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ATTACHMENT -
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FMEA #: 35-S70-0517-PD7--01

END ITEM EFFECTIVITY:

X	X	X
OV102	OV103	OV104

MODEL NO/NAME: S70-0517, LH₂ T-0 Umbilical Carrier Plate

ORBITER SUBSYSTEM: Aft Fuselage

PART NUMBER:	PART NAME:	REFERENCE DESIGNATION:	QUANTITY (PER SYSTEM)
G070-582353-029	8 Inch Disconnect Assembly	S0517PD7	1

CRITICALITY NUMBER: 1

FUNCTION: LH₂ fill and drain quick disconnect.

CRITICAL FAILURE MODE: External leakage before separation

CAUSE: Mechanical failure, seal deterioration

FAILURE EFFECT ON:

- (A) END ITEM: Possible damage to QD and carrier plate from ignited hydrogen if purge also fails.
- (B) INTERFACING SUBSYSTEM(S): Possible damage to ground hydrogen system (fire hazard).
- (C) ORBITER: Loss of orbiter or possible damage to orbiter surface or MPS if purge fails and leaking hydrogen is ignited. Internal MPS valves are doubly redundant, minimising orbiter damage.
- (D) PERSONNEL: Loss of crew life due to potential fire/explosion.

HAZARDS: Fire of gaseous hydrogen at the QD/orbiter interface.

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ACCEPTANCE RATIONALE

DESIGN: The 8-Inch disconnect assembly is designed for LH₂ and is kept in Helium purged environment during use. It is designed for fail-safe separation (closure at umbilical separation) with 0 - 5 psig of fluid at T-0. It is equipped with drain assist pressure tubes, and is housed in a purge can with a sealed monodirectional gas flow gasket and foam insulation outside the can. The specification for the disconnect within the assembly (MC276-0005) states that the disconnect is designed for 440 mate/demate cycles. During flow through mated ground and flight halves, pressure drop of LH₂ will not be greater than 1.25 psi at -413 F. Leakage from inside to outside shall not exceed 1000 scfm, or 4.26 gal/min, at cryogenic temperatures and 35 psig maximum pressure (with offset). The disconnect has proof and burst ratings of 260 and 300 psig when open; 400 and 800 when closed, with operating pressure during use of 30/130 psig. The QD uses teflon and Flourogold as seal materials and A286 CRES as its components materials. All materials used are compatible with service liquids and gases and are designed with a safety factor of 4 or greater.

TEST:

ACCEPTANCE AND CHECK-OUT: Per G070-582353 drawing (general note 24) and MC276-0005 specification, include high-pressure LH₂/LO₂ tests at cryogenic temperatures, gaseous pressure and leak tests (mated and unmated), pressure decay, external leakage, cyclic bellows compression, proof and burst pressure, hold test, vibration, and final acceptance test prior to installation into carrier plate.

CERTIFICATION OR QUALIFICATION TESTS: The disconnect assembly is in compliance with ATP per drawing G070-582353-029 and T-0 Umbilical Carrier Plate document ML0208-0012 and is certified per Rockwell CR No. 33-580529-001E.

PRE-OPERATION: Prior to use, functional testing with disconnect assembly installed in the carrier plate is performed to verify no leakage (CMI V1149). Cleanliness requirement for internal wetted surfaces per MA0110-301 Level 400 A is verified by particulate count.

INSPECTION: Disconnects are inspected for compliance to Quality Assurance provisions outlined in the procurement specification (MC276-5000), including dimensions, materials, construction, and identification marking.

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During installation of the disconnect into the assembly, inspection is made for torque requirements per assembly drawing G070-582300. Also included are inspections for cleanliness, precision measurements, and finishing. Foaming is added to the exterior to create a tight thermal seal, and is inspected for damage. During assembly of the carrier plate, inspections are made for precision measurements (angle and depth of insertion, alignment) prior to mating to the orbiter for testing. Final inspections of precision mating and alignment are made during carrier plate mating to the orbiter per OMI V3516.

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 LH₂ 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: No critical failures were reported which would have caused catastrophic results because of leakage before or after separation during its actual fuel/oxidizer loading task. Leakage after separation is eliminated by purging procedures completed just before separation.