

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : SEPARATION MECHANISMS-PYRO FMEA NO P2-3A -F3 -2 REV:10/09/87

ASSEMBLY : FORWARD SEPARATION BOLT

P/N RI : SKD26100098-245

P/N VENDOR:

QUANTITY : 1

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

CRIT. FUNC: 1
CRIT. HDW: 1

| | | | | | | | | | |
|--------------|-----------------|-----------|--------------------|-----|----------------------------------|----------|---------------------|--------------------|----------------------------|
| PREPARED BY: | DES | R. H. YEE | APPROVED BY: | DES | <i>R. H. Yee for A.C. Ordway</i> | 10/11/87 | APPROVED BY (NASA): | SSM | <i>But for T.J. Graves</i> |
| REL | M. B. MOSKOWITZ | REL | <i>Russell</i> | REL | <i>[Signature]</i> | | REL | <i>[Signature]</i> | |
| QE | E. M. GUTIERREZ | QE | <i>[Signature]</i> | QE | <i>[Signature]</i> | | QE | <i>[Signature]</i> | |

10-27-87

ITEM:
FORWARD ATTACH SHEAR BOLT

FUNCTION:
STRUCTURALLY TIES TOGETHER THE ORBITER/EXTERNAL TANK (ET) AT FORWARD ATTACH POINT. FRACTURES UPON RECEIVING A PRESSURE OUTPUT FROM EITHER OR BOTH CARTRIDGES.

FAILURE MODE:
FAILS TO FRACTURE

CAUSE(S):
INADEQUATE PRESSURE OUTPUT FROM CARTRIDGES, IMPROPER MACHINING AT SEPARATION PLANE, RUPTURED HOUSING, OVER-STRENGTH MATERIAL, BINDING OF EITHER PISTON, PISTON SEAL BLOWBY, CARTRIDGE BLOWOUT/O-RING BLOWBY

EFFECT(S) ON:
(A)SUBSYSTEM (B)INTERFACES (C)MISSION (D)CREW/VEHICLE
(A,B,C,D) LOSS OF FUNCTION - LOSS OF CREW/VEHICLE.

DISPOSITION & RATIONALE:
(A)DESIGN (B)TEST (C)INSPECTION (D)FAILURE HISTORY (E)OPERATIONAL USE

(A) DESIGN
REDUNDANT PRESSURE CARTRIDGES; A SINGLE CARTRIDGE WILL MEET PERFORMANCE REQUIREMENTS WHEN LOADED WITH 85% OF OUTPUT CHARGE; OMISSION OF A REDUNDANT PISTON SEAL WILL MEET PERFORMANCE REQUIREMENTS. BOLT MACHINED FROM INCONEL 718 FORGING AND HEAT TREATED FOR MATERIAL CONSISTENCY.

(B) TEST
COMPONENT QUALIFICATION TESTS: SALT/FOG, VIBRATION AND HIGH TEMPERATURE, TENSION/SHEAR - LIMIT AND ULTIMATE LOADS. ENVIRONMENTAL FIRINGS AT -65 DEG F/AMBIENT/+225 DEG F, MARGIN DEMO FIRINGS AT 85% SINGLE CARTRIDGE LOAD AND 115% DUAL CARTRIDGE LOAD. MISSING O-RING TEST AT -65 DEG F/AMBIENT/+225 DEG F. CERTIFICATION REQUIREMENTS (CR) 45-325-0014.

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

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 (6 UNDER LOAD), STATIC LIMITS AND ULTIMATE LOADS TESTS. CR-45-562001.

ACCEPTANCE TESTS: 100% DYE PENETRANT, 100% ULTRASONIC TEST ON SHANKS AND HOUSINGS, 100% HOUSINGS HYDROSTATICALLY PROOF PRESSURE TESTED, 100% SHANK HARDNESS TEST, 100% SHANK PROOF LOAD; TENSILE TEST COUPONS FOR HOUSING, PISTON AND SHANKS VERIFIES MATERIAL INTEGRITY. DESTRUCTIVE LOT ACCEPTANCE TESTING BY SAMPLE SIZE VERSUS LOT SIZE. CR-45-325-0014, ATP 8664; SKD26100098, ATP 8875.

OMRSD: VERIFY CARTRIDGE O-RING INTEGRITY. 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

SHANKS 100% DIMENSIONALLY VERIFIED AT SEPARATION CROSS SECTION. SELECTED MANUFACTURING/ASSEMBLY STEPS ARE IDENTIFIED BY NASA AND QUALITY ASSURANCE AND VERIFIED BY GOVERNMENT INSPECTION MANDATORY INSPECTION POINTS (MIPS).

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.