CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	External Tank Carrier Assembly	PHASE(S):	a
REV & DATE:	J, 12-19-97	HAZARD REF:	S.11
DCN & DATE:	004, 6-30-99		
ANALYSTS:	E. Flauss/H. Claybrook		

FAILURE MODE: Failure to Provide Structural Support for GUCA

FAILURE EFFECT: a) Loss of mission and vehicle/crew due to leakage of GH2 resulting in fire/explosion.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S):
- A: Structural Failure of Plate
- B: Structural Failure of Support Hardware
- C: Fracture of Key Lock Insert
- D: Disengagement of Key Lock Insert

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Supporting hardware for attaching ground umbilical carrier plate to ET.

FMEA ITEM CODE(S)	PART NO.	PART NAME	QTY	EFFECTIVITY
2.15:1.1	80913000460-039	Panel 6 Assy (Intertank Umbilical Support Plate)	1	LWT-54 thru 73
	-049		1	LWT-74 thru 88
	-409		1	LWT-89 thru 113
	-410		1	LWT-114 & Up

REMARKS:

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	External Tank Carrier Assembly	DCN & DATE:	
FMEA ITEM CODE(S):	2.15.1.1		

RATIONALE FOR RETENTION

DESIGN:

A: The ET Intertank Umbilical Support is a structural plate located on the Intertank (Panel 6) that provides support for the ET Carrier Assembly (ETCA) and the interfacing Ground Umbilical Carrier Assembly (GUCA). The carrier plate is machined from 2219 aluminum alloy plate, penetrant inspected and has two integral longitudinal channel sections and two transverse L-shaped sections constituting the peripheral edges. It is mechanically fastened to the intertank skin panel by four flanges, with an external skin doubler reinforcement. The support plate was designed to the required yield (1.1) and ultimate (1.25 for well defined loads and 1.4 for other loads) safety factors (ET Stress Report 826-2188). Material selected in accordance with MMC-ET-SE16 and controlled per MMMA Approved Product Assurance Plan assures conformance of composition, material compatibility and properties.

B: The umbilical hinge brackets serve as a structural pivotal support to facilitate ground umbilical carrier assembly mate and demate. The brackets are attached to the Intertank wall using two 1/4 inch attachment pins for each bracket. The total weight of the GUCA is supported by a 1/2 inch support pin on each bracket. The brackets are machined from 7075 aluminum and penetrant inspected. The support and attachment pins are fabricated from A286 and are both cadmium plated to preclude corrosion. Cadmium plate application is specified by QQ-P-416, Type II, Class 3. The brackets and pins are designed to the required yield (1.1) and ultimate (1.4) safety factors (ET Stress Report 826-2188).

C: The key lock insert is installed in a tapped hole in the external tank carrier plate and provides for attachment of the pyro separator bolt. The insert and pyro separator bolt are subjected to a preload of 5450 lbs when supporting the weight of the facility umbilical line, its retract line and disconnect pressure loads. Procurement of inserts is governed by material, fabrication, processing and inspection specifications per MMC Standard 34L2. The inserts are fabricated from 304 CRES (body) and 302 CRES (key locks) and are cadmium plated. Cadmium plate application is specified by QQ-P-416, Type II, Class 3. Zinc chromate is applied to external threads to prevent corrosion between the insert and carrier plate. Inserts are designed to meet the required yield (1.1) and ultimate (1.25) safety factors (ET Stress Report 826-2188).

D: The inserts have self locking internal threads to preclude separator bolt detachment and a locking feature on the external threads to prevent disengagement of the insert. Inserts were selected from the Approved Standard Parts List (ASPL 826-3500) and installed per STP2024 using location dimensions specified on engineering drawings.

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SUBSYSTEM:	External Tank Carrier Assembly	DCN & DATE:	005, 6-30-00
FMEA ITEM CODE(S):	2.15.1.1		

RATIONALE FOR RETENTION

TEST:

The Panel 6 Assy (Intertank Umbilical Support Plate) is certified. Reference HCS MMC-ET-TM08-L-P003.

Qualification:

The Intertank Umbilical Support is an Intertank component providing for installation of the ETCA and the support for the GUCA. During qualification of the GUCA, the test configuration included the support plate for the SWT. The LWT configuration was qualified by analysis, similarity and SWT testing.

Testing of one Ground Umbilical Carrier Assembly (GUCA) and External Tank Carrier Assembly (ETCA) included 15 life cycle separations at cryogenic temperature using pyro separator bolts. In addition, the carrier assemblies were separated two times at cryogenic temperatures using lanyard separation. There was no evidence of structural damage (MMC-ET-RA09-48).

The ET umbilical and intertank access arm system qualification testing was conducted at the Launch Equipment Test Facility (LETF) at KSC. The objectives were to verify the KSC ground system hardware design and to perform integrated testing with the ETCA. Testing was conducted in a series of 13 tracking tests and 17 disconnect tests simulating various vehicle configurations with motions for anticipated environmental, test, and launch conditions from predicted worst-case vehicle stacking and on-pad positioning offsets including 2.75 seconds of simulated engine firing. Test results and data analysis verified that the KSC design/hardware is satisfactory, and when integrated with the MSFC flight umbilical, the system meets all of the specified requirements and is qualified for Space Shuttle operations at launch sites (KSC-DD-119-TR).

INSPECTION:

Lockheed Martin Procurement Quality Representative:

A-C: Verify materials selection and verification controls (MMC-ET-SE16, drawings 80913000443, 80913000445, Standard drawings 22L2, 25L1, 34L2 and MS24665).

D: Verify installation (drawing 80913000460) for LWT-54 thru 113

MAF Quality Inspection:

A-C: Inspect ETCA for no damage (Shakedown log 80901000SCL).

D: Verify installation (drawing 80913000460) for LWT-114 & Up

Launch Site:

C, D: Verify installation and witness torque (drawings 82629021109).

FAILURE HISTORY:

Current data on test failures, unexplained anomalies and other failures experienced during ground processing activity can be found in the PRACA data base.