SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LH2 Propellant Feed	PHASE(S):	a, b
REV & DATE:	J, 12-19-97	HAZARD REF:	P.06, P.07, S. 11
DCN & DATE:	002, 2-28-99		
ANALYSTS:	J. Kuttruff/H. Claybrook		

FAILURE MODE: Leakage

FAILURE EFFECT:
a) Loss of mission and vehicle/crew due to clogging of Orbiter feedline screens, inadequate LH2 supply to engines during start and uncontrolled SSME shutdown.
b) Loss of mission and vehicle/crew due to gas ingestion in LH2 feed, clogging/rupture of Orbiter feedline screens and uncontrolled SSME shutdown.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S):
A: Structural Failure of Hardline Component
B: Flange Mating Surface Defects
C: Fracture of One Flange Bolt (Reference CIL No. 2.5.5.1)

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Transports LH2 from the feedline inlet near the base of the LH2 tank aft dome to the internal LH2 feedline bellows.

FMEA ITEM CODE(S)	PART NO.	PART NAME	QTY	EFFECTIVITY
2.5.6.1	80924901909-009 -500	LH2 Internal Feedline, Welded Assy (Siphon)	1 1	LWT-54 thru 88, 600 & Up LWT-89 thru 599

REMARKS:

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	LH2 Propellant Feed	DCN & DATE:	
FMEA ITEM CODE(S):	2.5.6.1		

RATIONALE FOR RETENTION

DESIGN:

The 17 inch diameter LH2 feedline siphon design consists of a straight tube section, elbow, siphon inlet; fixed flange configuration and support frame. The screen segments are attached to the support frame in the siphon inlet.

The LH2 siphon inlet position and its distance above the tank bottom is established and maintained by mechanical attachment on the tank aft dome.

A: The siphon assembly is fabricated from 2219 aluminum and is an all welded configuration. Emphasis has been placed on joint geometry to enhance weld integrity. Materials were selected in accordance with MMC-ET-SE16 which assumes repetitive conformance of composition and properties. Fusion welding is specified and is controlled by MSFC-SPEC-504 Class I for butt welds and Class II for fillet welds. The assembly has been designed to meet the required ultimate (1.4) and yield (1.1) safety factors (EI Stress Report 826-2188) and other operating and nonoperating requirements specified per 80924901918.

B: Ring and fixed flange dimensions and mating surface flatness, waviness and finish are specified which ensures flange contact and sealing performance.

TEST:

The siphon assembly is qualified. Reference COQ MMC-ET-TN06-109.

Qualification : One siphon assembly of flight configuration was fabricated and subjected to testing that included leakage, baffle ring support structural test, 5 thermal operating life cycles - 320°F (atmospheric pressure) to 120°F (7 psig). The siphon was then configured into the complete anti-vortex assembly and subjected to sine and random vibration testing. There was no evidence of leakage. The baffles were removed and the siphon only was subjected to limit load, and ultimate load testing. No damage, or permanent deformation was noted. Penetrant inspection showed no evidence of cracks (MMC-ET-RA09-106).

INSPECTION

Vendor Inspection - Lockheed Martin Surveillance:

A: Verify materials selection and verification controls (MMC-ET-SE16; drawing 80924901909 for LWT-54 thru 73).

A: Inspect welding (drawing 80924901909 for LWT-54 thru 73).

A: Penetrant inspect welding (drawing 80924901909 for LWT-54 thru 73).

B: Inspect flange mating surface waviness, finish and dimensions (drawing 80924901912 for LWT-54 thru 73).

Lockheed Martin Procurement Quality Representative:

A: Verify X ray results (drawing 80924901909 for LWT-54 thru 73).

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	LH2 Propellant Feed	DCN & DATE:	002, 2-26-99
FMEA ITEM CODE(S):	2.5.6.1		

RATIONALE FOR RETENTION

INSPECTION: (cont)

M&F Inspection:

A: Verify materials selection and verification controls (MMC-ET-SE16 and drawing 80924901909 for LWT-74 & Up).

A: Inspect welding (drawings 80924901909, 80924901911, and 80924901912 for LWT-74 & Up).

A: Penetrant inspect welding (drawings 80924901909, 80924901911, and 80924901912 for LWT-74 & Up).

B: Inspect flange mating surface waviness, finish and dimensions (drawing 80924901912 for LWT-74 & Up).

A: Verify X-ray results (drawing 80924901909 for LWT-74 & Up).

M&F Quality Inspection:

C: Verify installation and witness torque (drawing 80924901916).

A: Inspect for freedom of damage during post installation shakedown (MPP 80904000SCL for LWT-54 thru 68, 80924011901 for LWT-69 thru 88, 600 & Up and 80924901919 for LWT-89 thru 599).

B: Inspect sealing surfaces for freedom of nicks and radial scratches (Acceptance drawing 82620000001).

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.