

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CRITICAL HARDWARE
NUMBER: 06-3B-0401-X**

SUBSYSTEM NAME: ATCS - AMMONIA BOILER SYSTEM

REVISION: 1 08/25/93 W

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: AMMONIA BOILER SUB-SYSTEM	MC250-0005-0007 74716050
SRU	: BOILER, AMMONIA	74716050

PART DATA

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
BOILER, AMMONIA**

**QUANTITY OF LIKE ITEMS: 1
ONE**

**FUNCTION:
PROVIDES COOLING FOR FREON COOLANT LOOPS WITH VAPORIZATION OF AMMONIA
AS THE COOLING SOURCE. THE AMMONIA BOILER SYSTEM IS USED DURING
POSTLANDING OPERATIONS, LAUNCH ABORTS, AND AS A BACKUP DURING NORMAL
DEORBITS.**

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-38 -0401 -1 REV:08/23/88

ASSEMBLY : AMMONIA BOILER SUBSYSTEM CRIT. FUNC: 1R
P/N RI : MC250-0005-0007 CRIT. HDW:
P/N VENDOR: 74716050 VEHICLE 102 103 104
QUANTITY : 1 EFFECTIVITY: X X X
: ONE PHASE(S): PL LO X OO X DC X LS
:

REUNDANCY SCREEN: A-PASS B-PASS C-PASS
PREPARED BY: APPROVED BY: APPROVED BY (NASA):
DES J. MORGAN DES *[Signature]* SSM *[Signature]*
REL D. RISING REL *[Signature]*
QE W. SMITH QE *[Signature]*

ITEM:
BOILER, AMMONIA.

FUNCTION:
PROVIDES COOLING FOR FREON COOLANT LOOPS WITH VAPORIZATION OF AMMONIA AS THE COOLING SOURCE. THE AMMONIA BOILER SYSTEM IS USED DURING POSTLANDING OPERATIONS, LAUNCH ABORTS, AND AS A BACKUP SYSTEM DURING NORMAL DEORBITS

FAILURE MODE:
RESTRICTED FLOW, FREON.

CAUSE(S):
CORROSION, CONTAMINATION, MECHANICAL SHOCK, VIBRATION.

EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
(A) LOSS OF FREON FLOW IN ONE FREON COOLANT LOOP.
(B) LOSS OF ONE FREON COOLANT LOOP FOR VEHICLE COOLING.
(C) POSSIBLE LOSS OF MISSION. EARLY MISSION TERMINATION MAY BE REQUIRED FOR FIRST FAILURE.
(D) SECOND ASSOCIATED FAILURE (LOSS OF REDUNDANT FREON COOLANT LOOP) WILL CAUSE LOSS OF ALL VEHICLE COOLING AND MAY RESULT IN LOSS OF CREW/VEHICLE

DISPOSITION & RATIONALE:
(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN
STANDARD BRAZED TUBE-SHELL CONSTRUCTION. DESIGN OF HEAT EXCHANGER MAKES THIS A REMOTE FAILURE DUE TO THE LARGER FLOW AREA IN THE HEAT EXCHANGER THAN THE SUPPLY PLUMBING (FREON TUBING MINIMUM DIAMETER IS 0.25 INCH). GSE FINAL FILTER (15 MICRON ABSOLUTE) AND PUMP PACKAGE INLET FILTER (25 MICRON) CONTROL CONTAMINATION. PARTIAL RESTRICTION RESULTS IN PERFORMANCE DEGRADATION. MATERIALS ARE CRES STAINLESS STEEL, WHICH IS CORROSION RESISTANT AND COMPATIBLE WITH AMMONIA AND FREON 21.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3B -0401 -1 REV:08/25/88

(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 +/- 2
G/AXIS.

ACCEPTANCE TEST - ATP INCLUDES FLOW TEST.

OMRSD - FLUIDS CONTROLLED TO SE-S-0073. FREON FLOWRATES ARE VERIFIED
BEFORE EACH FLIGHT.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL CERTIFICATION VERIFIED BY INSPECTION. PART PROTECTION
VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES, CONTAMINATION CONTROL PLAN, AND
CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION. SYSTEM FLUID
SAMPLES FOR CONTAMINATION ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION, AND ASSEMBLY OPERATIONS ARE VERIFIED BY
INSPECTION.

CRITICAL PROCESSES

TUBE BRAZING AND TUBE WELDING PROCESSES ARE VERIFIED BY INSPECTION.
PASSIVATION OF CRES MATERIALS IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION OF TIG WELDS IS VERIFIED. RADIOGRAPHIC INSPECTION
OF BRAZE JOINTS ARE VERIFIED BY INSPECTION.

TESTING

FLOWRATES ARE VERIFIED TO SPECIFIED LIMITS BY INSPECTION.

HANDLING/PACKAGING

HANDLING AND STORAGE ENVIRONMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

NO APPLICABLE FAILURE HISTORY.

(E) OPERATIONAL USE

ON-BOARD ALARM, FREON FLOW, WILL INDICATE HARDWARE FAILURE. FREON PUMP
WILL BE TURNED OFF AND LOSS OF ONE FREON LOOP POWERDOWN WILL BE
PERFORMED. ENTRY AT NEXT PRIMARY LANDING SITE.