

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Quick Disconnect and Cap
Assembly (Hydraulic)

PART NO.: 10201-0055-801 FM CODE: A04
10201-0056-801 (Cap)
M83248/1 (O-ring)

ITEM CODE: 20-01-36 REVISION: Basic

CRITICALITY CATEGORY: 1R REACTION TIME: Seconds

NO. REQUIRED: 4 DATE: March 1, 2001

CRITICAL PHASES: Final Countdown, Boost SUPERCEDES: March 31, 2000

FMEA PAGE NO.: A-124 ANALYST: B. Snook/S. Parvathaneni

SHEET 1 OF 5 APPROVED: S. Parvathaneni

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 Defective or damaged sealing surface
- o Contamination
- o Improperly lockwired

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

REDUNDANCY SCREENS AND MEASUREMENTS:

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

DCN 042
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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 body are protected by a primary and back up O-ring. (Defective or Damaged O-ring and Defective or Damaged Sealing Surface)
- o O-rings are made of viton which is compatible with hydraulic fluid. (Defective or Damaged O-ring)
- o The hydraulic fluid is MIL-H-83282 or MIL-PRF-83282 which was developed specifically to minimize the fire hazard. (Contamination)
- o Contamination is controlled by Kaiser Electro Precision Cleaning and Packaging specifications RYY-101-140, and RYY-101-141. (Contamination) DCN 042
- o The aft skirt 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-201-062 Rev. A and supplemental qualifications test report RYY-204-036, Rev. N/C. (All Failure Causes)
- o Assembled parts are cleaned per 10PRC-0620. (Contamination)

B. TESTING

- o Acceptance testing is performed at vendor's plant per Kaiser ATP RYY-101-152. This includes visual examination, cleanliness verification, proof pressure test to 4875 psig and fluid leak test for no evidence of leaking. (All Failure Causes)
- o During refurbishment and prior to reuse, nipple assembly is processed for rework per 10SPC-0131 and acceptance tested per the criteria of 10SPC-0057 by USA SRBE/TBE Florida Operations. This includes visual examination, cleanliness verification, proof pressure test to 4975 ± 100 psig and fluid leak test for no leakage sufficient to form a liquid drop. (All Failure Causes)
- o During refurbishment and prior to reuse, the cap assembly is reworked per 10SPC-0131 and acceptance tested by USA SRBE/TBE Florida operations per criteria of 10SPC-0057. This includes visual examination, cleanliness verification, proof pressure test to 4975 ± 100 psig without failure or permanent deformation and external leakage test at 3300 ± 50 psig for 5 minutes with no leakage sufficient to form a liquid drop. (All Failure Causes)
- o Hydraulic system leak test with helium to an acceptable level per 10REQ-0021 para. 2.3.3.3. (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 Hydraulic fluid is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board Hydraulic circuits per 10REQ-0021, para. 2.3.2.6. (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 Visual leak check of hydraulic (system) joints is performed per 10REQ-0021, para. 2.3.12.2. (All Failure Causes)
- o Functional test is performed during hotfire operations per 10REQ-0021 para. 2.3.11, 2.3.15 and 2.3.16 respectively for: (All Failure Causes)
 - Low speed GN2 spin
 - High speed GN2 spin
 - Hotfire
- o Hydraulic fluid is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board Hydraulic circuits during prelaunch operations per OMRSD File V, Vol. 1, Requirement Number B42HP0.010. (Contamination)
- o Prelaunch hydraulic system leak test is performed per OMRSD File V, Vol. 1, Requirement Number B42HP0.020. (All Failure Causes)

The above referenced OMRSD testing is performed every flight.

C. INSPECTION

I. VENDOR RELATED INSPECTIONS

- o Vendor acceptance of sealing surfaces and O-rings are verified by USA SRBE PQAR per SIP 1180. (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 acceptance tests are witnessed by USA SRBE PQAR per SIP 1180. (All Failure Causes)
- o Final inspection and packaging is verified by USA SRBE PQAR per SIP 1180. (All Failure Causes)

- o Critical Processes/Inspections:
 - None

II. KSC RELATED REFURBISHMENT INSPECTION

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

III. KSC RELATED ASSEMBLY AND OPERATIONS INSPECTIONS

- o Verification of visual leak check of hydraulic circuit (system) joints is performed per 10REQ-0021, para. 2.3.12.2. (All Failure Causes)
- 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 Hydraulic fluid cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board Hydraulic circuits per 10REQ-0021, para. 2.3.2.6. (Contamination)
- o The moisture content and cleanliness (water content and particulate count) of the effluent hydraulic fluid from the rock actuator, the tilt reservoir, the rock reservoir and the tilt actuator are verified per 10REQ-0021, para. 2.3.12.3. (Contamination)
- o Visual inspection for hydraulic circuit fluid leaks is performed per 10REQ-0021 para. 2.3.12.2 prior to hotfire. (All Failure Causes)
- o Verify Rock Hydraulic Reservoir level is greater than 30 percent during low speed GN2 spin per 10REQ-0021, para. 2.3.11.2. (All Failure Causes)
- o Verify Tilt Hydraulic Reservoir level is greater than 30 percent during low speed GN2 spin per 10REQ-0021, para. 2.3.11.2. (All Failure Causes)
- o Verify Rock Hydraulic Reservoir level is greater than 50 percent during high speed GN2 spin per 10REQ-0021, para. 2.3.15.2. (All Failure Causes)
- o Verify Tilt Hydraulic Reservoir level is greater than 50 percent during high speed GN2 spin per 10REQ-0021, para. 2.3.15.2. (All Failure Causes)
- o Proper function of TVC system is demonstrated during hotfire operations per 10REQ-0021, para. 2.3.11, 2.3.15, and 2.3.16 respectively for: (All Failure Causes)
 - Low speed GN2 spin
 - High speed GN2 spin

- Hotfire (Includes verification of Rock and Tilt reservoirs to between 50 and 90 percent)
- o TVC System is inspected for external leaks per 10REQ-0021, para. 2.3.11.3, 2.3.15.5 and 2.3.16.4 respectively following low speed GN2 spin, high speed GN2 spin and post hotfire inspection. (All Failure Causes)
- o Hydraulic fluid cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board Hydraulic circuits during prelaunch operations per OMRSD File V, Vol. 1, Requirement Number B42HP0.010. (Contamination)
- o Verification of torquing and lockwiring by SPC per OMRSD File V, Vol. I, requirement numbers B42GEN.010 and B42GEN.020. (Improper torque, Improper lockwiring)
- o Prelaunch hydraulic system leak test is performed per OMRSD File V, Vol. 1, Requirement Number B42HP0.020. (All Failure Causes)
- 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)

D. FAILURE HISTORY

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

E. OPERATIONAL USE

- o Not applicable to this failure mode.