

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ACTUATION MECH-KU-BAND PYRO FMEA NO P2-4H-R106-1 REV:08/25/88

ASSEMBLY :KU-BAND ANTENNA JETTISON MECH CRIT. FUNC: 1R
 P/N RI :SKD26100105-301 CRIT. HDW: 2
 P/N VENDOR:
 QUANTITY :2 VEHICLE 102 103 104
 EFFECTIVITY: X X X
 PHASE(S): PL X LO X OO X DO X LS
 :TWO

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

PREPARED BY: APPROVED BY: APPROVED BY (NASA):
 DES R. H. YEE DES *[Signature]* 55H *[Signature]* 9-12-88
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ITEM:

PRESSURE CARTRIDGE, KU-BAND ANTENNA EMERGENCY JETTISON MECHANISM (2 CARTRIDGES IN THE GUILLOTINE)

FUNCTION:

PROVIDES PRESSURE OUTPUT FROM EITHER OR BOTH (REDUNDANT) CARTRIDGES TO ACTIVATE THE GUILLOTINE ASSEMBLY AND SEVER THE ELECTRICAL UMBILICAL.

FAILURE MODE:

INADVERTENT-OPERATION

USE(S):

EXCESSIVE TEMPERATURE, ERRONEOUS SIGNAL TO NASA STANDARD INITIATOR (NSI) (REF. APPENDIX I), SHOCK/VIBRATION

EFFECT(S) ON:

- (A)SUBSYSTEM (B)INTERFACES (C)MISSION (D)CREW/VEHICLE
- (A) LOSS OF ANTENNA FUNCTIONAL CAPABILITY WHEN REQUIRED.
- (B) LOSS OF KU-BAND OPERATIONS.
- (C) FIRST FAILURE - LOSS OF MISSION THAT REQUIRES RADAR ASSIST RENDEZVOUS OR HIGH DATA RATE CHANNEL.
- (D) SECOND FAILURE - POSSIBLE LOSS OF CREW/VEHICLE RESULTING FROM STRUCTURAL DAMAGE CAUSED BY INADVERTENT OPERATION OF THE ANTENNA PYRO RELEASE NUT MECHANISM.

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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 OF WIRES FOR PROTECTION AGAINST ELECTROMAGNETIC INTERFERENCE (EMI) AND RADIO FREQUENCY INTERFERENCE (RFI). NSI MEETS EMI COMPATIBILITY PER MC999-0002 AND RFI PER AIR FORCE EASTERN TEST RANGE MANUAL (AFETRM) 127-1. PYRO INITIATOR CONTROLLER (PIC) IS TWO FAILURE TOLERANT FOR PROTECTION AGAINST AN ERRONEOUS ELECTRICAL OUTPUT. EXPLOSIVE MIX IS HERCULES "HIGH-TEMPERATURE" FOR PROTECTION AGAINST A HIGH TEMPERATURE ENVIRONMENT (AUTOIGNITION AT +500 DEG F).

(B) TEST

QUALIFICATION TESTS: 8 FOOT DROP, SHOCK, RANDOM VIBRATION, THERMAL CYCLING FROM -130 DEG F TO +270 DEG F, HIGH TEMPERATURE FIRINGS AT +160 DEG F, AUTO-IGNITION TEST VERIFIED NO-FIRE WHEN EXPOSED TO +370 DEG F FOR 1 HOUR (MAXIMUM EXPECTED FLIGHT TEMPERATURE IS +270 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) 44-325-0024, OEA 2889-10-3 & 44-325-0025, OEA 2956-10/A NSI: 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); REF 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 PER SEC HELIUM), AND WEIGHT (PYRO CHARGE AND ALL OTHER CARTRIDGE PARTS WERE WEIGHED PRE- AND POST-ASSEMBLY; TOTALS MUST BE WITHIN SPECIFIED TOLERANCES). (CR)44-325-0024 & 44-325-0025; ATP 2956-7/8 & 2889-7-400 (OEA, INC.)

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, AND KU-BAND JETTISON 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 AND STORAGE ENVIRONMENTS ARE MONITORED AND 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, IDENTIFICATION 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

HANDLING/PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO FAILURE HISTORY OF PREMATURE FIRINGS INCLUDING SATURN AND APOLLO.

(E) OPERATIONAL USE

NONE FOR REGAINING KU-BAND OPERATIONS. LOSS OF MISSION IF KU-BAND OPERATIONS ARE REQUIRED. S-BAND AND/OR UHF CAN BE USED AS BACKUPS FOR STATE VECTOR UPDATES.