FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL HARDWARE
NUMBER: 06-1B-0330-X

SUBSYSTEM NAME: ARS-COOLING

REVISION: 4 08/25/93

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	CABIN FAN AND DEBRIS TRAP HALMITON STANDARD	MC621-0008-0311 SV755508
LRU	:	FILTER, DEBRIS TRAP	SV787982

PART DATA

QUANTITY OF LIKE ITEMS: 1

FUNCTION:
REMOVES AIRBORNE PARTICLES GREATER THAN 40/70 MICRONS FROM THE AIR FLOWING TO THE FANS THUS PROTECTING THE FANS AND DOWNSTREAM COMPONENTS FROM DAMAGE OR CLOGGING.

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NUMBER: 06-1B-0330-02

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SUBSYSTEM: ARS - COOLING
LRU: CABIN FAN AND DEBRIS TRAP
ITEM NAME: FILTER, DEBRIS TRAP

CRITICALITY OF THIS FAILURE MODE: 1R2

FAILURE MODE:
FAILS TO FILTER (DAMAGED ELEMENT, RUPTURE IN MESH)

MISSION PHASE:

LO	LIFT-OFF
OO	ON-ORBIT
DO	DE-ORBIT

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

CAUSE:
VIBRATION, CORROSION, MECHANICAL SHOCK

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN
A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:
A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
CONTAMINATION OF DOWNSTREAM COMPONENTS. POSSIBLE DAMAGE TO FANS AND CLOGGING OF HEAT EXCHANGER.

(B) INTERFACING SUBSYSTEM(S):
DECREASE IN COOLING AIR FLOW OF FLIGHT DECK AVIONICS.

(C) MISSION:
POSSIBLE EARLY MISSION TERMINATION.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECTS:

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SECOND ASSOCIATED FAILURE (FAILURE OF UPSTEAM AVIONICS INLET FILTERS) RESULTS IN CONTAMINATION CLOGGING HUMIDITY CONTROL HEAT EXCHANGER WHICH WILL CAUSE LOSS OF COOLING FOR FLIGHT DECK AVIONICS AND MAY RESULT IN LOSS OF CREW/VEHICLE. (HUMIDITY CONTROL HEAT EXCHANGER IS NOT ACCESSIBLE FOR CLEANING DURING FLIGHT).

-DISPOSITION RATIONALE-

(A) DESIGN:
DESIGNED TO WITHSTAND 13 INCHES OF WATER. THE FILTER IS COMPOSED OF THREE 40/70 MICRON RATING STAINLESS STEEL WIRE MESH SECTIONS, EACH 7 X 7 INCH CROSS SECTION AND 130 SQ. IN. FILTER AREA. THE WIRE MESS SIZE IS 50 (0.0055 INCH) X 250 (0.0045 INCH). PER SQ. IN. THE SCREENS ARE BONDED AND RIVETED TO THE INSIDE OF THE FRAME. A RUBBER SEAL IS BONDED TO THE OUTSIDE OF THE FRAME TO PREVENT AIR BYPASS LEAKAGE. THE FILTER ASSEMBLY IS INSERTED INTO THE SLOTTED FAN HOUSING AND LID IS CLOSED TO SECURE SCREEN. THIS FILTER IS IMMEDIATELY UPSTREAM OF THE CABIN FAN: THERE ARE FILTERS UPSTREAM AT THE AVIONIC BOX INLETS. THE FILTER IS ACCESSIBLE FOR CLEANING IN FLIGHT.

(B) TEST:
ACCEPTANCE TEST - THERE IS NO ATP FOR THE INDIVIDUAL FILTER. OVERALL PERFORMANCE OF THE FAN PACKAGE INCLUDES THE FILTER.

QUALIFICATION TEST - THE NEW FILTER (40/70 MICRONS) WAS CERTIFIED BY SIMILARITY TO THE OLD CONFIGURATION (300 MICRONS). VIBRATION ENVELOPE OF 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.09 G**2/HZ, CONSTANT AT 0.09 G**2/HZ FROM 150 TO 900 HZ, DECREASING AT 9 DB/OCTAVE FROM 900- 2000 HZ FOR 48 MINUTES PER AXIS FOR THREE ORTHOGONAL AXES. DESIGN SHOCK - THREE TERMINAL SAWTOOTH PULSES OF 20 G PEAK AMPLITUDE AND 11 MS DURATION APPLIED IN BOTH DIRECTIONS ALONG EACH OF THREE ORTHOGONAL AXES.

OMRSD - DAMAGED ELEMENT WOULD BE FOUND DURING CLEANING, WHICH IS PERFORMED EACH TURNAROUND.

(C) INSPECTION:
RECEIVING INSPECTION
INCOMING MATERIALS ARE VERIFIED FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL
CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
FRAME SEAL COATED WITH LUBRICATION KRYTOX 240AC IS VERIFIED PER DRAWING SPEC. INSPECTION VERIFIES BONDING BETWEEN SEAL AND FRAME PER REQUIREMENT. BUBBLE POINT WATER TEST IS VERIFIED BY INSPECTION. INSPECTION VERIFIES ABSENCE OF DEBRIS AND CLOGGING.

CRITICAL PROCESSES
HEAT TREATMENT OF FILTER FRAME IS VERIFIED BY INSPECTION. WELDING OF FILTER FRAME PIECES IS VERIFIED BY INSPECTION. BONDING COVERAGE OF FRAME EDGE TO SCREEN WIRE IS CHECKED.

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TESTING
ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
PACKAGING FOR SHIPMENT IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
NO FAILURE HISTORY APPLICABLE TO DAMAGED ELEMENT FAILURE MODE. THE FILTER HAS SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE:
NONE.

- APPROVALS -

EDITORIALLY APPROVED	: RI	: 9/1/93
EDITORIALLY APPROVED	: JSC	: 9/1/93
TECHNICAL APPROVAL	: VIA CR	: S50350U