY VOLTAGE CHECK, POWER-ON STRAY VOLTAGE CHECK, NSI ELECTRICAL VERIFICATION, RMS JETTISON VERIFICATION, AND RMS JETTISON RESET/DEADFACE VERIFICATION.

(C) INSPECTION

RECEIVING INSPECTION
RAW MATERIAL IS VERIFIED BY INSPECTION TO ASSURE SPECIFIED SHUTTLE REQUIREMENTS ARE SATISFIED.

CONTAMINATION CONTROL
CONTAMINATION CONTROL AND CORROSION PROTECTION PROCESSES ARE VERIFIED BY INSPECTION.

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ASSEMBLY/INSTALLATION
CARTRIDGE RELATIVE TO HOUSING IS INSPECTED AFTER INSTALLATION TO ASSURE PROPER BACKUP RING SEATING TO PREVENT PRESSURE BLOWBY. SELECTED MANUFACTURING/ASSEMBLY STEPS ARE IDENTIFIED BY NASA QUALITY ASSURANCE AN VERIFIED BY GOVERNMENT INSPECTION AS MANDATORY INSPECTION POINTS (MIPS).

NONDESTRUCTIVE EVALUATION
PARTS ARE X-RAYED AND N-RAYED TO ASSURE FREEDOM FROM VOIDS AND CRACKS AN TO VERIFY CORRECT ASSEMBLY AND PRESENCE OF ALL DETAILED PARTS. X-RAYS AND N-RAYS ARE REVIEWED BY VENDOR, DCAS, NASA QUALITY, AND ENGINEERING.

CRITICAL PROCESSES
ALL MANUFACTURING PROCESSES, SUCH AS WELDING, HEAT TREATING PASSIVATION, AND ANODIZING ARE VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED PER PROCEDURE.

HANDLING/PACKAGING
HANDLING, PACKAGING AND STORAGE ENVIRONMENT ARE VERIFIED BY INSPECTION

(D) FAILURE HISTORY
NO FAILURE HISTORY OF PREMATURE FIRINGS INCLUDING SATURN AND APOLLO.

(E) OPERATIONAL USE
IF PREMATURE RELEASE AT FWD, MID, OR AFT PEDESTAL OCCURS ON ORBIT WITH RMS DEPLOYED, THERE IS NO IMMEDIATE EFFECT AND RMS CAN BE JETTISONED TO ALLOW FOR SAFE ENTRY.