CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	Ground Umbilical Carrier Assembly	PHASE(S):	a
REV & DATE:	J, 12-19-97	HAZARD REF:	S.06
DCN & DATE:	005, 6-30-00		
ANALYSTS:	J. Attar/H. Claybrook		

FAILURE MODE: Leakage

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

TIME TO EFFECT: Seconds

FAILURE CAUSE(S):
A: Structural Failure of Disconnect Component
B: Seal Leakage
C: Mating Surface Defects

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Interface hardware to provide GH2 venting capability and separation at lift-off.

FMEA ITEM CODE(S)	PART NO.	PART NAME	QTY	EFFECTIVITY
2.14.7.3	PD4800173-029	GH2 Vent Disconnect	1	LWT-54 thru 114
	82629021020-009		1	LWT-115 & Up

REMARKS:

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	Ground Umbilical Carrier Assembly	DCN & DATE:	005, 6-30-00
FMEA ITEM CODE(S):	2.14.7.3		

RATIONALE FOR RETENTION

DESIGN:

A: The GH2 vent disconnect is installed in the ground umbilical carrier plate. The spring loaded check valve poppet is mechanically retracted prior to mate with the ET carrier assembly. After mate, the poppet is retained in the open position by the mechanical stop in the flight half disconnect housing. The check valve closes at separation (T-0). The mated disconnect is designed to operate with internal pressures ranging from zero to 37 psig, and to withstand proof pressure of 56 psig and burst pressure of 74 psig without rupture. The disconnect has been designed to meet the required yield (2.0) and ultimate (4.0) safety factors (ET Stress Report 826-2188 and Lear Siegler Report TR2105) and other operating and nonoperating requirements specified by PD4800173. The disconnect is fabricated from A356-T61 or A356-T6 aluminum alloy and penetrant inspected. Material was selected in accordance with MMC-ET-SE16 to assure conformance of composition, material compatibility and properties.

B, C: The poppet seal is manufactured and machined from teflon (FEP, 100 percent virgin material). The flange seal and body seal are manufactured from Kel-F 81, grade 6061 TEC. Seal mating surface flatness and finish are specified on engineering drawings to assure performance within the capability of the seal.

TEST:

The ET Vent Disconnect (groundside) is qualified as a subassembly to the total vent disconnect assembly. Reference COQ MMC-ET-TM06-027.

Development: Testing of a disconnect assembly (ground and flight sides) included alignment, mating and sealing force, proof pressure, leakage, (at ambient and cryogenic), for acceptance; misalignment, mating and sealing force, leakage (at ambient and cryogenic), bonding test, alignment, and burst pressure. There was no evidence of structural failure or leakage (Lear Siegler Inc. TR-2161).

Qualification: Testing of two disconnect assemblies (ground and flight sides) include alignment, initial and final mating and sealing force, proof pressure, leakage (at ambient and cryogenic), and cracking cycle for acceptance; proof pressure, bonding, leakage, random vibration, static and dynamic load, 100 operating life cycles (50 at ambient and 50 at cryogenic) and burst pressures. There was no evidence of structural failure or leakage (MMC-ET-RA09-32).

System Qualification: 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).

Acceptance:

Vendor - (Disconnect Assembly):

B, C: Perform test fixture alignment, initial and final mating and sealing force (Lear Siegler, TP-995 for LWT-54 thru 114: Ketema, 8-840822 for LWT-115 & Up).

A: Perform proof pressure test (Lear Siegler, TP-995 for LWT-54 thru 114: Ketema, 8-840822 for LWT-115 & Up).

B, C: Perform two leakage tests at ambient and cryogenic respectively (Lear Siegler, TP-995 for LWT-54 thru 114: Ketema, 8-840822 for LWT-115 & Up).

A-C: Perform functional tests (Lear Siegler, TP-995 for LWT-54 thru 114: Ketema, 8-840822 for LWT-115 & Up).

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SUBSYSTEM:	Ground Umbilical Carrier Assembly	DCN & DATE:	005, 6-30-00
FMEA ITEM CODE(S):	2.14.7.3		

RATIONALE FOR RETENTION

TEST: (cont)

Vendor - (Ground Side):

A: Perform proof pressure test (Lear Siegler, TP-995 for LWT-54 thru 114: Ketema, 8-840822 for LWT-115 & Up).

B, C: Perform two leakage tests at ambient and cryogenic respectively (Lear Siegler, TP-995 for LWT-54 thru 114: Ketema, 8-840822 for LWT-115 & Up).

A-C: Perform two functional tests (Lear Siegler, TP-995 for LWT-54 thru 114: Ketema, 8-840822 for LWT-115 & Up).

Launch Site:

B, C: Perform leakage test (OMRSD File IV).

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

A, B: Verify material selection and verification controls (MMC-ET-SE16 and drawings RG42513, RR42396, RD42503, Lear Siegler for LWT-54 thru 114), (MMC-ET-SE16 and drawings 82629021019, 82629021023, 82629021028, 82629021030, 82629021031 for LWT-115 & Up).

B: Inspect (visually) seal surface for freedom of nicks, radial scratches or other imperfections during installation (drawing RR42690, Lear Siegler for LWT-54 thru 114) and 82629021020 for LWT-115 & Up.

B, C: Witness assembly and torque (drawing RR 42690, Lear Siegler for LWT-54 thru 114) and 82629021020 for LWT-115 & Up.

C: Inspect (visually) mating surface for freedom of nicks, radial scratches or other imperfections during installation (drawing RR42690, Lear Siegler for LWT-54 thru 114) and 82629021020 for LWT-115 & Up.

Lockheed Martin Procurement Quality Representative:

A: Witness proof pressure, leakage and functional test (TP-995, Lear Siegler for LWT-54 thru 114: Ketema, 8-840822 for LWT-115 & Up).

Launch Site:

A-C: Witness leakage test (OMI T6148).

A, C: Inspect for freedom of damage during refurbish (OMI T6148).

A, C: Witness installation of GUCA (drawing 82629021109).

B, C: Witness leakage test (OMRSD File IV).

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.