

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : SEPARATION MECHANISMS-MECH FMEA NO 02-3A -US -2 REV:10/09/87

ASSEMBLY : UMBILICAL SEPARATION SYSTEM  
P/N RI : V070-565335 (LH2 SIDE) CRIT. FUNC: 1  
: V070-565330 (LO2 SIDE) CRIT. HDW: 1-  
QUANTITY : 2 VEHICLE 102 103 104  
EFFECTIVITY: X X X  
PHASE(S): PL LO X OO DO LS

PREPARED BY: DES F. M. WILLIAMS  
REL M. B. MOSKOWITZ  
QE E. M. GUTIERREZ

REDUNDANCY SCREEN: A- B- C-  
APPROVED BY: DES F.M. Williams APPROVED BY (NASA):  
REL M.B. Moskowitz SSM  
QE E.M. Gutierrez REL J.G. [Signature]  
10/17/87 10-23-87

ITEM:

ELECTRICAL DISCONNECT ASSEMBLY, UMBILICAL

FUNCTION:

MAINTAIN MECHANICAL CONNECTION AND ALIGNMENT OF ELECTRICAL CONNECTORS PRIOR TO ORBITER/EXTERNAL TANK (ET) SEPARATION. COMPENSATE FOR RADIAL CONTRACTION OF ET WHICH WOULD TEND TO DISENGAGE PINS. DURING UMBILICAL PLATE SEPARATION, ASSURE A STRAIGHT PULL ON THE ELECTRICAL PINS SUCH THAT NO SIDE LOAD BINDING OCCURS.

FAILURE MODE:

PHYSICAL BINDING/JAMMING

CAUSE(S):

ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, FAILURE/DEFLECTION OF INTERNAL PART, LOSS OF LUBRICANT, TEMPERATURE

EFFECT(S) ON:

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

(A,B,C,D) JAMMING OF DISCONNECT WOULD INTERFERE WITH ET SEPARATION RESULTING IN POSSIBLE RECONTACT AND DAMAGE TO ORBITER. POSSIBLE LOSS OF CREW/VEHICLE.

DISPOSITION & RATIONALE:

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

(A) DESIGN

CONTOURED/LUBRICATED (VITRO-LUBE 1220) SHAFT ON ET MONOBALL PLATE ALIGNS WITH HOLE IN ORBITER MONOBALL PLATE TO PREVENT SIDE LOAD IN CONNECTORS. THREE HYDRAULIC RETRACTORS SEPARATE ORBITER UMBILICAL PLATE FROM ET UMBILICAL PLATE PRIOR TO ORBITER/ET STRUCTURAL SEPARATION. MAXIMUM DISCONNECT FORCE FOR 12 CONNECTORS IN DEVELOPMENT TEST WAS 300 LB. UPPER AND LOWER SEALS ON ORBITER MONOBALL PREVENT ENTRY OF CONTAMINATION/DEBRIS AT INTERFACE. FLOAT OF ORBITER MONOBALL AND GIMBALING OF ORBITER AND ET MONOBALLS ENSURES ALIGNMENT OF MATING CONNECTORS.

(B) TEST

QUALIFICATION TESTS: DOWNEY PRE-QUALIFICATION DEVELOPMENT TESTS OF ORBITER/ET ELECTRIC DISCONNECT INCLUDED LOW TEMPERATURE SEPARATIONS WITH ET MONOBALL FIXED FREE TO ROTATE.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : SEPARATION MECHANISMS-MECH FMEA NO 02-3A -U8 -2 REV:10/09/87

SYSTEM QUALIFICATION TESTS: SYSTEM QUALIFICATION TESTS OF LO2 AND LH2 ORBITER/ET UMBILICAL PLATES INCLUDED ORBITER/ET ELECTRICAL DISCONNECT MONOBALLS. LO2 UMBILICAL TESTS INCLUDED 25 SEPARATIONS AT CRYOGENIC TEMPERATURE, WITH SIMULATED RETRACTOR FAILURE ON 11 TESTS. LH2 UMBILICAL TESTS INCLUDED VIBRATION TESTS IN THREE AXES AND 25 SEPARATIONS AT CRYOGENIC TEMPERATURE WITH SIMULATED RETRACTOR FAILURE ON 11 TESTS. MAXIMUM ALLOWABLE LOAD FOR MONOBALL GUIDE PEG EXTRACTION WAS 500 LB. MEASURED LOADS WERE 88 LB AND 85 LB WITH SIMULATED RETRACTOR FAILURE. REFERENCE TEST REPORTS STS 82-0805 AND LTR 22212-3101.

OMRSD: DISCONNECT MATING PROCEDURES PER MLC308-0056 INCLUDE VERIFICATION OF TURNBUCKLE ADJUSTMENT FOR 100 LB ENGAGEMENT FORCE PER CONNECTOR. DISCONNECT MONOBALL ON ORBITER SIDE IS INSPECTED FOR DAMAGE AFTER EACH FLIGHT.

(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 ON DETAIL PARTS AND VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGED AND PROTECTED PER APPLICABLE SPECIFICATION AND VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NONE.

(E) OPERATIONAL USE

NONE.