

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Fuel Filter

PART NO.: 10203-0016-801 (Filter)
10209-0042-801 (Connector)

FM CODE: A04

ITEM CODE: 20-01-08

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-14

ANALYST: B. Snook/ S. Parvathaneni

SHEET 1 OF 4

APPROVED: S. Parvathaneni

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FAILURE MODE AND CAUSES: Rupture caused by:

- o Manufacturing defect
- o Defective material

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 Fuel Filter is designed per Source Control Drawing 10203-0016 and is qualified in accordance with end item specification 10SPC-0049. (All failure causes)
- o The fuel filter is made of 304 stainless steel with the MS 33649 boss port welded on each end (85,000 lb/in² tensile). (Manufacturing defect)
- o Material selection is per MSFC-SPEC-522A. (Defective material)
- o The aft skirt area is purged with GN2 prior to APU startup, reducing the O2 concentration to less than four percent per OMRSD File II, Vol. 1, requirement number S00FM0.430. (All failure causes)
- o Fuel filter case burst occurred at 3250 psia during qualification testing. This is a safety factor of 8.0. (All failure causes)
- o Qualification testing verified design requirements as reported in ARDE Qualification Test Report QA41006-19. (All failure causes)

B. TESTING

- o Acceptance testing is performed per Wintec ATP 15228-591 on each new flight article. This includes Bubble Point Test, Visual Examination, Proof Pressure Test to 800 psig, Leakage Test to $\leq 1 \times 10^{-6}$ SCCS of helium, Flow Test and Cleanliness Verification. (All failure causes)
- o During refurbishment and prior to reuse, the fuel filter is reworked per 10SPC-0131 and acceptance tested by USA SRBE/TBE Florida operations per the criteria of 10SPC-0049. This includes Visual Examination, Bubble Point Test, Proof Pressure Test to 650 psig for 1.0 minutes with no evidence of external leakage or failure or permanent deformation, External Leakage Test to $\leq 1 \times 10^{-4}$ SCCS of helium when pressurized to 455 ± 25 psig for 5 minutes, Flow Test and Cleanliness Verifications. (All Failure Causes)
- o Fuel system leak test is performed at 380 ± 10 psig helium per 10REQ-0021, para. 2.3.3.1. (All failure causes)
- o Hotfire test is performed during hotfire operations to demonstrate proper function per 10REQ-0021, para. 2.3.16. (All failure causes)
- o GSE used for pressurizing the fuel system has multiple relief valves set at 440 psig, to inhibit overpressurization. (All failure causes)
- 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 Verification of FSM bottle pressure for hydrazine system pressure check per File V, Vol. I, requirement number B42AP0.025. (All failure causes)

The above referenced OMRSD testing is performed every flight.

C. INSPECTION

I. VENDOR RELATED INSPECTIONS

- o Filter dimensions including wall thickness are inspected by USA SRBE PQAR per SIP 1213. (Manufacturing defect)

- o Material test reports are verified by USA SRBE PQAR per SIP 1213. (Defective material)
- o Acceptance testing is witnessed by USA SRBE PQAR per SIP 1213. (All failure causes)
- o Final inspection to drawing requirements by USA SRBE PQAR per SIP 1213. (All failure causes)

NOTE: Inspections per SIP 1213 are performed on USA SRBE procured filters only. Filters procured by ARDE undergo verification by USA SRBE that all tests and inspections were performed per SIP 1110.

- o Critical Processes/Inspections:
 - EB Welding (Element Assembly) per MIL-W-46132
 - TIG Welding (Fittings) per WS F-008-321
 - Resistance Welding (Element Assembly) per MIL-W-6858

II. KSC RELATED REFURBISHMENT INSPECTION

- o Visual inspection of Fuel Filter will be performed per 10SPC-0131, para. II. (All Failure Causes)
- o Functional testing of Fuel Filter 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 INSPECTIONS

- o Fuel Filter connections are pressure checked during acceptance tests by USA SRBE per 10REQ-0021, para. 2.3.11.1. (All failure causes)
- o Fuel leak check after installation is witnessed per 10REQ-0021, para. 2.3.3.1. (All failure causes)
- o Proper function of TVC system is witnessed during hotfire by USA SRBE per 10REQ-0021, para. 2.3.16. (All failure causes)

- 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 The TVC system aft skirt is inspected 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 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 defect).
- 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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D. FAILURE HISTORY

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

E. OPERATIONAL USE

- O Not applicable to this failure mode.