

ATTACHMENT
S 40200V Pg 17 of 45

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : SEPARATION MECHANISMS-MECH FMEA NO 02-3A -08 -1 REV:10/09/87

ASSEMBLY : UMBILICAL SEPARATION SYSTEM
P/N RI : V070-565335 (LE2 SIDE)
: V070-565330 (LO2 SIDE)
QUANTITY : 2

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

CRIT. FUNC: 1
CRIT. HDW: 1

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

REDUNDANCY SCREEN: A- B- C-
APPROVED BY: APPROVED BY (NASA):
DES *[Signature]* SSM *[Signature]*
REL *[Signature]* REL *[Signature]*
QE *[Signature]* QE *[Signature]*

ITEM:

ELECTRICAL DISCONNECT ASSEMBLY, UMBILICAL

FUNCTION:

MAINTAIN MECHANICAL CONNECTION AND ALIGNMENT OF ELECTRICAL CONNECTORS PRIOR TO ORBITER/ET SEPARATION. COMPENSATE FOR RADIAL CONTRACTION OF EXTERNAL TANK (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:

STRUCTURAL FAILURE

CAUSE(S):

EXCESSIVE LOAD, FAILURE/DEFLECTION OF PARTS, FATIGUE, VIBRATION

EFFECT(S) ON:

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

(A) NO EFFECT.

(B,C,D) FAILURE OF A SINGLE TURNBUCKLE OR SUPPORT BRACKET MAY RESULT IN THE LOSS OF ESSENTIAL ELECTRICAL SIGNALS BETWEEN ORBITER AND ET. POSSIBLE LOSS OF CREW/VEHICLE DUE TO PARTIAL LOSS OF ELECTRICAL CONTINUITY.

DISPOSITION & RATIONALE:

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

(A) DESIGN

ELECTRICAL CONNECTORS ARE MOUNTED IN MONOBALL PLATES IN ORBITER AND ET TO PREVENT TRANSFER OF LOADS THROUGH CONNECTORS. ORBITER MONOBALL FLOATS AND GIMBALS. EACH CONNECTOR ON ORBITER SIDE HAS 100 LB PRELOAD SPRING TO ENSURE PIN/SOCKET ENGAGEMENT AND COMPENSATE FOR ET RADIAL CONTRACTION. MONOBALL MATERIAL IS A286 STEEL. MONOBALL DESIGNED FOR 100 MISSION LIFE. FACTOR OF SAFETY 1.4 WITH POSITIVE MARGINS FOR ALL COMPONENTS. DESIGN STRESS ANALYSIS REPORT SD77-SH-0175.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

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

(B) TEST

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

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. REFERENCE TEST REPORTS STS 82-0805 AND LTR 22212-3101.

OMRSD: ORBITER/ET ELECTRICAL DISCONNECT MATING PROCEDURES PER ML0308-0056 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 AND VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGED AND PROTECTED PER APPLICABLE SPECIFICATION AND VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NONE.

(E) OPERATIONAL USE

NONE.