

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: Gas Generator

PART NO.: 5905078 FM CODE: A04  
Alt: 5905067  
Alt: 58727  
Alt: 5903456  
(Includes Pressure Sensor 27476, Tube Assy. 27516,  
dynatube fitting R44730 PF-03.)

ITEM CODE: 20-01-16 REVISION: Basic

CRITICALITY CATEGORY: 1 REACTION TIME: Seconds

NUMBER REQUIRED: 2 DATE: March 1, 2002

CRITICAL PHASES: Final Countdown, Boost SUPERCEDES: March 31, 2000

FMEA PAGE NUMBER: A-59a ANALYST: C.J.Smith/S. Finnegan

SHEET 1 OF 3 APPROVED: S. Parvathaneni

CN 044  
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FAILURE MODE AND CAUSES: External leakage of hot gases at gas generator pressure chamber tube that connects the chamber to the Pressure Transducer, caused by:

- o Improper torque
- o Defective or damaged sealing surface
- o Misalignment of sealing surfaces
- o Contamination
- o Thread Failure

FAILURE EFFECT SUMMARY: Hot gas leakage from the Gas Generator would act as an ignition source for hydrazine leakage or heat source for hydrazine contained in the system. This can result in fire and explosion leading to loss of mission, vehicle and crew.

REDUNDANCY SCREENS AND MEASUREMENTS: N/A

RATIONALE FOR RETENTION:

A. DESIGN

- o The Gas Generator is designed and qualified in accordance with APU end item specification 10SPC-0050. (All failure causes)
- o Material selection is per MSFC-SPEC-522A. (All Failure Causes)
- o 8 RMS surface finish on the Transducer fitting and mating elbow fitting (Defective or damaged sealing surface)

- o Fluid procurement is controlled by SE-S-0073. (Contamination)
- o Threaded fitting is torqued to 60-72 inch pounds per General Dynamics OTS Aerospace Drawing 27275 on new units. (Improper Torque)
- o Per the stress analysis performed by USA SRBE (Ref. JLR-026-94E dated March 11, 1994), torque value of 60-72 inch pounds is more than adequate to prevent loosening of the B-nut during its design life. (Improper torque) CN 044
- o The Aft Skirt is purged with GN2 prior to APU start up. This reduces the O<sub>2</sub> concentration to less than four percent per OMRSD File II, Vol. I, requirement number S00FM0.030. (All Failure Causes)
- o Qualification testing verified design requirements as reported in Sundstrand Qualification Test Report AER-1539-6. (All Failure Causes)

## B. TESTING

- o Acceptance testing is performed per General Dynamics OTS Aerospace ATP TP 0600 prior to installation in the APU. (All Failure Causes)
- o External leak check is carried out to 1500 ± 50 psig using helium per General Dynamics OTS Aerospace drawing 27275. Maximum allowable leakage rate is 1 X 10<sup>-4</sup> sccs. (All Failure Causes) (This test is performed on the first built)
- o The gas generator is proof pressure tested per General Dynamics OTS Aerospace drawing 27275 to 2250 ± 100 psig. The proof pressure is performed every 5th flight using GN2. (All Failure Causes)
- o Pressure Decay testing is performed per Sundstrand drawing 737722/1700061(Alt.) at 15 ± 2 psig helium. Pressure decay of 1 psig in 10 minutes for single leak point and 1.5 psig in 10 minutes for multiple leaks is allowed. This test is performed before and after hot firing operation conducted at Sundstrand. (All Failure Causes) CN 044
- o Acceptance testing of the APU is performed per Sundstrand ATP TS 2409 which includes hot firing operation. (All Failure Causes)
- o Helium is verified for cleanliness and composition prior to introduction to on-board circuits per 10REQ-0021 para. 2.3.2.5 (Contamination)
- o GN2 is verified for cleanliness and composition prior to introduction to on-board hydrazine circuits per 10REQ-0021 para. 2.3.2.2, OMRSD File V, Vol. I requirement number B42AP0.012. (Contamination)
- o Hydrazine is verified for cleanliness and composition prior to introduction to on board circuits per 10REQ-0021 para. 2.3.2.1 and OMRSD File V, Vol. I, requirement number B42AP0.010. (Contamination)

- o Functional Test is performed during hot fire operation per 10REQ-0021 para. 2.3.11, 2.3.15 and 2.3.16 respectively for: (All Failure Causes)
  - Low Speed Spin
  - High Speed Spin
  - Hot fire

C. INSPECTION

VENDOR RELATED INSPECTIONS

- o Source inspection plan verifies proper manufacturing and assembly per SIP 1491. (All Failure Causes)
- o Verification of proper operation per SIP 1491. (All Failure Causes)
- o Verification of inspection and test records by USA SRBE PQAR per SIP 1491 (All Failure Cause)
- o Critical Processes/Inspections:
  - None

KSC RELATED INSPECTIONS

- o Exhaust leak check per 10REQ-0021 para 2.3.3.2. at 14 +1/-0 psig with GN2. Less than 2.5 psig decay is allowed in 10 minutes. (All Failure Causes.)
- o Helium cleanliness and composition are verified prior to introduction to onboard circuits per 10REQ-0021 para. 2.3.2.5. (Contamination)
- o GN2 is verified for cleanliness and composition prior to introduction to on-board circuits per OMRSD File V, Vol. I, requirement number B42AP0.012. (Contamination)
- o Proper function of TVC system is verified during hotfire 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.