

CRITICAL ITEMS LIST

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SUBSYSTEM TOOL BOX
EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: TBA-3
NAME / QUANTITY: BOX DOOR (2)
DRAWING REFERENCE: 10181-30201-1(LT)20202-21(RT)

PROJECT: HST
LRU NAME / QUANTITY: BOX DOOR (2)
LRU PART NUMBER: 10181-30201-01(LT)20202-21(RT)

FAILURE MODE NUMBER HST-TBA-2-1	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE				
FUNCTION The tool box RT/LT doors enclose the box, contain all equipment within the box as well as serve as a storage location for some tools.		END ITEM Cannot close or remove door from the tool box if the door positioning system is jammed.	DESIGN I. Design Feature to Minimize the Chance of the Failure Mode A. <u>Design</u> All tool box components were designed to a structural safety factor of 2.0. B. <u>Tolerances</u> Sufficient tolerances will be used in the door positioning system and door hinge design to prevent jamming by expansion and contraction of material due to temperature extremes or on-orbit use. C. <u>Materials - Major Components</u> 1. Door Positioning System: Bar - 15-5PH H1050, Plunger - CRES 304 Cond A 2. Door Hinges: 15-5 PH 1025, AL Bronze 650 II. Testing and Analysis A. <u>Acceptance Testing</u> 1. PDA A full pre delivery acceptance (PDA) test will be performed on the tool box assembly before it is delivered to JSC for the beginning of the certification process. The PDA will verify that the door positioning system and hinges are operating correctly and that the assembly is clean. 2. Vibration The flight tool box will be exposed to acceptance vibration loads while it is in flight configuration. The test will verify that the door positioning system or hinge assembly will withstand the vibration loads.				
FAILURE MODE AND CAUSE MODE Door(s) stuck in the deployed position.							
CAUSE(S) 1.) Door positioning system is jammed due to: a.) Piece part failure b.) Contamination 2.) Galling in the door hinges.							
REDUNDANCY SCREENS A - Pass B - N/A C - Pass	REMAINING PARTS 1.) Remove doors by removing the conf. 7/16 in. hex head bolts from the door hinges and from the check bar attachment location to the doors.	MISSION Mission objectives are complete.					
RECOMMENDATION SCREENS A - Pass B - N/A C - Pass							
REMARKS None							
MISSION PHASE		CREW / VEHICLE Possible damage to the orbiter if door and/or box contents become loose in the payload bay.					
CORRECTIVE ACTION TIMES		INTERFACE None					
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">TIME TO EFFECT</th> <th style="width: 50%;">TIME TO CORRECT</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Hours</td> <td style="text-align: center;">Minutes</td> </tr> </tbody> </table>		TIME TO EFFECT	TIME TO CORRECT	Hours	Minutes		
TIME TO EFFECT	TIME TO CORRECT						
Hours	Minutes						
EVA							

PREPARED BY: J. F. PARK

REVISION: BASIC

SUPERSEDING DATE: NONE

DATE: 2003

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CRITICAL ITEMS LIST

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SUBSYSTEM TOOL BOX
EFFECTIVITY ALL ORBITERS

REFERENCE DENOMATOR: TBA-2
NAME / QUANTITY: BOX DOOR (2)
DRAWING REFERENCE: 10401-20001 (LT)20001 (RT)

PROJECT: HBT
L/RU NAME / QUANTITY: BOX DOOR (2)
L/RU PART NUMBER: 10401-20001-01 (LT)20001-01 (RT)

