SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-3B-0405-X

SUBSYSTEM NAME: ATCS - AMMONIA BOILER SYSTEM
REVISION : 10/19/88

CLASSIFICATION		NAME	PART NUMBER
LRU	:	AMMONIA BOILER SUB-SYSTEM	MC250-0005-0007
SRU	:	TANK, AMMONIA	74716066-3

QUANTITY OF LIKE ITEMS: 2
TWO, ONE PER SYSTEM

DESCRIPTION/FUNCTION:
TANK, AMMONIA SUPPLY.

STORES AMMONIA FOR COOLING DURING RE-ENTRY. EACH TANK SUPPLIES AMMONIA FOR AT LEAST 15 MINUTES OF VEHICLE COOLING. THE AMMONIA BOILER SYSTEM IS USED DURING POSTLANDING OPERATIONS, LAUCNH ABORTS, AND AS A BACKUP SYSTEM DURING NORMAL DEORBITS.

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SUMMARY

SUBSYSTEM NAME: ATCS - AMMONIA BOILER SYSTEM
LRU :AMMONIA BOILER SUB-SYSTEM
LRU PART #: MC250-0005-0007
ITEM NAME:TANK, AMMONIA

FMEA NUMBER	ABBREVIATED FAILURE MODE DESCRIPTION	CIL FLG	CRIT	HZD FLG
06-3B-0405-01	EXTERNAL LEAKAGE	X	1 1	

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REVISION: 10/19/88

SUBSYSTEM: ATCS - AMMONIA BOILER SYSTEM
LRU :AMMONIA BOILER SUB-SYSTEM CRITICALITY OF THIS
ITEM NAME: TANK, AMMONIA FAILURE MODE:1 1

FAILURE MODE:
BURST

MISSION PHASE:
PL PRELAUNCH
LO LIFT-OFF
OO ON-ORBIT
DO DE-ORBIT
LS LANDING SEQUENCE

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

CAUSE:
CORROSION, STRUCTURAL DAMAGE.

CRITICALITY 1/1 DURING ANY MISSION PHASE OR ABORT? Y

REDUNDANCY SCREEN A) N/A
B) N/A
C) N/A

PASS/FAIL RATIONALE:
A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF ONE REDUNDANT AMMONIA TANK, AND POSSIBLE LOSS OF AMMONIA SYSTEM.

(B) INTERFACING SUBSYSTEM(S):
POSSIBLE DAMAGE TO FREON 21 COOLANT LOOPS AND OTHER HARDWARE LOCATED IN THE IMMEDIATE AREA.

(C) MISSION:
ABORT DECISION FOR DAMAGE TO OTHER HARDWARE.

(D) CREW, VEHICLE, AND ELEMENT(S):
POSSIBLE LOSS OF CREW/VEHICLE IF SURROUNDING SUBSYSTEMS ARE SEVERELY DAMAGED.

RATIONALE FOR CRITICALITY:

- DISPOSITION RATIONALE -

(A) DESIGN:
BURST PRESSURE FACTOR OF 2.3 TIMES MAXIMUM OPERATING PRESSURE OF 550 PSIG AND 3 TIMES THE MAXIMUM NORMAL SERVICED PRESSURE OF 430 PSIG AT 85 F. DESIGN BURST PRESSURE IS 1290 PSIG AND THE ACTUAL QUALIFICATION BURST PRESSURE WAS 1625 AND 1650 PSIG. TANK HAS A 550 PSIG RELIEF VALVE IN THE SYSTEM. TANK IS FORGED TITANIUM IN TWO SECTIONS. PRIOR TO JOINING BY GIRTH TIG WELD, THE INTERNAL AND EXTERNAL SURFACES ARE PENETRANT INSPECTED. TANK IS DESIGNED TO LEAK BEFORE BURSTING. NO IN-FLIGHT

CONDITION EXISTS WHICH CAN CAUSE BURST. TITANIUM IS CORROSION RESISTANT AND COMPATIBLE WITH AMMONIA.

(B) TEST:
QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE. PRESSURE CYCLING TEST TO 600 PRESSURE CYCLES AT A PRESSURE OF 605 - 635 PSIA. VIBRATION TESTED AT 0.01 G2/HZ FOR 48 MIN/AXIS AND SHOCK TEST AT +/- 20 G/AXIS. TANK TAKEN TO BURST IN QUALIFICATION TESTING.

ACCEPTANCE TEST - PROOF PRESSURE TESTED.

OMRSD - FUNCTIONAL TEST IS MONITORED DURING PRESSURIZATION CYCLE TO DETECT LEAKAGE. NH3 SYSTEM OVERPRESSURE TEST AFTER INSTALLATION. PERIODIC NH3 RELIEF VALVE CHECK PERFORMED DURING GROUND TURNAROUND. LIFE CYCLE HISTORY RECORDED (150 FATIGUE LIFE CYCLE LIMIT). AMMONIA SAMPLE VERIFIED TO MEET SE-S-0073 REQUIREMENTS PRIOR TO LOADING.

(C) INSPECTION:
RECEIVING INSPECTION
RAW MATERIAL AND PROCESS CERTIFICATIONS VERIFIED BY INSPECTION.
PARTS PROTECTION VERIFIED BY INSPECTION.

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

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ASSEMBLY/INSTALLATION
INSTALLATION AND ASSEMBLY ARE VERIFIED BY INSPECTION. DIMENSIONS AND SURFACE FINISHES VERIFIED BY INSPECTION. USE OF TITANIUM-COMPATIBLE PROCESSING MATERIALS ONLY, VERIFIED BY INSPECTION.

CRITICAL PROCESSES
TITANIUM FORGING AND TIG WELDING ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
X-RAY AND ULTRASONIC EVALUATIONS VERIFIED BY INSPECTION. INSPECTION VERIFIES PENETRANT INSPECTION OF TANK INTERNAL AND EXTERNAL SURFACES BEFORE GIRTH TIG WELDING AND VERIFIES PENETRANT INSPECTION OF WELD.

TESTING
PROOF PRESSURE AND FUNCTIONAL TESTING PERFORMED DURING ATP ARE VERIFIED BY INSPECTION.

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

(D) FAILURE HISTORY:
NO APPLICABLE FAILURE HISTORY.

(E) OPERATIONAL USE:
DAMAGE WILL BE ASSESSED AND CORRECTIVE ACTION DERIVED. ABORT DECISION REQUIRED.

- APPROVALS -

RELIABILITY ENGINEERING	D. R. RISING	
DESIGN ENGINEERING	J. MORGAN	
QUALITY ENGINEERING	W. J. SMITH	
NASA RELIABILITY		
NASA DESIGN		4/8/88
NASA QUALITY ASSURANCE		