SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Quick Disconnect (QD) and Cap Assembly (Hydrazine)

PART NO.: 10201-0053-801
10201-0054-801 (Cap)

FM CODE:A05

ITEM CODE: 20-01-01

REVISION: Basic

CRITICALITY CATEGORY: 1

REACTION TIME:Seconds

NO. REQUIRED: 8

DATE: March 31, 2000 CN 038

CRITICAL PHASES: Final Countdown, Boost

SUPERCEDES: March 31, 1997 CN 038

FMEA PAGE NO.:A-6

ANALYST: B. Snook/S. Parvathaneni CN 038

SHEET 1 OF 4

APPROVED: S. Parvathaneni CN 038

FAILURE MODE AND CAUSES: Rupture caused by:

- Material Defect
- Manufacturing Defect

FAILURE EFFECT SUMMARY: Fire and explosion will lead to loss of mission, vehicle, and crew.

REDUNDANCY SCREENS AND MEASUREMENTS: N/A

RATIONALE FOR RETENTION:

A. DESIGN

- The Quick Disconnect and Cap Assembly is designed and qualified in accordance with end item specification 10SPC-0057. (All failure causes)

- The service panel end of the quick disconnect mates with a Dynatube "B" nut. (Manufacturing defects)

- The 0.25 inch port size parts are designed to withstand four times operating pressure (1600 psi) and all other parts to withstand 2.5 times operating pressure (1000 psi). (Material defects, Manufacturing Defects)

- Material selection is per MSFC-SPEC-522A; body 455 stainless; nipple-455 stainless, Cap-455 stainless. (Material defects)

- The aft skirt area is purged with GN2 prior to APU start up, reducing the O2 concentration to less than four percent per OMRSD File II, Vol. 1, requirement number S00FM0.430. (All Failure Causes)

- The cap is not exposed to rupture unless a prior failure of the poppet or nipple has occurred. (All Failure Causes)

- Qualification testing verified design requirements. These results are in Kaiser Electro Precision Qualification Test Report, RYY201-061, Rev. A. During qualification test, burst occurred at 25,000 psi. (All failure causes)

B. TESTING

- Acceptance Testing is performed per Kaiser ATP RYY-101-147 on each new flight article. This includes visual inspection, proof pressure testing to 650 + 50/-0 psig and helium leakage $\leq 1 \times 10^{-4}$ sccs helium test. (All failure causes)

- During refurbishment and prior to reuse, the quick disconnect (CapAssembly and Nipple Assembly) are reworked per 10SPC-0131 and acceptance tested per the criteria of 10SPC-0057 by USA SRBE/TBE Florida operations. This includes visual examination, proof pressure testing to 675 ± 25 psig and helium leakage $\leq 1 \times 10^{-4}$ SCCS helium test. (All Failure Causes)

- Fuel system leak test is performed at 380 +0/-10 psig helium per 10REQ-0021, para. 2.3.3.1. (Manufacturing defects)

- Hydrazine cleanliness and composition (purity and particulate count) are verified prior to introduction on-board the flight hardware per 10REQ-0021, para. 2.3.2.1 and OMRSD File V, Vol. 1, requirement number B42AP0.010. (Material Defects)

- GN2 cleanliness and composition (purity and particulate count) are verified prior to introduction on-board the flight hardware per 10REQ-0021, para. 2.3.2.2, and OMRSD File V, Vol. 1, requirement number B42AP0.012. (Material Defects)

- System pressure decay test is monitored per 10REQ-0021 para. 2.3.3.1.b for the fuel system prior to hot fire. (All failure causes)

- Verification of FSM bottle pressure for hydrazine system pressure check per File V, Vol. I, requirement number B42AP0.025. (All Failure Causes)

- GN2 (from MLP portable panels) is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per OMRSD File V, Vol. 1, requirement number B42AP0.012. (Material Defects)

- Helium cleanliness and composition (purity and particulate count) are verified prior to introduction on-board the flight hardware per 10REQ-0021, para. 2.3.2.5. (Material Defects)

The above referenced OMRSD testing is performed every flight.

