

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LANDING/DECELERATION-PYRO FMEA NO P2-1A -107 -2 REV:12/02/87

ASSEMBLY : NOSE LANDING GEAR	CRIT. FUNC:	1
P/N RI : SKD26100100-301	CRIT. HDW:	1
P/N VENDOR:	VEHICLE	102 103 104
QUANTITY : 2	EFFECTIVITY:	X X X
: TWO PRESSURE CARTRIDGES	PHASE(S):	PL LO X 00 X DO X LS

PREPARED BY:	DES	R. H. YEE	APPROVED BY:	12/4/87	APPROVED BY (NASA):	1-7-8
REL	MA	B. MOSKOWITZ	DES	<i>R. H. YEE for A. C. Ordway</i>	SSM	<i>R. W. Thomas</i>
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ITEM:
PYRO-PRESSURE CARTRIDGE, EXTENSION THRUSTER, NOSE LANDING GEAR

FUNCTION:
DUAL CARTRIDGES ACTIVATE PYRO THRUSTER TO PROVIDE ASSIST IN INITIAL PHASE OF NOSE GEAR EXTENSION IN WHICH THE GEAR DOORS ARE OPENED (FIRES EVERY FLIGHT).

FAILURE MODE:
INADVERTENT OPERATION

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

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

(A) LOSS OF FUNCTION.

(B) NONE - NOSE LANDING GEAR WILL NOT DEPLOY PREMATURELY WHILE STILL IN THE UNLOCKED POSITION.

(C,D) POSSIBLE LOSS OF CREW/VEHICLE IF NOSE GEAR FAILS TO EXTEND UPON NORMAL DEPLOY COMMAND (EXTENSION THRUSTER NOT ABLE TO ASSIST).

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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 "HI-TEMP" FOR PROTECTION AGAINST EXCESSIVE THERMAL ENVIRONMENT (AUTOIGNITION AT APPROXIMATELY 500 DEG F).

(B) TEST

QUALIFICATION TESTS: RANDOM VIBRATION, +200 DEG F FIRINGS; NSI AUTOIGNITION TEST VERIFIED NO FIRE WHEN EXPOSED TO 425 DEG F FOR ONE HOUR (MAXIMUM EXPECTED FLIGHT ENVIRONMENT IS +200 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) 26-325-0006-0002, OEA INC QTR #2737-9, 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-26-325-0006-0002, ATP OEA INC. # 2737-7, SKD26100100.

OMRSD: 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 SPECIFIC SHUTTLE REQUIREMENTS ARE SATISFIED.

CONTAMINATION CONTROL

CONTAMINATION CONTROL AND CORROSION PROTECTION PROCESSES VERIFIED BY INSPECTION.

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ASSEMBLY/INSTALLATION

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

NONDESTRUCTIVE EVALUATION

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

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 ENVIRONMENT VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO FAILURE HISTORY OF PREMATURE FIRINGS INCLUDING SATURN AND APOLO.

(E) OPERATIONAL USE

NONE.