

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Fluid Manifold Assembly

PART NO.: 10201-0066-102  
10201-0098-801 (alt.)

FM CODE: A02

ITEM CODE: 20-01-47

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME: Seconds

NUMBER REQUIRED: 2

DATE: March 31, 2000

CRITICAL PHASES: Final Countdown, Boost

SUPERCEDES: March 31, 1997

FMEA PAGE NUMBER: A-143

ANALYST: B. Snook/S. Parvathaneni

SHEET 1 OF 4

APPROVED: S. Parvathaneni

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FAILURE MODE AND CAUSES: High pressure relief valve fails to open (System A and/or B) caused by:

- o Improper spring preload
- o Housing and main poppet galling/pilot poppet galling
- o Contamination
- o Clogged filter screen (For Pneudraulics relief valve only, not applicable to Wright Components part)
- o Improper assembly

FAILURE EFFECT SUMMARY: Fire and explosion will lead to loss of mission, vehicle and crew.

REDUNDANCY SCREENS AND MEASUREMENTS:

- 1) Pass - All units are subject to ATP during turnaround and refurbishment.
- 2) Pass - Hydraulic pressure measurements B58P1303C, B58P1304C.
- 3) Fail - Contamination.

RATIONALE FOR RETENTION:

A. DESIGN

- o The Fluid Manifold Assembly is designed and qualified in accordance with end item specification 10SPC-0054. (All Failure Causes)
- o Fluid procurement is controlled by SE-S-0073. (Contamination)
- o Main poppet is 440 CRES and housing is nitronic 40. (Housing and Main Poppet Galling/Pilot Poppet Galling)

- o The spring is 17-7 PH CRES CH900. (Improper Spring Preload)
- o Main poppet diameter is 0.692 +0/-0.001 inch with a 16 finish; and housing is 0.696 +.001/-0 inch with an 8 finish, maximum clearance is 0.006 inches. Pilot poppet diameter is 0.0995 + 0/-0.005 inch and seat is 0.102 + 0.001/-0 inch, maximum clearance is 0.004 inch. Main poppet diameter for the alternate manifold is 0.623 + 0.001 inch with a 16 finish; and housing is 0.626 + 0.001 dia. with a 32 finish, maximum clearance is 0.005. Pilot poppet diameter for the alternate manifold is 0.121/0.122 inch with a 32 finish and seat is 0.124/0.125 inch with a 32 finish, maximum clearance is 0.004 inches. (Housing and Main Poppet Galling/Pilot Poppet Galling)
- 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 S00FM0.430. (All Failure Causes)
- o Qualification testing verified design requirements as reported in Pneudraulics, Inc. Qualification Test Report QTR 8090, Rev. A or Wright Components QTR 80335A for the alternate manifold. (All Failure Causes)

#### B. TESTING

- o Acceptance testing of the high pressure relief valve is performed per Pneudraulics ATP 1674-1 or Wright Components ATP 11355 for the alternate manifold. This includes a visual examination, cleanliness, cracking pressure test and cleanliness. (All Failure Causes)
- o Acceptance testing of the manifold assembly is performed per Wright Components ATP 15980, at vendor's plant. This includes a visual examination, cleanliness, cracking pressure of the HPRV and cleanliness. (All Failure Causes)
- o During refurbishment and prior to reuse the fluid manifold assembly is processed for rework per 10SPC-0131 and acceptance tested per the criteria of 10SPC-0054 at USA SRBE/TBE Florida operations. This includes a visual examination, cleanliness verification, and HPRV cracking pressure and reseal pressure. (All Failure Causes)
- o Helium is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board circuits per 10REQ-0021, para. 2.3.2.5. (Contamination)
- o Hydraulic fluid is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board Hydraulic circuits per 10REQ-0021, para. 2.3.2.6. (Contamination)
- o The hydraulic manifold HPRV is functionally checked per 10REQ-0021, para. 2.3.10.3. (All Failure Causes)
- 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)

The above referenced OMRSD testing is performed every flight.

C. INSPECTION

I. VENDOR RELATED INSPECTIONS

- o Review of inspection reports on detailed parts is performed by USA SRBE PQAR per SIP 1259 or SIP 1298. (Improper Spring Preload, Housing and Main Poppet Galling/Pilot Poppet Galling, Improper Assembly)
- o Verification of material requirements and test results is performed by USA SRBE PQAR per SIP 1259 or SIP 1298. (Improper Spring Preload, Housing and Main Poppet Galling/Pilot Poppet Galling)
- o Witnessing of pre ATP contamination checks is performed by USA SRBE per SIP 1259 or SIP 1298. (All Failure Causes)
- o Verification of cracking pressure is performed by USA SRBE PQAR per SIP 1259 or SIP 1298. (All Failure Causes)
- o Verification of final cleaning is performed by USA SRBE PQAR per SIP 1259 or SIP 1298. (Contamination)
- o Witnessing of manifold assembly acceptance test is performed by USA SRBE per SIP 1252 or SIP 1298. (All Failure Causes)
- o Refurbished units are subject to cracking pressure verification by USA SRBE per SIP 1252 or SIP 1298. (All Failure Causes)
- o Critical Processes/Inspection
  - None

II. KSC RELATED REFURBISHMENT INSPECTIONS

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

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III. KSC RELATED ASSEMBLY & OPERATION INSPECTIONS

- o Helium cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board circuits per 10REQ-0021, para. 2.3.2.5. (Contamination)
- o Hydraulic fluid cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board Hydraulic circuits 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 rock actuator, the tilt reservoir, the rock reservoir and the tilt actuator are verified per 10REQ-0021, para. 2.3.12.3. (Contamination)

- o Verification of hydraulic manifold HPRV function is performed per 10REQ-0021, para. 2.3.10.3. (All Failure Causes)
- o Hydraulic fluid cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board Hydraulic circuits during prelaunch operations per OMRSD File V, Vol. 1, Requirement Number B42HP0.010. (Contamination)
- o Proper function of TVC system is demonstrated during hotfire operations per 10REQ-0021, para. 2.3.16. (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.