

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Manual Shutoff Valve Assembly

PART NO.: 10201-0046-802
Includes

FM CODE: A02

Fitting, Connector
10209-0034-801
Manual Shutoff Valves
Outlet Lines and Fittings
Rigid Lines
10201-0003-105
10201-0003-108 (Alt.)
10201-0003-106
10201-0003-109 (Alt.)
Elbow
10209-0067-801
10209-0132-801 (Alt.)
Connectors
10209-0028-801
10209-0034-801
Plug, Bleeder
MS24391J4L
MS24391S4L (Alt.)
O-rings
Type M83248/1

ITEM CODE: 20-01-38

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-127

ANALYST: B. Snook/S. Parvathaneni

SHEET 1 OF 6

APPROVED: S. Parvathaneni

FAILURE MODE AND CAUSES: External leakage of hydraulic fluid (Systems A and/or B) at inlet fitting O-ring caused by:

- o Improper torque
- o Thread failure
- o Defective or damaged o-ring
- o Improperly lockwired
- o Defective or damaged sealing surface
- o Contamination

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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 Manual Shutoff Valve Assembly is designed and qualified in accordance with end item specification 10SPC-0081. (All Failure Causes)
- o O-ring material is Viton which is compatible with hydraulic fluid. (Contamination and Defective or Damaged O-Ring)
- o Designed for 3250 psig normal operating pressure with a burst pressure of 8125 psig. (Thread Failure)
- o Threads are 455 stainless steel. (Thread Failure)
- o Hydraulic fluid is MIL-H-83282 or MIL-PRF-83282 which was developed to minimize fire hazard. (Contamination)
- o All threaded fittings and connectors are torqued per engineering specifications and are lockwired per MS 33540, as applicable. (Improper Torque, Improperly Lockwired)
- o Ports are per requirement of MS 33649. (Thread Failure)
- o Contamination is controlled by Kaiser Electro Precision cleaning and packaging specifications RYY 101-140, Rev. E and RYY 101-141, Rev. D. (Contamination)
- o O-ring seal glands are per MIL-G-5514. (Defective or Damaged Sealing Surface)
- o Fluid procurement is controlled per SE-S-0073. (Contamination)
- o Assembled parts are cleaned per 10PRC-0620. (Contamination)
- o The aft skirt area is purged with GN2 prior to APU startup. This reduces the O2 concentration to less than four percent per OMRSD File II, Vol. 1, requirement number S00FM0.430. (All Failure Causes)
- o Qualification testing verified design requirements as reported in Kaiser Electro Precision Qualification Test Report RYY-204-032, Rev. Basic and supplemental Qualification Test Report RYY-204-036, Rev. Basic. (All Failure Causes)

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B. TESTING

- o Acceptance testing is performed by Kaiser Electro Precision ATP RYY-104-039 on each new unit. This includes visual examination, cleanliness verification, proof pressure test to 4875 psig and leak tests for five minutes at 3250 psig with leakage insufficient to form a drop. (All Failure Causes)

- o During refurbishment and prior to reuse, the Manual Shut Off Valve Assy. is reworked per 10SPC-0131 and acceptance tested by USA SRBE/TBE Florida operations per the criteria of 10SPC-0081. This includes visual examination, cleanliness verification, proof pressure test to 4975 ± 100 psig and leak test for five minutes at 3300 ± 50 psig with leakage insufficient to form a liquid drop. (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. (Contamination)
- o At installation, the Manual Shut-Off Valve fluid connections are leak tested during hydraulic system leak test with helium to an acceptable level per 10REQ-0021, para. 2.3.3.3. (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 Hydraulic fluid cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.6. (Contamination)
- o Verify effluent hydraulic fluid cleanliness and moisture (water content and particulate count) from the actuators and the reservoirs per 10REQ-0021, para. 2.3.12.3. (Contamination)
- o Visual leak check of hydraulic circuit (system) joints is performed per 10REQ-0021, para. 2.3.12.2. (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 Hydraulic fluid is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board Hydraulic circuits during prelaunch operations per OMRSD File V, Vol. 1, Requirement Number B42HP0.010. (Contamination)
- o Hydraulic fluid (effluent) is verified for moisture per OMRSD File V, Vol. 1, Requirement Number B42HP0.011. (Contamination)
- o Pre-launch hydraulic system leak test is performed per OMRSD File V, Vol. 1, Requirement Number B42HP0.020. (All Failure Causes)

