

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- HARDWARE**NUMBER: M0-AG1-M10 -X****SUBSYSTEM NAME:** REMOTELY OPERATED FLUID UMBILICAL (ROFU)**REVISION:** 12/08/02**PART DATA**

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
: ROFU	V847-544100-001
:BUNGEE ASSEMBLY	V751-544180-001

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

BUNGEE ASSEMBLY - ARM DRIVE MECHANISM

REFERENCE DESIGNATORS: N/A**QUANTITY OF LIKE ITEMS:** 1

ONE PER ASSEMBLY

FUNCTION:

THE ARM DRIVE BUNGEE ALLOWS FOR CONTROLLED PRELOAD TO BE APPLIED TO THE PAYLOAD BY THE POSITIONING ARM DRIVE ASSEMBLY DURING MATE/STOW PROCESSES.

FAILURE MODES EFFECTS ANALYSIS FMEA -- FAILURE MODE

NUMBER: M0-AG1-M10- 01

REVISION#: 01/23/03

SUBSYSTEM NAME: REMOTELY OPERATED FLUID UMBILICAL (ROFU)

LRU:

CRITICALITY OF THIS

ITEM NAME: BUNGEE ASSEMBLY

FAILURE MODE: 2/2

FAILURE MODE:

PHYSICAL BINDING/JAMMING

MISSION PHASE:

OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:

ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECTS/DEBRIS, LOSS OF LUBRICANT, FAILURE/DEFLECTION OF INTERNAL PARTS, TEMPERATURE, VIBRATION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

- A) N/A
- B) N/A
- C) N/A

PASS/FAIL RATIONALE:

A)
N/A

B)
N/A

C)
N/A

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF PRELOAD FORCE TO PAYLOAD OR ARM DOES NOT FULLY EXTEND.

(B) INTERFACING SUBSYSTEM(S):

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- FAILURE MODE
NUMBER: M0-AG1-M10- 01**

THE MECHANISM MAY REACH A HARD STOP BEFORE LIMIT SWITCHES ARE ACTUATED TO INHIBIT THE DRIVE MOTORS. THIS MAY IMPOSE STRESS AT THE INTERFACE OR ARM MAY NOT EXTEND FAR ENOUGH TO PERFORM THE MATE FUNCTION.

(C) MISSION:

LOSS OF MISSION OBJECTIVE.

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

NO EFFECT

SUCCESS PATHS REMAINING AFTER FIRST FAILURE: 0

- TIME TO EFFECT -

REACTION TIME: SECONDS

-DISPOSITION RATIONALE-

(A) DESIGN:

BUNGEE IS SEALED TO EXCLUDE CONTAMINATION, FACTOR OF SAFETY IS 1.4 OVER LIMIT LOAD. POSITIVE MARGINS ON ALL COMPONENTS.

ALL THE MECHANISM MATERIALS HAVE BEEN CHOSEN FOR HIGH STRENGTH/LOW WEAR CHARACTERISTICS. MECHANISM DESIGNED WITH POSITIVE MARGINS OF SAFETY FOR WORST CASE THERMAL CONDITIONS. ALIGNMENT MECHANISM DESIGNED TO ENSURE PROPER CAPTURE ENVELOPE FOR WORST CASE THERMAL CONDITIONS.

(B) TEST:

QUALIFICATION:

THE ROFU MECHANISM IS CERTIFIED PER CR 60-44-544100-001-C. SYSTEM

QUALIFICATION TESTS INCLUDED:

- * VISUAL EXAMINATION TO VERIFY CONFORMANCE TO DRAWINGS, IDENTIFICATION MARKINGS, AND CLEANLINESS.
- * ENVIRONMENTAL TESTS - VIBRATION FOR 600 SEC/AXIS (STOWED). VIBRATION FOR 1400 SEC/AXIS (MATED) BY THE ROFU QUALIFICATION TEST. FIVE THERMAL / VACUUM CYCLES.
- * OPERATIONAL LIFE TESTS - 500 CYCLES, BY THE ROFU QUALIFICATION TEST, ON ARM AND LATCH MECHANISM.
- * QUALIFICATION ACCEPTANCE TESTS TO CERTIFY MECHANISM FOR FIVE ACCEPTANCE THERMAL AND FIVE ACCEPTANCE VIBRATION TESTS.
- * MAXIMUM DISPLACEMENT TESTS TO VERIFY OPERATIONAL ENVELOPE.
- * LIMIT, LIMIT PLUS LOADS TESTS TO VERIFY STATIC LOADING.
- * ARM AND LATCH STALL LOAD TESTS.

ACCEPTANCE:

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- FAILURE MODE
NUMBER: M0-AG1-M10- 01**

THE LATCH MECHANISMS WERE RIGGED PER CONTROLLED SPECIFICATION ML0308-0187, PLUS:

- * ACCEPTANCE VIBRATION RANDOM SPECTRUM 3 MIN/AXIS.
- * FIVE ACCEPTANCE THERMAL CYCLES.

CERTIFICATION BY ANALYSIS/SIMILARITY:

FACTORS INCLUDE: HUMIDITY, FUNGUS, OZONE, SALTSPRAY, SAND/DUST, ACCELERATION, FACTORS OF SAFETY, HAIL, LIGHTNING, RAIN, SOLAR RADIATION (THERMAL AND NUCLEAR), STORAGE/OPERATING LIFE, METEOROIDS, ACOUSTICS, AND EXPLOSIVE ATMOSPHERE.

GROUND TURNAROUND:

OMRSD - ANY TURNAROUND TEST CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD

(C) INSPECTION:

RECEIVING INSPECTION

MATERIAL AND PROCESS CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

INSPECTION VERIFIES CLEANLINESS IS MAINTAINED. INSPECTION VERIFIES CORROSION PROTECTION PER MA0608-301.

ASSEMBLY/INSTALLATION

DIMENSIONS OF DETAIL PARTS VERIFIED BY INSPECTION. FASTENER INSTALLATION IS VERIFIED BY INSPECTION. ASSEMBLY AND RIGGING OF BUNGEE ASSEMBLY IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION OF DETAIL PARTS IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

APPLICATION OF LB0140-005 DRY FILM LUBRICANT PER MA0112-302 IS VERIFIED BY INSPECTION. HEAT TREATING IS VERIFIED BY INSPECTION.

TESTING

ACCEPTANCE TESTING OF THE BUNGEE ASSEMBLY PRIOR TO DELIVERY IS VERIFIED BY INSPECTION PER APPLICABLE PROCEDURE.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATA BASE.

(E) OPERATIONAL USE:

NONE

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NUMBER: M0-AG1-M10- 01

- APPROVALS -

S&R ENGINEER	:A. NGUYEN	:/s/ Anh Nguyen_____
CARGO/INTEG ITM	:J. CAPALENI	:/s/ Bob Dueuease for_____
DESIGN ENGINEER	:P. HOE	:/s/ Pham Hoe_____
SSM	:L. J. SALVADOR	:/s/ Pham Hoe for_____
NASA/DCE	:B. BROWN	:/s/ B. Brown_____
MOD	:K. SMITH	:/s/ K. Smith_____
SR&QA	:H. MALTBY	:/s/ Harry Maltby_____
USA/SAM	:R. SMITH	:/S/ R. SMITH_____
USA CARGO/INTG ELEMENT	:S. KUNKEL	:/s/ S. Kunkel_____
USA ORBITER ELEMENT	:S. LITTLE	:/s/ Suzanne Little_____