

PRINT DATE: 02/14/89

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SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-5E-D01-X

SUBSYSTEM NAME: PAYLOAD RETEN & DEPLOY - IUS DAMPER/LATCHES
REVISION : 0 02/14/89 W

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	IUS DAMPER ASSEMBLY	V589-544001

ITEM:
IUS DAMPER

QUANTITY OF LIKE ITEMS: 2

DESCRIPTION/FUNCTION:
PROVIDES DYNAMIC DAMPING FORCE IN 2-AXIS AT INTERFACE BETWEEN INERTIAL UPPER STAGE (IUS) AIRBORNE SUPPORT EQUIPMENT (ASE) AND ORBITER FOR FREQUENCIES BELOW 20 HZ. TWO DAMPERS, ONE EACH SIDE, ATTACH TO ASE SPREADER BEAM AND PEDESTAL ON ORBITER LONGERON BRIDGE FITTING.

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SUMMARY

SUBSYSTEM NAME: PAYLOAD RETEN & DEPLOY - IUS DAMPER/LATCHES
LRU IUS DAMPER ASSEMBLY
ITEM NAME: IUS DAMPER ASSEMBLY

FMEA NUMBER	ABBREVIATED FAILURE MODE DESCRIPTION	CIL FLG	CRIT	HZO FLG
02-5E-D01-01	INSUFFICIENT DAMPING	X	1R2	
02-5E-D01-02	PHYSICAL BINDING/JAMMING	X	1R2	
02-5E-D01-03	BROKEN DAMPER, PEDESTAL OR ATTACHMENT	X	1R2	

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LRU IUS DAMPER ASSEMBLY
ITEM NAME: IUS DAMPER ASSEMBLY
CRITICALITY OF THIS FAILURE MODE: 1R2

FAILURE MODE:
PHYSICAL BINDING/JAMMING

MISSION PHASE:
DO DE-ORBIT
LS LANDING SAFING

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
: 103 DISCOVERY
: 104 ATLANTIS
: IUS/GALILEO
: IUS/MAGELLAN
: IUS/TDRS

CAUSE:
ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS,
FAILURE/DEFLECTION OF INTERNAL PART, TEMPERATURE

CRITICALITY 1/1 DURING INTACT ABORT ONLY? N

REDUNDANCY SCREEN A) PASS
B) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)

B)
FAILS REDUNDANCY SCREEN "B" SINCE THERE IS NO VISUAL OR INSTRUMENTED
WAY OF DETECTING A FAILURE OF THE IUS DAMPER ASSEMBLY IN FLIGHT.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF DAMPING FORCE.

(B) INTERFACING SUBSYSTEM(S):
INCREASED LOADS ON IUS/ORBITER. POTENTIAL FLIGHT CONTROL LIMIT CYCL
ACCEPTABLE AMPLITUDE.

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(C) MISSION:
POSSIBLE DAMAGE TO IUS.

(D) CREW, VEHICLE, AND ELEMENT(S):
FIRST FAILURE - NO EFFECT. SECOND FAILURE DURING DESCENT/LANDING WIT
UNLAUNCHED IUS, LOSS OF DAMPING FROM BOTH DAMPERS RESULTS IN DEGRADED
FLIGHT CONTROL RESULTING IN POTENTIAL LOSS OF CREW/VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS

- DISPOSITION RATIONALE -

(A) DESIGN:
DAMPER DEVICE INCORPORATES CYLINDRICAL BRAKE SHOE SPRING LOADED
AGAINST CYLINDER LINER. ALL COMPONENTS HAVE POSITIVE MARGINS FOR 1.4
FACTOR OF SAFETY OVER LIMIT LOAD. ALL MOVING MECHANISM PARTS ARE
ENCLOSED INSIDE THE BARREL TO EXCLUDE ANY CONTAMINATION. MATERIALS
SELECTED FOR COMPONENTS ARE HIGH STRENGTH ALUMINUM AND CORROSION
RESISTANT STEEL WITH SPECIFIC TEMPERATURES REQUIREMENT. ONE IUS
DAMPER IS CAPABLE OF REDUCING OSCILLATIONS BETWEEN THE ASE SPREADER
BEAM AND PAYLOAD BAY BRIDGE INTERFACE TO ENSURE SATISFACTORY FLIGHT
CONTROL IF THE OTHER IUS DAMPER FAILS TO PROPERLY FUNCTION. (REF.
HONEYWELL DOC. E-X-FR-1-260-T/G VOL. 1-5; ENTRY TAL & GRTLS, FCS STS.
FLEX STABILITY ASSESSMENT FINAL REPORT VOL. 1-5; HONEYWELL TCL NO.
ROCKWELL SS&V 88-023, STS-26 ADDED SCOPE ASSESSMENT).

