

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M8-1SS-E055 -X**

**SUBSYSTEM NAME: ECLSS - ISS NITROGEN TRANSFER SYSTEM
REVISION: 0 04/08/97**

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:PANEL, DOCKING BASE GN2	V076-643039-001
SRU	:VALVE, N2 MANUAL VENT CARLETON TECHNOLOGIES	MC250-0004-0017 1-4-00-51-39

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
DOCKING BASE GN2 PANEL ISS NITROGEN TRANSFER LINE MANUAL VENT VALVE**

**QUANTITY OF LIKE ITEMS: 1
ONE**

FUNCTION:
WITH THE MMU SYS 1 ISOLATION VALVE CLOSED, THE VENT VALVE PROVIDES A MEANS TO RELIEVE THE PRESSURE IN THE ISS NITROGEN TRANSFER LINE FOR STOWAGE OF THE NITROGEN FLEXIBLE LINES. THIS VALVE IS LOCATED ON THE DOCKING BASE GN2 PANEL AND IS MANUALLY OPERATED. VALVE IS NORMALLY CLOSED DURING ISS NITROGEN TRANSFER OPERATIONS.

**REFERENCE DOCUMENTS: VS28-643001
V076-643036**

FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE
NUMBER: M8-1SS-E055-03

REVISION#: 0 04/08/97

SUBSYSTEM NAME: ECLSS - ISS NITROGEN TRANSFER SYSTEM
 LRU: DOCKING BASE GN2 PANEL
 ITEM NAME: VALVE, ISS N2 TRANSFER MANUAL VENT

CRITICALITY OF THIS
 FAILURE MODE: 1R3

FAILURE MODE:
 FAILS TO CLOSE, INTERNAL LEAKAGE

MISSION PHASE: 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 PROVIDED BY WORKAROUNDS ARE IN STANDBY UNTIL REQUIRED.

C)

METHOD OF FAULT DETECTION:

NONE UNTIL NITROGEN TRANSFER LINE IS REPRESSURIZED. THEN CREW COULD
 POSSIBLY HEAR THE NITROGEN BEING VENTED OUT THE RELIEF VALVE WHEN THE
 SHUTOFF VALVE IS MANUALLY OPENED DURING NITROGEN TRANSFER. CREW CAN
 ALSO MONITOR THE DOCKING BASE GN2 GAGE.

CORRECTING ACTION: MANUAL

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CORRECTING ACTION DESCRIPTION:

THERE IS NO CORRECTIVE ACTION TO SEALING A FAILED OPEN VENT VALVE FOR CONTINUING NITROGEN TRANSFER. HOWEVER, A FAILED OPEN VENT VALVE WOULD RESULT IN A NITROGEN LEAK WHICH CAN BE ISOLATED BY CLOSING THE UPSTREAM DOCKING BASE NITROGEN SHUTOFF VALVE OR MMU SYS 1 ISO VALVE. A FLOW RESTRICTOR (ORIFICE) LOCATED IN THE NITROGEN LINE NEAR THE ORBITER INTERFACE WILL REDUCE THE FLOW RATE OF NITROGEN TO 25 +/-1 LBM/HR, IN THE EVENT AN EXTERNAL NITROGEN LEAK OCCURS AFTER THIRD FAILURE. EVEN AFTER FULL DEPLETION OF THE ORBITER NITROGEN SUPPLY, THE CREW CABIN AREA CONTAINS SUFFICIENT NITROGEN FOR CREW SURVIVAL DURING ABORTED MISSION DE-ORBIT AND LANDING PHASES.

REMARKS/RECOMMENDATIONS:

THE NITROGEN FLEX LINES ARE DEPRESSURIZED FOLLOWING COMPLETION OF THE NITROGEN TRANSFER TO ALLOW THEM TO BE EASILY STOWED. RECOMMEND THAT THE NITROGEN LINE NOT BE DEPRESSURIZED BETWEEN TRANSFER PERIODS TO PREVENT A FAILING TO CLOSE FAILURE MODE OF THE VENT VALVE FROM LOSING SUBSEQUENT NITROGEN TRANSFER CAPABILITIES. WITH BOTH THE NITROGEN SHUTOFF VALVE AND MMU SYS 1 ISO VALVE CLOSED ANY DOWNSTREAM LEAKAGE OF NITROGEN IN THE NITROGEN LINE WOULD THEN BE LIMITED TO THAT CONTAINED WITHIN THE FLEX LINES.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

UNABLE TO TERMINATE NITROGEN LINE PRESSURE RELIEF OPERATIONS. IF THE VENT VALVE FAILS TO CLOSE, FOLLOWING NITROGEN LINE DEPRESSURIZATION, ALL SUBSEQUENT NITROGEN TRANSFER CAPABILITIES WOULD BE LOST.

