FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE
NUMBER: 02-5E-MK06-X

SUBSYSTEM NAME: P/L RETENTION & DEPLOY - LATCHES
REVISION: 3 10/18/94

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
ASSEMBLY	:	MIDDLEWEIGHT KEEL LATCH	V073-544430
LRU	:	SWITCH MECHANISM, LATCH OPEN	V073-544360

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SWITCH MECHANISM, LATCH OPEN LIMIT SWITCH

QUANTITY OF LIKE ITEMS: 5
5 MAX
ONE PER LATCH

FUNCTION:
MIDDLEWEIGHT KEEL LATCH REACTS FLIGHT LOADS ON PAYLOAD VERTICAL TRUNNION HELD BETWEEN TWO SPHERICAL HALF BEARINGS. WHEN LATCH IS OPEN, LATCH OPEN LIMIT SWITCH ASSEMBLY VERIFIES LATCH IS OPENED SUFFICIENTLY TO ALLOW PAYLOADS TO BE BERTHED OR DEPLOYED. LIMIT SWITCH SIGNAL REMOVES POWER FROM THE MOTORS AND GIVES THE CREW AN INDICATION THAT THE LATCH IS OPEN.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL FAILURE MODE
NUMBER: 02-5E-MK06- 01

REVISION# 3 10/18/94

SUBSYSTEM NAME: P/L RETENTION & DEPLOY - LATCHES
LRU: MIDDLEWEIGHT KEEL LATCH
ITEM NAME: SWITCH MECHANISM, LATCH OPEN

CRITICALITY OF THIS FAILURE MODE: 2/2

FAILURE MODE:
TRANSFERS PREMATURELY/INADVERTENTLY

MISSION PHASE:
OO ON-ORBIT

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

CAUSE:
ACCELERATION, CONTAMINATION/FOREIGN OBJECT/DEBRIS, DEFECTIVE PART/MATERIAL OR MANUFACTURING DEFECT, 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)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
FAILURE WILL RESULT IN SWITCH OUTPUT INDICATING LATCH OPEN REGARDLESS OF ACTUAL LINKAGE POSITION. FAILURE WILL PREVENT LATCH FROM DRIVING IN THE OPEN DIRECTION.

(B) INTERFACING SUBSYSTEM(S):
FAILURE WILL RESULT INABILITY TO RELEASE PAYLOAD IF LATCH IS IN CLOSED POSITION.

(C) MISSION:
FAILURE WITH LATCH CLOSED WILL RESULT IN LOSS OF MISSION DUE TO INABILITY TO RELEASE PAYLOAD.

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(D) CREW, VEHICLE, AND ELEMENT(S):
NONE

(E) FUNCTIONAL CRITICALITY EFFECTS:
NONE

-DISPOSITION RATIONALE-

(A) DESIGN:
THE SWITCH MECHANISM CONSISTS OF DUAL LIMIT SWITCHES ACTIVATED BY A COMMON LEVER. ONLY ONE SWITCH IS REQUIRED FOR SIGNAL ACTUATION. TWO SPRINGS ARE USED TO MAINTAIN SWITCH MODULE ACTUATION ARM IN UNACTUATED POSITION.

(B) TEST:
ACCEPTANCE TESTS: THE FOLLOWING TESTS ARE PERFORMED FOR ALL FLIGHT ARTICLES AND WERE PERFORMED FOR EACH QUALIFICATION TEST ARTICLE: VIBRATION - RANGE 20 TO 2,000 HZ MAXIMUM LEVEL OF 0.04 G2/HZ FROM 80 TO 350 HZ, ALL AXES. THERMAL - STABILIZED RANGE FROM -180 DEG F TO +255 DEG F. FUNCTIONAL TESTS CONDUCTED AT -80 DEG F, AMBIENT AND +255 DEG F. LOADS/ ALIGNMENT - VERIFY RETENTION OF LATCHED POSITION AT 80% LIMIT LOAD, AS WELL AS SPHERICAL BEARING TORQUE RESISTANCE AND TRAVEL LIMITS. ELECTRICAL - VERIFY (WITHIN DESIGN LIMITS) CONTINUITY, DIELECTRIC STRENGTH, INSULATION RESISTANCE, AND SWITCH OPERATION.

QUALIFICATION TESTS: QUALIFICATION IS BY SIMILARITY TO LIGHTWEIGHT KEEL LATCH (V073-544300). FIRST UNIT TESTED TO 100% LIMIT LOAD.

OMRSD: ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
TEST RECORDS AND REPORTS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES. RECEIVING INSPECTION PERFORMS VISUAL AND DIMENSIONAL EXAMINATION OF ALL INCOMING PARTS.

CONTAMINATION CONTROL
CORROSION PROTECTION REQUIREMENTS VERIFIED BY INSPECTION. QUALITY CONTROL VERIFIES PROPER MAINTENANCE AND OPERATION OF THE ENVIRONMENTALLY CONTROLLED MANUFACTURING AREA. ULTRASONIC CLEANING VERIFIED BY INSPECTION. CONTAMINATION CONTROL PROCEDURES INCLUDING USE OF COVERED TOTE PANS IS VERIFIED.

ASSEMBLY/INSTALLATION
DETAILED INSPECTION PERFORMED ON ALL PARTS PRIOR TO NEXT ASSEMBLY. ASSEMBLY OPERATIONS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
X-RAY INSPECTION UNDER MINIMUM 7X MAGNIFICATION FOR EVIDENCE OF WELD

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FLASH, LOST PARTS, AND ASSEMBLY ANOMALIES. ALL LIMIT SWITCHES ARE PIND TESTED.

CRITICAL PROCESSES
CRITICAL PROCESSES INCLUDING WELDING, BRAZING, AND PASSIVATION ARE MONITORED AND VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED PER PROCEDURE.

HANDLING/PACKAGING
HANDLING AND PACKAGING REQUIREMENTS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
FAILURE HISTORY IS TRACKED IN THE PRACA SYSTEM.

(E) OPERATIONAL USE:
NONE

- APPROVALS -

EDITORIALLY APPROVED	: RI	:
EDITORIALLY APPROVED	: JSC	: Melanie C. Baker 10-26-94
TECHNICAL APPROVAL	: VIA CR	:S50279AP