FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER: M8-1SS-BM015-X

SUBSYSTEM NAME: MECHANICAL - EDS

REVISION: 1 DEC, 1996

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	DOCKING MECHANISM RSC-ENERGIA	MC621-0087-6001 ("SOFT") MC621-0087-7001 (PMA1) MC621-0087-8001 (PMA2/3)
SRU	:	SEAL,OUTER RSC-ENERGIA	D410223802 D410223802
	:	SEAL, OUTER RSC-ENERGIA SEAL, INNER	D410223803 D410223803 D410223707

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
ACTIVE/PASSIVE MECHANISM PRESSURE SEAL (LINER)

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 10
TEN (REDUNDANT SEALS AT 5 INTERFACES)

FUNCTION:
A SEAL (LINER) LOCATED ON THE INNER AND OUTER GROOVES AT FIVE PLACES: (1) BETWEEN THE ORBITER DOCKING BASE & DOCKING MECHANISM; (2) BETWEEN ORBITER DOCKING MECHANISM AND ISS PMA 2 PASSIVE MECHANISM; (3) BETWEEN PMA 2 AND PASSIVE (PMA 2) MECHANISM; (4) BETWEEN PMA 1 AND ACTIVE (PMA 1) MECHANISM AND (5) BETWEEN PMA 1 ACTIVE MECHANISM AND FGB PASSIVE MECHANISM. THESE SEALS PROVIDE A REDUNDANT MEANS OF PREVENTING LOSS OF HABITABLE VOLUME THROUGH THESE INTERFACES DURING IVA.

SERVICE IN BETWEEN FLIGHT AND MAINTENANCE CONTROL:
VISUAL INSPECTION, SERVICEABILITY CONTOL

MAINTAINABILITY
REPAIR METHOD - REPLACEMENT.

REFERENCE DOCUMENTS:
33U.4114.004-05-004 ("SOFT"; PMA1)
33U.4114.004-10-01 (PMA2/3)
33U.6201.006-09 ("SOFT")
33U.6201.006-05-004 (PMA1)
33U.6201.006-08 (PMA2/3)
33U.9914.006-05-002 ("SOFT", PMA1)
33U.9914.006-05-003 (PMA2/3)
V076-534000

PRINT DATE: 01/24/97

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M8-1SS-BM015- 01

REVISION# 1 DEC, 1996

SUBSYSTEM NAME: MECHANICAL - EDS
LRU: DOCKING MECHANISM
ITEM NAME: SEAL, PRESSURE

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
LEAKAGE (O-RING SEALS)

MISSION PHASE:
OO ON-ORBIT

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

CAUSE:
AGING/OXIDATION/SUBLIMATION, CONTAMINATION/FOREIGN OBJECT/DEBRIS, DEFECTIVE PART MATERIAL OR MANUFACTURING DEFECT, INADEQUATE/ EXCESSIVE/UNEVEN SEAL COMPRESSION LOADS, MISHANDLING, THERMAL DISTORTION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? N/A

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

PASS/FAIL RATIONALE:
A)

B)
N/A - AT LEAST TWO REMAINING PATHS ARE DETECTABLE IN FLIGHT.

C)

METHOD OF FAULT DETECTION:
INSTRUMENTATION/VISUAL OBSERVATION - LOSS OF PRESSURE FOLLOWING SECOND SEAL FAILURE.

CORRECTING ACTION: CREW MEMBERS COULD ISOLATE LEAK BY CLOSING THE APPROPRIATE HATCH(S).

REMARKS/RECOMMENDATIONS:
SEALS PROVIDE REDUNDANT PROTECTION AGAINST EXTERNAL LEAKAGE.

- FAILURE EFFECTS -

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE
NUMBER: M8-1SS-BM015-01

(A) SUBSYSTEM:
NO EFFECT FIRST FAILURE. FAILURE OF REDUNDANT SEAL WOULD RESULT IN DROP OR LOSS OF PRESSURE IN HABITABLE VOLUME THROUGH AFFECTED INTERFACE.

(B) INTERFACING SUBSYSTEM(S):
POTENTIAL LOSS OF PRESSURE IN CREW CABIN WITH "A" HATCH OPEN UPON LOSS OF BOTH SEALS.

(C) MISSION:
NO EFFECT FIRST FAILURE. POSSIBLE EARLY MISSION TERMINATION IF FAILURE OF REDUNDANT SEAL OCCURS PRIOR TO COMPLETION OF IVA ACTIVITIES.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE. POSSIBLE EXTERNAL LEAKAGE OF HABITABLE PRESSURE GIVEN SIMILAR FAILURE OF SECOND SEAL DURING ON-ORBIT OPERATIONS.

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE - NO EFFECT. LOSS OF REDUNDANCY ONLY.
SECOND FAILURE - WORST CASE, RAPID DECOMPRESSION IN HABITABLE VOLUMES. LOSS OF CONSUMABLES IN HABITABLE AREAS WITH ALL INTERNAL HATCHES OPEN. SAFETY OF CREW MEMBERS IS JEOPARDIZED UPON LOSS OF CONSUMABLES. EARLY MISSION FOLLOWING FAILURE OF SECOND SEAL. LOSS OF EVA CREW MEMBERS IF EVA IS REQUIRED OUT TUNNEL ADAPTER "C" HATCH (ISS 1) OR OUT EXTERNAL AIRLOCK AFT HATCH (MULTI-ISS) AND EXTERNAL AIRLOCK CANNOT BE REPRESSURIZED FOR RETURN TO CABIN (EVA CREW MEMBERS MUST REMAIN IN INTERNAL AIRLOCK UNTIL LANDING.) POTENTIAL LOSS OF PRESSURE IN ISS IF SECOND FAILURE OCCURS WHILE ISS HATCH IS OPEN.

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
THIRD AND FOURTH FAILURE (INABILITY TO CLOSE APPROPRIATE HATCHES) - LOSS OF CAPABILITY TO ISOLATE LEAK FROM CREW CABIN. POSSIBLE LOSS OF CREW AND VEHICLE DUE TO INCREASED USE OF CONSUMABLES.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: HOURS TO DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: SECONDS TO MINUTES

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

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW HAS AMPLE TIME TO CLOSE APPROPRIATE HATCH(S) TO ISOLATE THE LEAK FROM THE CREW CABIN.

HAZARDS REPORT NUMBER(S): ORBI 511

HAZARD(S) DESCRIPTION:

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LOSS OF PRESSURE IN HABITABLE VOLUME.

- APPROVALS -

PRODUCT ASSURANCE ENGR.	:	M. NIKOLAYEVA	:
DESIGN ENGINEER	:	E. BOBROV	: