PRINT DATE: 03/28/96

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 04-1A-0122 -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, CHECK, WATER SUPPLY CIRCLE SEAL	ME284-0475-0001 P10-201

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
VALVE, CHECK, WATER SUPPLY

REFERENCE DESIGNATORS: 40V45CV170
40V45CV270
40V45CV370

QUANTITY OF LIKE ITEMS: 3
THREE

FUNCTION:
PREVENTS LOSS OF PRODUCT WATER FROM ALL FUEL CELLS THROUGH FAILED OPEN RELIEF VALVE OF SAME FUEL CELL.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 04-1A-0122-01

REVISION#: 3 03/27/96

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION: FUEL CELL
LRU: VALVE, CHECK, WATER SUPPLY
ITEM NAME: VALVE, CHECK, WATER SUPPLY

CRITICALITY OF THIS FAILURE MODE: 2R3

FAILURE MODE:
FAILS OPEN, FAILS TO CHECK

MISSION PHASE: OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:
MECHANICAL SHOCK, VIBRATION, PHYSICAL BINDING/JAMMING, CONTAMINATION.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN
A) PASS
B) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)

B)
VALVE IS NORMALLY OPEN DURING FUEL CELL OPERATION.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
NO EFFECT - CHECK VALVE OPEN DURING NORMAL OPERATION.

(B) INTERFACING SUBSYSTEM(S):

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: 04-1A-0122- 01

NO EFFECT FIRST FAILURE. SECOND FAILURE (INTERNAL LEAKAGE OF MATCHING RELIEF VALVE) CAN RESULT IN OVERBOARD VENTING OF ALL FUEL CELL PRODUCT WATER FOR COOLING AND CREW CONSUMPTION. COULD RESULT IN EARLY MISSION TERMINATION.

(C) MISSION:
SAME AS (B)

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT - MISSION CAN BE SAFELY TERMINATED USING ONBOARD SUPPLIES. POTABLE WATER TANK "A" INLET VALVE MUST BE CLOSED TO PREVENT LOSS OF TANK "A" WATER OVERBOARD IN THE EVENT OF THIS SECOND FAILURE.

(E) FUNCTIONAL CRITICALITY EFFECTS:

-DISPOSITION RATIONALE-

(A) DESIGN:
CHECK VALVE FABRICATED OF STAINLESS STEEL, HAVING A STATIC ETHYLENE PROPYLENE SEAL THAT IS NOT AGE SENSITIVE.

PROVEN COMPONENT, APOLLO ENVIRONMENTAL CONTROL SYSTEM CHECK VALVE. APOLLO SHOCK AND ACCELERATION DESIGN REQUIREMENTS MORE SEVERE THAN SHUTTLE.

CHECK VALVE AND LINES ARE WRAPPED WITH REDUNDANT ELECTRICAL HEATERS TO PREVENT FREEZING OF STAGNANT WATER IF ASSOCIATED FUEL CELL SHUT DOWN.

WATER IS FILTERED IN FUEL CELLS PRIOR TO DISCHARGE INTO WATER DELIVERY/RELIEF SYSTEM. WATER IS DELIVERED FROM FUEL CELLS AT 150 DEG F AND CONTINUOUSLY FLOWS WHILE THE POWER PLANTS ARE OPERATING.

(B) TEST:
CHECK VALVE DELTA QUALIFICATION TEST WAS CONDUCTED INCLUDING 1000 OPERATING CYCLES, INTERNAL/EXTERNAL LEAKAGE, RANDOM VIBRATION, 220 DEG F TEMPERATURE, AND PRESSURE DROP.

OMRSD: CHECK VALVE FUNCTION VERIFIED DURING OMDP.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: 04-1A-0122-01

(C) INSPECTION:
RECEIVING INSPECTION
TEST REPORTS AND RECORDS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES. VISUAL AND DIMENSIONAL EXAMINATION IS PERFORMED ON INCOMING PARTS.

CONTAMINATION CONTROL
CLEANLINESS OF THE INTERNAL WETTED SURFACES OF THE VALVE IS VERIFIED BY QC TO APPLICABLE REQUIREMENTS. (PARTS ARE ASSEMBLED IN A CLASS 10,000 CLEAN ROOM AND VERIFIED BY INSPECTION ON SEPARATE SHOP TRAVELERS FOR CLEANLINESS). QC VERIFIES PROPER MAINTENANCE AND PROCEDURES ARE USED FOR CLEAN ROOM OPERATIONS.

ASSEMBLY/INSTALLATION
DETAILED INSPECTION IS PERFORMED ON ALL PARTS PRIOR TO NEXT ASSEMBLY. ALL CRITICAL DIMENSIONS ARE VERIFIED BY INSPECTION. SURFACE FINISH IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
ALL CRITICAL PROCESSES, PASSIVATION, AND CLEANING ARE MONITORED AND VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED BY QC BY REVIEW OF ROUTER/TEST RESULTS AND A SIGN-OFF OF EACH OPERATION.

HANDLING/PACKAGING
IN-PROCESS OPERATIONS ARE VERIFIED BY QC TO PROTECT PARTS AND PRECLUDE MISHANDLING. PARTS PACKAGING IS VERIFIED BY INSPECTION TO APPLICABLE REQUIREMENTS INCLUDING PREPACKAGING TO ASSURE MAINTENANCE OF THE PRESCRIBED CLEANLINESS LEVEL.

(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 PROCEDURES REQUIRED FOR FIRST FAILURE.

PRINT DATE: 03/27/96

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 04-1A-0122-01

- APPROVALS -

PAE MANAGER	: D. F. MIKULA	D.F. Mikula 29may96
PRODUCT ASSURANCE ENGR	: L. X. DANG	3/29/96
DESIGN ENGINEERING	: MUSTIN, LLOYD	5-28-96
NASA SSMA	:	6/16/97
NASA SUBSYSTEM MANAGER	:	Howard L Wiggins 6/16/97