

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : CREW STATION & EQUIP-MISSION FMEA NO M7-101 -PA1 -2 REV:06/15/88

ASSEMBLY : PROVISION STOWAGE ASSY (PSA)	CRIT. FUNC:	1R
P/N RI : V568-340405	CRIT. HDW:	2
P/N VENDOR:	VEHICLE	102 103 104
QUANTITY : 2	EFFECTIVITY:	X X X
: 1 PORT & 1 STRBD	PHASE(S):	PL LO OO X DO LS

PREPARED BY:	REDUNDANCY SCREEN:	A-PASS B-N/A C-PASS
DES R. A. LAWRENCE	APPROVED BY:	APPROVED BY (NASA):
REL G. M. PIKUS	DES <i>[Signature]</i> 4-22-88	SSM <i>[Signature]</i> 6/22/88
QE W. J. SMITH	REL <i>[Signature]</i>	REL <i>[Signature]</i> 6-29-88
	QE <i>[Signature]</i> 6-21-88	QE <i>[Signature]</i> 6/29/88

ITEM:
PROVISION STOWAGE ASSEMBLY - DOOR ASSEMBLY

FUNCTION:
PROVIDE FOR RETENTION OF AND ACCESS TO TOOLS STOWED IN THE PROVISION STOWAGE ASSEMBLY.

FAILURE MODE:
DOOR ASSEMBLY FAILS TO OPEN

CAUSE(S):
BINDING/JAMMED MECHANISMS

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

(A) INABILITY TO ACCESS TOOLS AND EQUIPMENT.

(B) NONE.

(C) DEGRADATION OF CAPABILITIES TO PERFORM MISSION OBJECTIVES REQUIRING PSA TOOLS.

(D) SUBSEQUENT TO FAILURE OF PAYLOAD BAY DOOR LATCHES, THE FAILURE OF PSA DOOR COULD POSSIBLY RESULT IN LOSS OF CREW OR VEHICLE DUE TO INACCESSIBILITY OF PAYLOAD BAY DOOR CLOSURE TOOLS.

DISPOSITION & RATIONALE:
(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN
THE PSA DOOR ASSEMBLY IS A TWO COMPONENT DOOR CONSISTING OF A SLIDING SECTION AND A FLIPPER OR HINGED SECTION MADE OF 2024-T851 ALUMINUM. THE SLIDING DOOR IS A SANDWICHED STRUCTURE CONSISTING OF A MACHINED BASEPLATE AND BONDED SKIN. THE SLIDING DOOR IS SUPPORTED BY FOUR TEFLON ROLLERS ATTACHED TO EACH SIDE OF THE DOOR AND ENCOMPASSED IN SIDE RAILS/TRACK

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WITH A MINIMUM ROLLER/TRACK CLEARANCE OF 0.030 INCH PER SIDE. THE SLIDING DOOR HANDLE IS RETAINED CLEAR OF THE PAYLOAD ENVELOPE IN THE CLOSED POSITION BY TWO SPRING LOADED BALL DETENTS. THE DOOR HANDLE DETENT BALL SPRING LOAD IS DESIGNED TO BE OVERRIDDEN BY A MAXIMUM FORCE OF 15 LBS TO RAISE THE DOOR HANDLE FROM CLOSED TO OPEN POSITION. THE SLIDING DOOR LATCHING/UNLATCHING MECHANISM IS A CAM (BELLCRANK)/ROD OPERATED SPRING PAWL AND CAM LATCH. THE BELLCRANK IS MADE OF A-286 CRES WITH AN A-286 CRES BUSHING/PIVOT HELD IN PLACE BY A CRES SCREW. THE PAWL IS MADE OF 0.375 INCH DIAMETER A-286 CRES ROD. THE HOUSING IS 2024-T851 ALUMINUM WITH HOLE DIAMETER OF 0.380 INCH. DESIGN TEMPERATURE EXTREMES OF -200 DEG F TO +200 DEG F ARE UTILIZED IN DETERMINING CLEARANCES BETWEEN THE HOUSING, LATCHING MECHANISM AND LATCH PAWL. A DOOR HANDLE MOVEMENT (SLIDING) OF 0.50 INCH (DESIGN FORCE OF 24 LBS) DRIVES THE BELL CRANK AND LINKAGE, RETRACTING THE DOOR LATCHING PAWL FROM THE FWD AND AFT DOOR RAIL CAM LATCHES. IN THE EVENT A DOOR HANDLE JAMS, THE DOOR LATCH MECHANISM CAN BE OVERRIDDEN BY A FORCE OF 50 LBS APPLIED TO THE HANDLE IN THE NORMAL DOOR ACTUATING POSITION. IN THE EVENT THE BELLCRANK OR LINKAGE SEIZES OR JAMS IN THE CLOSED POSITION, THE PAWL LATCH MECHANISM CANNOT BE OVERRIDDEN. THE BELLCRANK/LINKAGE MECHANISM CAN BE EXPOSED BY REMOVING THE COVER PLATE AND MANUALLY RELEASING THE LATCH.