FAILURE MODE NUMBER HST-TBA-2-1	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE																										
FUNCTION The tool box RTLT doors enclose the box, contain all equipment within the box as well as serve as a stowage location for some tools.		END ITEM Cannot close or remove door from the tool box if the door positioning system is jammed. MISSION Mission objectives are complete. ORBITER / VEHICLE Possible damage to the orbiter if door and/or box contents become loose in the payload bay. INTERFACE None.	DESIGN A. <u>Acceptance Testing (continued)</u> The following vibration levels are per SMD memo ES42-92-134: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>Frequency (Hz)</th> <th>Slope (dB/oct)</th> <th>Constant Level (g²/Hz)</th> <th>Overall Gms</th> </tr> </thead> <tbody> <tr> <td>20-80</td> <td>+3.0</td> <td rowspan="2">.04</td> <td rowspan="2">8.1</td> </tr> <tr> <td>80-350</td> <td>-3.0</td> </tr> <tr> <td>350-2000</td> <td>-3.0</td> <td rowspan="3">.08</td> <td rowspan="3">7.7</td> </tr> <tr> <td>20-45</td> <td>+10.0</td> </tr> <tr> <td>45-800</td> <td>-6.0</td> </tr> <tr> <td>800-2000</td> <td>-6.0</td> <td rowspan="3">.05</td> <td rowspan="3">7.0</td> </tr> <tr> <td>20-70</td> <td>+4.0</td> </tr> <tr> <td>70-800</td> <td>-6.0</td> </tr> </tbody> </table> B. <u>Certification Testing</u> 1. <u>Thermal Vacuum</u> The Tool Box will be exposed to the following thermal vacuum environment. Push button activation, door operation, and contingency bolts operation will be a part of the test plan. a. <u>Temperature</u> - Cold Side Only (amb. to -90°F) b. <u>Pressure</u> - ATM to 1x10 ⁻⁵ torr	Frequency (Hz)	Slope (dB/oct)	Constant Level (g ² /Hz)	Overall Gms	20-80	+3.0	.04	8.1	80-350	-3.0	350-2000	-3.0	.08	7.7	20-45	+10.0	45-800	-6.0	800-2000	-6.0	.05	7.0	20-70	+4.0	70-800	-6.0
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EVA	Hours	Minutes																											

PREPARED BY: J.P. PARR

REVISION: 0430C

SUPERSEDING DATE: NONE

DATE: 11/20/92

CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: TBA-2
 NAME / QUANTITY: BOX DOOR (2)
 DRAWING REFERENCE: 10181-28021-01(LTy2822-01)(RT)

PROJECT: HWT
 LRU NAME / QUANTITY: BOX DOOR (2)
 LRU PART NUMBER: 10181-28021-01(LTy2822-01)(RT)

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 SUBSYSTEM: TOOL BOX
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-TBA-2-1	CRITICALITY IR/2	FAILURE EFFECT	RETENTION RATIONALE								
FUNCTION The tool box RT/LT doors enclose the box, contain all equipment within the box as well as serve as a storage location for some tools.		END ITEM Cannot close or remove door from the tool box if the door positioning system is jammed.	DESIGN B. <u>Certification Testing (continued)</u> 2. <u>Functionals</u> The tool box components like the door positioning system will be functionally operated prior to and immediately after all certification test to verify that the test environment does not degrade the hardware performance. C. <u>Certification Analysis</u> The door positioning system and hinges will be analyzed to the following induced environments to verify that the assembly can withstand the environment levels: 1. <u>Requirements</u> Source a. <u>Shock</u> - Functional NSTS-07700 VOL. XIV b. <u>Vibration (FL Levels)</u> - Acoustics NSTS-07700 VOL. XIV - Modal JSC-14046 c. <u>Structures</u> - Ul. (fs = 2.0) NSTS-07700 VOL. XIV - Fracture NSTS-07700 VOL. XIV d. <u>Acceleration</u> - Flight MF0004-014D - Crash MIL-STD-810, Method 516, Procedure I e. <u>Temperature</u> - Hot (+250°F) HST S/AD (10181-10081A)								
FAILURE MODE AND CAUSE MODE Door(s) stuck in the deployed position.											
CAUSE(S) 1.) Door positioning system is jammed due to: a.) Piece part failure b.) Contamination 2.) Galling in the door hinges.											
REIMPACT SCREENS A - Pass B - N/A C - Pass	REMAINING PATHS 1.) Remove doors by removing the conf. 7/16 in. hex head bolts from the door hinges and from the check bar attachment location to the doors.	MISSION Mission objectives are complete.									
		CREW / VEHICLE Possible damage to the orbiter if door and/or box contents become loose in the payload bay.									
		INTERFACE None.									
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EVA	Hours	Minutes									

PREPARED BY: J. F. PARK

REVISION: BASIC

SUPERSEDING DATE: NONE

DATE: 88/03

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CRITICAL ITEMS LIST

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SUBSYSTEM: TOOL BOX
EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: TBA-2
NAME / QUANTITY: BOX DOOR (2)
DRAWING REFERENCE: 10161-30001(L)/20002(RT)

