FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE
NUMBER: M8-1MR-BM004A-X
(APPLIES ONLY TO THE PMA1 MECHANISM)

SUBSYSTEM NAME: MECHANICAL - EDS

REVISION: 1 DEC, 1996

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	MECH, BALLSCREW INTERCONNECTING NPO-ENERGIA	33U.6365.011-05 33U.6365.011-05
SRU	:	ASSY, ELECTRO-MAGNETIC DAMPER NPO-ENERGIA	33U.6661.005 33U.6661.005

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
GUIDE RING ELECTRO-MAGNETIC DAMPER ASSEMBLY

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 3
THREE (ONE PER BALLSCREW INTERCONNECTING MECH)

FUNCTION:
AN ELECTRO-MAGNETIC DAMPER IS LOCATED WITHIN EACH BALLSCREW INTERCONNECTING MECHANISM BETWEEN EACH ROD OF THE BALLSCREW PAIR. IT IS MAINTAINED IN THE "ON" POSITION AND DOES NOT REQUIRE EXTERNAL POWER TO ENGAGE OR DISENGAGE. THESE DAMPERS ARE USED TO DAMP OUT RELATIVE ROLL AND LATERAL ROTATIONAL VELOCITIES OF THE DOCKING RING.

SERVICE IN BETWEEN FLIGHT AND MAINTENANCE CONTROL:
VISUAL INSPECTION, SERVICEABILITY CONTOL, DOCKING WITH CALIBRATING DOCKING MECHANISM.

MAINTAINABILITY
REPAIR METHOD - REPLACEMENT.

REFERENCE DOCUMENTS: 33U.6661.005
33U.6365.011-05

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: M8-1MR-BM004A- 01
(APPLIES ONLY TO THE PMA1 MECHANISM)

REVISION# 1 DEC, 1996

SUBSYSTEM NAME: MECHANICAL - EDS
LRU: BALLSCREW INTERCONNECTING MECHANISM **CRITICALITY OF THIS**
ITEM NAME: ASSEMBLY, RING DAMPER **FAILURE MODE:** 2/2

FAILURE MODE:
JAMMING

MISSION PHASE:
OO ON-ORBIT

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

CAUSE:
CONTAMINATION, STRUCTURAL FAILURE DUE TO MECHANICAL SHOCK, VIBRATION, OR MANUFACTURE/MATERIAL DEFECT

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

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

PASS/FAIL RATIONALE:
A)
N/A

B)
N/A

C)
N/A

METHOD OF FAULT DETECTION:
A JAMMED RING DAMPER CAN BE DETECTED THROUGH VISUAL OBSERVATION FOLLOWING CAPTURE. TELEMETRY DATA ASSOCIATED WITH MOVEMENT OF THE RING (BALLSCREW MISALIGNMENT) IS AVAILABLE TO GROUND PERSONNEL FOR EVALUATION OF A JAMMED DAMPER.

REMARKS/RECOMMENDATIONS:
NONE

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(APPLIES ONLY TO THE PMA1 MECHANISM)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
A JAMMING OF ONE DAMPER WILL DISALLOW ROTATIONAL MOVEMENT OF ITS ASSOCIATED BALLSCREW PAIR. ROLL AND TRANSLATION MOVEMENT IS RESTRICTED AT ONE POINT ON THE DOCKING RING. CAPTURE AND RING ALIGNMENT MAY BE IMPAIRED WITH A SINGLE JAMMED RING DAMPER.

(B) INTERFACING SUBSYSTEM(S):
NO EFFECT ON INTERFACING SUBSYSTEMS.

(C) MISSION:
WORST CASE, A SINGLE JAMMED DAMPER MAY PREVENT CAPTURE OR PREVENT RING ALIGNMENT FOR MATING OF PMA1/ISS (FGB) DOCKING MECHANISMS RESULTING IN LOSS OF DOCKING AND SUBSEQUENT LOSS OF PMA1/ISS (FGB) MISSION CAPABILITIES.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT ON CREW OR VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
N/A

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

(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:
N/A (THERE ARE NO WORKAROUNDS TO CIRCUMVENT THIS FAILURE.)

-DISPOSITION RATIONALE-

(A) DESIGN:
DESIGN OF THE DAMPERS PROVIDES SUFFICIENT FREEPLAY BETWEEN SURFACES TO ALLOW FOR TEMPERATURE EXPANSION AND TO PREVENT JAMMING. THE DAMPING PORTION IS A MAGNETIC FIELD DEVICE. GRAPHITE LUBRICATION IS PROVIDED TO PREVENT MOVING SURFACES FROM STICKING.

(B) TEST:
REFER TO "APPENDIX A" FOR DETAILS OF THE FOLLOWING ACCEPTANCE AND QUALIFICATION TESTS OF THE DOCKING MECHANISMS RELATIVE TO THIS FAILURE MODE.

DOCKING MECHANISM ACCEPTANCE TESTS:

1. VIBRATION TEST
2. THERMAL VACUUM TEST

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DOCKING MECHANISM QUALIFICATION TESTS:

1. TRANSPORTABILITY STRENGTH TEST
2. VIBRATION TEST
3. SHOCK-BASIC DESIGN TEST
4. THERMAL VACUUM TEST
5. SIX-DEGREE-OF-FREEDOM TEST
6. SERVICE LIFE TEST
7. DISASSEMBLY INSPECTION

OMRSD - TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
COMPONENTS ARE SUBJECTED TO A 100% RECEIVING INSPECTION PRIOR TO INSTALLATION.

CONTAMINATION CONTROL
CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL VERIFIED BY INSPECTION. CHECK OF ROOM CLEANLINESS; PARTS WASHING AND OTHER OPERATIONS OF THE TECHNOLOGICAL PROCESS WHICH PROVIDES CLEANLINESS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
HEAT TREATING AND CHEMICAL PLATING VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
TORQUE, ADJUSTMENTS AND TOLERANCES ACCORDING TO TECHNICAL REQUIREMENTS OF THE DRAWINGS ARE VERIFIED BY INSPECTION.

TESTING
ATP/QTP/OMRSD TESTING VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING/PACKAGING PROCEDURES AND REQUIREMENT FOR SHIPMENT VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF ODS DOCKING MECHANISMS CAN BE FOUND IN PRACA DATA BASE.

(E) OPERATIONAL USE:
THERE IS NO WORKAROUND TO JAMMING OF A RING DAMPER.

PRINT DATE: 01/27/97

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- APPROVALS -

PRODUCT ASSURANCE ENGR.	: M. NIKOLAYEVA	:
DESIGN ENGINEER	: E. BOBROV	:
NASA SS/MA	:	:
NASA SUBSYSTEM MANAGER	:	:
JSC MOD	:	: