

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Hydraulic Bootstrap Reservoir

PART NO.: Bleeder Valve, Hydraulic:
10200-0098-801. Part of
Hydraulic Reservoir 10203-0008
includes:
Fluid Quantity Transducer:
1711016-350

FM CODE: A09

Fittings, Connector:
10209-0035-801
10209-0039-801
Fittings, Plug, Bleeder:
MS24391J12L
MS24391S12L (Alt.)
MS24391J4L
MS24391S4L (Alt.)
Vent Plug:
Primary MS24391J8L
Alternate MS24391K8L
O-rings:
Type M83248/1

ITEM CODE: 20-01-28B

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME:Seconds

NO. REQUIRED: 1

DATE: March 1, 2002

CRITICAL PHASES: Final Countdown, Boost

SUPERCEDES: March 1, 2001

FMEA PAGE NO.: A-100A

ANALYST: B. Snook/S. Parvathaneni

CN 044

SHEET 1 OF 5

APPROVED: S. Parvathaneni

FAILURE MODE AND CAUSES: External leakage of hydraulic fluid (System A and/or B) at bleed valves (Leakage past stem seat and cap seal) caused by:

- o Defective or damaged valve stem
- o Defective or damaged seat
- o Contamination
- and -
- o Improper torque
- o Improperly lockwired
- o Defective or damaged O-ring
- o Defective or damaged cap sealing surface
- o Contamination

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

REDUNDANCY SCREENS AND MEASUREMENTS:

- 1) Pass - Redundancy is verified on new unit
- 2) Fail - Loss of redundancy not detectable
- 3) Fail - Contamination

RATIONALE FOR RETENTION:

A. DESIGN

- o The Bleeder Valve is designed and qualified in accordance with end item specification 10SPC-0174. (All failure causes)
- o The bleeder valve cap has an O-ring seal which provides redundancy to the internal stem seal to protect against external leakage from an internal source. (Defective or Damaged O-ring)
- o Fluid procurement is controlled by SE-S-0073. (Contamination)
- o All threaded fittings and connectors are torqued per engineering specifications and are lockwired per MS 33540, as applicable. (Improper Torque, Improper Lockwired)
- o Stem material is 17-4PH CRES, CH900. (Defective or Damaged Valve Stem))
- o The cap O-ring is made of Viton rubber which was selected for its compatibility with hydraulic oil. (Defective or Damaged O-ring) CN 044
- o Body seat is made of 303 CRES, AMS 5640. (Defective or Damaged Seat)
- o Assembled parts are cleaned per 10PRC-0620. (Contamination)
- o The Bleeder Valve is scrapped after every flight and replaced with a new one. (All Failure Causes)
- o The hydraulic fluid is MIL-H-83282 or MIL-PRF-83282 which was developed specifically to minimize the fire hazard. (Contamination)
- o The aft skirt is purged with GN2 prior to APU start up, reducing the O2 concentration to less than four (4) percent per OMRSD File II, Vol. 1, requirement number S00FM0.430. (All Failure Causes)
- o Qualification testing verified design requirements as reported in Circle Seal Controls Qualification Test Report 815. (All Failure Causes)

B. TESTING

- o Acceptance testing is performed per Circle Seal Controls ATP T.M. 1068. This includes visual examination, fluid cleanliness verification, fluid leak test for no evidence of leaking, and proof pressure test to 6500 PSIG. (All Failure Causes)

- o Hydraulic system helium leak test to an acceptable level per 10REQ-0021, para. 2.3.3.3. (All Failure Causes)
- o Hydraulic fluid is sampled for purity and particulate count prior to introduction to on-board hydraulic circuits per 10REQ-0021, para. 2.3.2.6. (Contamination)
- o Effluent hydraulic fluid is sampled for water content and particulate count from the rock actuator, the tilt reservoir, the rock reservoir and the tilt actuator per 10REQ-0021, para. 2.3.12.3. (Contamination)
- 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 spin, para. 2.3.15
 - Hotfire, para. 2.3.16
- o Hydraulic fluid is sampled for purity and particulate count prior to introduction to on-board Hydraulic circuits during prelaunch operations per OMRSD File V, Vol. 1, requirement no. B42HP0.010. (Contamination)
- o Prelaunch Hydraulic leak test is performed per OMRSD File V, Vol. 1, requirement no. B42HP0.020.(All Failure Causes)
- o Hydraulic system integrity is monitored from APU start-up to lift off during final countdown per OMRSD File II, Vol. 1, requirement number S00FR0.070. (All Failure Causes)
- o Helium is tested for purity and particulate count prior to introduction to on-board circuits per 10REQ-0021, para. 2.3.2.5. (Contamination)

C. INSPECTION

VENDOR RELATED INSPECTIONS

- o Manufacturing and Assembly is controlled by USA SRBE Source Inspection Plan 1390. (All failure causes)
- o Vendor acceptance of dimensional conformance is verified by USA SRBE-BPC PQAR per SIP 1390. (Defective or Damaged Seat, Defective or Damaged O-ring, and Defective or Damaged Sealing Surface)
- o Verification of O-rings cure date by USA SRBE-BPC PQAR per SIP 1390. (Defective O-ring).
- o All material certifications are verified by USA SRBE-BPC PQAR per SIP 1390. (Defective or Damaged Valve Stem)
- o Cleanliness of components is verified by USA SRBE-BPC PQAR per SIP 1390. (Contamination)

- o Final acceptance tests are witnessed by USA SRBE-BPC PQAR per SIP 1390. (All Failure Causes)
- o Final inspection and packaging is verified by USA SRBE-BPC PQAR per SIP 1390. (All Failure Causes)
- o Critical Processes/Inspections:
 - Heat Treat per P.B. 104, CH900

KSC RELATED INSPECTIONS

- o Helium cleanliness is verified per 10REQ-0021, para. 2.3.2.5. (Contamination)
- o Assembly and torque are witnessed per 10REQ-0021, para. 2.1.4. (Improper torque)
- o Lockwire is verified per 10REQ-0021, para. 2.1.4. (Improperly lockwired)
- o Hydraulic system helium leak test is witnessed per 10REQ-0021, para. 2.3.3.3. (All Failure Causes)
- o Hydraulic fluid 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 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 Verify Rock Hydraulic Reservoir level is greater than 30 percent per 10REQ-0021, para. 2.3.11.2 during low speed GN2 spin. (All Failure Causes)
- o Verify Tilt Hydraulic Reservoir level is greater than 30 percent per 10REQ-0021, para. 2.3.11.2 during low speed GN2 spin. (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 Data review and performance verification during Hotfire operations by USA SRBE-BPC 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, para. 2.3.16 (Includes verification of Rock and Tilt reservoirs to between 50 and 90 percent)
- o TVC System is inspected for external leaks per 10REQ-0021, following low speed GN2 spin per para. 2.3.11.3, External leaks following high speed GN2 spin per para. 2.3.15.5 and post Hotfire inspection per para. 2.3.16.4. (All Failure Causes)
- o Hydraulic fluid purity and particulate count are verified prior to introduction to on-board Hydraulic circuits during prelaunch operations per OMRSD Rile V, Vol. 1, requirement no. B42HP0.010. (Contamination)
- o Prelaunch leak test is witnessed per OMRSD File V, Vol. 1, requirement no. 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.