

DATE: October 16, 1990

S040244P  
ATTACHMENT -  
Page 19 of 55

FMEA #: 35-S70-0517-05-PD41-01

END ITEM EFFECTIVITY:		
X	X	X
OV102	OV103	OV104

MODEL NO/NAME: S70-0517, LH<sub>2</sub> T-0 Umbilical Carrier Plate

ORBITER SUBSYSTEM: Aft Fuselage

PART NUMBER:	PART NAME:	REFERENCE DESIGNATION:	QUANTITY (PER SYSTEM)
MC276-0012-4222	Disconnect, Gaseous	S0517PD41	1

CRITICALITY NUMBER: 1

FUNCTION: Provide connections for PRSD GH<sub>2</sub> flow into orbiter for ground operation of fuel cells.

CRITICAL FAILURE MODE: External leakage before separation.

CAUSE: Interface seal failure (fatigue or contaminants).

FAILURE EFFECT ON:

- (A) END ITEM: Possible damage to other carrier plate components from heat and flame if purge fails and hydrogen is ignited.
- (B) INTERFACING SUBSYSTEM(S): Possible damage to ground GH<sub>2</sub> system (fire hazard).
- (C) ORBITER: Loss of orbiter or possible damage to orbiter surface or PRSD system if purge fails and hydrogen is ignited.
- (D) PERSONNEL: Loss of crew life due to potential fire/explosion.

HAZARDS: Gaseous hydrogen leak into T-0 LH<sub>2</sub> Umbilical.

35-870-0517-05-PD41-01 (Continued)

DATE: October 16, 1990

**ACCEPTANCE RATIONALE**S040244P  
ATTACHMENT -  
Page 20 of 55

**DESIGN:** Disconnect is designed for 2,000 cycles at ambient temperature, with an operating life of 20,000 hours. It will operate in any orientation, will support bi-directional flow, requires no lubrication, and is composed of corrosion-resistant steel. The 11.5 pound Class II (non-latching) version provides fail-safe separation with spring-actuated valves.

QD has built-in filter upstream of interface with orbiter to control contamination. Disconnect line pressure is 0 PSI at T-0 separation.

The external leakage is controlled by an interface seal during mating via Umbilical Carrier Plate. The interface seal material is vespel (SP-21 polyimide). The dimensions of the critical areas of the interface seal are kept within .002" tolerance with 16  $\mu$  finish. All dissimilar materials are compatible with working fluids. Mechanical failure is limited to operation of umbilical carrier.

The following pressures are applicable to this disconnect:

*Proof: 480  $\frac{+0}{-25}$  Psig, Burst: 640  $\frac{+0}{-25}$  Psig, Operating: 330  $\pm$  10 Psig*

**TEST:**

**ACCEPTANCE TESTS:** Acceptance tests per MC276-0012 include proof pressure, internal leakage, external leakage, pressure drop, verification of poppet leak path, cleanliness, bubble point and element drying.

**CHECK-OUT TESTS:** Check-out tests per MC276-0012 include rated flow, reverse flow, contaminant capacity, poppet valve spring force, vibration and thermal cycling.

**CERTIFICATION OR QUALIFICATION TESTS:** The disconnect is in compliance with Source Control drawing MC276-0012 and is certified per Rockwell CR No. 15-276-0010-011G and T-0 Umbilical Carrier Plate Acceptance Test Procedure MLO208-0012, Rockwell CR No. CR33-580529-001E.

**PRE-OPERATIONAL:** Testing includes precision mating to flight half and flow testing using helium per ONI V1149.

**INSPECTION:** Disconnects meet cleanliness requirements per MA0110-301 Level 100A, plus sealing, packing, and storage requirements.

35-S70-0517-05-PD41-01 (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:** Gas flow would be cut off per OMI V1040; orbiter fuel cells would continue to operate using onboard supply.

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:** No critical failures were reported in the PRACA system. Problem reports include instances of one QD suffering centering spring collar finger loss during launch, and several cases of missing dust covers, unknown cleanliness levels, and minor scratches.