C. INSPECTION

I. VENDOR RELATED INSPECTION

- Material certification is verified by USA SRBE PQAR per SIP 1180. (Material defects)

- Proper manufacturing is verified by a Source Inspection Plan (SIP) 1180. (Manufacturing defects)
- Vendor QA acceptance of all seals and sealing surfaces is verified by USA SRBE PQAR per SIP 1180. (Manufacturing defects)
- Assembly and torque are verified by USA SRBE PQAR per SIP 1180. (Manufacturing defects)
- USA SRBE verifies that NDT has been performed per SIP 1180. (Material defects, Manufacturing Defects)
- Final inspection is verified by USA SRBE PQAR per SIP 1180. (All failure causes)

o Acceptance test of components is witnessed by USA SRBE PQAR per SIP 1180. (All failure causes)

- Critical Processes/Inspections:
  - Heat Treat per RYY115-022

II. KSC RELATED REFURBISHMENT INSPECTIONS

CN 038

- Visual inspection of quick disconnect Nipple and Cap assembly will be performed per 10SPC-0131, para. II. (All Failure Causes)
- Functional testing of quick disconnect Nipple and Cap assembly will be performed per 10SPC-0131, paragraph IV.

  All manual tests will be witnessed by Quality or verified for those instances when controlled software is utilized and a test report is generated. (All Failure Causes)

CN 038

III. KSC RELATED ASSEMBLY AND OPERATIONS INSPECTIONS

- Precision cleaning of tubes/hoses is verified by USA SRBE per 10REQ-0021, para. 2.3.0. (Material defects)
- Helium cleanliness and composition (purity and particulate count) are verified prior to introduction on-board the flight hardware per 10REQ-0021, para. 2.3.2.5 (Material defects)
- Hydrazine cleanliness and composition (purity and particulate count) are verified prior to introduction on-board the flight hardware per 10REQ-0021, para. 2.3.2.1 and OMRSD File V, Vol. 1, requirement number B42AP0.010. (Material defects)
- GN2 cleanliness and composition (purity and particulate count) are verified prior to introduction on-board the flight hardware per 10REQ-0021, para. 2.3.2.2 and OMRSD File V, Vol. 1, requirement number B42AP0.012. (Material defects)
- Inspect TVC system in aft skirt for damage per 10REQ-0021 following low speed GN2 spin, para. 2.3.11.3, and high speed GN2 spin, para. 2.3.15.5. No leaks, signs of rubbing or discoloration allowed. (All failure causes)

- o System pressure decay test is monitored per 10REQ-0021 para. 2.3.3.1.b for the fuel system prior to hot fire. (All failure causes)

- o Proper function of TVC system is demonstrated during hotfire operations per 10REQ-0021 to include: (All Failure Causes)

  - Low speed GN2 spin, para. 2.3.11
  - High speed GN2 spin, para. 2.3.15
  - Hotfire, para. 2.3.16

- o Closeout inspection of all TVC service panels is performed at pad by SPC. (All failure causes)

- o Verification of FSM bottle pressure for hydrazine system pressure check per File V, Vol. I, requirement number B42AP0.025. (All Failure Causes)

- o GN2 (from MLP portable panels) is verified for cleanliness and composition (purity and particulate count) prior to introduction to hydrazine on-board circuits per OMRSD File V, Vol. 1, requirement number B42AP0.012. (Contamination)

- o TVC Couplings (Both SRB and GSE) are inspected each time prior to mating per 10REQ-0021 para. 2.3. After transfer to SPC they are inspected prior to mating per File V, Vol. I, requirement number B42GEN.070. (All Failure Causes).

CN 038

- o GN2 (from servicing cart) is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per OMRSD File V, Vol. 1, requirement number B42AP0.012. (Contamination)

- o Hydrazine (from servicing cart) is verified for cleanliness and composition (purity and particulte count) prior to introduction to on-board hydrazine circuits per OMRSD File V, Vol. 1, requirement number B42AP0.010. (Contamination)

D. FAILURE HISTORY:

o Failure Histories may be obtained from the PRACA database.

E. OPERATIONAL USE

O Not applicable to this failure mode.