

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Single Mission Fuel Isolation Valve (SMFIV)

PART NO.: 10201-0122-801 FM CODE: A02  
(Alt. for BI109 and BI110,  
Mandatory for BI111 and Subs.)

ITEM CODE: 20-01-10A REVISION: Basic

CRITICALITY CATEGORY: 1R REACTION TIME: Seconds

NO. REQUIRED: 2 DATE: April 1, 2001

CRITICAL PHASES: Boost SUPERCEDES:

FMEA PAGE NO.: A-20G ANALYST: G. Hoskins/S. Finnegan

SHEET 1 OF 3 APPROVED: S. Parvathaneni

FAILURE MODE AND CAUSES: Fail to remain open (Systems A and B) caused by:

- o Electrical open circuit.
- o Loss of connector retention.
- o Solenoid Failure
- o Contamination

FAILURE EFFECT SUMMARY: Failure of valves to remain open during boost will result in loss of TVC which leads to vehicle break up and 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) Pass - ATP-MR A-9480 at vendor's plant and acceptance per criteria of 10SPC-0240.
- 2) Pass - FIV position measurements, B46X1851X, B46X1852X.
- 3) Fail - Contamination

RATIONALE FOR RETENTION:

A. DESIGN

- o The Fuel Isolation Valve is designed and qualified in accordance with end item specification 10SPC-0240. (All failure causes)
- o Valve is designed to preclude malfunction or inadvertent completion of electrical circuits by conducting or nonconducting fluid debris by isolation of electrical circuits and hydrazine. (Electrical open circuit)
- o Valve is designed and is tested for 20 valve cycles minimum life (One SRB mission). (All failure causes)
- o Qualification testing verified design requirements as reported in Moog Inc.'s Qualification Test Report MR T-10241. (All failure causes)
- o Connector housing is CRES 304L. (Loss of connector retention)
- o Material selection is per MSFC-SPEC-522A. (Material defect)

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## B. TESTING

- o Acceptance testing is performed per Moog Inc.'s ATP MR A-9480 on each flight article at vendor's plant. This includes Visual Examination, Electrical Tests, Position Indicator Checks, Performance Checks, and Cleanliness Verification. (All failure causes)
- o Electrical and functional tests are performed per 10REQ-0021, para. 2.3.4.3, and 2.3.15.2. (All failure causes)
- o TVC system functional test is performed during Hot Fire operations per 10REQ-0021, para. 2.3.16. (All failure causes)
- o APU BITE resistance test B42AP0.050 and frequency test B42AP0.060 per OMRSD File V, Vol. I provides confidence that the coil assembly of the fuel isolation valve is not degraded. (Electrical Open Circuit)
- o The last functional test of FIV operations is per OMRSD File II, Vol. 1, requirement number S00FR0.070. (All failure causes)
- o Nitrogen is verified for cleanliness and composition (purity and particulate count) prior to introduction to on board flight hardware per 10REQ-0021 Para 2.3.2.2 and OMRSD File V Vol 1, Requirement Number B42APO.012. (All failure causes)
- o Hydrazine is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.1 and OMRSD File V, Vol. 1, Requirement Number B42APO.010. (All failure causes)
- 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. (All failure causes)

The above referenced OMRSD testing is performed every flight.

## C. INSPECTION

### I. VENDOR RELATED INSPECTION

- o Verification that material certifications meet the requirements called for on drawings and USA-SRB Element Purchase Order by USA SRBE PQAR per SIP 1511. (All failure causes)
- o Verification of data and supplier acceptance of the following by USA SRBE PQAR. (All failure causes)
  - Solder Joints - SIP 1511.
  - Cure data of diode board encapsulation and coil assembly - SIP 1511.
  - EB Welding - SIP 1511.
  - Heat Treat/Annealing - SIP 1511.
  - Nickel Plate with co-deposited Teflon coating – SIP 1511.
- o Witness acceptance testing in which measurements and/or readings are manually taken and/or recorded for the first two units in each test lot of FIV by USA SRBE PQAR per SIP 1511. Monitor acceptance testing for all other units in each test lot. (All failure causes).
- o All surfaces exposed to Hydrazine media, and require cleanliness verification, have been inspected and accepted by Moog and verified by USA SRBE PQAR per SIP 1511. (Contamination)
- o Perform post-ATP final inspection of unit (Ref. ATP MR-9480) by USA SRBE PQAR per SIP 1511. (All failure causes)

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Supersedes:

DRD 1.4.2.1-b

- o CRITICAL PROCESSES/INSPECTIONS:
  - Solder per NHB5300.4 (3A-2) per EP 2856
  - EB Welding per EP 3406
  - Heat Treat per EP 3233
  - Annealing per EP 3388

II. KSC RELATED REFURBISHMENT INSPECTIONS

- o N/A

III. KSC RELATED ASSEMBLY AND OPERATIONS INSPECTIONS

- o Proper function of TVC system is demonstrated during hotfire per 10REQ-0021, para. 2.3.16. (All failure causes)
- o Verification of proper valve resistance during BITE per OMRSD File V, Vol. 1 Requirement Number B42APO.050. (All failure causes)
- o FIV is functionally tested at bearing soak per OMRSD File V, Vol. 1 Requirement Number B42APO.080. (All failure causes)
- o Helium cleanliness and composition (purity and particulate count) are verified prior to introduction to on board flight hardware per 10REQ- 0021, para. 2.3.2.5. (All failure causes)
- o Nitrogen is verified for cleanliness and composition (purity and particulate count) prior to introduction to on board flight hardware per 10REQ-0021 Para 2.3.2.2 and OMRSD File V Vol 1, Requirement Number B42APO.012. (All failure causes)
- o Hydrazine cleanliness and composition (purity and particulate count) are verified prior to introduction to on board flight hardware per 10REQ- 0021, para. 2.3.2.1 and OMRSD File V, Vol. 1, Requirement Number B42APO.010. (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.

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