

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-38 -0408 -3 REV:08/25/81

ASSEMBLY : AMMONIA BOILER SUBSYSTEM CRIT. FUNC: 1
 P/N RI : MC290-0005-0007 CRIT. HDW:
 P/N VENDOR: 75374000-103 VEHICLE 102 103 104
 QUANTITY : 2 EFFECTIVITY: X X X
 : ONE PER SYSTEM PHASE(S): PL LO OO DO X LS

		REDUNDANCY SCREEN:	A-PASS	B-N/A	C-PAS
PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):		
DES	J MORGAN	DES	SSM		
REL	D. RISING	REL			
QE	W. SMITH	QE			

ITEM:

SOLENOID VALVE, ISOLATION, AMMONIA TANK.

FUNCTION:

RETAINS AMMONIA IN THE TANKS PRIOR TO USAGE. RELEASES AMMONIA TO THE FLOW CONTROL VALVE. THE AMMONIA BOILER SYSTEM IS USED DURING POST-LANDING OPERATIONS, LAUNCH ABORTS, AND AS A BACKUP SYSTEM DURING NORMAL DEORBITS.

FAILURE MODE:

FAILS CLOSED (MECHANICAL).

CAUSE(S):

PHYSICAL BINDING/JAMMING, CORROSION, MECHANICAL SHOCK, VIBRATION, CONTAMINATION.

EFFECT(S) ON:

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

(A, B) LOSS OF ONE OF TWO AMMONIA SYSTEMS FOR VEHICLE COOLING.

(C) REDUCED LENGTH OF PAYLOAD POSTLANDING COOLING.

(D) SECOND ASSOCIATED FAILURE (LOSS OF REDUNDANT AMMONIA SUPPLY SYSTEM) WILL CAUSE LOSS OF ALL VEHICLE COOLING AND MAY RESULT IN LOSS OF CREW/VEHICLE. SCREEN "B" IS N/A BECAUSE THE AMMONIA BOILER SYSTEM AND THIS ISOLATION VALVE ARE IN STANDBY.

DISPOSITION & RATIONALE:

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

(A) DESIGN

SPRING IS DESIGNED TO MAINTAIN CONSTANT PRESSURE ON POPPET SEAT. THE TOLERANCE BETWEEN THE PLUNGER AND THE VALVE BODY PREVENTS MISALIGNMENT OF THE SEALING SURFACE. VALVE HAS A 25 MICRON ABSOLUTE FILTER AT INLET TO PROTECT AGAINST CONTAMINATION. GSE HAS A 15 MICRON ABSOLUTE FILTER TO PROTECT AGAINST CONTAMINATION. MATERIALS USED ARE CRES STAINLESS STEEL, INCONEL, AND TEFLON WHICH ARE CORROSION RESISTANT AND COMPATIBLE WITH AMMONIA.

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(B) TEST

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE.
VIBRATION TESTED AT 0.01 G²/HZ FOR 48 MIN/AXIS AND SHOCK TESTED AT +/- 20
G/AXIS. CYCLE TESTED FOR 8000 CYCLES.

ACCEPTANCE TEST - FUNCTIONAL CHECK PRIOR TO INSTALLATION INTO THE BOILER
ASSEMBLY VERIFIES PERFORMANCE.

OMRSD - SOLENOID VALVE OPERATION IS VERIFIED EVERY TWO FLIGHTS. AMMONIA
SAMPLE VERIFIED TO MEET SE-S-0073 REQUIREMENTS PRIOR TO SERVICING.

(C) INSPECTION

RECEIVING INSPECTION

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

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES, CONTAMINATION CONTROL PLAN, AND
CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION. SYSTEM FLUID
SAMPLE FOR CONTAMINATION IS 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. SEALS ARE VISUALLY INSPECTED AT 3X TO 7X
MAGNIFICATION FOR DAMAGE.

CRITICAL PROCESSES

HEAT TREATING, PASSIVATION, WELDING AND BRAZING PROCESSES ARE VERIFIED BY
INSPECTION.

NONDESTRUCTIVE EVALUATION

RADIOGRAPHIC INSPECTION OF WELDS AND BRAZED JOINTS ARE VERIFIED BY
INSPECTION.

TESTING

FUNCTIONAL TESTING PERFORMED DURING ATP IS VERIFIED BY INSPECTION TO BE
WITHIN SPECIFIED LIMITS.

HANDLING/PACKAGING

HANDLING AND STORAGE ENVIRONMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

(CAR 03F025) DURING STS-3 POSTLANDING OPERATIONS, SYSTEM B ISOLATION
VALVE FIRST FAILED TO OPEN WHEN ACTIVATED AND, AFTER IT WAS
FINALLY OPENED, FAILED TO CLOSE WHEN AMMONIA SYSTEM WAS DEACTIVATED. THE
CAUSE WAS FOUND TO BE AMMONIUM CHLORIDE, CALCIUM CARBONATE, AND SOME RUST
PARTICLES LODGED IN THE VALVE. VALVE HANDLING PROCEDURES AT THE
SUPPLIER AND AMMONIA FLUID REQUIREMENTS WERE CHANGED TO CONTROL FORMATION
OF CONTAMINANTS.

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(E) OPERATIONAL USE

FAILURE NOT DETECTABLE UNTIL AMMONIA BOILER IS REQUIRED. RECONFIGURE
AMMONIA BOILER TO THE REDUNDANT AMMONIA SYSTEM.