

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER:M8-1SS-E026A -X

SUBSYSTEM NAME: ECLSS - ARPCS

REVISION: 0

04/08/97

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:NUT, FLEXIBLE AIR DUCT COUPLING	V727-643115-001

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EXTERNAL AIRLOCK/PRESSURIZED PAYLOAD FLEXIBLE AIR DUCT COUPLING NUT

QUANTITY OF LIKE ITEMS: 1
ONE

FUNCTION:

PROVIDES QUICK CONNECT/DISCONNECT OF A TUNNEL ADAPTER FLEXIBLE DUCT TO/FROM AN EXTERNAL AIRLOCK FLEXIBLE DUCT. THE OTHER END OF THE FLEXIBLE DUCT CONNECTS TO THE TUNNEL ADAPTER RIGID DUCTING USING A STRAP. THIS FLEXIBLE DUCT EXTENDS THROUGH THE EXTERNAL AIRLOCK AFT HATCH OPENING. THIS FMEA IS ONLY APPLICABLE IF THERE IS A PRESSURIZED PAYLOAD INSTALLED IN THE PAYLOAD BAY AND A HATCH INSTALLED AT THE EXTERNAL AIRLOCK AFT HATCH LOCATION.

REFERENCE DOCUMENTS: V727-643115
M072-643400
M072-643829
M072-643501

FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE

NUMBER: M8-1SS-E026A-01

REVISION#: 2 04/08/97

SUBSYSTEM NAME: ECLSS - ARPCS

LRU: NUT, FLEXIBLE AIR DUCT COUPLING

ITEM NAME: NUT, FLEXIBLE AIR DUCT COUPLING

CRITICALITY OF THIS
FAILURE MODE: 1R3FAILURE MODE:
UNABLE TO DISCONNECT

MISSION PHASE: OO ON-ORBIT

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

CAUSE:
MECHANICAL SHOCK, PHYSICAL DAMAGE, OVER TIGHTENED, CORROSION/
CONTAMINATION

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:
PHYSICAL OBSERVATION - UNABLE TO TURN.

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:
THERE ARE NO OTHER MEANS OF QUICKLY DETACHING THE TUNNEL ADAPTER
FLEXIBLE DUCT. HOWEVER, IF THE FLEXIBLE DUCT CANNOT BE DETACHED FOR
CLOSURE OF THIS HATCH, IN A TIMELY MANNER, CREW CAN ISOLATE EXTERNAL
AIRLOCK/TUNNEL ADAPTER VOLUMES FROM THE CREW CABIN BY CLOSING THE 576

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BULKHEAD HATCH. IF REQUIRED, AND TIME PERMITTING, CREW CAN DETACH THIS FLEXIBLE DUCT BY REMOVING ONE OF TWO STRAPS. ONE STRAP IS USED TO HOLD THE OTHER END OF THE FLEXIBLE DUCT TO THE TUNNEL ADAPTER RIGID DUCTING AND THE OTHER STRAP IS USED TO HOLD THE EXTERNAL AIRLOCK KEEL FLEXIBLE DUCT TO THE REDUCER. (THE NUT END OF THE FLEXIBLE DUCT IS ATTACHED TO THIS REDUCER.) IF EITHER STRAP CANNOT BE REMOVED, CREW COULD SIMPLY CUT THE FLEXIBLE DUCT ITSELF. ONCE SEPARATED THE FLEXIBLE DUCT CAN BE STOWED AND EXTERNAL AIRLOCK AFT HATCH CLOSED.

REMARKS/RECOMMENDATIONS:

THE COUPLING NUT CAN BE SCREWED OR UNSCREWED DURING FLIGHT. IT REQUIRES SIX FULL 360 DEGREE TURNS TO REMOVE WHICH TAKES ABOUT 22 SECONDS TO ACCOMPLISH. THIS FMEA IS ONLY APPLICABLE IF THERE IS A PRESSURIZED PAYLOAD INSTALLED IN THE ORBITER.

