FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 06-3E-0327 -X

SUBSYSTEM NAME: ATCS - FLASH EVAPORATOR SYSTEM (FES)
REVISION: 1 04/18/01

PART DATA

	PART NAME / **VENDOR NAME**	**PART NUMBER** / **VENDOR NUMBER**
ASSY	:FLASH EVAPORATOR ASSY	MC250-0017
LRU	:DUCT & HEATER, OFFSET	MC250-0017-0004
	HAMILTON STANDARDS	SV767604
LRU	:NOZZLE DUCT, TOPPING	MC250-0017-0006
	HAMILTON STANDARDS	SV767606-1
LRU	:NOZZLE DUCT, TOPPING	MC250-0017-0007
	HAMILTON STANDARDS	SV767606-2
LRU	:DUCT & HEATER, TOPPING	MC250-0017-0502
	HAMILTON STANDARDS	SV767602
LRU	:TRANSITION	MC250-0017-0503
	HAMILTON STANDARDS	SV767603
LRU	:ELBOW & HEATER, TOPPING	MC250-0017-0505
	HAMILTON STANDARDS	SV767605

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
STEAM DUCT, TOPPING EVAPORATOR.

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 1
ONE; DUCT SECTIONS

FUNCTION:
TRANSFERS THE TOPPING EVAPORATOR EXHAUST OVERBOARD. THE DUCT ASSEMBLY CONTAINS TEN HEATER CONTROL ASSEMBLIES.

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SUBSYSTEM NAME: ATCS - FLASH EVAPORATOR SYSTEM (FES)
LRU: TOPPING DUCTS AND NOZZLES **CRITICALITY OF THIS**
ITEM NAME: TOPPING DUCT ASSEMBLY **FAILURE MODE:** 2/2

FAILURE MODE:
BLOCKAGE (FREEZING)

MISSION PHASE:
LO LIFT-OFF
OO ON-ORBIT
DO DE-ORBIT

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

CAUSE:
EXCESSIVE WATER CARRYOVER

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

PASS/FAIL RATIONALE:
A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF TOPPING EVAPORATOR OPERATION DUE TO BLOCKED DUCT BEFORE SPLITTING.

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(B) INTERFACING SUBSYSTEM(S):
LOSS OF SUPPLEMENTAL VEHICLE COOLING FOR ON-ORBIT.

(C) MISSION:
POSSIBLE LOSS OF MISSION DUE TO LOSS OF TOPPING EVAPORATOR COOLING TO SUPPORT PAYLOAD OPERATIONS.

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
THIS FAILURE ALSO HAS A 1R3 (PPP) CRITICALITY EFFECT DURING LIFT-OFF AND DE-ORBIT PHASES: POSSIBLE LOSS OF CREW/VEHICLE DUE TO LOSS OF VEHICLE COOLING CAPABILITY AFTER TWO ADDITIONAL FAILURES (HI-LOAD VAPORATOR, RADIATOR, AND/OR AMMONIA BOILER SYSTEM).

-DISPOSITION RATIONALE-

(A) DESIGN:
STEAM DUCT IS 6 INCH DIAMETER ALUMINUM TUBING. TOPPING DUCT IS COMPOSED OF SEVERAL SEGMENTS EACH WITH TRIPLE-REDUNDANT HEATER ELEMENTS COMPOSED OF 6 SEGMENTS BONDED TO THE DUCT AND WRAPPED WITH CONDUCTIVE TAPE. THE FIRST TWO SEGMENTS EACH HAVE 6 THERMAL SWITCHES, AND THE ELBOW SEGMENT HAS 4 THERMAL SWITCHES.

(B) TEST:
QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE. HEATER ASSEMBLY BONDED TO DUCT CYCLED ON-OFF 140,000 TIMES AND CYCLED FROM - 100 TO 350 DEGREE FAHRENHEIT 200 TIMES.

GROUND TURNAROUND CHECKOUT
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

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

CONTAMINATION CONTROL

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

ASSEMBLY/INSTALLATION
MANUFACTURING, INSTALLATION AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION. ALL DETAIL ASSEMBLY PER DRAWING REQUIREMENTS IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
ADHESIVE BONDING OF SWITCHES AND HEATER ELEMENTS TO DUCTS IS VERIFIED BY INSPECTION. SOLDERING OF SWITCHES PER NHB5300.4(3A) IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
X-RAY, PENETRANT AND VISUAL INSPECTION OF WELDS IS VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED BY INSPECTION.

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

(D) FAILURE HISTORY:
CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATA BASE.

(E) OPERATIONAL USE:
FAILURE IS INDICATED BY ON-BOARD ALARM, "TOPPING DUCT TEMPERATURE" DURING FES OPERATION. FES SECONDARY CONTROLLER WILL BE SELECTED ON HIGH LOAD WHEN REQUIRED. PERFORM MINIMUM DURATION MISSION.

- APPROVALS -

S&R ENGINEER	: T. T. AI	:_/S/ T. AI_____
S&R ENGINEERING ITM	: P. A. STENGER-NGUYEN	:_/S/ P. STENGER-NGUYEN___
DESIGN ENGINEER	: J. HILL	:_/S/ J. HILL_____
SUBSYSTEM MANAGER	: S. NGUYEN	:_/S/ S. NGUYEN_____
MOD	: P. HASBROOK	:_/S/ P. HASBROOK_____
USA SAM	: B. HARKNESS	:_/S/ B. HARKNESS_____
USA ORBITER ELEMENT	: S. LITTLE	:_/S/ S. LITTLE_____