

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3B -0414 -4 REV: 03/09/8

ASSEMBLY : AMMONIA BOILER SUBSYSTEM ABORTS CRIT. FUNC: 10  
P/N RI : ME276-0030-0011 AOA, RTLS, TAL CRIT. HDW: 3  
P/N VENDOR: 60870-11 VEHICLE 102 103 104  
QUANTITY : 4 EFFECTIVITY: X X X  
: FOUR PHASE(S): PL LO OO DC X LS  
: 2 PER TANK

REDUNDANCY SCREEN: A- FAIL B- FAIL C- PAS  
PREPARED BY: APPROVED BY: APPROVED BY (NASA):  
DES J. MORGAN DES *[Signature]* SSM *[Signature]* 4/11  
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ITEM:

QUICK DISCONNECT/CAP, AMMONIA FILL AND DRAIN.

FUNCTION:

PROVIDES CAPABILITY TO FILL AND DRAIN AMMONIA TANK, RETAINS AMMONIA IN TANKS WHEN DISCONNECTED AFTER SERVICING. THE AMMONIA BOILER SYSTEM IS USED DURING POSTLANDING OPERATIONS, LAUNCH ABORTS AND AS A BACKUP SYSTEM DURING NORMAL DEORBITS.

FAILURE MODE:

INTERNAL LEAKAGE

CAUSE(S):

CORROSION, VIBRATION, MECHANICAL SHOCK, CONTAMINATION.

EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) LOSS OF ONE REDUNDANT SEAL FOR AMMONIA STORAGE.

(B, C, D) NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECT - SECOND ASSOCIATED FAILURE (LOSS OF REDUNDANT SEAL) CAUSES LOSS OF ONE HALF OF THE AMMONIA COOLING SYSTEM CAPABILITY. THIRD ASSOCIATED FAILURE (REDUNDANT AMMONIA SYSTEM) WILL CAUSE LOSS OF ALL VEHICLE COOLING AND LOSS OF CREW/VEHICLE. REDUNDANCY SCREEN 'B' FAILS BECAUSE QD POPPET INTERNAL LEAK IS UNDETECTABLE IN FLIGHT - PRESSURE CAP PROVIDES REDUNDANT SEAL. REDUNDANCY SCREEN 'A' FAILS BECAUSE PRESSURE CAP CAN NOT BE LEAK CHECKED AFTER INSTALLATION.

DISPOSITION & RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN

DESIGN BURST PRESSURE OF 1100 PSIG. POPPET IS SPRING LOADED CLOSED. MATERIALS USED ARE NYLON AND CRES STAINLESS STEEL WHICH ARE COMPATIBLE WITH AMMONIA. GSE HAS A 15 MICRON ABSOLUTE FILTER TO PROTECT AGAINST CONTAMINATION.

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(B) TEST

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE.

- 1) LIFE CYCLES AT PRESSURE: 360/350/250 PSIG.
- 2) THERMAL CYCLES AT PRESSURE: 3 THERMAL CYCLES.
  - (A) HIGH TEMPERATURE - (275 F AT 360 PSIG; POPPET CLOSED AND CAPPED)
  - (B) LOW TEMPERATURE - (-100 F AT 360 PSIG; POPPET CLOSED AND CAPPED)
  - (C) HIGH TEMPERATURE - (275 F AT 360 PSIG; POPPET OPENED AND CAPPED)
- 3) VIBRATION - QD CAPPED AND PRESSURIZED AT 360 PSIG - AT 0.7 G<sup>2</sup>/HZ FOR 34 MIN/AXIS.

ACCEPTANCE TEST - PROOF TEST AT 835 PSIG. LEAK CHECK AT 550 PSIG.

OMRSD - AMMONIA SAMPLE VERIFIED TO MEET SE-3-0073 REQUIREMENTS PRIOR TO LOADING. AMMONIA FILL AND DRAIN QD LEAK CHECK (GSE MATED AND DEMATED) DURING TURNAROUND. QD/TP COUPLING AND CAP INSPECTION AND CHECKOUT DURING TURNAROUND.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION. PARTS PROTECTION VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PLAN AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION, AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND FINISH OF SEALING SURFACES ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELDING, HEAT TREATING AND PASSIVATION ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

LEAK TEST IS VERIFIED BY INSPECTION.

TESTING

ACCEPTANCE TEST, INCLUDING LEAKAGE TEST, IS VERIFIED BY INSPECTION.

HANDLING/STORAGE

HANDLING, PACKAGING AND STORAGE PROVISIONS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO APPLICABLE FAILURE HISTORY.

(E) OPERATIONAL USE

NO CREW ACTION REQUIRED FOR FIRST FAILURE. AMMONIA TANK TEMPERATURE AND PRESSURE SENSORS WILL IDENTIFY LEAK WHEN SECOND SEAL BEGINS TO LEAK.