

CRITICAL ITEMS LIST (CIL)

SYSTEM: Propulsion/Mechanical
 SUBSYSTEM: GH2 Vent/Relief
 REV & DATE: J, 12-19-97
 DCN & DATE:
 ANALYSTS: J. Attar/H. Claybrook

FUNCTIONAL CRIT: 1R
 PHASE(S): b, c
 HAZARD REF: P.01

FAILURE MODE: Blockage

FAILURE EFFECT: b) Loss of mission and vehicle/crew due to structural failure of LH2 tank.
 c) Loss of life due to early LH2 tank structural failure resulting in impact outside designated footprint.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S): A: Sense Port Tape in Place (LWT-54 thru 68)
 B: Ice Formation
 C: Foreign Objects

REDUNDANCY SCREENS: Screen A: PASS
 Screen B: FAIL - No detection method for failure mode in flight.
 Screen C: PASS

FUNCTIONAL DESCRIPTION: Provides primary sensing capabilities of the ambient pressure exterior to the intertank.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.8.12.1	MS24394-J4	Vent Sense Port	1	LWT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

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RATIONALE FOR RETENTION

DESIGN:

The vent valve relief setting is referenced to ambient pressure through a 1/4 inch tube run that penetrates the Intertank at station 1075 on the minus Z axis. The system terminates with an elbow, the open end of which is the primary sense port. A secondary orifice is installed in the line within the Intertank. The elbow was selected based on operational experience and its capability to meet ET requirements for class 3 threads and leakage performance.

- A: For shipping purposes from MAF to the launch site, protection requirements and removal are specified. Tape is applied across the elbow sense port. Failure cause A is only applicable for effectivities thru LWT-68 since protection requirements for sense ports were deleted at LWT-69.
- B: A helium purge is provided to the sense line from the valve actuation system whenever actuation pressure is applied to the valve. Ice formation at the elbow sense port and cryopumping within the sense line is prevented.
- C: Flow testing is required that assures the sense system is operable.

Redundancy Description:

The vent valve relief pressure is referenced to ambient pressure through a sense line terminating outside the Intertank. Redundancy for the vent sense port is provided by the auxiliary bleed orifice located in the sense line within the Intertank compartment.

Effect of First Redundancy Loss:

Loss (blockage) of the primary ambient vent sense port will transfer the sensing function to the auxiliary bleed orifice. The sense pressure will be increased a maximum of 3.0 psid, culminating in a maximum relief setting of 40.0 psid. Analysis performed for the LH2 tank at flight times from High-0 to post staging showed that the membrane stresses violate proof test by up to 14% but the minimum ultimate factor of safety of 1.289 reflects a safe condition against tank rupture.

Effect of Second Redundancy Loss:

In event of loss (blockage) of the ambient sense port and the auxiliary bleed, the sense pressure will be the locked up ambient pressure at the time of blockage. The relief pressure will be higher by the difference between the locked up and actual ambient pressure. Structural failure of the LH2 tank by overpressurization will occur only if the flow control valves fail open.

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TEST:

The Vent Sense Port is certified. Reference HCS MMC-ET-TM08-L-P015.

Acceptance:

MAF - (Vehicle Assembly):

A-C: Perform flow test (MMC-ET-TM04k).

Launch Site:

A-C: Perform flow test (CMRSD File IV).

INSPECTION:

MAF Quality Inspection:

A-C: Witness flow test (MMC-ET-TM04k).

C: Inspect (visually) cleanliness during installation (drawing 80923021009).

Launch Site:

A: Witness tape removal for LWT-54 thru 68 (drawing 80900000041).

A-C: Witness flow test (CMRSD 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.