

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : SEPARATION MECHANISMS-PYRO FMEA NO P2-3A -F1 -2 REV:10/09/87

ASSEMBLY : FORWARD SEPARATION BOLT CRIT. FUNC: 1
P/N RI : SKD26100098-301 CRIT. HDW: 1
P/N VENDOR: VEHICLE 102 103 104
QUANTITY : 2 EFFECTIVITY: X X X
PHASE(S): PL X LO X OO DO LS

PREPARED BY: REDUNDANCY SCREEN: A- B- C-
DES R. H. YEE APPROVED BY: 10/1/87 APPROVED BY (NASA):
REL M. B. MOSKOWITZ DES R. H. YEE for A.C. Cassidy SSM RAH for T. GRAVES
QE E. M. GUTIERREZ REL Resident QE [Signature]
10-27-87

ITEM:

PRESSURE CARTRIDGE - FORWARD SEPARATION SHEAR BOLT

FUNCTION:

DELIVERS A PRESSURE OUTPUT TO FRACTURE THE BOLT WHICH STRUCTURALLY TIES TOGETHER THE ORBITER/EXTERNAL TANK (ET) AT THE FORWARD ATTACH POINT.

FAILURE MODE:

INADVERTENT OPERATION

CAUSE(S):

EXCESSIVE TEMPERATURE, ERRONEOUS SIGNAL TO NASA STANDARD INITIATOR (NSI)

EFFECT(S) ON:

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

(A,B,C,D) LOSS OF CREW/VEHICLE.

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. PYRO INITIATOR CONTROLLER (PIC) IS TWO FAILURE TOLERANT FOR PROTECTION AGAINST AN ERRONEOUS OUTPUT.

(B) TEST

QUALIFICATION TESTS: PRESSURE CARTRIDGE QUALIFIED AS PART OF SEPARATION BOLT CERTIFICATION REQUIREMENT (CR) 45-325-0014 AND ORBITER FORWARD SEPARATION SYSTEM CR-45-562001. AUTOIGNITION TEST VERIFIED NO FIRE WHEN EXPOSED TO 350 DEG F FOR 1 HOUR (MAXIMUM EXPECTED FLIGHT TEMPERATURE IS +225 DEG F). NSI HAS BEEN QUALIFIED TO A NO FIRE CONDITION WHEN SUBJECTED TO 1 WATT/1 AMP FOR 5 MINUTES.

DESIGN VERIFICATION TEST: NSI AND WIRING WAS TESTED FOR CLOSE PROXIMITY RFI SUSCEPTIBILITY PRIOR TO APOLLO-SOYUZ TEST PROJECT (ASTP).

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ACCEPTANCE TESTS: INTERNAL PROOF PRESSURE (1.2 X MAX OPERATION PRESSURE), TENSILE TEST (3 COUPONS FROM SAME HEAT TREAT), EXAMINATION OF PRODUCT (WEIGHT, WORKMANSHIP, FINISH, DIMENSIONS, CONSTRUCTION, CERTIFIED M&P). 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 (1 X 10 TO 6CC PER SEC HELIUM), AND WEIGHT (PYRO CHARGE AND ALL OTHER CARTRIDGE PARTS WEIGHED PRE- AND POST-ASSEMBLY. TOTALS MUST BE WITHIN SPECIFIED TOLERANCE). CR-45-325-0014, ATP 8664; SKD26100098.

OMRSD: TURNAROUND TESTS INCLUDE - FIRING LINE RESISTANCE CHECK, PYRO INITIATOR CONTROLLER (PIC) GO AND NO-GO RESISTANCE TESTS, POWER OFF/ON STRAY VOLTAGE TESTS, PIC RESISTANCE TEST ON EACH INSTALLED NSI (POST HOOKUP), PYRO FIRING CIRCUITRY VERIFICATION, AND ISOLATION HI-POT VERIFICATION.

2) INSPECTION

RECEIVING INSPECTION

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

CONTAMINATION CONTROL

CONTAMINATION CONTROL AND CORROSION PROTECTION PROCESSES VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

SELECTED MANUFACTURING/ASSEMBLY STEPS ARE IDENTIFIED BY NASA AND QUALITY ASSURANCE AND VERIFIED BY GOVERNMENT INSPECTION MANDATORY INSPECTION POINTS (MIPS).

NONDESTRUCTIVE EVALUATION

PARTS ARE X-RAYED AND N-RAYED TO VERIFY CORRECT ASSEMBLY AND PRESENCE OF ALL DETAIL PARTS AND EXPLOSIVES. X-RAYS AND N-RAYS ARE REVIEWED BY VENDOR, DCAS, AND NASA QUALITY AND ENGINEERING.

CRITICAL PROCESSES

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

STORAGE

STORAGE ENVIRONMENT VERIFIED BY INSPECTION.

3) FAILURE HISTORY

NO FAILURE HISTORY OF PREMATURE FIRINGS INCLUDING SATURN AND APOLLO.

4) OPERATIONAL USE

NONE.