

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

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

PART NO.: 10201-0055-801 FM CODE: A05
10201-0056-801 (Cap)
M83248/1 (O-ring)

ITEM CODE: 20-01-36 REVISION: Basic

CRITICALITY CATEGORY: 1 REACTION TIME: Seconds

NO. REQUIRED: 4 DATE: March 1, 2001

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

FMEA PAGE NO.: A-125 ANALYST: B. Snook/S. Parvathaneni

SHEET 1 OF 4 APPROVED: S. Parvathaneni

FAILURE MODE AND CAUSES: Rupture caused by:

- o Material Defect
- o Manufacturing Defect

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

REDUNDANCY SCREENS AND MEASURES: N/A

RATIONALE FOR RETENTION:

A. DESIGN

- o The Quick Disconnect (QD) and Cap Assembly (Hydraulic) is designed and qualified in accordance with end item specification 10SPC-0057. (All Failure Causes)
- o The 0.75 inch port size part is designed to withstand 2.5 times operating pressure (8125 psi). (All Failure Causes)
- o Material selection is per MSFC-SPEC-522, Body 455 stainless and nipple 455 stainless, cap 455 stainless. (Material Defects)
- o The hydraulic fluid is MIL-H-83282 or MIL-PRF-83282 which was developed specifically to minimize fire hazard potential. (Material Defects)
- o The Cap is not exposed to rupture unless a prior failure of poppet or nipple has occurred. (All Failure Causes)

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- 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 201-062, Rev. A. (All Failure Causes)
- o During qual test, burst occurred at 19,000 psig. (Material Defect, Manufacturing Defect)

B. TESTING:

- o Acceptance testing at vendor's plant is performed per Kaiser Electro Precision ATP RYY 101-152. This includes visual examination, cleanliness verification, proof pressure test to 4875 psig, and fluid leak test for no leakage sufficient to form liquid drop. (All Failure Causes)
- o During refurbishment and prior to reuse, nipple assembly is processed for rework per 10SPC-0131 and acceptance tested per 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 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, external leakage test at 3300 ± 50 psig for 5 minutes with no leakage sufficient to form a liquid drop. (All failure causes)
- o Functional test is performed during Hotfire operations per 10REQ-0021 which includes: (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 Prelaunch hydraulic system leak test is performed per OMRSD File V, Vol. 1, Requirement Number B42HP0.020. (All Failure Causes)
- o Hydraulic system helium leak test is performed per 10REQ-0021, para. 2.3.3.3 prior to hot fire test. (All Failure Causes)
- o Hydraulic system integrity is monitored from SRB power up to liftoff during final countdown. (All Failure Causes)

The above referenced OMRSD testing is performed every flight.

C. INSPECTION:

I. VENDOR RELATED INSPECTIONS

- o Verification of proper manufacturing and assembly witnessed by USA SRBE PQAR per SIP 1180. (Manufacturing Defects)
- o All material certifications are verified by USA SRBE PQAR per SIP 1180. (Material Defect)
- o Verification of NDT by USA SRBE PQAR per SIP 1180. (Manufacturing Defect)
- o Final Acceptance Tests are witnessed by USA SRBE PQAR per SIP 1180. (All failure causes)
- o Verification of final Inspection and Packaging by USA SRBE PQAR per SIP 1180. (All failure causes)
- o Critical Processes/Inspections:
 - o Heat Treat per RYY-115-022

II. KSC RELATED REFURBISHMENT INSPECTIONS

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

III. KSC RELATED ASSEMBLY AND OPERATIONS INSPECTIONS

- o Hydraulic circuit fluid leak test is verified per 10REQ-0021, para. 2.3.12.2 prior to hotfire. (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 Inspect TVC system for damage - no leaks, rubbing and discoloration are allowed per 10REQ-0021 following low speed GN2 spin, para. 2.3.11.3, and high speed GN2 spin, para. 2.3.15.5. (All Failure Causes)
- o Post Hotfire inspection for leaks and damage is performed per 10REQ-0021, para. 2.3.16.4. (All Failure Causes)
- o Closeout inspection of all service panels of TVC system is performed per 10REQ-0021, para. 2.3.16.4. (All Failure Causes)

- o Hydraulic fluid is verified for cleanliness and composition (purity and particulate count) prior to introduction on board the flight hardware per 10REQ-0021, para. 2.3.2.6 and during prelaunch per OMRSD File V, Vol. I, requirement number B42HP0.010. (Material Defects)
- o Verification of hydraulic fluid (effluent) sampled for moisture and dissolved air content per OMRSD File V, Vol. I, requirement number B42HP0.011 and .070 respectively. (Material Defects)
- o Helium is verified for cleanliness and composition (purity and particulate count) prior to introduction to on board flight hardware per 10REQ-0021, para. 2.3.2.5. (Material Defects)
- 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. (Manufacturing Defects).
- o Performance of visual leak check of hydraulic circuit (system) joints per 10REQ-0021, para. 2.3.12.2. (All Failure Causes)
- o Prelaunch hydraulic system leak test is performed per OMRSD File V, Vol. 1, Requirement Number B42HP0.020. (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.