

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : P/L RETEN & DEPLOY-~~MM~~, MRL FMEA NO 02-5C-R06-2 REV:04/04/88

ASSEMBLY : MANIPULATOR RETENTION LATCH (MRL) CRIT. FUNC: 2
 P/N RI : MC287-0027-0006 CRIT. HDW: 2
 P/N VENDOR: VEHICLE 102 103 104
 QUANTITY : 3 EFFECTIVITY: X X X
 PHASE(S): PL LO OO X DO LS

PREPARED BY: REDUNDANCY SCREEN: A- B- C-
 DES D. S. CHEUNG APPROVED BY: *A. Sampson* APPROVED BY (NASA):
 REL M. B. MOSKOWITZ DES *DSC For G. CAMPBELL* SSM *M.B. Moskowitz*
 QE W. J. SMITH REL *M.B.M. Moskowitz* REL *M.B.M. Moskowitz*
 QE *W.J. Smith* QE *W.J. Smith*

ITEM:

SWITCH MECHANISM, MANIPULATOR RETENTION LATCH (MRL) OPEN LIMIT SWITCH

FUNCTION:

SWITCH MECHANISM GIVES INDICATION THAT MANIPULATOR RETENTION LATCH (MRL) HOOKS ARE FULLY OPEN AND REMOTE MANIPULATOR SYSTEM (RMS) HAS BEEN RELEASED. LIMIT SWITCHES ARE ENCLOSED IN THE GEARBOX AND ARE ACTUATED BY A GEAR AND A SINGLE LEVER.

FAILURE MODE:

FAILS TO TRANSFER/CONTINUOUS OR PREMATURE CLOSE

CAUSE(S):

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

EFFECTS ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

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

(B) FAILURE WILL RESULT IN INABILITY TO RELEASE RMS.

(C) FAILURE WITH LATCH CLOSED WILL RESULT IN LOSS OF MISSION DUE TO INABILITY TO RELEASE MRL AND UNBERTH RMS.

(D) NONE.

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DISPOSITION & RATIONALE:

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

(A) DESIGN

SWITCH ACTUATING LEVER IS CAM OPERATED WITH ROLLER AND SPRING LOADED PLUNGER. SWITCH MODULE ACTUATION FORCES ARE LOW (2 LB MAXIMUM). THE SWITCH MECHANISM CONSISTS OF DUAL LIMIT SWITCHES ACTIVATED BY A COMMON LEVER. ONLY ONE LIMIT SWITCH IS REQUIRED FOR SIGNAL ACTUATION.

(B) TEST

QUALIFICATION TESTS: QUALIFICATION TESTS INCLUDE QUALIFICATION ACCEPTANCE VIBRATION TEST (QAVT), FLIGHT VIBRATION, THERMAL CYCLING, OPERATION LIFE CYCLING, MECHANICAL/ELECTRICAL LIMITS, IR, EJECTION DEVICE TEST, AND READY-TO-LATCH SWITCH TEST.

ACCEPTANCE TESTS: ACCEPTANCE TESTS INCLUDE ACCEPTANCE VIBRATION TESTING (AVT), OPERATIONAL CYCLING, INSULATION RESISTANCE (IR), DIELECTRIC WITHSTANDING VOLTAGE (DWV), AND CONTINUITY.

OMRSD: GROUND TURNAROUND INCLUDES RELEASE PORT MRL (SYSTEM 1), LATCH PORT MRL (SYSTEM 1), RELEASE PORT MRL (SYSTEM 2), LATCH PORT MRL (SYSTEM 2), RELEASE PORT MRL (SYSTEMS 1 AND 2), AND LATCH PORT MRL (SYSTEMS 1 AND 2).

(C) INSPECTION

RECEIVING INSPECTION

MATERIAL AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION. ALL PURCHASED PART DATA PAKS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS PER SPECIFICATION TO LEVEL 300 OF MA0110-301 AND A CLASS 100,000 CLEAN ROOM IN ACCORDANCE WITH FED-STD-209 ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

DIMENSIONS ARE VERIFIED BY INSPECTION. MANUFACTURING, INSTALLATION AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

HEAT TREAT AND PASSIVATION ARE VERIFIED BY INSPECTION.

TESTING

ATP IS VERIFIED PER PROCEDURE.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

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(D) FAILURE HISTORY

CAR NO. AB6938 : DURING SUPPLIER ACCEPTANCE TEST OF LATCH ASSEMBLY, LIMIT SWITCH FOR SYSTEM 1, UNLATCH POSITION, FAILED TO TRANSFER; CAUSE OF THE SWITCH FAILURE TO TRANSFER WAS EXCESSIVE CONTACT RESISTANCE; DEFECTIVE LIMIT SWITCH REPLACED WITH A NEW LIMIT SWITCH AND ACCEPTANCE TESTS OF THE LATCH WERE COMPLETED SATISFACTORILY.

CAR NO. AC0517 : DURING ACCEPTANCE TESTS, THE LIMIT SWITCH FAILED TO TRANSFER; FAILURE CAUSED BY THE SWITCH ACTUATING SCREW WHICH WAS ADJUSTED TOO FAR IN, SUCH THAT WHEN THE LATCH ACTUATOR MOVED AWAY FROM THE UNLATCHED POSITION, THE UNLATCHED LIMIT SWITCH ARM REMAINED DEPRESSED; THE SUSPECT LIMIT SWITCH WAS REPLACED WITH ANOTHER LIMIT SWITCH AND THE LATCH ASSEMBLY SUBSEQUENTLY PASSED ACCEPTANCE TESTS SATISFACTORILY.

(E) OPERATIONAL USE
NONE.