PRINT DATE: 07/09/97

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER:M8-16S-E047 -X

SUBSYSTEM NAME: ECLSS - EMU OXYGEN RECHARGE SYSTEM
REVISION: 0 04/08/97

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:VALVE, O2 SHUTOFF CARLETON TECHNOLOGIES	MC250-0004-0006 1-4-00-51-27

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EMU OXYGEN SHUTOFF VALVE

QUANTITY OF LIKE ITEMS: 1
ONE

FUNCTION:
PROVIDES A QUICK MEANS OF MANUALLY SHUTTING OFF OXYGEN FLOW TO BOTH EMU SERVICE PORTS LOCATED ON THE EXTERNAL AIRLOCK ECLSS PANEL. VALVE IS NORMALLY OPEN DURING EMU SERVICING.

REFERENCE DOCUMENTS: VS28-643001

FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE
NUMBER: M8-1SS-E047-02

REVISION#: 0 04/08/97

SUBSYSTEM NAME: ECLSS - EMU OXYGEN RECHARGE SYSTEM
LRU: EMU OXYGEN SHUTOFF VALVE **CRITICALITY OF THIS**
ITEM NAME: VALVE, EMU OXYGEN SHUTOFF **FAILURE MODE:** 1R3

FAILURE MODE:
FAILS TO CLOSE, INTERNAL LEAKAGE

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

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

CAUSE:
CONTAMINATION, CORROSION, MECHANICAL SHOCK, EXCESSIVE VIBRATION, PHYSICAL BINDING/JAMMING, MATERIAL DEFECT, SEAL MATERIAL DEGRADATION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

PASS/FAIL RATIONALE:
A)

B)
N/A - REDUNDANCY IS IN STANDBY UNTIL REQUIRED.

C)

METHOD OF FAULT DETECTION:
INTERNAL LEAKAGE FAILURE MODE - NONE UNTIL THERE IS A LEAK DOWNSTREAM OF THE SHUTOFF VALVE. THEN FAILURE CAN BE DETECTED THROUGH INSTRUMENTATION BY AN INCREASE USE IN O2 CONSUMABLES.
FAILS TO CLOSE FAILURE MODE - INSTRUMENTATION BY AN- EMU OXYGEN PRESSURE INDICATION ON AW82D PANEL PRESSURE GAUGE OR ON EMU ITSELF OR BY AN INCREASE USE OF ORBITER OXYGEN SUPPLY.

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CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:
INTERNAL LEAKAGE FAILURE MODE - SUBSEQUENT LEAKAGE OF O2, DOWNSTREAM OF THIS VALVE, WOULD REQUIRE ORBITER HIGH PPO2 AND LEAK ISOLATION TROUBLESHOOTING.
FAILS TO CLOSE FAILURE MODE - CREW COULD CLOSE AFFECTED OXYGEN CONTROL VALVE ON ECLSS PANEL TO STOP OXYGEN TO IT'S EMU QUICK DISCONNECT/FITTING. IF O2 LEAKAGE OCCURS DOWNSTREAM OF THE CONTROL VALVE ORBITER HIGH PPO2 AND LEAK ISOLATION TROUBLESHOOTING WOULD BE REQUIRED.

REMARKS/RECOMMENDATIONS:
THIS VALVE, WHICH IS MANUALLY OPERATED, REMAINS OPEN DURING ON-ORBIT OPERATIONS AND CLOSED DURING ALL OTHER TIMES. WORST CASE SCENARIO IS WHEN AN EXTERNAL LEAKAGE CONDITION (DOWNSTREAM OF THIS VALVE) ACCOMPANIES THIS FAILURE. EFFECTIVITY OF THE "INTERNAL LEAKAGE" FAILURE MODE IS DURING LIFT-OFF, ON-ORBIT, AND DE-ORBIT MISSION PHASES, WHERE AS, THE EFFECTIVITY FOR THE "FAILS TO CLOSE" FAILURE MODE IS ONLY DURING ON-ORBIT OPERATIONS.

