

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Hydraulic Pressure Block Assembly

PART NO.: 10200-0038-102, -103 (Rock) FM CODE: A02  
10200-0040-102, -103 (Tilt)

Includes:

O-rings  
Type MS28775-019(2)  
Type MS28775-026(2)

Pressure Transducer  
10400-0126-801 (1)  
10400-0126-802 (1)

ITEM CODE: 20-01-48

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME: Seconds

NO. REQUIRED: 2

DATE: March 1, 2001

CRITICAL PHASES: Final Countdown, Boost

SUPERCEDES: March 31, 2000

FMEA PAGE NO.: A-155

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SHEET 1 OF 5

APPROVED: S. Parvathaneni

DCN 042  
DCN 042

FAILURE MODE AND CAUSES: External leakage of hydraulic fluid (System A and/or B) at pressure transducer or plate (transducer cover) primary and secondary O-rings caused by:

- o Contamination
- o Defective or damaged O-ring
- o Defective or damaged sealing surface
- and-
- o Improper torque
- o Contamination
- o Defective or damaged O-ring
- o Defective or damaged sealing surface
- o Improperly lockwired
- o Fastener failure (four each)

FAILURE EFFECT SUMMARY: Fire and explosion 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:

- o Fail - Redundancy not tested during turnaround or checkout.
- o Fail - Loss of redundancy not detectable.
- o Fail - Contamination.

## RATIONALE FOR RETENTION:

## A. DESIGN

- o The Pressure Transducers are sealed with a primary O-ring which is backed up by a secondary O-ring. (Defective or Damaged O-Ring and Defective or Damaged Sealing Surface)
- o All threaded fasteners are torqued per engineering specifications and are lockwired per MS 33540 as applicable. (Improper Torque, Improperly Lockwired)
- o The pressure transducers each use four NAS 1351C4H16 fasteners to maintain the pressure seal. (Fastner Failure)
- o O-ring material is Nitrile which is compatable with hydraulic fluid. (Contamination)
- o The hydraulic fluid is MIL-H-83282 or MIL-PRF-83282 which was developed to minimize the fire potential. (Contamination)
- o The pressure block is designed to withstand internal proof pressure of 1.5 times maximum operating pressure (4875 psig) and burst pressure of 2.5 times maximum operating pressure (8125 psig). (Fastner Failure) DCN 042
- 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 Qualificaiton testing verified design requirements as reported in NASA qualification Test Report TM-78258. (All Failure Causes)

## B. TESTING

- o TVC System functional test is performed during hotfire operations per 10REQ-0021, para. 2.3.16. (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 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 Visual leak check of hydraulic circuit (system) joints is performed per 10REQ-0021, para. 2.3.12.2. (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 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 Prelaunch hydraulic system leak test is performed per OMRSD File V, Vol. 1, Requirement Number B42HP0.020. (All Failure Causes)

The above referenced OMRSD testing is performed every flight.

## C. INSPECTION

### I. VENDOR RELATED INSPECTIONS

- o Verification of traceability of block material to actual chemical/physical test records is performed by USA SRBE PQAR SIP 1373. (Defective or Damaged Sealing Surfaces)
- o Verification of material certifications for pressure transducer is performed by USA SRBE PQAR per SIP 1244. (Defective or Damaged Sealing Surface)
- o Physical inspection of pressure transducer is performed by USA SRBE PQAR per SIP 1244. (Defective or Damaged Sealing Surface)
- o Verification of all sealing surfaces is performed by USA SRBE PQAR per SIP 1373. (Defective or Damaged Sealing Surface)
- o Critical Processes/Inspections:
  - Heat Treat the pressure block per QQ-S-763

### II.KSC RELATED REFURBISHMENT INSPECTION

- o Verification of inspection of hydraulic pressure block per 10SPC-0131, para. IIA, IIB and IID. (All Failure Causes)

### III. KSC RELATED ASSEMBLY AND OPERATIONS INSPECTIONS

- o Verify proper torque per 10REQ-0021, para. 2.1.4. (Improper Torque)
- o Verify proper lockwire per 10REQ-0021, para. 2.1.4. (Improperly Lockwired)
- o Proper function of TVC system is demonstrated during hotfire per 10REQ-0021, para. 2.3.16. (All Failure Causes)
- o Prelaunch hydraulic system leak test is verified per OMRSD File V, Vol. 1, Requirement Number B42HP0.020. (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 O-Rings 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 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 Hydraulic circuit fluid leak test is verified per 10REQ-0021, para. 2.3.12.2 prior to hotfire. (All Failure Causes)
- o TVC System is inspected for external leaks per 10REQ-0021, para. 2.3.11.3, 2.3.15.5 and 2.3.16.4 respectively following low speed GN2 spin, high speed GN2 spin and post Hotfire inspection. (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 Verification of visual leak check of hydraulic circuit (system) joints is performed per 10REQ-0021, para. 2.3.12.2. (All Failure Causes)

#### D. FAILURE HISTORY

##### Criticality Category 1R:

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

#### E. OPERATIONAL USE

- o Not applicable to this failure mode.

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