

CRITICAL ITEMS LIST (CIL)

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|-------------|--------------------------|------------------|---------------------|
| SYSTEM: | Propulsion/Mechanical | FUNCTIONAL CRIT: | 1 |
| SUBSYSTEM: | LH2 Propellant Feed | PHASE(S): | a, b |
| REV & DATE: | J, 12-19-97 | HAZARD REF: | P.03, P.06, S.11 |
| DCN & DATE: | | | |
| ANALYSTS: | J. Kuttruff/H. Claybrook | | |

FAILURE MODE: Fails to Provide Pivotal Support

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 Support Hardware
B: Bearing Seizure
C: Fracture of Attachment Hardware

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Provides structural support for the internal LH2 feedline. It attaches to lugs with spherical bearings at the flange where it mates with the siphon. Tank support is from the 2058 frame structure.

| <u>FMEA ITEM CODE(S)</u> | <u>PART NO.</u> | <u>PART NAME</u> | <u>QTY</u> | <u>EFFECTIVITY</u> |
|--------------------------|-----------------|-------------------------|------------|--------------------|
| 2.5.9.1 | 80914901996-009 | Brace Assembly Internal | 1 | LWT-54 & Up |

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical
SUBSYSTEM: LH2 Propellant Feed
FMEA ITEM CODE(S): 2.5.9.1

REV & DATE: J, 12-19-97
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RATIONALE FOR RETENTION

DESIGN:

The fitting supports the LH2 feedline from the ring frame at station 2058. Swiveling is provided by use of spherical bearings which allow for fabrication misalignments and relative motions between the 2058 ring frame and the bottom of the LH2 dome. The overall support assembly is designed to the required yield (1.1) and ultimate (1.4) safety factors (ET Stress Report 826-2188). Material selected in accordance with MMC-ET-SE16 assures repetitive conformance of composition and properties.

- A: The fittings are machined from 2219-T81 plate stock and incorporate swivel attachments to the feedline and to the ring frame. The fitting material is ultrasonically inspected prior to machining and penetrant inspected after machining.
- B: Spherical bearings used in this support system are of the self aligning type and approved for use in an LH2 environment. They are constructed of A-286 steel races and Inconel balls, and are lubricated to prevent galling.
- C: Attachment hardware was selected from the Approved Standard Parts List (ASPL 826-3500), installed per STP2014 and torqued using values specified on Engineering drawings.

TEST:

The Brace Assembly is certified. Reference HCS MMC-ET-TM08-L-P005.

Qualification - ET: The pivotal support was subjected to sine and random vibration testing with the LH2 siphon assembly. Inspection showed no structural damage or bearing seizure (MMC-ET-RA09-5).

MPTA Firings/Tankings: The MPTA pivotal support has accumulated 62.5 minutes of firing time, 26 cryogenic cycles and 42 pressurization cycles. No visual defects were noted during tank entries, the last of which was after SF-12.

Vendor:

- C: Attachment hardware are procured and tested to Standard drawings 25L1, 26L3, and 26L4.

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

- A: Penetrant inspect after machining (drawings 80914901996, 80914901946 and Standard drawing 36L10).
- A, C: Verify materials selection and verification controls (MMC-ET-SE16 and Standard drawings 36L10, 26L3, 26L4 and 25L1).
- B: Inspect conformance to dimensions, lubricant, radial clearance and misalignment (Standard drawing 36L10).
- B: Verify freedom of contamination (Standard drawing 36L10).

MAF Quality Inspection:

- B: Inspect bearing for freedom of binding prior to and during installation (drawing 80914901989).
- C: Verify installation (drawing 80914901989).
- C: Inspect installation of cotter pins (drawing 80924901916).

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.