

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Hydraulic Pump

PART NO.: 10201-0051-801, -802(Alt.)

FM CODE: A07

Includes:

Fittings, Connector
10209-0038-801
10209-0077-801
10209-0036-801

O-Rings
Type M83248/1

Plug, Seepage
MS24391 J4L

ITEM CODE: 20-01-29

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME: Seconds

NO. REQUIRED: 2

DATE: March 1, 2002

CRITICAL PHASES: Boost

SUPERCEDES: March 1, 2001

FMEA PAGE NO.: A-109

ANALYST: B. Snook/S. Finnegan

SHEET 1 OF 4

APPROVED: S. Parvathaneni

CN 044

FAILURE MODE AND CAUSES: Depressurization valve (NC) fails to close (for Phase A only) or remain closed (System A and B) caused by:

- o Spring breakage
- o Solenoid shaft binding breakage
- o Contamination
- o Solenoid spool and sleeve binding breakage

FAILURE EFFECT SUMMARY: Loss of TVC will lead to 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 - Pump operation is verified by ABEX ATP TP-675.
- 2) Pass - Hydraulic pressure measurements B58P1303C and B58P1304C.
- 3) Fail - Contamination

RATIONALE FOR RETENTION:

A. DESIGN

- o The Hydraulic Pump is designed and qualified in accordance with end item specification 10SPC-0053. (All failure causes)
- o Valve washers are 300 series stainless steel.
- o Valve spring is 17-7PH wire, heat treated CH900. (Spring Breakage)
- o Spool is 52100 alloy steel heat treated to Rockwell hardness of C58-62 (310-350 KSI).
- o Sleeve is 52100 alloy steel heat treated to Rockwell hardness of C58-62 (310-350 KSI).
- o Spool and sleeve are matched items, fitted to a .0001 inch clearance.
- o Material meets the requirements of MSFC-SPEC-522A. (Spring Breakage)
- o The solenoid has an NAJOH-8-98P water proof connector with Tecknit Consil-II compound 842 gasket and seal with an adhesive sealant. Solenoid design requirements are controlled by ABEX EDS-62234. (Contamination)
- o Fluid procurement is controlled per SE-S-0073. (Contamination)
- o Qualification testing verified design requirements as reported in ABEX Qualification Test Report AER-729. (Spring Breakage)

B. TESTING

- o Acceptance testing is performed per ABEX ATP TP-675 on each flight item. This includes visual examination, electrodepressurization valve test, functional test which includes electrical bonding, depressurized start, and pressurization. (All Failure Causes)
- o During refurbishment, the pump is reworked per 10SPC-0131 and tested per ATP TP-675 to ensure proper operations. (All Failure Causes)
- 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 Effluent hydraulic fluid is verified for moisture content and cleanliness (water content and particulate count) from the rock actuator, the tilt reservoir, the rock reservoir and the tilt actuator 10REQ-0021, para. 2.3.12.3. (Contamination)

- o Proper operation of the depressurization valve is verified by test during high speed GN2 spin per 10REQ-0021, para. 2.3.15 and during hotfire per 10REQ-0021, para. 2.3.16. (Spring breakage)
- 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 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)

C. INSPECTION

VENDOR RELATED INSPECTIONS

- o Nondestructive Evaluation (NDE) is performed on subassemblies by USA SRBE PQAR per SIP 1258. (Defective or Damaged Sealing Surface)
- o Witnessing of acceptance testing is performed by USA SRBE PQAR per SIP 1258. (Spring Breakage)
- o Verification that Parker Abex has performed and accepted all required Hydraulic Pump refurbishment and inspections per TP-1210 by USA SRBE PQAR per SIP 1258. (Spring Breakage) CN 044
- o Critical Processes/Inspections:
 - Heat treat per MIL-H-6875
 - Penetrant inspection per ASTM E1417
 - Magnetic particle inspection per ASTM-E-1444

KSC RELATED INSPECTIONS

- 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 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 Verification of hydraulic fluid (effluent) sample is performed for moisture and dissolved air content per OMRSD File V, Vol. 1, Requirement Number B42HP0.011 and B42HP0.070. (Contamination)

- o Hydraulic fluid cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board hydrazine circuits during prelaunch operations per OMRSD File V, Vol. 1, Requirement Number B42HP0.010. (Contamination)
- o Proper function of TVC system is verified during hotfire operations per 10REQ-0021, para. 2.3.11, 2.3.15 and 2.3.16 respectively for: (Spring Breakage)
 - Low speed GN2 spin
 - High speed GN2 spin
 - Hotfire
- o Valve operation is verified during hotfire operations per 10REQ-0021, para. 2.3.16. (Spring Breakage)
- o Valve operation is verified during Final Countdown from T-15 Sec. to T-7 Sec. by the automatic GLS System per OMRSD File II, Vol. 1, requirement number S00FR0.070. (Spring Breakage)

D. FAILURE HISTORY

- o Failure Histories may be obtained from the PRACA database.

E. OPERATIONAL USE

- O Not applicable to this failure mode.