

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : SEPARATION MECHANISMS-PYRO FMEA NO P2-3A -F1 -1 REV:10/09/87

ASSEMBLY : FORWARD SEPARATION BOLT

P/N RI : SKD26100098-301

P/N VENDOR:

QUANTITY : 2

VEHICLE	102	103	104
EFFECTIVITY:	X	X	X
PHASE(S):	PL	LO X OO	DO LS

CRIT. FUNC: 1R

CRIT. HDW: 2

PREPARED BY:

DES R. H. YEE

REL M. B. MOSKOWITZ

QE E. M. GUTIERREZ

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

APPROVED BY: 10/11/87 APPROVED BY (NASA):

DES R. H. YEE for A.C. Ordway SSM RHM for T.J. GRAVES

REL [Signature] REL [Signature]

QE [Signature] 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:

FAILS TO FUNCTION OR LOW PRESSURE OUTPUT

CAUSE(S):

LOSS OF INPUT - ELECTRICAL/NASA STANDARD INITIATORS (NSI'S) (REFER TO CIL 02-5-J05-1), CONTAMINATION OR IMPROPER LOADING OF PYRO MIXTURE, HANDLING DAMAGE, THREAD FAILURE/NSI BLOWOUT

EFFECT(S) ON:

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

(A) LOSS OF REDUNDANCY.

(B,C,D) NONE. REDUNDANT CARTRIDGE AVAILABLE TO ACCOMPLISH FUNCTION. DUAL FAILURE RESULTS IN CREW/VEHICLE LOSS.

DISPOSITION & RATIONALE:

(A)DESIGN (B)TEST (C)INSPECTION (D)FAILURE HISTORY (E)OPERATIONAL USE

(A) DESIGN

ONE OF THE TWO REDUNDANT PRESSURE CARTRIDGES, AT 85% OF NOMINAL OUTPUT, IS SUFFICIENT TO SHEAR THE ATTACH BOLT. CARTRIDGE MATERIAL IS INCONEL 718 (ULTIMATE TENSILE 180-200 KSI) FOR CORROSION PROTECTION.

(B) TEST

COMPONENT QUALIFICATION TESTS: QUALIFIED AS PART OF SKD26100098-245 SEPARATION BOLT. SALT/FOG, VIBRATION AND HIGH TEMPERATURE, ENVIRONMENTAL FIRINGS AT -65 DEG F/AMBIENT/+225 DEG F, MARGIN DEMO FIRINGS AT 85% SINGLE CARTRIDGE LOAD AND 115% DUAL CARTRIDGE LOAD, AND 8 FOOT DROP TEST. CERTIFICATION REQUIREMENTS (CR) 45-325-0014.

DELTA QUALIFICATION TESTS (FOR SHOCK ATTENUATION REDESIGN): FIRINGS AT +225 DEG F WITH TWO 100% CARTRIDGES, AMBIENT SYMPATHETIC DUAL CARTRIDGES, AND 2 MILLISEC TIME DELAY DUAL CARTRIDGES. CR-45-325-0014.

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UBSYSTEM :SEPARATION MECHANISMS-PYRO FMEA NO P2-3A -F1 -1 REV:10/09/87

DESIGN VERIFICATION TEST (LIMITED FREE TRAVEL OF PRIMARY PISTON): FIRINGS AT -65 DEG F WITH SINGLE 100% CARTRIDGE AND +225 DEG F WITH DUAL 100% CARTRIDGES. CR-45-325-0014.

SYSTEM QUALIFICATION TESTS: 9 SYSTEM LEVEL SEPARATION FIRINGS (5 UNDER LOAD), STATIC LIMIT AND ULTIMATE LOADS TESTS. CR 45-562001.

ACCEPTANCE TESTS: EACH EXPLOSIVE MIX BATCH IS VERIFIED FOR CALORIC OUTPUT, CTG HOUSINGS ARE 100% INTERNAL PROOF PRESSURE TESTED (1.2 X MAX OPERATING PRESSURE), TENSILE TEST (3 COUPONS FROM SAME HEAT TREAT), LEAK TEST, WEIGHT (PYRO CHARGE AND ALL OTHER CARTRIDGE PARTS WEIGHED PRE- AND POST-ASSEMBLY), LOT ACCEPTANCE TEST FIRINGS ON RANDOM CARTRIDGES. CR-45-325-0014, ATP 8664; SKD26100098.

PYRO VERIFICATION TEST: SAMPLE LOT FIRING YEARLY AT KSC UNTIL AGE LIFE EXPIRES.

OMRSD: TURNAROUND TESTS INCLUDE - PYRO INITIATOR CONTROLLER (PIC) RESISTANCE TEST, CIRCUIT CHECKOUT, AND NSI PREFLIGHT BRIDGEWIRE CHECK. NEW HARDWARE INSTALLED EACH FLIGHT.

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, 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.

FAILURE HISTORY

NONE.

OPERATIONAL USE

NONE.