(B) TEST:
QUALIFICATION TESTS: THE DAMPER HAS BEEN CERTIFIED BY CR 44-544001-
001A. QUAL TESTS INCLUDE: EXAMINATION OF PRODUCT - ALL COMPONENTS OF
THE DAMPER ASSEMBLY WERE VERIFIED TO HAVE COMPLETED ACCEPTANCE
REQUIREMENTS. RANDOM VIBRATION - THE VIBRATION LEVELS IN THE Y-AXIS
WERE CONDUCTED AT LOWER LEVELS THAN THOSE SPECIFIED IN THE CR AND TR
BUT WERE ACCEPTED BY ANALYSIS STS 83-0404. THE SPECIFIED GRMS IN THE
X-AXIS WAS 10.9, BUT THE ACTUAL TEST LEVELS WERE APPROXIMATELY 8.5. THE
TEST WAS CONDUCTED FROM 20 TO 100 HZ, INCREASING AT +6 dB/oct AND 10
TO 2,000 HZ AT A CONSTANT 0.03 g²/HZ; THE REQUIREMENTS WERE 20 TO 40
HZ, INCREASING AT +12 dB/oct, AND 40 TO 2,000 HZ AT A CONSTANT 0.06
g²/HZ. THE VIBRATION LEVELS IN THE Z-AXIS WERE CONDUCTED AT HIGHER
LEVELS THAN THOSE SPECIFIED IN THE CR AND TR. THE SPECIFIED GRMS IN
THE Z-AXIS WAS 7.6, BUT THE TEST LEVELS WERE APPROXIMATELY 12. THE
TEST WAS CONDUCTED FROM 20 TO 40 HZ, INCREASING AT +12 dB/oct, 40 TO
2,000 HZ AT A CONSTANT 0.06 g²/HZ. THE REQUIREMENTS WERE 20 TO 100
INCREASING AT +6 dB/oct, AND 100 TO 2,000 HZ AT A CONSTANT 0.03 g²/H

QUAL TESTS ALSO INCLUDE: MISSION CYCLE (DYNAMIC CYCLING) - THE DAMPE
WAS CYCLED 4 TIMES AT 12 DIFFERENT STROKES TO SIMULATE LIFT-OFF,
BOOST, ENTRY AND LANDING CONDITIONS AT VARIOUS TEMPERATURES (AMBIENT

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+250 DEG F AND -110 DEG F) WITH SIDE LOADING. CERTIFICATION BY ANALYSIS - FUNGUS, OZONE, HUMIDITY, SALT SPRAY, SAND/DUST, SOLAR RADIATION (NUCLEAR), SOLAR RADIATION (THERMAL), METEORIODS, AND FACTOR OF SAFETY FOR THE DAMPER ASSEMBLY.

ACCEPTANCE TESTS: DYNAMIC CYCLING - THE DAMPER WAS CYCLED, 1 TIME AT 12 DIFFERENT STROKES TO SIMULATE LIFT-OFF, BOOST, ENTRY AND LANDING CONDITIONS AT VARIOUS TEMPERATURES (AMBIENT, +250 DEG F AND -110 DEG F) WITH SIDE LOADING.

OMRSD: GROUND TURNAROUND INCLUDES INERTIAL UPPER STAGE FRICTION DAMPER INSPECTION. RE-RUN LOAD TEST AFTER EACH FLIGHT AT ROCKWELL-DOWNEY.

(C) INSPECTION:

RECEIVING INSPECTION
ALL PURCHASED PARTS FABRICATED TO CONTROLLED DRAWINGS AND SPECIFICATIONS ARE VERIFIED BY INSPECTION FROM PURCHASE ORDERS AND PROCESS CERTIFICATIONS.

CONTAMINATION CONTROL
CLEANLINESS REQUIREMENTS AND CORROSION PROTECTION PER MA0608-301 ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
DAMPER ASSEMBLY IS ASSEMBLED PER DRAWINGS AND DETAILED DRAWING GENERAL NOTES; PLANNED SEQUENTIALLY INCLUDING TORQUE. BEARING AND NUT WET INSTALLATION WITH PRIMER ON MATING THREADS IS VERIFIED BY INSPECTION. LOCKWIRE AND THREADED FASTENERS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
PASSIVATION AND WELDING ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
DETAIL PARTS ARE PENETRANT OR MAGNETIC PARTICLE INSPECTED, VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED PER PROCEDURE.

HANDLING/PACKAGING
PACKAGING AND HANDLING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.

(E) OPERATIONAL USE:
NONE.

- APPROVALS -

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RELIABILITY ENGINEERING: M. B. MOSKOWITZ
DESIGN ENGINEERING : D. S. CHEUNG
QUALITY ENGINEERING : W. J. SMITH
NASA RELIABILITY :
NASA SUBSYSTEM MANAGER :
NASA QUALITY ASSURANCE :

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