

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Check Valve and Filter Assembly (CVFA)

PART NO.: 10201-0047-802
10201-0047-803 (Alt.)
Includes

FM CODE: A07

Fittings, Connector
10209-0038-801
10209-0106-801
10209-0157-801 (Alt.)
10209-0105-801
10209-0067-801 or
10209-0132-801 (Alt.)
O-rings
Type M83248/1

ITEM CODE: 20-01-30

REVISION: Basic

CRITICALITY CATEGORY: 1

REACTION TIME: Seconds

NO. REQUIRED: 2

DATE: March 31, 2000

CRITICAL PHASES: Final Countdown, Boost

SUPERCEDES: March 31, 1997

FMEA PAGE NO.: A-120

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, such as thin walls

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

- o The Check Valve and Filter Assembly is designed and qualified in accordance with end item specification 10SPC-0048. (All Failure Causes)
- o CVFA housing is 316 CRES condition A (80,000 lb/in² tensile). (Material Defect)

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- o CVFA is designed for proof pressure of 1.5 times operating pressure and burst pressure of 2.5 times operational pressure. Actual burst during qualification testing occurred at 11,000 psig which is 3.4 times operating pressure. (All Failure Causes)
- o Hydraulic system includes a pressure relief valve which opens at 1.18 times operating pressure. (All Failure Causes)
- o Materials are selected in compliance with MSFC-SPEC-522A. (Material Defect)
- o Dynatube fittings are 6AL-4V Titanium. (Material Defects)
- o Filter case is nitronic 40 condition A with .322 inch exposed thickness. (All Failure Causes)
- o The aft skirt area is purged with GN2 prior to APU start up. This reduces the O2 concentration to less than four percent per OMRSD File II, Vol. 1, requirement number SOOFMO.430. (All Failure Causes)
- o Qualification testing verified design requirements as reported in Purolator Technologies Qualification Test Report No. 11362. (All Failure Causes)

B. TESTING

- o Acceptance testing is performed per PTI PAT 7588778 on each new flight article. This includes visual examination, proof pressure testing to 4875 psig and operational leak test to less than required to form a drop. (All Failure Causes)
- o During refurbishment and prior to reuse, the check valve filter assembly is reworked per 10SPC-0131 and acceptance tested by USA SRBE/TBE Florida operations per the criteria of 10SPC-0048. This includes visual examination, proof pressure test to 4975 ± 100 psig, operational leak test for five minutes at 3300 ± 50 psig to verify leakage is less than that required to form a drop, and cleanliness verification. (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 Visual leak check of hydraulic circuit (system) joints is performed per 10REQ-0021, para. 2.3.12.2. (All Failure Causes)
- o Hydraulic circuit fluid leak test is performed per 10REQ-0021, para. 2.3.12.2 prior to hotfire. (All Failure Causes)
- o CVFA is exposed to operating pressure during Hotfire test operations per 10REQ-0021 which includes: (All Failure Causes)
 - Low speed GN2 spin, para. 2.3.11
 - High speed 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 B42HPO.020. (All Failure Causes)

The above referenced OMRSD testing is performed every flight.

C. INSPECTION

I. VENDOR RELATED INSPECTIONS

- o Verification of material certifications by USA SRBE PQAR per SIP 1264. (Material Defect)
- o Verification of assembly and dimensional data by USA SRBE PQAR per SIP 1264. (Manufacturing Defect, Such As Thin Walls)
- o Witnessing of acceptance test by USA SRBE PQAR per SIP 1264. (All Failure Causes)
- o Refurbished hardware is reworked and inspected by USA SRBE PQAR per SIP 1264. (All Failure Causes)
- o Critical processes/Inspections:
 - o Annealing per QQ-S-763
 - o Heat treat per QQ-S-763

II. KSC RELATED REFURBISHMENT INSPECTION

- o Visual inspection of CVFA will be performed per 10SPC-0131, para. II. (All Failure Causes)
- o Functional testing of CVFA 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 OPERATIONS INSPECTION

- 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 Proper function of TVC System is demonstrated during hotfire operations per 10REQ-0021 to include: Low speed GN2 spin, para. 2.3.11, High speed GN2 spin, para. 2.3.15 and Hotfire, para. 2.3.16. (Rock and Tilt Reservoir Level Are Each Between 50 and 90 Percent) (All Failure Causes)
- o Inspect TVC system for damage - no leaks, signs of rubbing or 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 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 B42HPO.010. (Material Defects)

- o Verification of hydraulic fluid (effluent) sampled for moisture and dissolved air content per OMRSD File V, Vol. I, requirement number B42HPO.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 Post hotfire inspection for leaks and damage is performed per 10REQ-0021, para. 2.3.16.4. (All Failure Causes)
- o Pre-launch hydraulic system leak test is performed per OMRSD File V, Vol. 1, Requirement Number B42HPO.020. (All Failure Causes)

D. FAILURE HISTORY

CRITICALITY 1:

- o No SRB failure history for this failure mode.

E. OPERATIONAL USE

- o Not applicable to this failure mode.