

**SHUTTLE CRITICAL ITEMS LIST - ORBITER**

SUBSYSTEM : EPD&C - MANIP DEPLY CNTL PMEA NO 05-61B-2002 -2 REV:10/26/88.

ASSEMBLY : MID MCA 2,4 (V070-764550) CRIT. FUNC: 1  
 P/N RI : MC455-0135-0001 CRIT. HDW: 1  
 P/N VENDOR: (V070-764550)  
 QUANTITY : 4 VEHICLE 102 103 104  
 EFFECTIVITY: X X X  
 PHASE(S): PL LO OO DO X IS

PREPARED BY: REDUNDANCY SCREEN: A-PASS B-PASS C-PASS  
 DES B SEARS *R.S.* APPROVED BY: APPROVED BY (NASA):  
 REL H YEW REL *[Signature]* SSM *[Signature]*  
 QE J COURSEN QE *[Signature]* 10-31-88

ITEM:  
 HYBRID RELAY

*EPD&C SSM [Signature] 11-8-88*  
*EPD&C REL [Signature] 11/10/88*

FUNCTION:  
 REDUNDANT HYBRID RELAYS USE MPM POSITION MICROSWITCHES AND MPM STOW/DEPLOY COMMANDS TO CONTROL OPERATION OF REDUNDANT MOTORS. THERE ARE FOUR HYBRID RELAYS, SYS1 STOW, SYS1 DEPLOY, STS2 STOW, SYS2 DEPLOY. 40V76A118K22,24, 40V76A120K60,72.

FAILURE MODE:  
 FAILS CLOSED, FAILS TO OPEN, PREMATURELY CLOSES

CAUSE(S):  
 PIECE PART FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY, THERMAL STRESS

EFFECT(S) ON:

EFFECT(S) ON:  
 (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) POSSIBLE MPM MOVEMENT IF STOW RELAY FAILS CLOSED DURING RMS OPERATION AS : (1) MID MCA LOGIC POWER MNA, MNB AND MNC MAY BE ON DURING RMS OPERATION AND (2) PAYLOAD BAY MECH POWER MAY BE ON FOR PAYLOAD RETENTION LATCH OPERATION OR OTHER PAYLOAD BAY OPERATIONS WHILE RMS IS IN OPERATION. THIS ALLOWS A SINGLE POINT RELAY FAILURE RESULTING IN UNCOMMANDED MPM MOVEMENT.

(B) STOW RELAY FAILURE DURING RMS OPERATION WITH PAYLOAD BAY MECH POWER PRESENT COULD CAUSE MPM MOVEMENT AND VEHICLE STRUCTURAL DAMAGE. DEPLOY RELAY FAILURE IN DEPLOY POSITION AFTER MPM DEPLOYMENT COULD CAUSE LOSS OF CAPABILITY TO STOW THE MPM USING THE ASSOCIATED ACTUATOR MOTOR. THIS REQUIRES THE REDUNDANT ACTUATOR MOTOR TO COMPLETE MPM STOW IN SINGLE MOTOR TIME. LOSS OF REDUNDANT ACTUATOR MOTOR COULD RESULT IN PREVENTING PAYLOAD BAY DOOR CLOSURE, AND REQUIRES CREW EVA OR POSSIBLE MPM JETTISON.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : EPD&C - MANIP DEPLY CNTL FMEA NO 05-6IB-2002 -2 REV:10/26/80

(C) POSSIBLE LOSS OF MISSION IF STOW RELAY FAILS PRIOR TO MPM DEPLOYMENT CAUSING BLOCKAGE OF PAYLOAD DEPLOYMENT/RETRIEVAL ENVELOPE AND INABILITY TO OPERATE RMS.

(D) POSSIBLE LOSS OF CREW/VEHICLE IF VEHICLE STRUCTURAL DAMAGE OCCURS DUE TO AN UNCOMMANDED MPM MOVEMENT DURING RMS OPERATION WITH PAYLOAD BAY MECH POWER PRESENT.

DISPOSITION & RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A-D) DISPOSITION AND RATIONALE

REFER TO APPENDIX C, ITEM 1 - HYBRID RELAY

(B) GROUND TURNAROUND TEST

VERIFY MPM OPERATION BY PERFORMING DEPLOY/STOW CONTROL REDUNDANCY TESTS FOR SYSTEM 1 AND 2. TESTS ARE PERFORMED FOR EVERY FLIGHT WITH MPM/MRL/RMS AND LRU REPLACEMENT.

(E) OPERATIONAL USE

STS OPERATIONAL FLIGHT RULE PDRS 12-23 PREVENTS UNCOMMANDED MPM MOTION BY INTERRUPTING THREE PHASE AC POWER TO THE MPM ACTUATOR WHENEVER MANIPULATOR ARM IS UNRESTRAINED. THE CREW IS TRAINED AND EVA TOOLS AND PROCEDURES HAVE BEEN DEVELOPED AND VALIDATED TO PERFORM MANUAL MPM STOW AND DEPLOY.

05-6IB-6