(B) INTERFACING SUBSYSTEM(S):

NO INITIAL EFFECT ON ORBITER INTERFACING SUBSYSTEMS. HOWEVER, IF NITROGEN FLOW TO THIS VALVE CANNOT BE TERMINATED, LEAKAGE OF NITROGEN INTO THE DOCKING BASE WOULD DECREASE ORBITER SUPPLY OF NITROGEN.

(C) MISSION:

NO EFFECT UNTIL THE UPSTREAM MANUAL SHUTOFF VALVE AND MMU SYS 1 ISO VALVE FAIL TO CLOSE OR INTERNALLY LEAK. THEN INCREASE USE OF N2 COULD RESULT IN EARLY MISSION TERMINATION. LOSS OF MISSION OBJECTIVES ASSOCIATED WITH TRANSFERRING GN2 TO SPACE STATION.

(D) CREW, VEHICLE, AND ELEMENT(S):

NO EFFECT UNTIL THE UPSTREAM MANUAL SHUTOFF VALVE AND MMU SYS 1 ISO VALVE FAIL TO CLOSE OR INTERNALLY LEAK. THEN SAFETY OF CREW AND VEHICLE IS JEOPARDIZED IF NITROGEN MAKEUP CAPABILITIES ARE REQUIRED DURING CREW'S

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RETURN TO EARTH. LOSS OF N2 SUPPLY TO ISS COULD IMPACT SPACE STATION OPERATIONS.

(E) FUNCTIONAL CRITICALITY EFFECTS:

FIRST FAILURE (VENT VALVE FAILS TO CLOSE OR INTERNALLY LEAKS) - LOSS OF NITROGEN FLOW ISOLATION BETWEEN DOWNSTREAM QD AND UPSTREAM SHUTOFF VALVE.

SECOND FAILURE (SHUTOFF VALVE FAILS TO CLOSE OR INTERNALLY LEAKS) - LOSS OF NITROGEN FLOW ISOLATION BETWEEN RELIEF VALVE AND UPSTREAM MMU SYS 1 ISOLATION VALVE. NO EFFECT - LOSS OF REDUNDANCY ONLY.

THIRD FAILURE (MMU SYS 1 ISO VALVE FAILS TO CLOSE OR INTERNALLY LEAKS) - INABILITY TO ISOLATE AN EXTERNAL NITROGEN LEAK WOULD RESULT IN PREMATURE DEPLETION OF ORBITER GN2 TANKS. LOSS OF EVA CAPABILITIES DUE TO INABILITY TO REPRESSURIZE EXTERNAL AIRLOCK RESULTING FROM LACK OF CONSUMABLES. CREW WOULD HAVE TO RELY ON CONSUMABLES REMAINING IN CREW CABIN DURING ORBITER'S RETURN TO EARTH. AN UNCONTROLLED EXTERNAL LEAKAGE OF NITROGEN WOULD RESULT IN EARLY MISSION TERMINATION. - CRITICALITY 2R3 CONDITION.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 2R3

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

FOURTH FAILURE (EXTERNAL LEAKAGE OF CABIN PRESSURE) - LOSS OF CABIN PRESSURE WITH NO N2 MAKEUP CAPABILITY WOULD RESULT IN LOSS OF CREW AND VEHICLE. - CRITICALITY 1R3 CONDITION.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: MINUTES

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

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:

CREW WOULD HAVE AMPLE TIME TO SHUT OFF NITROGEN FLOW TO ISS USING THE DOCKING BASE N2 SHUTOFF VALVE OR MMU SYS 1 ISO VALVE BEFORE DEPLETION OF ORBITER NITROGEN SUPPLY BECAME CATASTROPHIC.

HAZARD REPORT NUMBER(S): ORBI 071, ORBI 406

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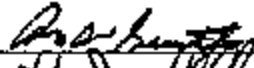
HAZARD(S) DESCRIPTION:

INADEQUATE NITROGEN SUPPLY TO MAINTAIN CABIN PRESSURE (ORBI 071). LOSS OF HABITABLE ENVIRONMENT IN THE CREW CABIN/ODS HABITABLE VOLUME DUE TO FLOODING OF VOLUME WITH GASEOUS NITROGEN (ORBI 406).

- APPROVALS -

SS & PAE
DESIGN ENGINEER

: M. W. GUENTHER
: K. J. KELLY

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