

## SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Gas Generator Valve Module

PART NO.: 5902651  
5912183 (alternate)

FM CODE: A13

ITEM CODE: 20-01-14

REVISION: Basic

CRITICALITY CATEGORY: 1

REACTION TIME: Seconds

NUMBER REQUIRED: 2

DATE: March 31, 1999

CRITICAL PHASES: Final Countdown, Boost

SUPERCEDES: March 31, 1997

FMEA PAGE NUMBER: A-56

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SHEET 1 OF 4

APPROVED: P. Kalia

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FAILURE MODE AND CAUSES: Rupture (System A and/or B) caused by:

- o Material defect
- o Manufacturing defect
- o Internal leakage of hydrazine to the electrical components.

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

REDUNDANCY SCREENS AND MEASUREMENTS: N/A

RATIONAL FOR RETENTION:

### A. DESIGN

- o The Gas Generator Valve Module is designed and qualified in accordance with end item specification 10SPC-0050. (All failure causes)
- o Body material is 6AL-4V titanium. (Material Defects)
- o The Aft skirt area is purged with GN2 prior to APU startup. This reduced 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 Sundstrand Qualification Test Report AER-1539-6, Rev. B, and AER 1539-10, Rev. Basic. (All Failure Causes)
- o Material selection is per MSFC-SPEC-522A. (Material defects)

## B. TESTING

- o Acceptance testing is performed per Marotta ATP 281951-9002 on each new unit. This includes visual and dimensional examination, proof pressure, internal leakage, external leakage and cleanliness level check. (All Failure Causes)
- o Abbreviated acceptance testing of units that only require rework of the solder joints is performed per Marotta AATP 281951-9002. This includes visual and dimensional examination, internal leakage and cleanliness level check. (All Failure Causes).
- o Acceptance testing of the assembled APU is performed per Sundstrand ATP TS 2409. This includes hotfire acceptance test and decontamination and precision cleaning of the fuel system. (All Failure Causes)
- o During refurbishment and prior to reuse, the GGVM is tested per Sundstrand ATP TS 2409, just as new units are. (Material Defects, Manufacturing Defects)
- o Helium (inflow) cleanliness and composition (purity and particulate count) are verified per 10REQ-0021, para. 2.3.2.5 prior to fuel pump shaft seal leak check. (Material Defect)
- o Helium cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.5. (Material Defect)
- o Hydrazine cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.1 and OMRSD File V, Vol. 1, requirement number B42APO.010. (Material Defect)
- o GN2 cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.2 and OMRSD File V, Vol. 1, requirement number B42APO.012. (Material Defect)
- o TVC system functional test is performed during hotfire to demonstrate proper operation per 10REQ-0021, para. 2.3.16 prior to hotfire. (Material Defects, Manufacturing Defects)
- o GN2 (from MLP portable panels) is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board flight hardware per OMRSD File V, Vol. 1, requirement number B42APO.012. (Material Defect)
- o Verification of APU Fuel system GN2 blanket pressure check per File V, Vol. I, requirement number B42APO.030 (All Failure Causes)

- o The APU Bite resistance test B42AP0.060 per File V, Vol. I, at post hydrazine loading to L-24 hours and at T-9 hours, provides confidence that electrical components of GGVM are not degraded by the exposure to hydrazine. (Internal leakage of hydrazine to the electrical components)

The above referenced OMRSD testing is performed every flight.

### C. INSPECTION

#### VENDOR RELATED INSPECTIONS

- o Vendor inspection and test records are verified per SIP 1128 by USBI QAR. (Manufacturing Defects, Material Defects)
- o Verification of test data from Marotta per SIP 1128, by USBI QAR. (All Failure Causes)
- o Verification of GGVM assembly in a 100 K clean room per SIP 1128 by USBI QAR. (Material Defects)
- o Verification of material certifications per SIP 1128 by USBI QAR. (Material Defects)
- o Verification of final leak tests per SIP 1128 by USBI QAR. (Manufacturing Defects, Material Defects)
- o Witnessing of acceptance testing per SIP 1128 by USBI QAR. (Manufacturing Defects, Material Defects)
- o Verifications that are required on new units are performed on refurbished units, per SIP 1128 by USBI QAR. (Manufacturing Defects, Material Defects)
- o Critical processes/inspections:
  - Annealed per AMS 4928

#### KSC RELATED INSPECTION

- o Helium (influent) cleanliness and composition (purity and particulate count) are verified per 10REQ-0021, para. 2.3.2.5 prior to fuel shaft seal leak check. (Material Defects)
- o Precision cleaning of tubes/hoses is verified by USBI per 10REQ-0021, para. 2.3.0. (Material Defects)
- o Helium cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.5. (Material Defects)
- o Hydrazine cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.1 and OMRSD File V, Vol. 1, requirement number B42AP.010. (Material Defects)

- o GN2 cleanliness and composition (purity and particulate count) are verified prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.2 and OMRSD File V, Vol. 1, requirement number B42AP0.012. (Material Defects).
- o Proper function of TVC system is demonstrated during hotfire operations per 10REQ-0021 to include hotfire, para. 2.3.16. (Material Defects, Manufacturing Defect)
- o Inspect TVC system for damage - no leaks, signs of rubbing or discoloration are allowed per 10REQ-0021 following low speed GN2 spin, para. 2.3.11.3 and high speed GN2 spin, para. 2.3.15.5. (Material Defects, Manufacturing Defect)
- o Post hotfire verification, including inspection and leak check per 10REQ-0021, para. 2.3.16.4. (Material Defects, Manufacturing Defect)
- o GN2 (from MLP portable panels) is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per 10REQ-0021, para. 2.3.2.2 and OMRSD File V, Vol. 1, requirement number B42AP0.012. (Material Defects)
- o GN2 (from servicing cart) is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per OMRSD File V, Vol. 1, requirement number B42AP0.012. (Material Defect)
- o Hydrazine (from servicing cart) is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board hydrazine circuits per OMRSD File V, Vol. 1, requirement number B42AP0.010. (Material Defect)
- o Verification of APU Fuel system GN2 blanket pressure check per File V, Vol. I, requirement number B42AP0.030 (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.