

FAILURE MODES EFFECTS ANALYSIS (FMEA) — CRITICAL HARDWARE

NUMBER: 06-3B-0403-X

1639

SUBSYSTEM NAME: ATCS - AMMONIA BOILER SYSTEM

REVISION : 2 06/13/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	AMMONIA BOILER SUB-SYSTEM	MC250-0005-0007 74716050
LRU :	TEMPERATURE SENSOR, ABS	74716048-5 74716050

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
TEMPERATURE SENSOR, AMMONIA BOILER FAULT LOGIC.

QUANTITY OF LIKE ITEMS: 2
ONE/SYS. A OR B CONTROLLER; TWO PER VEHICLE

FUNCTION:
PROVIDES UNDER TEMPERATURE SIGNAL TO THE SYSTEM "A" OR "B" AMMONIA CONTROLLER FAULT LOGIC CIRCUIT FOR AUTOMATIC SWITCHOVER TO SECONDARY CONTROLLER AND CONTROL VALVE FOR UNDER TEMPERATURE PROTECTION. THE AMMONIA BOILER SYSTEM IS USED DURING POSTLANDING OPERATIONS, LAUNCH ABORTS, AND AS A BACKUP SYSTEM DURING NORMAL DEORBITS.

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SUBSYSTEM: ATCS - AMMONIA BOILER SYSTEM
LRU :AMMONIA BOILER SUB-SYSTEM
ITEM NAME: TEMPERATURE SENSOR, ABS

CRITICALITY OF THIS
FAILURE MODE:LR3

FAILURE MODE:
OPEN (ELECTRICAL), OUT OF TOLERANCE/HIGH

MISSION PHASE:
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
: 103 DISCOVERY
: 104 ATLANTIS
: 105 ENDEAVOUR

- CAUSE:
VIBRATION, MECHANICAL SHOCK, CORROSION
- CRITICALITY 1/1 DURING INTACT ABORT ONLY? YES

AOA	ABORT ONCE AROUND
RTLS	RETURN TO LAUNCH SITE
TAL	TRANS ATLANTIC ABORT

REDUNDANCY SCREEN A) PASS
B) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)

- B)
REDUNDANCY SCREEN 'B' FAILS BECAUSE FAILED SENSOR CANNOT BE MONITORED BY CREW OR GROUND.

C)

- FAILURE EFFECTS -

- (A) SUBSYSTEM:
LOSS OF UNDER TEMPERATURE PROTECTION FOR THE AFFECTED SYSTEM.

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- (B) INTERFACING SUBSYSTEM(S):
NO EFFECT UNLESS PRIMARY CONTROLLER LOGIC FAILS.
- (C) MISSION:
NO EFFECT.
- (D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECTS:
FUNCTIONAL CRITICALITY EFFECT - LOSS OF ALL FREON UNDER TEMPERATURE CONTROL (PRIMARY CONTROLLER AND REDUNDANT AMMONIA SYSTEM PRIMARY AND SECONDARY CONTROLLERS) CAN FREEZE THE INTERCHANGER AND RESULT IN RUPTURE OF WATER AND FREON COOLANT LOOPS. LOSS OF VEHICLE COOLING CAN CAUSE LOSS OF CREW/VEHICLE.

- DISPOSITION RATIONALE -

(A) DESIGN:

SENSOR IS A PLATINUM ELEMENT RESISTANCE THERMOMETER WHICH FUNCTIONS AS PART OF A CLOSED LOOP CONTROL SYSTEM TO PROVIDE UNDER TEMPERATURE PROTECTION TO KEEP THE INTERCHANGER FROM FREEZING. EACH AMMONIA SYSTEM ("A" OR "B") USES A DEDICATED SENSOR. SENSORS HAVE SHEET METAL COVERS TO PREVENT MOISTURE FROM ENTERING THE SENSOR ELEMENT. PLATINUM SENSOR IS BONDED TO STAINLESS STEEL TUBING, WHICH IS COMPATIBLE WITH FREON 21, OUTSIDE ENVIRONMENT, AND AMMONIA.

■ (B) TEST:

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE. PERFORMANCE CHECK. VIBRATION TESTED AT 0.01 G**2/HZ FOR 48 MIN/AXIS AND SHOCK TESTED AT +/- 20 G IN EACH AXIS.

ACCEPTANCE TEST - COMPONENT VENDOR ATP CHECKS CALIBRATION, INSULATION RESISTANCE. AMMONIA BOILER SUBSYSTEM ATP CHECKS FOR LOW TEMPERATURE TRANSFER FUNCTION AND TRANSFER TEMPERATURES FOR SYSTEMS "A" AND "B".

OMRSD - AMMONIA CONTROLLER SWITCHOVER CHECKOUT EVERY TEN FLIGHTS.

(C) INSPECTION:

RECEIVING INSPECTION

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

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES AND CORROSION PROTECTION PROVISIONS ARE

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VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
MANUFACTURING, INSTALLATION AND ASSEMBLY OPERATIONS, INCLUDING PARTS
PROTECTION, ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
SPOT WELDING OF WIRES TOGETHER AND BRAZING ARE VERIFIED BY INSPECTION.

TESTING
ATP, INCLUDING INSULATION RESISTANCE AND LEAD WIRE PULL TESTS, IS
VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING, PACKAGING AND STORAGE REQUIREMENTS ARE VERIFIED BY
INSPECTION.

(C) FAILURE HISTORY:
NO APPLICABLE FAILURE HISTORY.

(E) OPERATIONAL USE:
FIRST FAILURE IS NOT DETECTABLE. WITH A SUBSEQUENT FAILURE (PRIMARY
CONTROL LOGIC), CREW ACTION IS REQUIRED TO SWITCH TO THE SECONDARY
CONTROLLER OR TO THE OTHER AMMONIA SYSTEM.

- APPROVALS -

RELIABILITY ENGINEERING:	D. R. RISING	DRS	: <i>D. R. Rising 7/25/90</i>
DESIGN ENGINEERING	: J. MORGAN		: <i>J. Morgan 6/21/90</i>
QUALITY ENGINEERING	: M. SAVALA	DRS	: <i>M. Savala 9/6/90</i>
NAS RELIABILITY	:	DRS	: <i>D. R. Rising 10/23/90</i>
NAS SUBSYSTEM MANAGER	:	DRS	: <i>J. Morgan 10/23/90</i>
NAS QUALITY ASSURANCE	:	DRS	: <i>J. Morgan 11/17/90</i>