

DATE: October 16, 1990

S040244P  
ATTACHMENT -  
Page 22 of 55

FMEA #: 35-S70-0517-05-PD887-01

END ITEM EFFECTIVITY:

X	X	X
OV102	OV103	OV104

MODEL NO/NAME: S70-0517, LH<sub>2</sub> T-O Umbilical Carrier Plate

ORBITER SUBSYSTEM: Aft Fuselage

PART NUMBER:	PART NAME:	REFERENCE DESIGNATION:	QUANTITY (PER SYSTEM)
MC276-0004-0002	Disconnect, Gaseous	S0517PD887	1

CRITICALITY NUMBER: 1

FUNCTION: Provide connection for LH<sub>2</sub> high point bleed.

CRITICAL FAILURE MODE: External leakage before separation.

CAUSE: Mechanical failure, seal deterioration.

FAILURE EFFECT ON:

- (A) END ITEM: Possible damage to adjacent electrical and freon disconnects from ignited hydrogen.
- (B) INTERFACING SUBSYSTEM(S): Possible damage to ground gas line from hydrogen fire.
- (C) ORBITER: Loss of orbiter or possible damage to orbiter surface of MPS if purge fails and leaking hydrogen is ignited.
- (D) PERSONNEL: Loss of crew life due to potential fire.

HAZARDS: Ignition of gaseous hydrogen leak prior to T-O separation.

35-870-0517-05-PD887-01 (Continued)

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**ACCEPTANCE RATIONALE**

**DESIGN:** Disconnect is designed for 2,000 cycles at ambient temperature, with an operational life of 20,000 hours. It will operate in any orientation, will support bi-directional flow, requires no lubrication, and is composed of CRES. The Class II (non-latching) version provides fail-safe separation with spring-actuated valves. Disconnect is isolated in its own nitrogen purge can for purging operations before separation. The two seals used are compatible with the service fluids, and are very capable to handle the service temperatures and pressures. Disconnect is rated to 100 psig while operating pressure is 32 psig and burst pressure is 400 psig, with a safety factor of 4.0. To provide good sealing, the sealing surface has a 32 micron finish and is flat to 0.0003 in/in.

Materials used (CRES) are compatible with O<sub>2</sub>, H<sub>2</sub>, He, deionized water, trichlorotrifluorethane. External purge is executed before separation. This procedure eliminates the presence of flammable gases during separation and minimizes failure mode and cause.

**TEST:**

**ACCEPTANCE TESTS:** Acceptance tests per MC276-0004 include examination of product, proof pressure (mated/demated), operational test, external leakage (mated/demated) and cleanliness.

**CHECK-OUT TESTS:** Check-out tests per MC276-0004 include salt fog, sand and dust, vibration, shock, flow capacity, thermal cycle, operating life, cryogenic leakage, burst, and post test inspection.

**CERTIFICATION OR QUALIFICATION TESTS:** The disconnect is in compliance with Source Control drawing MC276-0004 and is certified per Rockwell CR No. 15-276-0004-0001A and (T-0) Umbilical Carrier Plate Acceptance Test Procedure ML0208-0012, Rockwell CR No. CR33-580529-001B.

**PRE-OPERATIONAL:** CMI V1149 includes post-installation leak checks of the QD while installed and mated to the flight half, using helium and nitrogen.

**INSPECTION:** Disconnects meet cleanliness requirements per MA0110-301 Level 100A, plus sealing, packing, and storage requirements. Verification of material and equipment conforming to contracts is performed by Inspection by review of certification documents from the suppliers.

35-870-0517-05-PD887-01 (Continued)

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Prior to carrier plate assembly, inspections are made for identification, damage, and cleanliness. During assembly, inspections cover torque and other precision measurements (angle and depth of insertion, alignment).

**OPERATIONAL USE:** If excessive leakage is detected (overwhelm of purge), cryogenic lines would be drained and purged, gas from ET would be vented, and the LH<sub>2</sub> system would be secured per S1014.

Leakage can be detected by hazardous gas detection system. Terminate and purge fuel supply line if leakage exceeds 3.5% per launch commit criteria.

**FAILURE HISTORY:** One failure was reported against this part number. The QD poppet valve stuck open after separation during a test, a failure which, in actual use, may have resulted in damage to other systems. A recent purge procedure modification eliminates the hazard. Ground system valves are closed, purge is initiated, and QD closure is verified.