SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	GO2 Pressurization	PHASE(S):	a, b, c
REV & DATE:	J, 12-19-97	HAZARD REF:	P.06, P.07, P.09, P.10, S.03, S.07
DCN & DATE:			
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 or LO2 tank structural failure.
c) 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: Transports GHe/GO2 during prelaunch and GO2 during ascent to maintain LO2 tank ullage pressure requirements.

FMEA ITEM CODE(S)	PART NO.	PART NAME	QTY	EFFECTIVITY
2.2.2.1	PD4800180-010	Upper Line Assy (Curved)	1	LWT-54 & Up

REMARKS:

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	GO2 Pressurization	DCN & DATE:	
FMEA ITEM CODE(S):	2.2.2.1		

RATIONALE FOR RETENTION

DESIGN:

A: The Upper Line Assembly (curved) consists of fixed flanges and a tube bend section. The line assembly is an all welded configuration fabricated from Inconel 718 and Armco 21-6-9 CRES. Emphasis has been placed on joint geometry to enhance weld integrity. The line assembly has been designed to meet the required ultimate safety factors (1.4 for loads and 1.5 for pressure) and the required yield safety factors (1.1 for loads and 1.25 for pressure) (ET Stress Report 826-2188 and ET10-SR-0001-1, Arrowhead). The line assembly also meets the other operating and nonoperating requirements specified per P04800180. 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. Fusion and seam welding specifications, processes and quality controls are in accordance with MPS-MPQ-103 (Arrowhead).

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

TEST:

The Upper Line Assembly is qualified. Reference COQ MMC-ET-TM06-022.

Qualification: Testing of one line assembly (similar flange to tube weld configuration) included proof load (16,165 lb at 972 psig), ultimate load (19,200 lb at 1000 psig) and three sliding mount support tests (120 psig and side loads of 750 lb, 1050 and 1500 lb). The line assembly did not exhibit any evidence of damage or permanent deformation, (MMC-ET-RA09-79). The Upper Line Assembly was qualified by similarity, analysis, and the above test.

MPTA Firings/Tankings: The upper line assembly has accumulated 62.5 minutes of firing time, 27 cryogenic cycles, and 42 pressurization cycles. There was no evidence of structural damage.

Acceptance:

Vendor - (Line Assembly):

A: Perform proof loads/operating pressure and leakage rate tests. (ATP 180-310 Arrowhead).

MAF - (Line Assembly):

B: Perform dual seal leakage rate test for flange joints after installation. (MMC-ET-TM04k).

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	GO2 Pressurization	DCN & DATE:	
FMEA ITEM CODE(S):	2.2.2.1		

RATIONALE FOR RETENTION

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

A: Verify materials selection and verification controls (MMC-ET-SE16 and drawings 14180-81, 14180-3 and 14180-39 Arrowhead).

A: Inspect welding (MPS-MPO-103, Arrowhead).

A: Witness penetrant inspection (MIL-I-6866, Type I, Method A, Sensitivity Group VI).

A: Verify x-ray results (QCI-16-057, Arrowhead).

B: Inspect mating surface flatness, finish and dimensions (drawings 14180-81, and 14180-3, Arrowhead).

Lockheed Martin Procurement Quality Representative:

A, B: Witness proof loads/operating pressure and leakage tests (ATP 180-310, Arrowhead).

MAF Quality Inspection:

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

B: Verify installation (drawing 80921021009).

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

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.