IF THE EXTERNAL AIRLOCK AFT HATCH IS INSTALLED, THERE IS ONLY ONE MEANS OF QUICKLY DISCONNECTING THE FLEXIBLE DUCT THAT EXTENDS THROUGH THIS HATCH. THIS IS THE COUPLING NUT ADDRESSED IN THIS FMEA (THE REMAINING FLEX DUCT ATTACHMENTS UTILIZE A STRAP). AS SUCH, A RECOMMENDATION IS MADE TO REPLACE ONE OF THE REMAINING STRAPS WITH A QUICK DISCONNECT (OVER-CENTER) CLAMP TO PROVIDE A REDUNDANT MEANS OF QUICKLY DETACHING THIS FLEXIBLE DUCT.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

UNABLE TO REMOVE THE TUNNEL ADAPTER FLEXIBLE DUCT FROM THE EXTERNAL AIRLOCK FLEXIBLE DUCT OUTLET. THEN FAILURE TO DETACH FLEXIBLE DUCT WOULD RESULT IN LOSS OF CAPABILITY TO QUICKLY CLOSE EXTERNAL AIRLOCK AFT HATCH WHEN REQUIRED.

(B) INTERFACING SUBSYSTEM(S):

FAILURE TO QUICKLY DETACH THIS DUCT, WHEN REQUIRED, WOULD PRECLUDE IMMEDIATE CLOSURE OF THE EXTERNAL AIRLOCK AFT HATCH. THEN IF AN EXCESSIVE PRESSURE LEAK OCCURS WITHIN THE TUNNEL ADAPTER VOLUME A FAILURE TO CLOSE THE AFT HATCH WOULD RESULT IN AN INCREASED USE OF CONSUMABLES.

(C) MISSION:

NO EFFECT UNTIL AN EXTERNAL LEAK WITHIN THE TUNNEL ADAPTER OCCURS. AT WHICH TIME PRIMARY MISSION OBJECTIVES (CREW ACCESS TO SPACE STATION AND VICE VERSA) WOULD BE LOST.

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

INABILITY TO DETACH DUCT AND QUICKLY CLOSE EXTERNAL AIRLOCK AFT HATCH COULD JEOPARDIZE THE SAFETY OF CREW AND VEHICLE IF AN EXCESSIVE LEAK WITHIN THE TUNNEL ADAPTER OCCURS.

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(E) FUNCTIONAL CRITICALITY EFFECTS:

FIRST FAILURE (UNABLE TO DISCONNECT COUPLING NUT) - UNABLE TO QUICKLY DETACH FLEXIBLE DUCT FOR CLOSING OF EXTERNAL AIRLOCK AFT HATCH.
SECOND FAILURE (AN EXCESSIVE PRESSURE LEAK WITHIN TUNNEL ADAPTER) - CREW IS PREVENTED FROM ISOLATED THE EXTERNAL AIRLOCK FROM THE PRESSURIZED PAYLOAD RESULTING IN LOSS OF CONSUMABLES WITHIN EXTERNAL AIRLOCK HABITABLE VOLUME. - CRITICALITY 1R2 CONDITION.

POSSIBLE LOSS OF PRESSURE IN SPACE STATION WITH EXTERNAL AIRLOCK UPPER HATCH OPEN FOLLOWING SECOND FAILURE.

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

UNDER WORST CASE CONDITIONS, CREW MAY NOT HAVE TIME TO REMOVE A STRAP THAT ATTACHES THE FLEXIBLE DUCT TO THE TUNNEL ADAPTER RIGID DUCTING OR THAT ATTACHES THE EXTERNAL AIRLOCK KEEL FLEXIBLE DUCT TO THE REDUCER OR CUT THE DUCT. AS SUCH THESE WORKAROUNDS CANNOT BE CONSIDERED IN DETERMINING CRITICALITY OF THIS FAILURE MODE.

THIRD FAILURE (INABILITY TO CLOSE 576 BULKHEAD HATCH) - LOSS OF ISOLATION BETWEEN EXTERNAL AIRLOCK AND CREW CABIN RESULTING IN LOSS OF CONSUMABLES WITHIN CREW CABIN. CREW SAFETY JEOPARDIZED WITH LOSS OF CONSUMABLES. - CRITICALITY 1R3 CONDITION.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: IMMEDIATE

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: SECONDS

**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 CLOSE 576 BULKHEAD HATCH BEFORE LOSS OF CONSUMABLES BECAME CATASTROPHIC.**

HAZARD REPORT NUMBER(S): NONE - HAZARD WAS CLOSED OUT AT THE ANALYSIS LEVEL AND NEVER ELEVATED TO AN ORBITER HAZARD REPORT.


**HAZARD(S) DESCRIPTION:
N/A**

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- APPROVALS -

SS & PAE
DESIGN ENGINEER

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