FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE
NUMBER: MO-AA4-205-X

SUBSYSTEM NAME: STABILIZED PAYLOAD DEPLOYMENT SYSTEM
REVISION : 2 07/31/90

	PART NAME / VENDOR NAME	PART NUMBER / VENDOR NUMBER
■ SRU :	BUNGEE - SUPPORT ARM ASSEMBLY	V790-544120

PART DATA

■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

■ QUANTITY OF LIKE ITEMS: 2
ONE PER PEDESTAL ASSEMBLY

■ FUNCTION:
THE BUNGEE ASSEMBLY IS A PRINCIPAL LINK BETWEEN THE PEDESTAL AND THE LONGERON SILL. ITS FUNCTION IS TO COMPENSATE FOR STRUCTURAL DEFLECTIONS CAUSED BY EXTERNALLY APPLIED LOADS BY YIELDING ELASTICALLY TO MAINTAIN COMPLIANCE CONTACT BETWEEN THE SILL AND THE PEDESTAL. THESE UNITS SERVE AS INDEPENDENT COMPENSATORS FOR THEIR RESPECTIVE PEDESTALS, THEY DO NOT NECESSARILY WORK IN PARALLEL. THE FOLLOWING EVENTS PERTAIN: WITH THE KEEL LATCH OPEN, THEN NEAR SIDE LATCHES RELEASED, THE Zo SPRINGS CAUSE UPWARD MOVEMENT OF THE PEDESTAL AND PAYLOAD. ENERGIZING THE Yo ACTUATOR THEN CAUSES THE PEDESTALS TO ROTATE OUTBOARD APPROXIMATELY 1 3/4 INCHES. THE KEEL TRUNNION CONTACTING ITS KEEL LATCH STOPS PEDESTAL MOVEMENT BUT THE Yo ACTUATOR CONTINUES TO RUN ADDING ENERGY TO THE PRELOAD OF THE BUNGEE UNTIL MECHANICAL LIMITS ARE REACHED, THE LIMIT SWITCHES ARE ACTUATED, AND THE Yo ACTUATOR STOPS RUNNING. THE FAR SIDE LATCHES ARE RELEASED AND THE BUNGEE PRELOAD CAUSES THE PEDESTAL TO CONTINUE ITS OUTBOARD ROTATION (CARRYING THE PAYLOAD ALONG) TO THE FULL 3-INCH POSITION. THIS NEW POSITION ALLOWS THE PAYLOAD TRUNNIONS TO CLEAR THE LATCHES. LINKAGE THEN CAUSES BUNGEE RESIDUAL FORCE TO MAINTAIN A FIRM CONTACT BETWEEN PEDESTAL AND SILL THUS PROVIDING THE REQUIRED COMPLIANCE. THE KEEL TRUNNION WILL CLEAR ITS LATCH OPENING WITH 1 3/4 INCH Yo OUTBOARD POSITION.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: MO-AA4-205-01

SUBSYSTEM: STABILIZED PAYLOAD DEPLOYMENT SYSTEM REVISION# 2 07/31/90

ITEM NAME: BUNTE - SUPPORT ARM ASSEMBLY CRITICALITY OF THIS FAILURE MODE:2/2

■ FAILURE MODE:
LOSS OF CONTROLLED RESILIENCY

MISSION PHASE:
00 ON-ORBIT

■ VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
: 103 DISCOVERY
: 104 ATLANTIS
: 105 ENDEAVOUR

■ CAUSE:
CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

■ CRITICALITY 1/I DURING INTACT ABORT ONLY? NO

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

PASS/FAIL RATIONALE:
■ A)

■ B)

■ C)

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:
PEDESTAL DOES NOT PROPERLY COMPENSATE FOR STRUCTURAL DEFLECTIONS BETWEEN ITSELF AND THE LONGERON.

■ (B) INTERFACING SUBSYSTEM(S):
PEDESTAL DOES NOT PROPERLY COMPENSATE FOR STRUCTURAL DEFLECTIONS BETWEEN ITSELF AND THE LONGERON.

■ (C) MISSION:
LOSS OF MISSION IF FAILURE OCCURS DURING DEPLOYMENT.

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

■ (E) FUNCTIONAL CRITICALITY EFFECTS:
LOSS OF FUNCTION WOULD RESULT IN MISSION ABORT.

- DISPOSITION RATIONALE -

■ (A) DESIGN:
THE SUPPORT ARM ASSEMBLY IS MADE OF HIGH STRENGTH CORROSION RESISTANT MATERIAL FOR SPACE ENVIRONMENT USE. THE DESIGN SHOWS POSITIVE STRUCTURAL MARGIN BY ANALYSIS AND MEETS 1.4 MINIMUM FACTOR OF SAFETY

■ (B) TEST:
QUALIFICATION TESTS PER DTP4779-801 WERE SUCCESSFULLY COMPLETED JANUARY 5, 1990 AND WILL BE DOCUMENTED IN TEST REPORT STS9000115.

■ (C) INSPECTION:
ALL DIMENSIONAL CHARACTERISTICS ARE VERIFIED BY INSPECTION. PROCESSES ARE VERIFIED BY INSPECTION EITHER AT ROCKWELL OR AT SUPPLIER FACILITIES. CLEANLINESS AND MATERIAL CERTIFICATION ARE VERIFIED BY INSPECTION.

■ (D) FAILURE HISTORY:
NONE.

■ (E) OPERATIONAL USE:
NONE.

- APPROVALS -

RELIABILITY ENGINEERING: W. R. MARLOWE : 8/6/90
DESIGN ENGINEERING : G. CAMPBELL :
QUALITY ENGINEERING : M. F. MERGEN : 8/3/90
NASA RELIABILITY : G-E : 9/17/90
NASA SUBSYSTEN MANAGER : : 9/25/90
NASA QUALITY ASSURANCE : : 9/6/90