

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : SEPARATION MECHANISMS-MECH FMEA NO 02-3A -U7 -1 REV:10/09/87

ASSEMBLY : UMBILICAL SEPARATION SYSTEM CRIT. FUNC: 1R  
P/N RI : V072-565429 CRIT. HDW: 2  
: V072-565431  
QUANTITY : 6 VEHICLE 102 103 104  
: TWO -565429 PER UMB EFFECTIVITY: X X X  
: ONE -565431 PER UMB PHASE(S): PL LO X OO X DO X LS

PREPARED BY: REDUNDANCY SCREEN: A-PASS B-FAIL C-PASS  
DES R. H. YEE APPROVED BY: APPROVED BY (NASA):  
REL M. B. MOSKOWITZ REL *R.H. Yee for A.C. Ordway* SSM *[Signature]*  
QE E. M. GUTIERREZ REL *P.A. [Signature]* REL *[Signature]*  
QE *[Signature]* QE *[Signature]*

ITEM:  
SIDE RESTRAINT STRUT, UMBILICAL

FUNCTION:  
RESTRAIN AND DAMPENS ORBITER UMBILICAL PLATE IN X-Y PLANE AFTER ORBITER SEPARATION FROM EXTERNAL TANK (ET).

FAILURE MODE:  
PHYSICAL BINDING/JAMMING

CAUSE(S):  
ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, DEFECTIVE PART/MATERIAL OR MANUFACTURING DEFECT, TEMPERATURE, VIBRATION

EFFECT(S) ON:  
(A)SUBSYSTEM (B)INTERFACES (C)MISSION (D)CREW/VEHICLE  
(A,B,C,D) NO EFFECT DUE TO FAILURE OF SINGLE STRUT. IF ONE STRUT JAMS, THE OTHER TWO WILL COMPENSATE BY EXTENDED MOTION DURING UMBILICAL PLATE RETRACTION. POSSIBLE LOSS OF CREW/VEHICLE IF 2 STRUTS FAIL.

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

(A) DESIGN  
DESIGNED FOR RE-USE (100 MISSIONS); WASHER, SLEEVE, SHAFT, BARREL, HOUSING FABRICATED FROM A286 CRES; SPRING WASHERS FABRICATED FROM CHROME-VANADIUM STEEL; ROD END AND TURNBUCKLE FABRICATED FROM INCONEL 718; DRY FILM LUBE (LBO140-004) CLOSE-FITTING BARREL, HOUSING AND SLEEVE ARE BARRIERS TO INTERNAL CONTAMINATION FROM DEBRIS.

(B) TEST  
COMPONENT QUALIFICATION TESTS: SIMULATED 400 MISSION LIFE-CYCLE TESTING TO QUALIFY FOR 100 MISSION LIFE.

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SYSTEM QUALIFICATION TESTS: SYSTEM QUALIFIED AS PART OF THE ORBITER/ET UMBILICAL (MPS CLUSTER) SEPARATION SYSTEM CERTIFICATION/VERIFICATION TESTING PER CR-45-565330, TAR-STS-82-0146 AND TAR-STS-82-0508; 49 SIMULATED LH2/LO2 SEPARATIONS TESTS (LH2-SIDE, 23 TESTS TOTAL; LO2-SIDE, 26 TESTS TOTAL); INCLUDES CRYOGENIC CHILL-DOWN AND SOAK, UMBILICAL RETRACTION AND MOTION KINEMATICS, GN2 PURGE ATMOSPHERE, VIBRATION, STRUCTURAL LOADING; HIGH AND LOW SPEED DATA RATES. VIBRATION TESTING (FOR 42 MINUTES) IN EACH OF THREE MUTUALLY PERPENDICULAR AXES FOR 126 MINUTES - TOTAL. LH2 SEPARATION TEST SETUP: 1 AMBIENT TEMPERATURE TEST, 26 CRYOGENIC TEMPERATURE TESTS. LO2 SEPARATION TEST SETUP: 1 AMBIENT TEMPERATURE TEST AND 13 CRYOGENIC TEMPERATURE TESTS. THERMAL SIMULATION OF MPS DISCONNECT WITH LOAD-STROKE SEQUENCE (STRUT LOADS, DEFLECTION AND TEMPERATURE) PER CR-45-565429-0016 AND TAR-STS-81-0609.

ACCEPTANCE TESTS: ASSEMBLED, ADJUSTED PRELOAD, AND THEN LOADED AND STROKED (ALTERNATE COMPRESSION AND TENSION) 5 COMPLETE CYCLES TO DRAWING REQUIREMENTS V070-565249 AND V072-565431.

OMRSD: VISUALLY INSPECT AFTER EACH FLIGHT FOR SIGNS OF CHAFING, SCORING, CORROSION, WEAR, DISTORTION (OR BENT PARTS), LOOSENESS, CRACKS, BROKEN OR MISSING FASTENERS.

(C) INSPECTION

ASSEMBLY/INSTALLATION

MATERIAL ISSUED IS VERIFIED BY INSPECTION ON MANUFACTURING ORDERS. MACHINE TOLERANCES ARE PER DRAWING AND APPLICABLE SPECIFICATION AND ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION IS REQUIRED AND VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGED AND PROTECTED PER APPLICABLE SPECIFICATION AND VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NONE.

(E) OPERATIONAL USE

NONE.