

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Quick Disconnect and Cap Assembly (Hydrazine)

PART NO.: 10201-0053-801(QD)
10201-0054-801 (Cap)
RS900BW (O-Ring)

FM CODE: A02

ITEM CODE: 20-01-01

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME:Seconds

NO. REQUIRED: 8

DATE: March 31, 2000

CRITICAL PHASES: Final Countdown, Boost

SUPERCEDES: March 31, 1997

FMEA PAGE NO.: A-3

ANALYST: B. Snook/S. Parvathaneni

SHEET 1 OF 5

APPROVED: S. Parvathaneni

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FAILURE MODE AND CAUSES: External leakage (Leakage of Poppet seal and leakage of cap seal) caused by:

- o Poppet Spring Failure
- o Defective or Damaged Seat
- o Contamination
- and -
- o Improper Torque
- o Improperly Lockwired
- o Defective or Damaged O-ring
- o Contamination
- o Defective or Damaged Sealing Surface

FAILURE EFFECT SUMMARY: Fire and explosion will lead to loss of mission, vehicle, and crew. One success path remains after the first failure. Operation is not affected until both paths are lost.

REDUNDANCY SCREENS AND MEASUREMENTS:

- 1) Fail - Redundancy is not verified on new or refurbished units.
- 2) Fail - Loss of redundancy not detectable.
- 3) Fail - Contamination.

RATIONALE FOR RETENTION:

A. DESIGN

- o The Quick Disconnect and Cap Assembly is designed and qualified in accordance with end item specification 10SPC-0057. (All failure causes)
 - o Material selection is per MSFC-SPEC-522A; body 455 stainless; nipple-455 stainless, Cap-455 stainless (defective or damaged seat, defective or damaged sealing surface)
 - o The quick disconnect cap has an O-ring seal which provides redundancy to the internal poppet seal to protect against external leakage from an internal source. (Defective or Damaged Seat or Sealing Surfaces, Poppet Spring Failure and Contamination)
 - o Fluid procurement is controlled by SE-S-0073 (Contamination)
 - o All threaded fittings and connectors are torqued per engineering specifications and are lockwired per MS 33540, as applicable. (Improper Torque, Improperly Lockwired)
 - o The poppet is spring loaded to the closed (sealed) position. Spring material is 17-7PH CH900. (Poppet Spring Failure)
 - o The cap O-ring is made of ethylene propylene rubber and the poppet seal is made of teflon, both of which were selected for their compatibility with hydrazine. The use of these materials is controlled by Kaiser Drawings 2152-0049 and RS900-BW111. (Defective or Damaged O-Ring)
 - o Contamination is controlled by Kaiser cleaning and packaging specifications RYY-101-140, Rev. E and RYY-101-141, Rev. D. (Contamination)
 - o 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 S00FMO.430. (All Failure Causes)
 - o Qualification testing verified design requirements as reported in Kaiser Electro Precision Qualification Test Report RYY-201-061, Rev. A. (All Failure Causes)
 - o Assembled parts are cleaned per 10PRC-0339. (Contamination)
- B. TESTING
- o Acceptance Testing is performed per Kaiser ATP RYY-101-147 on each new flight article. This includes visual inspection, cleanliness verification, proof pressure testing to 650 +50/-0 psig, helium leakage $\leq 1 \times 10^{-4}$ sccs of helium test. (All Failure Causes)
 - o During refurbishment and prior to reuse, the quick disconnect (Cap Assembly and Nipple Assembly) are reworked per 10SPC-0131 and also acceptance tested per the criteria of 10SPC-0057 by USA SRBE/TBE Florida operations. This includes visual examinations, cleanliness verification, proof pressure testing to 675 \pm 25 psig and helium leakage $\leq 1 \times 10^{-4}$ SCCS helium test. (All Failure Causes)