C. INSPECTION

I. VENDOR RELATED INSPECTIONS

- o Material certifications verified by USA SRBE PQAR per SIP 1180. (Defective or Damaged Sealing Surface)
- o Verification of O-Ring cure dates by USA SRBE PQAR per SIP 1180. (Defective or Damaged O-Ring)
- o Assembly verified by USA SRBE PQAR per SIP 1180. (All Failure Causes)
- o Acceptance test witnessed by USA SRBE PQAR per SIP 1180. (All Failure Causes)
- o Verify threads per SIP 1180. (Thread Failures)
- o Critical Processes/Inspections:
 - None

II. KSC RELATED REFURBISHMENT INSPECTION

- o Visual inspection of Manual Shutoff Valve Assembly will be performed per 10SPC-0131, para. II. (All Failure Causes)
- o Functional testing of Manual Shutoff Valve 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 O-Rings, K-Seals and E-Seals (as applicable) are inspected prior to installation for absence of physical defects per 10REQ-0021, para. 2.3.0. (Defective or Damaged O-Ring)
- o Sealing surfaces are inspected prior to installation verifying no contaminant or obstruction exists per 10REQ-0021, para. 2.3.0. (Defective or Damaged Sealing Surface)
- o Torque applied to critical components is verified per 10REQ-0021, para. 2.1.4. (Improperly Torqued)
- o Lockwire installation verified per 10REQ-0021, para. 2.1.4. (Improperly Lockwired)
- o Helium cleanliness and composition (purity and particulate count) are verified prior to introduction on-board the flight hardware per 10REQ-0021, para. 2.3.2.5. (Contamination)

- o Hydraulic fluid cleanliness and composition (purity and particulate count) are verified prior to introduction on-board the flight hardware per 10REQ-0021, para. 2.3.2.6. (Contamination)
- o The moisture content and cleanliness (water content and particulate count) of the effluent hydraulic fluid from the actuators and the reservoirs are verified per 10REQ-0021, para. 2.3.12.3. (Contamination)
- o Hydraulic circuit fluid leak test is witnessed/verified per 10REQ-0021, para. 2.3.12.2 prior to hotfire. (All Failure Causes)
- o Performance of visual leak check of hydraulic circuit (system) joints per 10REQ-0021, para. 2.3.12.2. (All Failure Causes)
- o Verify Rock Hydraulic Reservoir level is greater than 30 percent during low speed GN2 spin per 10REQ-0021, para. 2.3.11.2. (All Failure Causes)
- o Verify Tilt Hydraulic Reservoir level is greater than 30 percent during low speed GN2 spin per 10REQ-0021, para. 2.3.11.2. (All Failure Causes)
- o Verify Rock Hydraulic Reservoir level is greater than 50 percent during high speed GN2 spin per 10REQ-0021, para. 2.3.15.2. (All Failure Causes)
- o Verify Tilt Hydraulic Reservoir level is greater than 50 percent during high speed GN2 spin per 10REQ-0021, para. 2.3.15.2. (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 (Includes verification of rock and tilt reservoirs between 50 and 90 percent), para. 2.3.16
- o TVC System is inspected for external leaks per 10REQ-0021 following low speed GN2 spin, para. 2.3.11.3, high speed GN2 spin, para. 2.3.15.5 and post Hotfire inspection, para. 2.3.16.4. (All Failure Causes)
- o Hydraulic fluid cleanliness and composition (purity and particulate count) are verified prior to introduction on-board Hydraulic circuits during prelaunch operations per OMRSD File V, Vol. 1, Requirement Number B42HP0.010. (Contamination)
- o Verification of hydraulic fluid (effluent) sampled for moisture per OMRSD File V, Vol. 1, Requirement Number B42HP0.011. (Contamination)
- o Prelaunch hydraulic system leak test is witnessed 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.