

SRB CRITICAL ITEMS LIST

SUBSYSTEM: THRUST VECTOR CONTROL

ITEM NAME: APU Hydrazine Lines and Fittings

PART NO.: Part of 10201-0049 (740414)

FM CODE: A02

Includes:

Fuel Supply Line 726322

Bypass Fuel Line 726323

Dynatube Fitting 59065-1

Dynatube Pressure Cap 57905-4

Dynatube Pressure Cap 57954

Tee Fitting 57963

Reducer Tee Fitting 58559

90° Elbow 58195

60° Elbow 58196

ITEM CODE: 20-01-13A

REVISION: Basic

CRITICALITY CATEGORY: 1

REACTION TIME: Seconds

NUMBER REQUIRED: 2

DATE: March 31, 2000

CRITICAL PHASES: Final Countdown, Boost

SUPERCEDES: March 31, 1997

FMEA PAGE NUMBER: A-42

ANALYST: B. Snook/ S. Parvathaneni

SHEET 1 OF 4

APPROVED: S. Parvathaneni

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

- o Material defect
- o Manufacturing defect

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

REDUNDANCY SCREENS AND MEASUREMENTS: N/A

RATIONALE FOR RETENTION:

A. DESIGN

- o The APU Hydrazine Lines and Fittings are designed and qualified in accordance with end item specification 10SPC-0050. (All failure causes)
- o The tubing material is 304L stainless steel per MIL-T-8606. Type 1 is .250" OD by .035" wall thickness. (Material Defect)
- o Tube surface imperfections are controlled per MS33611. (All Failure Causes)

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- o Tube assembly installation meets minimum clearance distances requirements relative to other items to prevent vibration induced interference. (All Failure Causes)
- o Fluid procurement is controlled per SE-S-0073. (Material Defect)
- o The aft skirt is purged with GN2 prior to APU start up. This reduces 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 APU Qualification Test Report AER 1539-6, Rev. B. (All Failure Causes)

B. TESTING

- o The tube assemblies are proof pressure tested to 2200 ± 50 psig for five minutes with no leakage allowed, by the vendor. (All Failure Causes)
- o Acceptance testing is performed per Sundstrand ATP TS-2409 on all new units. This includes a hotfire acceptance test and decontamination and precision cleaning of the fuel system. (All Failure Causes)
- o During refurbishment and prior to reuse the APU and its lines and fittings are subjected to the same ATP as new units. (All Failure Causes)
- o Helium (influent) is verified for cleanliness and composition (purity and particulate count) prior to fuel pump shaft seal leak check per 10REQ-0021, para. 2.3.2.5. (Material Defect)
- o Helium is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.5. (Material Defect)
- o Hydrazine is verified for cleanliness and composition (purity and particulate count) prior to introduction to on-board flight hardware per 10REQ-0021, para. 2.3.2.1 and OMRSD File V, Vol. 1, requirement number B42AP0.010. (Material Defect)
- o GN2 is verified for cleanliness and composition (purity and particulate count) 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 Defect)
- o Hotfire test is performed during hotfire operations to demonstrate proper function per 10REQ-0021, para. 2.3.16. (All Failure Causes)
- 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 B42AP0.012. (Material Defect)

- o Verification of APU Fuel system GN2 blanket pressure check per File V, Vol. I, requirement number B42APO.030 (All Failure Causes)

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 USA SRBE PQAR. (All Failure Causes)
- o Verification of material certifications per SIP 1128 by USA SRBE PQAR. (Material Defects)
- o Witnessing of acceptance testing per SIP 1128 by USA SRBE PQAR. (All Failure Causes)
- o Final inspection to drawing requirements is performed by vendor and verified per SIP 1128 by USA SRBE. (All Failure Causes)
- o Verifications that are required on new units are performed on refurbished units per SIP 1128 by USA SRBE PQAR. (All Failure Causes)
- o Critical Processes/Inspections:
 - Penetrant inspect per CP16.03-01

KSC RELATED INSPECTIONS

- 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 Defect)
- o Precision cleaning of tubes/hoses is verified by USA SRBE per 10REQ-0021, para. 2.3.0. (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 B42AP0.010. (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 B42AP0.012. (Material Defect)

- o Proper function of TVC system is demonstrated during hotfire operations per 10REQ-0021 to include hotfire, para. 2.3.16. (All Failure Causes)
- o Inspect TVC system in aft skirt 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. (All Failure Causes)
- o Post hotfire verification, including inspection and leak check per 10REQ-0021, para. 2.3.16.4. (All Failure Causes)
- 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 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 Defects)
- o Hydrazine (from servicing cart) is verified for cleanliness and composition (purity and particulate count) prior to introduction on-board hydrazine circuits per OMRSD File V, Vol. 1, requirement number B42AP0.010. (Material Defects)
- o TVC Couplings (Both SRB and GSE) are inspected each time prior to mating per 10REQ-0021 para. 2.3. After transfer to SPC they are inspected prior to mating per File V, Vol. I, requirement number B42GEN.070. (All Failure Causes).
- o Verification of APU Fuel system GN2 blanket pressure check per File V, Vol. I, requirement number B42APO.030 (All Failure Causes)

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D. FAILURE HISTORY

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

E. OPERATIONAL USE

- o Not applicable to this failure mode.