

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3E -0322 -3 REV: 03/04/88

ASSEMBLY : FLASH EVAPORATOR ASSY CRIT. FUNC: 1R
P/N RI : MC250-0017-0970 CRIT. HDW: 3
P/N VENDOR: SV764208 VEHICLE 102 103 104
QUANTITY : 2 EFFECTIVITY: X X X
:TWO MODULES PHASE(S): PL LO X CO DO X LS
:ONE PER WATER LINE

PREPARED BY: DES J. MORGAN REL D. RISING QE W. SMITH

REDUNDANCY SCREEN: A-PASS B-FAIL C-PASS

APPROVED BY: DES *[Signature]* REL *[Signature]* QE *[Signature]*

APPROVED BY (NASA): SSM *[Signature]* REL *[Signature]* QE *[Signature]*

ITEM:

HIGH LOAD VALVE MODULE, HIGH LOAD EVAPORATOR WATER CONTROL VALVES AND SPRAY NOZZLE.

FUNCTION:

THE CONTROL VALVES METER AND THE NOZZLES SPRAY WATER OVER THE EVAPORATOR HEAT TRANSFER SURFACE. THE ISOLATION AND PULSER VALVES OPERATE SIMULTANEOUSLY. EACH VALVE ASSEMBLY CONSISTS OF A FILTER, PULSER VALVE, ISOLATION VALVE, SPRAY NOZZLE AND CAPPED TEST PORT.

FAILURE MODE:

FAILS TO CLOSE, PULSER OR ISOLATION VALVE.

CAUSE(S):

ELECTRICAL SHORT, CONTAMINATION, CORROSION, VIBRATION, MECHANICAL SHOCK.

EFFECT(S) ON:

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

(A,B) LOSS OF ONE REDUNDANT WATER FLOW CONTROL VALVE TO PREVENT FREEZING OF HIGH LOAD EVAPORATOR.

(C,D) NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECT - LOSS OF WATER FLOW CONTROL CAN CAUSE LOSS OF HIGH LOAD EVAPORATOR COOLING. ANY TWO ADDITIONAL FAILURES (ONE FREON COOLANT LOOP, TOPPING EVAPORATOR, RADIATORS, AMMONIA BOILER SYSTEM) WILL CAUSE LOSS OF VEHICLE COOLING AND RESULT IN LOSS OF CREW/VEHICLE. REDUNDANCY SCREEN 'B' FAILS BECAUSE REDUNDANT VALVE WILL CONTROL WATER FLOW MAKING FIRST FAILURE UNDETECTABLE.

DISPOSITION & RATIONALE:

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

(A) DESIGN

DESIGN SAFETY FEATURE - DUAL VALVE OPERATION WITH DUAL, POTTED COILS AND WITH SEPARATE CONTROLLERS FOR EACH VALVE. STAINLESS STEEL HOUSING. CONTAMINATION PROTECTION BY 40 MICRON INLET SCREEN. POPPETS ARE SPRING LOADED CLOSED UTILIZING A WAVE-TYPE SPRING. EACH VALVE IS NON-JAMMING & THEY ARE DIRECT, ELECTRO-MECHANICALLY ACTUATED VALVES WITH ONLY ONE

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM (ACTIVE THERMAL CONTROL FMEA NO 06-3E -0322 -3 REV: 03/09/88

MOVING PART TO EFFECT OPERATION. THE ISOLATION VALVE IS SELF-RELIEVING IN THE REVERSE PRESSURE DIRECTION TO PRECLUDE DAMAGE CAUSED BY TRAPPED FLUID EXPANSION BETWEEN IT AND THE PULSER VALVE. VALVE POPPET AND HOUSING ARE STAINLESS STEEL, WHICH IS COMPATIBLE WITH WATER.

(B) TEST

QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE. CYCLE TEST OF 10 MILLION CYCLES ON VALVES. RANDOM VIBRATION TESTED AT 0.3 G²/HZ FOR 60 MINUTES PER AXIS AND SHOCK TESTED AT +/- 20 G PER AXIS.

ACCEPTANCE TEST - FUNCTIONAL TEST DURING ATP VERIFIES VALVE INTEGRITY. THERMAL VACUUM VERIFICATION TEST. ATP CYCLE TEST AT VALVE ASSEMBLY LEVEL PERFORMED FOR MORE THAN 100,000 CYCLES. DIELECTRIC STRENGTH TEST PERFORMED AT 500 V.

OMRSD - PULSER AND ISOLATION VALVES LEAK CHECKED EVERY FIVE FLIGHTS. WATER SAMPLED PRIOR TO EACH FLIGHT AND CONTROLLED TO SE-5-0073. ELECTRICAL CURRENT LEVELS TO THE VALVES VERIFIED EVERY 5 FLIGHTS.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL VERIFIED BY INSPECTION. VERIFICATION OF MATERIAL AND EQUIPMENTS CONFORMANCE TO SPECIFICATION ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PLAN IS VERIFIED BY INSPECTION. ANALYSIS OF FLUID SAMPLES FOR CONTAMINATION IS VERIFIED BY INSPECTION. CORROSION PROTECTION PROVISIONS AND INTERNAL CLEANLINESS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION. TORQUING PERFORMANCE PER DRAWING REQUIREMENTS IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

ELECTRON BEAM WELDS ARE RADIOGRAPHIC AND DYE PENETRANT INSPECTED, VERIFIED.

CRITICAL PROCESSES

SOLDERING AND POTTING PROCESSES ARE VERIFIED BY INSPECTION. ELECTRON BEAM WELDING IS VERIFIED BY INSPECTION.

TESTING

FUNCTIONAL OPERATION IS VERIFIED BY INSPECTION TO BE WITHIN SPECIFIED LIMITS. RESULTS OF FUNCTIONAL PERFORMANCE TESTING AND ATP ARE VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PROPER HANDLING AND STORAGE ENVIRONMENTS ARE VERIFIED BY INSPECTION. PART PROTECTION VERIFIED BY INSPECTION.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTIVE THERMAL CONTROL FMEA NO 06-3E -0322 -3 REV: 03/09/88

(D) FAILURE HISTORY
NO APPLICABLE FAILURE HISTORY.

(E) OPERATIONAL USE
REDUNDANT VALVE WILL CONTROL WATER FLOW FOR NORMAL OPERATION OF HIGH LOAD EVAPORATOR. NO CREW ACTION REQUIRED.