FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 04-1A-0119 -X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION: FUEL CELL
REVISION: 2 12/18/89

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: VALVE, WATER PRESSURE RELIEF AERODYNE	MC284-0431-0001 3039-4-000

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
VALVE, WATER PRESSURE RELIEF.

REFERENCE DESIGNATORS: 40V45RV170
40V45RV270
40V45RV370

QUANTITY OF LIKE ITEMS: 3
THREE

FUNCTION:
RELIEVES EXCESS WATER PRESSURE FROM FUEL CELLS.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 04-1A-0119-03

REVISION#: 3 03/27/96
SUBSYSTEM NAME: ELECTRICAL POWER GENERATION, FUEL CELL
LRU: VALVE, WATER PRESSURE RELIEF **CRITICALITY OF THIS**
ITEM NAME: VALVE, WATER PRESSURE RELIEF **FAILURE MODE:** 2/2

FAILURE MODE:
LEAKAGE EXTERNAL

MISSION PHASE:
PL PRE-LAUNCH
LO LIFT-OFF
OO ON-ORBIT

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

CAUSE:
MECHANICAL SHOCK, CORROSION, VIBRATION.

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:
NO EFFECT - POSSIBLE LOSS OF OVERBOARD RELIEF CAPABILITY DUE TO VALVE FREEZING (REF. FMEA 04-1A-0119-1).

(B) INTERFACING SUBSYSTEM(S):
NO EFFECT - NO LOSS OF PRODUCT WATER TO ECLSS UNLESS WATER SEEPAGE CONTINUES.

(C) MISSION:
EFFECTS DEPENDENT UPON MISSION. WATER LEAKAGE OR ICE BUILDUP MAY INTERFERE WITH MISSION/PAYLOAD OBJECTIVES.

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
NONE.

-DISPOSITION RATIONALE-

(A) DESIGN:
THE RELIEF VALVE IS CONSTRUCTED OF STAINLESS STEEL AND THE HOUSING UTILIZES WELDED JOINTS FOR SEALING AND ELIMINATING ANY ELASTOMERIC SEALS.

BRAZE JOINTS ARE USED FOR FLUID CONNECTIONS.

THE VALVE IS DESIGNED TO TOLERATE THE VIBRATION AND SHOCK LEVELS ASSOCIATED WITH THE SERVICE ENVIRONMENT.

(B) TEST:
CERTIFICATION INCLUDED PROOF PRESSURE, EXTERNAL LEAKAGE, CRACK-FULL FLOW-RESEAT PRESSURES, INTERNAL LEAKAGE, VACUUM INTEGRITY, SALT FOG, VIBRATION, ACCELERATION, SHOCK, THERMAL CYCLES, OPERATING LIFE, AND BURST PRESSURE.

ACCEPTANCE TESTS INCLUDE PROOF PRESSURE, LEAKAGE, VACUUM INTEGRITY, FUNCTIONAL VERIFICATION, AND CLEANLINESS.

OMRSD: WATER RELIEF VALVE HEATER SYSTEM VERIFIED DURING EACH MISSION CYCLE.

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RECEIVING INSPECTION
TEST REPORTS AND RECORDS ARE MAINTAINED CERTIFYING MATERIALS AND CHEMICAL/METALLURGICAL PROPERTIES. VISUAL AND DIMENSIONAL EXAMINATION IS PERFORMED ON INCOMING PARTS.

CONTAMINATION CONTROL
PROPER OPERATION AND MAINTENANCE OF A CLASS 100,000 CLEAN ROOM IS VERIFIED BY QC. PART CLEANLINESS LEVEL 200 IS CERTIFIED BY INSPECTION. A PARTICLE COUNT EXAMINATION OF 50ML SAMPLES IS MADE UNDER 50X MAGNIFICATION, RECORDED, AND VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
DIMENSIONAL AND SURFACE CHECKS OF INLET AND OUTLET HOUSINGS AND BELLOWS ARE VERIFIED AND RECORDED BY INSPECTION. PREASSEMBLY CLEANING BY WASH AND RINSE, VAPOR DEGREASING, AND ULTRASONIC CLEANING IS VERIFIED BY INSPECTION. THE INLET FILTER IS EXAMINED UNDER 50X MAGNIFICATION. MASS SPECTROMETER LEAK CHECKS AND 10X VISUAL EXAMINATIONS OF ELECTRON BEAM WELDS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
ALL CRITICAL PROCESSES AND CERTIFICATIONS ARE MONITORED AND VERIFIED BY INSPECTION. CRITICAL PROCESSES ARE WELDING, COATING, AND CLEANING.

TESTING
ATP IS OBSERVED AND VERIFIED BY QC, INCLUDING PROOF PRESSURE/EXTERNAL LEAKAGE, VACUUM INTEGRITY, INTERNAL LEAKAGE, AND COMPONENT OPERATION.

HANDLING/PACKAGING
IN-PROCESS OPERATIONS ARE VERIFIED BY QC TO PROTECT PARTS AND PRECLUDE MISHANDLING. PARTS ARE VERIFIED TO BE PACKAGED AND TRANSPORTED IN ACCORDANCE WITH APPLICABLE REQUIREMENTS. SHUTTLE HARDWARE, INCLUDING RAW MATERIAL, IS SEGREGATED FROM OTHER STOCK IN 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.

THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.

(E) OPERATIONAL USE:
NO CREW ACTION AFTER FAILURE.

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NUMBER: 04-1A-0119- 03

- APPROVALS -

PAE MANAGER	: D. F. MIKULA	D. F. Mikula 29 MAR 96
PRODUCT ASSURANCE ENGR	: L. X. DANG	Carl Dang 3/29/96
DESIGN ENGINEERING	: MUSTIN, LLOYD	D. T. Mustin 3/27/96 for L. MUSTIN
NASA SSMA	:	[illegible] 6/16/97
NASA SUBSYSTEM MANAGER	:	Howard L. Wynne 6/16/97