- o Hydrazine is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per 10REQ-0021, para. 2.3.2.1 and OMRSD File V, Vol. 1 Requirement Number B42AP0.010. (Contamination)
- o Helium is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board circuits per 10REQ-0021, para. 2.3.2.5. (Contamination)
- o GN2 is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per 10REQ-0021, para. 2.3.2.2 and OMRSD File V, Vol. 1 Requirement Number B42AP0.012. (Contamination)
- 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 Helium leak test to less than 1×10^{-4} sccs is performed per 10REQ-0021, para. 2.3.3.3. (All Failure Causes)
- o TVC system functional test is performed during hotfire per 10REQ-0021, para. 2.3.16. (All Failure Causes) CN 038
- o GN2 (from MLP portable panels) is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per 10REQ-0021, para. 2.3.2.2. (Contamination)
- o Verification of FSM bottle pressure for hydrazine system pressure check per File V, Vol. I, requirement number B42AP0.025. (All Failure Causes)

C. INSPECTION

I. VENDOR RELATED INSPECTION

- o Verification of Material Certification by USA SRBE PQAR per SIP 1180. (Poppet Spring Failure)
- o Vendor QA acceptance of all seals and sealing surfaces is verified by USA SRBE PQAR per SIP 1180. (Defective or Damaged O-Ring, Defective or Damaged Seat, and Defective or Damaged Sealing Surface)
- o Proper assembly and torque are verified by USA SRBE PQAR per SIP 1180. (Improper Torque and Improperly Lockwired)
- o NDT verified by USA SRBE PQAR per SIP 1180. (Defective or Damaged Seat)
- o Cleanliness of components is verified by USA SRBE PQAR per SIP 1180. (Contamination)
- o 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)

- o Critical Processes/Inspections:
 - Heat treat per RYY 115-022.
 - Electropolish spring per RYY 101-204

II. KSC RELATED REFURBISHMENT INSPECTION

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

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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)

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III. KSC RELATED ASSEMBLY AND OPERATION INSPECTIONS

- o Helium cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board circuits per 10REQ-0021, para. 2.3.2.5. (Contamination)
- o Precision cleaning of tubes/hoses is verified by USA SRBE per 10REQ-0021, para. 2.3.0. (Contamination)
- o Hydrazine is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits 10REQ-0021, para. 2.3.2.1 and OMRSD File V, Vol. 1 Requirement Number B42AP0.010. (Contamination)
- o GN2 is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per 10REQ-0021, para. 2.3.2.2 and OMRSD File V, Vol. 1 Requirement Number B42AP0.012. (Contamination)
- 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 test by USA SRBE per 10REQ-0021, para. 2.3.16. (All Failure Causes)
- o Inspection for leaks, rubbing and discoloration are conducted per 10REQ-0021, para. 2.3.11.3 and 2.3.15.5 respectively, following low speed GN2 spin and high speed GN2 spin. (All Failure Causes)
- o Post hotfire inspection and leak check per 10REQ-0021, para. 2.3.16.4.(All Failure Causes)
- o GN2 (from MLP portable panels) cleanliness and composition (purity and particulate count) are verified prior to introduction to hydrazine on-board hydrazine 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. 1, requirement number B42GEN.070. (Defective or Damaged Sealing Surface, Contamination).

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- o GN2 (from servicing cart) cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board hydrazine circuits per OMRSD File V, Vol. 1 Requirement Number B42AP0.012. (Contamination)
- o Hydrazine (from servicing cart) cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board hydrazine circuits per OMRSD File V, Vol. 1 Requirement Number B42AP0.010. (Contamination)
- o Verification of FSM bottle pressure for hydrazine system pressure check per File V, Vol. I, requirement number B42AP0.025. (All failure causes)
- o Inspection of quick disconnect pressure cap torque per OMRSD File V, Vol. 1 Requirement Number B42GEN.010 during post servicing (closeout). (Improper Torque)
- o Inspection of quick disconnect lockwiring per OMRSD File V, Vol. 1 Requirement Number B42GEN.020 during post servicing (closeout). (Improper Lockwire)

D. FAILURE HISTORY:

- o Failure Histories may be obtained from the PRACA database.

E. OPERATIONAL USE

- O Not applicable to this failure mode.