

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M8-1SS-E054 -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	V076-643038-001
SRU	:VALVE, N2 MANUAL SHUTOFF CARLETON TECHNOLOGIES	MC250-0004-0017 1-4-00-51-39

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

**QUANTITY OF LIKE ITEMS: 1
ONE**

FUNCTION:
PROVIDES A QUICK MEANS OF SHUTTING OFF NITROGEN FLOW TO THE SPACE STATION. VALVE IS LOCATED ON THE DOCKING BASE GN2 PANEL AND IS MANUALLY OPERATED. VALVE IS NORMALLY OPEN DURING ISS NITROGEN TRANSFER OPERATIONS.

REFERENCE DOCUMENTS: VS2B-643001
V076-643036

FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE

NUMBER: MR-1SS-E054-02

REVISION#: 0 04/08/97

SUBSYSTEM NAME: ECLSS - ISS NITROGEN TRANSFER SYSTEM

LRU: DOCKING BASE GN2 PANEL

CRITICALITY OF THIS

ITEM NAME: VALVE, ISS N2 TRANSFER MANUAL 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 PROVIDED BY WORKAROUNDS ARE IN STANDBY UNTIL REQUIRED.

C)

METHOD OF FAULT DETECTION:

FAILS TO CLOSE FAILURE MODE: VISUAL OBSERVATION - CONTINUOUS TRANSFER OF NITROGEN TO SPACE STATION.

ORBITER INSTRUMENTATION - PRESSURE INDICATION ON N2 GAUGE ON DOCKING BASE GN2 PANEL. CONTINUOUS QUANTITY DEPLETION INDICATION ON AFFECTED ORBITER N2 TANK(S).

ISS INSTRUMENTATION - QUANTITY LEVELS IN AFFECTED SPACE STATION N2 TANK(S) INDICATE TANKS ARE STILL BEING FILLED.

INTERNAL LEAKAGE FAILURE MODE: NONE UNTIL AN INTERNAL LEAKAGE OF THE DOWNSTREAM QD AND UPSTREAM MMU SYS 1 ISO VALVE OCCUR, THEN EXTERNAL

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M8-1SS-ED54-02**

LEAKAGE OF NITROGEN CAN BE DETECTED THROUGH ORBITER INSTRUMENTATION BY A QUANTITY DEPLETION INDICATION ON AFFECTED ORBITER N2 TANK(S).

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:

FAILS TO CLOSE FAILURE MODE: CREW CAN TERMINATE NITROGEN TRANSFER BY CLOSING SYS 1 ISOLATION VALVE ON MMU INTERFACE PANEL OR BY DISCONNECTING ISS FLEX LINES USING QUICK DISCONNECT(S). IN THE EVENT EXTERNAL LEAKAGE CANNOT BE ISOLATED, THE CREW CABIN AREA CONTAINS SUFFICIENT NITROGEN FOR CREW SURVIVAL DURING ABORTED MISSION DE-ORBIT AND LANDING PHASES.

INTERNAL LEAKAGE FAILURE MODE: NONE FOR FIRST TWO FAILURES. IN THE EVENT EXTERNAL LEAKAGE CANNOT BE ISOLATED FOLLOWING THIRD FAILURE, THE CREW CABIN AREA CONTAINS SUFFICIENT NITROGEN FOR CREW SURVIVAL DURING ABORTED MISSION DE-ORBIT AND LANDING PHASES.

REMARKS/RECOMMENDATIONS:

A SERIES QD AND ISOLATION VALVE PROVIDE REDUNDANCY AGAINST AN "INTERNAL LEAKAGE" OR "FAILS TO CLOSE" CONDITION OF THE NITROGEN SHUTOFF VALVE. SHUTOFF VALVE IS ONLY OPEN DURING ORBITER/ISS NITROGEN TRANSFER OPERATIONS AND REMAINS CLOSED ALL OTHER TIMES.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

INABILITY TO ISOLATE NITROGEN FLOW BETWEEN THE UPSTREAM MMU SYS 1 ISO VALVE AND DOWNSTREAM QD.

(B) INTERFACING SUBSYSTEM(S):

NO INITIAL EFFECT SINCE MMU SYS 1 ISO VALVE AND QUICK DISCONNECT PROVIDE BACKUP SEALS TO THIS VALVE.

(C) MISSION:

NO EFFECT UNTIL NITROGEN TRANSFER CANNOT BE TERMINATED USING THE QD OR ISOLATION VALVE. THEN INCREASE USE OF N2 WOULD REQUIRE GN2 SYSTEM ISOLATION TROUBLESHOOTING RESULTING IN EARLY MISSION TERMINATION.

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

NO EFFECT UNTIL THE DOWNSTREAM QD AND UPSTREAM MMU SYS 1 ISO VALVE INTERNALLY LEAK OR FAIL TO CLOSE. THEN SAFETY OF CREW AND VEHICLE IS

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M8-1SS-E054-02**

JEOPARDIZED IF NITROGEN MAKEUP CAPABILITIES ARE REQUIRED DURING CREW'S RETURN TO EARTH. IF THIRD FAILURE OCCURS DURING CREW/CARGO TRANSFERS GROSS LEAKAGE OF NITROGEN COULD CAUSE LOSS OF CREW DUE TO ASPHYXIATION.

(E) FUNCTIONAL CRITICALITY EFFECTS:

FIRST FAILURE (SHUTOFF VALVE INTERNALLY LEAKS OR FAILS TO CLOSE) - LOSS OF NITROGEN FLOW ISOLATION BETWEEN DOWNSTREAM QD AND UPSTREAM ISO VALVE. - NO EFFECT.

SECOND FAILURE (MMU SYS 1 ISO VALVE INTERNALLY LEAKS OR FAILS TO CLOSE) - NITROGEN TRANSFER LINE IS PRESSURIZED. NO EFFECT - LOSS OF REDUNDANCY ONLY.

THIRD FAILURE (NITROGEN QD INTERNALLY LEAKS) - INABILITY TO ISOLATE AN EXTERNAL LEAK WOULD RESULT IN PREMATURE DEPLETION OF 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 MMU SYS 1 ISO VALVE OR FLEX LINE QUICK DISCONNECT BEFORE DEPLETION OF ORBITER NITROGEN SUPPLY BECAME CATASTROPHIC.

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

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M8-1SS-E054-02

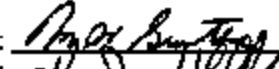
HAZARD(S) DESCRIPTION:

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

: 
: 