THE FLIPPER DOOR IS A SOLID ALUMINUM DOOR ATTACHED TO THE OUTBOARD PSA STRUCTURE WITH A PIANO HINGE. THE FLIPPER DOOR IS LOCATED BENEATH THE SLIDING DOOR AND CANNOT BE OPENED PRIOR TO THE COMPLETE OPENING OF THE SLIDING DOOR. THE FLIPPER DOOR IS PIVOTED ON THE PIANO HINGE AND MAINTAINED IN THE OPENED POSITION BY A SPRING LOADED BALL LOCK SYSTEM. THE BALL LOCK SYSTEM IS LOCATED ON THE AFT OUTBOARD SIDE OF THE BOX STRUCTURE AND IS ACTUATED IN THE FINAL 15 DEG OF DOOR OPENING.

(B) TEST

QUALIFICATION: THERMAL ANALYSIS WAS PERFORMED FOR A TEMPERATURE RANGE OF -200 DEG F TO +200 DEG F IN LIEU OF A THERMAL VACUUM TEST. RESULTS OF THE THERMAL ANALYSIS INDICATE A MAXIMUM 9 DEG F TEMPERATURE DELTA BETWEEN THE INSIDE AND OUTSIDE SURFACES OF THE SLIDING (SANDWICHED) DOOR. A 175 DEG F TEMPERATURE DELTA CAN EXIST BETWEEN THE DOORS AND THE PSA RAILS/STRUCTURE. UNDER WORST CASE THERMAL CONDITION THERE IS A MINIMUM CLEARANCE OF .005 INCHES BETWEEN THE ROLLERS AND TRACK. ANALYSIS OF LOADS INCLUDED TRANSIENT LIFT OFF LOADS PER CR 02-340428-0018 (TRANSIENT VIBRATION, ACOUSTIC VIBRATION, AND STEADY STATE ACCELERATION).

GROUND TURNAROUND: OPERATION OF THE PSA DOORS IS VERIFIED BY CHECKOUT AFTER PSA INSTALLATION PER TECH ORDER. CHECKOUT INCLUDES VERIFYING THE FORCES REQUIRED TO OPEN AND CLOSE THE SLIDING DOOR WITH THE HANDLE IN THE CLOSED AND THE OPEN POSITION.

(C) INSPECTION

RECEIVING INSPECTION

RECEIVING INSPECTION VERIFIES MATERIAL AND PROCESS CERTIFICATIONS.

CONTAMINATION CONTROL

CONTAMINATION AND CORROSION PROTECTION REQUIREMENTS ARE VERIFIED BY INSPECTION.

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ASSEMBLY/INSTALLATION

DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION. ALL PIECE PARTS ASSEMBLED PER TOP ASSEMBLY DRAWING ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

SKIN BONDING OF THE SLIDING DOOR PER MA0106-324, INCLUDING COUPON PULL TESTING TO VERIFY THE BOND, IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE TESTING

PENETRANT INSPECTION IS VERIFIED.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

TESTING

INSPECTION VERIFIES THAT THE DOOR LATCH MECHANISM WILL OPERATE FREELY.

(D) FAILURE HISTORY

NO FAILURE HISTORY.

(E) OPERATIONAL USE

OPERATIONAL EFFECT OF FAILURE

THIS FAILURE WOULD RESULT IN LOSS OF ACCESS TO STOWED TOOLS AND EQUIPMENT. POSSIBLE EXTENSION OF EXTRAVEHICULAR ACTIVITY (EVA) TIME TO PERFORM ASSIGNED TASK. IN WORST CASE, CREWMAN WOULD NOT HAVE ACCESS TO PAYLOAD BAY (PLB) DOOR LATCH TOOLS REQUIRED FOR A CONTINGENCY EVA.

CREW ACTION

THE EVA CREWMAN WOULD OPEN THE OPPOSITE SIDE OF THE PROVISION STOWAGE ASSEMBLY TO OBTAIN ANY TOOLS THAT MIGHT AID THEM IN OPENING A JAMMED DOOR. USING TOOLS FROM THE OPPOSITE SIDE PSA, OR FROM THE IN-FLIGHT MAINTENANCE TOOL (IFM) LOCKER, ACCESS CAN BE AFFORDED TO THE LATCHING MECHANISM AND RELEASE OF THE PAWL SECURING THE DOOR CAN BE ACCOMPLISHED. AN EFFORT COULD BE MADE TO OVERRIDE THE RESTRICTION BY SUPPLYING A SUFFICIENT FORCE ON THE HANDLE TO SLIDE OPEN THE DOOR. IN WORST CASE, THE EVA CREWMAN COULD USE IFM TOOLS TO ACCOMPLISH THEIR EVA TASKS, REQUIRING AN ADDITIONAL AIRLOCK REPRESS/DEPRESS CYCLE.

CREW TRAINING

STANDARD CREW TRAINING INCLUDES USE OF THE TOOLS REQUIRED FOR THIS CREW ACTION.

MISSION CONSTRAINTS

NONE IDENTIFIED.

INFLIGHT CHECKOUT

THE EVA CREWMAN WILL INSPECT THE PSA DOOR AT THE TIME OF ITS USE. THIS WILL MINIMIZE THE EFFECT OF FAILURES THAT COULD HAPPEN LATER IN THE EVA.