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF ISOLATION BETWEEN ORBITER O2 SYSTEM AND EMU ECLSS PANEL.

(B) INTERFACING SUBSYSTEM(S):
NO INITIAL EFFECT UNTIL AN EXTERNAL LEAK DOWNSTREAM OF THIS VALVE OCCURS. THEN INABILITY TO ISOLATE O2 LEAKAGE WOULD RESULT IN AN INCREASE USE OF ORBITER CONSUMABLES.

(C) MISSION:
NO EFFECT UNTIL AN EXTERNAL LEAK DOWNSTREAM OF THIS VALVE OCCURS. THEN INCREASE USE OF O2 DUE TO AN EXTERNAL LEAKAGE COULD RESULT IN EARLY MISSION TERMINATION.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE. AN UNCONTROLLED LEAKAGE DOWNSTREAM OF THIS VALVE COULD RESULT IN INADEQUATE O2 SUPPLY TO LES STATIONS. LOSS OF LES SUPPORT CAPABILITY MAY RESULT IN LOSS OF CREW IF UNCONTROLLED LEAK RATE PROHIBITS LES SYSTEM PRESSURIZATION AND LES IS REQUIRED.

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(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE (SHUTOFF VALVE FAILS TO CLOSE OR INTERNALLY LEAKS) - INABILITY TO ISOLATE ORBITER OXYGEN FROM EMU ECLSS PANEL. - NO EFFECT UNTIL A DOWNSTREAM LEAK OCCURS.
SECOND FAILURE (EXTERNAL LEAK OF O2 DOWNSTREAM OF VALVE) - POTENTIAL BUILDUP OF OXYGEN IN CREW CABIN, MID FUSELAGE, OR EXTERNAL AIRLOCK DEPENDING ON WHERE EXTERNAL LEAKAGE OCCURRED. - CRITICALITY 1R2 CONDITION.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1R2

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
THIRD FAILURE (INABILITY TO ISOLATE LEAKAGE) - GROSS EXTERNAL LEAKAGE RESULTS IN INADEQUATE O2 SUPPLY TO LES STATIONS. LOSS OF LES SUPPORT CAPABILITY MAY RESULT IN LOSS OF CREW IF LEAK RATE PROHIBITS LES SYSTEM PRESSURIZATION AND LES IS REQUIRED. NOTE - IN AN 8.0 PSIA HOLE IN CABIN CONTINGENCY MODE, AN EXTERNAL LEAK ALLOWING FLOW INTO THE CABIN MAY NOT BE CATASTROPHIC SINCE THERE IS A POSSIBILITY OF SAFELY BREATHING CABIN AIR, INTO WHICH THE O2 IS LEAKING, BY RAISING LES VISOR. WORST CASE FAILURE WOULD BE IN CASE OF CONTAMINATED CABIN ATMOSPHERE, WHEN LEAKAGE PREVENTS ADEQUATE FLOW TO LES STATIONS AND CABIN AIR MAY NOT BE SAFE FOR BREATHING. POTENTIAL LOSS OF CREW AND VEHICLE. - CRITICALITY 1R3 CONDITION.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: MINUTES

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: HOURS

IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?
YES

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW HAS SUFFICIENT TIME TO PERFORM HIGH PP02 AND LEAK ISOLATION TROUBLESHOOTING BEFORE LOSS OF O2 BECAME CATASTROPHIC.

HAZARD REPORT NUMBER(S): ORBI 270, ORBI 299

HAZARD(S) DESCRIPTION:
INABILITY TO SUPPLY O2 TO CABIN/CREW (ORBI 270), FLAMMABILITY THREAT IN CABIN DUE TO O2 LEAKAGE FROM ARS OR OTHER SYSTEMS (ORBI 299)

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- APPROVALS -

SS & PAE	:	M. W. GUENTHER	:
DESIGN ENGINEER	:	K. J. KELLY	: