

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : SEPARATION MECHANISMS-PYRO FMEA NO P2-3A -U4 -2 REV:10/09/87

ASSEMBLY : UMBILICAL PLATE SEPARATION CRIT. FUNC: 1
 P/N RI : SKD26100099-201 CRIT. HDW: 1
 P/N VENDOR: VEHICLE 102 103 104
 QUANTITY : 6 EFFECTIVITY: X X X
 : THREE PER SIDE 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 REL *[Signature]* SSM *[Signature]* for T. GRAVES
 QE E. M. GUTIERREZ QE *[Signature]* 10-27-87

ITEM: UMBILICAL NUT-FRANGIBLE

FUNCTION: IN CONJUNCTION WITH BOLTS, STRUCTURALLY TIES TOGETHER THE ORBITER/EXTERNAL TANK (ET) UMBILICAL PLATES AT THE LH2 AND LO2 VALVE SEPARATION PLANE. NUT FRACTURES UPON RECEIVING A SHOCK OUTPUT FROM EITHER OR BOTH DETONATORS.

FAILURE MODE: PREMATURE FRACTURE, STRUCTURAL FAILURE

MODE(S): MATERIAL DEFECT, FATIGUE, EXCESSIVE LOAD/PRELOAD, IMPROPER ASSEMBLY, PREMATURE PYRO FIRING (CIL P2-3A-U1-2)

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

(A,B,C,D) POSSIBLE LOSS OF CREW/VEHICLE DUE TO ESCAPE OF FLUIDS AT 17 INCH VALVE JOINT RESULTING IN A POSSIBLE EXPLOSION.

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

) DESIGN DESIGN MARGIN EQUAL TO OR GREATER THAN 1.4. NUT IS INCONEL 718 FOR CORROSION PROTECTION. ULTIMATE TENSILE STRENGTH 190-200 KSI.

) TEST COMPONENT QUALIFICATION TESTS: SALT FOG, FOUR SAMPLES WERE SUBJECTED TO ULTIMATE LOAD - NO STRUCTURAL FAILURES ALLOWED. CERTIFICATION REQUIREMENTS (CR) 45-114-0018-0003; SKD26100099.

SYSTEM TESTS: 8 SYSTEM LEVEL TESTS OF ORBITER/ET UMBILICAL SEPARATION SYSTEM AT CRYOGENIC TEMPERATURE UNDER PRELOAD. CR-45-565330.

ACCEPTANCE TESTS: 100% HARDNESS, 100% PROOF TESTED TO LIMIT LOAD WITH NO HEAD OR WEB DEFORMATION, 100% DYE PENETRANT, LIMIT AND ULTIMATE LOAD (RANDOM SAMPLES). MATERIAL INTEGRITY VERIFIED BY TENSILE TEST COUPONS. CR-45-114-0018-0003, ATP 8277; SKD26100099.

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OMRSD: TURNAROUND TESTS INCLUDE - UMBILICAL NUT/STUD FIT, THREAD CHECK
THREAD DEFECT CHECK, PRELOAD VERIFICATION, POST TENSION VERIFICATION,
SPHERICAL WASHER VERIFICATION, AND VERIFICATION OF ALL PARTS OF SEPARATION
SYSTEM IN DEBRIS CONTAINERS. NEW HARDWARE INSTALLED EACH FLIGHT.

(C) 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

100% DIMENSIONAL INSPECTION OF WEB THICKNESS.

CRITICAL PROCESSES

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

STORAGE

STORAGE ENVIRONMENTS ARE MONITORED AND VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NONE.

(E) OPERATIONAL USE

NONE.