SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LO2 Propellant Feed	PHASE(S):	a, b, c
REV & DATE:	J, 12-19-97	HAZARD REF:	P.06, P.07, P.09, S.07
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
b) Loss of mission and vehicle/crew due to fire/explosion
Loss of mission due to premature engine shutdown
c) Loss of mission and vehicle/crew due to ET/Orbiter collision
(Results only from Failure Cause A)
Loss of life due to ET impact outside designated footprint

TIME TO EFFECT: Seconds

FAILURE CAUSE(S):
A: Structural Failure of Hardline Component
B: Flange Mating Surface Defects

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: These straight LO2 feedline sections transport LO2 between the forward elbow and the aft flex assembly.

FMEA ITEM CODE(S)	PART NO.	PART NAME	QTY	EFFECTIVITY
2.1.8.1	80921011900-009	LO2 Fdl, Fwd Straight	1	LWT-54 thru 67
	80921011956-009		1	LWT-68 thru 112
	-020		1	LWT-113 & Up
2.1.9.1	80921011900-010	LO2 Fdl, Mid-Fwd Straight	1	LWT-54 thru 67
	80921011956-010		1	LWT-68 thru 112
	-029		1	LWT-113 & Up
2.1.10.1	80921011900-010	LO2 Fdl, Mid-Aft Straight	1	LWT-54 thru 67
	80921011956-010		1	LWT-68 thru 112
	-029		1	LWT-113 & Up
2.1.11.1	80921011900-020	LO2 Fdl, Aft Straight	1	LWT-54 thru 67
	80921011956-019		1	LWT-68 THRU 112
	-030		1	LWT-113 & Up

REMARKS: These items are grouped as the failure mode, causes and effects are the same.

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	LO2 Propellant Feed	DCN & DATE:	
FMEA ITEM CODE(S):	2.1.8.1, 2.1.9.1, 2.1.10.1, 2.1.11.1		

RATIONALE FOR RETENTION

DESIGN:

A: The 17 inch diameter straight line assemblies consist of machined flanges and straight tube section. Lugs built into the forward end of the assemblies provide attachment provisions for a pivotal support on the LH2 tank to allow limited axial movement of the line assembly and compensate for relative motion during loading and boost. The lines are an all welded configuration fabricated from aluminum 2219 alloy. Emphasis has been placed on joint geometry to enhance weld integrity. The lines have been designed to the required ultimate safety factors (1.4 for loads and 1.5 for pressure only) and the required yield safety factors (1.1 for loads and 1.25 for pressure only) (ET Stress Report 826-2188). Material selected in accordance with MMC-ET-SE16 and controlled per MMMA Approved Vendor Product Assurance Plan assures conformance of composition, material compatibility and properties.

B: Mating surface flatness, waviness and finish are specified on engineering drawings to assure performance within the capability of the seal.

TEST:

The Straight Feedline Assemblies are qualified. Reference COQ MMC-ET-TM06-089.

Qualification: Testing of a straight line assembly included proof load/operating pressure and leakage test for acceptance, operating life test, ten thermal and load cycles, and an ultimate load test of 80,200 lb axial load at 313 psig, performed at ambient temperature. There was no evidence of damage or permanent deformation. Straight line assemblies were qualified by similarity, analysis and the above test (MMC-3522-80-128, MMC-3542-80-003, AETL 5310-3221).

MPIA Firings/Tankings: The LO2 straight feedline assemblies have accumulated 62.5 minutes of firing time 27 cryogenic cycles, and 42 pressurization cycles. There was no evidence of structural failures resulting from these exposures.

Acceptance:

Vendor - (Line Assembly):

A, B: Perform proof load/pressure and leakage rate tests (ATP 068, Sargent Airite for LWT-54 thru 67).

MAF - (Line Assembly):

A, B: Perform proof load/pressure and leakage rate tests (drawing 80921011956 and TM04k for LWT-68 & Up).

B: Perform seal leakage tests on joints after installation (MMC-ET-TM04k).

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	LO2 Propellant Feed	DCN & DATE:	
FMEA ITEM CODE(S):	2.1.8.1, 2.1.9.1, 2.1.10.1, 2.1.11.1		

RATIONALE FOR RETENTION

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

A: Verify materials selection and verification controls (MMC-ET-SE16 and drawings 80921011901 and 80921011902 for LWT-54 thru 67).

A: Inspect welding (P1005W, Sargent Airite for LWT-54 thru 67).

A: Penetrant inspect welding (P1005I2, Sargent Airite for LWT-54 thru 67).

A: Verify x-ray results (P1005I, Sargent Airite for LWT-54 thru 67).

B: Inspect mating surface flatness, finish and dimensions (drawing 80921011901 for LWT-54 thru 67).

Lockheed Martin Procurement Quality Representative:

A, B: Witness proof load/pressure and leakage tests (ATP PTP-068, Sargent Airite for LWT-54 thru 67).

MAF Quality Inspection:

A, B: Witness proof load/pressure and leakage tests (drawing 80921011956 and TM04k for LWT-68 & Up).

A: Verify materials selection and verification controls (MMC-ET-SE16 and drawings 80921011957 and 80921011958 for LWT-68 & Up).

A: Inspect welding (drawing 80921011956 for LWT-68 & Up).

A: Penetrant inspect welding (drawing 80921011956 for LWT-68 & Up).

A: Verify x-ray results (drawing 80921011956 for LWT-68 & Up)

B: Inspect mating surface finish and dimensions (drawing 80921011957 for LWT-68 & Up).

B: Inspect mating surface flatness, finish and dimensions (drawing 80921011956 for LWT-68 & Up).

B: Inspect sealing surfaces for freedom of nicks, radial scratches or other imperfections (acceptance drawing 82620000001).

B: Verify installation (drawing 80921011009).

B: Witness seal flange leakage test (MMC-ET-TM04k).

Launch Site:

A, B: Visually monitor LO2 feedline system for no leakage (OMRSD File II).

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.