

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

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

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

FM CODE: A04

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-5

ANALYST: B. Snook/S. Parvathaneni

SHEET 1 OF 5

APPROVED: S. Parvathaneni

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FAILURE MODE AND CAUSES: External leakage (leakage of primary and secondary O-rings) caused by:

- o Defective or Damaged O-ring
- o Defective or Damaged Sealing Surface
- o Contamination
- and -
- o Improper Torque
- 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 External leakage paths around the quick disconnect are protected by a primary O-ring and a backup O-ring. (Defective or Damaged O-Rings and Defective or Damaged Sealing Surface)
 - o Lockwiring on QD is removed during assembly of Fuel Service Panel and anti-rotation is installed per drawing 10201-0001 after verifying nipple to body torque per drawing requirement. (Improper Torque)
 - o O-rings are made of ethylene propylene rubber which was selected for its compatibility with hydrazine. The use of this material is controlled by Kaiser drawings RS900BW-019 and RS900BW-020. (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 Fluid procurement is controlled per SE-S-0073. (Contamination)
 - 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 newflight 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 disconnects (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 examination, cleanliness verification, proof pressure testing to 675 ± 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 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. (Contamination)
 - 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 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^{-6} sccs is performed per 10REQ-0021, para. 2.3.3.1. (All Failure Causes)
- o TVC system functional test is performed during hotfire per 10REQ-0021, para. 2.3.16. (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)

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C. INSPECTION

I. VENDOR RELATED INSPECTION

- o Material Certification verified by USA SRBE PQAR per SIP 1180. (Defective or Damaged O-Ring)
- o Vendor QA acceptance of all seals and sealing surfaces is verified by USA SRBE PQAR per SIP 1180. (Defective or Damaged O-Ring , Decfective Damaged Seat and Defective or Damaged Sealing Surface)
- o All seals and sealing surfaces are verified per SIP 1180 by USA SRBE PQAR. (Defective or Damaged Sealing Surface)
- o Proper assembly and torque are verified by USA SRBE PQAR per SIP 1180. (Improper Torque)
- 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:
 - None

II. KSC RELATED REFURBISHMENT INSPECTION

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

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III. KSC RELATED ASSEMBLY AND OPERATIONS INSPECTIONS

- o Precision cleaning of tubes/hoses is verified by USA SRBE per 10REQ-0021, para. 2.3.0. (Contamination)

- 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 Hydrazine cleanliness and composition (purity and particulate count) are verified 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 GN2 cleanliness and composition (purity and particulate count) are verified 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 per 10REQ-0021, para. 2.3.16. (All Failure Causes)
- o Inspections 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 on-board hydrazine circuits per OMRSD File V, File 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. (Defective or Damaged Sealing Surface Contamination).
- 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) 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 B42AP0.010. (Contamination)
- o Inspection of quick disconnect pressure cap torque per OMRSD File V, Vol. 1 requirement number B42GEN.010 during post servicing (closeout). (Improper Torque)

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- o Inspection of quick disconnect lockwiring per OMRSD File V, Vol. 1 requirement number B42GEN.020 during post servicing (closeout). (Improperly Lockwired)
- o Verification of FSM bottle pressure for hydrazine system pressure check per File V, Vol. I, requirement number B42AP0.025. (All Failure Causes)

D. FAILURE HISTORY:

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

E. OPERATIONAL USE

- O Not applicable to this failure mode.