SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Fuel Isolation Valve

PART NO.: 10201-0052-801 (Eff. BI062 thru BI081)
10201-0052-802 (Alt for BI070 thru BI081 and mandatory BI082 and Subs)

FM CODE: A07

ITEM CODE: 20-01-10

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME: Seconds

NO. REQUIRED: 2

DATE: March 31, 2000 CN 038

CRITICAL PHASES: Boost, Separation

SUPERCEDES: March 31, 1997 CN 038

FMEA PAGE NO.: A-20B

ANALYST: B. Snook/S. Parvathaneni CN 038

SHEET 1 OF 3

APPROVED: S. Parvathaneni CN 038

FAILURE MODE AND CAUSES: Fails to remain open (System A and B) caused by:

- Electrical short circuit (power to ground, power to return)

FAILURE EFFECT SUMMARY: Failure of valves will result in loss of TVC and redundant power buses (A and B) 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 - Refurbished to ATP 74740 ATP1 Rev. T.

2) Pass - FIV position measurements, B46X1851X, B46X1852X; Bus power voltage measurements: B76V1600C, B76V1601C.

3) Pass - No single credible cause.

RATIONALE FOR RETENTION:

A. DESIGN

- The Fuel Isolation Valve is designed and qualified in accordance with end item specification 10SPC-0056. (Electrical Short Circuit)

- Valve is designed to preclude ignition of hydrazine due to electrical shorts. (Electrical Short Circuit)

- 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 Short Circuit)
- o Valve is designed and is tested for 1000 cycles minimum life. (Electrical Short Circuit)
- o Qualification testing verified design requirements as reported in Consol- idated Controls Qualification Test Report 74740 QTR-1, Rev. A. (Electri- cal Short Circuit)
- o Material selections are per JSC-SE-R-0006, Rev. A. (Electrical Short Circuit)
- o FIV isolation mount is subjected to vibration spectra testing prior to acceptance by Consolidated Controls per SP-1040, Rev. Basic. (Electrical Short Circuit)

B. TESTING

- o Acceptance testing is performed per Consolidated Controls Corporation ATP 74740 ATP 1 on each flight article at vendor's plant. This includes Visual Examination, Electrical Tests, Position Indicator Checks and Performance Checks. (Electrical Short Circuit)
- o During refurbishment and prior to reuse, Fuel Isolation Valves are reworked per 10SPC-0131 and acceptance tested per the criteria of 10SPC-0056 by USA SRBE/TBE Florida operations. (Electrical Short Circuit)
- o Electrical and functional tests are performed per 10REQ-0021, para. 2.3.4.3, and 2.3.15.2. (Electrical Short Circuit)
- o TVC system functional test is performed during Hot Fire operations per 10REQ-0021, para. 2.3.16. (Electrical Short Circuit)
- o FIV is functionally tested at bearing soak per OMRSD File V, Vol. 1 Requirement Number B42AP0.080. (Electrical Short Circuit)
- o Last test of FIV operation is at bearing soak at approximately T-11 per OMRSD File II, Vol. 1 Requirement Number S00FR0.070. (Electrical Short Circuit)

The above referenced OMRSD testing is performed every flight.

C. INSPECTION

I. VENDOR RELATED INSPECTION

- o Verification that all parts are inspected for burrs, damage and contamination by USA SRBE PQAR per SIP 1204. (Electrical Short Circuit)

- o All material certifications are verified by USA SRBE PQAR per SIP 1204. (Electrical Short Circuit)
- o Witness assembly and verify operation of valve by USA SRBE PQAR SIP 1204 as below: (Electrical Short Circuit)
  - Solder Inspect Operations
  - Potting Cure Time
- o Witness acceptance testing of FIV by USA SRBE PQAR per SIP 1204 (Electrical Short Circuit)
- o CRITICAL PROCESSES/INSPECTIONS:
  - Etching Wires per S-3079
  - Solder per NHB 5300.4(3A-1), S-3486.

II. KSC RELATED REFURBISHMENT INSPECTIONS

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

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III. KSC RELATED ASSEMBLY AND OPERATIONS INSPECTIONS

- o Proper function of TVC system is demonstarted during hotfire per 10REQ- 0021, para. 2.3.16. (Electrical Short Circuit)
- o Verification of proper valve operation during BITE per OMRSD File V, Vol. 1 Requirement Number B42AP0.050. (Electrical Short Circuit)
- o Verification of proper performance of BITE test by launch team per OMRSD File V, Vol. 1 Requirement Number B42AP0.050. (Electrical Short Circuit)
- 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)

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- o Fuel system leak test is performed per 10REQ-0021, para 2.3.6 (All failure causes)

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D. FAILURE HISTORY

Criticality 1R:

- o No SRB failure history for this failure mode.

E. OPERATIONAL USE

- o Not applicable to this failure mode.