SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :LANDING/DECELERATION-PYRO FMEA NO P2-1A -103 -2 REV:12/02/87

ASSEMBLY :NOSE LANDING GEAR
P/N RI :SKD26100101-301
P/N VENDOR:
QUANTITY :1
:ONE CARTRIDGE

CRIT. FUNC: 1
CRIT. HDW: 1

VEHICLE EFFECTIVITY:	102	103	104
	X	X	X

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

REDUNDANCY SCREEN: A- B- C-

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ITEM:
PYRO-PRESSURE CARTRIDGE, UPLOCK THRUSTER, NOSE LANDING GEAR

FUNCTION:
DUAL INITIATOR CARTRIDGE DELIVERS A PRESSURE OUTPUT TO ACTIVATE THE NOSE LANDING GEAR PYRO UPLOCK RELEASE THRUSTER AS AN EMERGENCY BACKUP TO THE PRIMARY HYDRAULIC SYSTEM. PYRO UPLOCK FUNCTIONS AUTOMATICALLY 1 SECOND AFTER GEAR DOWN COMMAND IF PROXIMITY SWITCH DOES NOT SENSE MOVEMENT.

FAILURE MODE:
INADVERTENT OPERATION

CAUSE(S):
EXCESSIVE TEMPERATURE, ERRONEOUS SIGNAL TO NASA STANDARD INITIATOR (NSI) SHOCK/VIBRATION

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

(A) NOSE LANDING GEAR EXTENDS PREMATURELY.

(B;C,D) LOSS OF CREW/VEHICLE DURING RE-ENTRY.

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 FOR ELECTROMAGNETIC INTERFERENCE (EMI) AND RADIO FREQUENCY INTERFERENCE (RFI) PROTECTION. NSI MEETS EMI COMPATIBILITY PER MC999-0002 AND RFI PER AFETRM 127-1. PYRO INITIATOR CONTROLLER (PIC) IS TWO FAILURE TOLERANT FOR PROTECTION AGAINST AN ERRONEOUS OUTPUT. EXPLOSIVE MIX IS HERCULES HIGH-TEMPERATURE FOR PROTECTION AGAINST EXCESSIVE THERMAL ENVIRONMENT (AUTOIGNITION AT APPROXIMATELY 500 DEG F).

(B) TEST

QUALIFICATION TESTS: SHOCK, RANDOM VIBRATION, THERMAL CYCLING (-65 DEG F TO +200 DEG F), THERMAL VACUUM, VIBRATION AT HIGH/LOW TEMPERATURE (-150 DEG F AND +30 DEG F - APOLLO), +250 DEG F FIRINGS; NSI AUTOIGNITION TEST TO +425 DEG F FOR ONE HOUR (MAXIMUM EXPECTED FLIGHT ENVIRONMENT IS +250 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) 26-325-0006-0001, APOLLO CRT 05336010, SOS INC. TR6068, HSTC TR2-323.

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

ACCEPTANCE TESTS: 100% INTERNAL PROOF PRESSURE TENSILE TEST (3 COUPONS FROM SAME HEAT TREAT), EXAMINATION OF PRODUCT (WEIGHT, WORKMANSHIP, FINISH, DIMENSIONS, CONSTRUCTION, CERTIFIED MATERIALS AND PROCESSES). BRIDGEWIRE RESISTANCE AND 50 VOLT INSULATION 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 AND ALL OTHER CARTRIDGE PARTS WEIGHED PRE- AND POST-ASSEMBLY; TOTALS MUST BE WITHIN SPECIFIED TOLERANCE). CR-26-325-0006-0001, ATP MA0208-0045, SKD2610010[illegible], QUANTIC IND. # Z13.0014.

CMRSD: GROUND TURNAROUND INCLUDES PYRO INITIATOR CONTROLLER (PIC) RESISTANCE TEST (POST HOOKUP) (V55AM0.110), PIC GO/NO-GO RESISTANCE TEST (PRE-HOOKUP) (V55AA0.020 AND V55AA0.030), POWER-OFF STRAY VOLTAGE CHECK (V55AM0.010), POWER ON STRAY VOLTAGE CHECK (V55AA0.040), NSI ELECTRICAL VERIFICATION (V55AN0.010), AND PYRO FIRING TEST (LANDING GEAR) (V55AD0.000).

(C) INSPECTION

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

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

ASSEMBLY/INSTALLATION
PARTS ARE X-RAYED AND N-RAYED TO VERIFY CORRECT ASSEMBLY AND PRESENCE OF ALL DETAIL PARTS AND EXPLOSIVES. VISUAL INSPECTION, IDENTIFICATION PERFORMED, AND PARTS PROTECTION VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
X-RAYS AND N-RAYS ARE REVIEWED BY VENDOR, DCAS, NASA QUALITY, AND ENGINEERING.

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CRITICAL PROCESSES
SELECTED MANUFACTURING/ASSEMBLY STEPS ARE IDENTIFIED BY NASA QUALITY ASSURANCE AND VERIFIED BY GOVERNMENT INSPECTION AS MANDATORY INSPECTION POINTS (MIPS). ALL MANUFACTURING PROCESSES, SUCH AS WELDING, PLATING, HEAT TREATING, PASSIVATION, AND ANODIZING ARE VERIFIED BY INSPECTION.

HANDLING/PACKAGING
STORAGE ENVIRONMENTS ARE MONITORED AND VERIPIED BY INSPECTION.

(D) FAILURE HISTORY
NONE.

(E) OPERATIONAL USE
NONE.