PROJECT: HST
LRU NAME / QUANTITY: BOX DOOR (2)
LRU PART NUMBER: 10161-30001-01(L)/20002-01(RT)

FAILURE MODE NUMBER HST-TBA-2-1	CRITICALITY 1FV2	FAILURE EFFECT	RETENTION RATIONALE
FUNCTION The tool box RTA T doors enclose the box, contain all equipment within the box as well as serve as a storage location for some tools.		END ITEM Cannot close or remove door from the tool box if the door positioning system is jammed	DESIGN III. Inspection A. Manufacturing 1. The door positioning system and door hinge components will be inspected prior to build-up for conformance to their applicable drawings. 2. All fracture critical piece parts will be inspected as described on their applicable drawings. D. Assembly 1. Exterior assemblies will be cleaned and inspected to the levels described in section 3.53.5 of the HST S/D (10161-30001A). Once cleaned, the tool box will be completely bagged to prevent any contamination from entering the door positioning system or the door hinges. C. Testing 1. The assembly will be fully inspected and functionally operated during PDAs and PIAs. 2. The hardware will be fully inspected for any signs of galling as a part of the pre/post functional tests performed prior to and immediately after all major certification and acceptance testing
FAILURE MODE AND CAUSE MODE Door(s) stuck in the deployed position.		MISSION Mission objectives are complete.	
CAUSE(S) 1.) Door positioning system is jammed due to: a.) Piece part failure b.) Contamination 2.) Galling in the door hinges.		CREW / VEHICLE Possible damage to the orbiter if door and/or box contents become loose in the payload bay.	
REDUNDANCY SCREENS A - Pass B - N/A C - Pass	REMAINING PATHS 1.) Remove doors by removing the cord. 7/16 in. hex head bolts from the door hinges and from the check bar attachment location to the doors.	INTERFACE None.	
MISSION PHASE	CORRECTIVE ACTION TIMES		
	TIME TO EFFECT	TIME TO CORRECT	
EVA	Hours	Minutes	

PREPARED BY: J.F.PARK

REVISION: BASIC

SUPERSEDED DATE: NONE

DATE: 12/2/98

CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: TBA-2
 NAME (QUANTITY): BOX DOOR (2)
 DRAWING REFERENCE: 10181-20201-2(LT)/20202-01(RT)

PROJECT: 1051
 LRU NAME / QUANTITY: BOX DOOR (2)
 LRU PART NUMBER: 10181-20201-2(LT)/20202-01(RT)

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 SUBSYSTEM: TOOL BOX
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-TBA-2-1	CRITICALITY 1F/2	FAILURE EFFECT	RETENTION RATIONALE			
FUNCTION The tool box RTAT doors enclose the box, contain all equipment within the box as well as serve as a storage location for some tools.		END ITEM Cannot close or remove door from the tool box if the door positioning system is jammed. MISSION Mission objectives are complete. CREW / VEHICLE Possible damage to the orbiter if door and/or box contents become loose in the payload bay. INTERFACE None.	DESIGN IV. Failure History A. There have been no failures associated with the door positioning system or the door hinges. V. Operations A. <u>Effects of Failure</u> Cannot close the door if the door positioning system is jammed. B. <u>Crew Actions</u> To activate the redundant path, the EVA crew will attach the EVA power tool or wrench to disengage the 7/16" hex-head bolts at the door hinges and the check bar attachment location. C. <u>Training</u> As part of the certification testing, crews will activate the redundant systems during the thermal vacuum tests. Additional training will occur in the WETF. D. <u>Mission Constraints</u> All contents in the box will have to be removed prior to landing in addition to the process listed in the crew actions section. E. <u>Initial Check-Outs</u> None.			
FAILURE MODE AND CAUSE MODE Door(s) stuck in the deployed position. CAUSE(S) 1.) Door positioning system is jammed due to: a.) Piece part failure b.) Contamination 2.) Galling in the door hinges.						
REDUNDANCY SCREENS A - Pass B - N/A C - Pass	REMAINING PATHS 1.) Remove doors by removing the conf. 7/16 in. hex head bolts from the door hinges and from the check bar attachment location to the doors.					
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TIME TO EFFECT	TIME TO CORRECT					
Hours	Minutes					

PREPARED BY: J. F. PARK

REVISION: 0406

SUPERSEDING DATE: NONE

DATE: 11/20/99

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