

## CRITICAL ITEMS LIST

REFERENCE DENOMINATOR: TBA-2  
 NAME / QUANTITY: BOX DOOR (1)  
 DRAWING REFERENCE: 10101-30001-01(LT/20202-01)RT

PROJECT: HBT  
 LRU NAME / QUANTITY: BOX DOOR (2)  
 LRU PART NUMBER: 10101-30001-01(LT/20202-01)RT

PAGE 1 OF 6  
 SUBSYSTEM: TOOL BOX  
 EFFECTIVITY: ALL DRAWINGS

FAILURE MODE NUMBER HST-TBA-2-2	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE
<b>FUNCTION</b> The tool box RT/LT doors enclose the box, contain all equipment within the box as well as serve as a stowage location for some tools.		<b>END ITEM</b> Cannot secure the box door(s) for re-entry.	<b>DESIGN</b> I. Design Features to Minimize the Chance of the Failure Mode  A. Design All tool box components were designed to a structural safety factor of 2.0.  B. Tolerances Sufficient tolerances will be used in the latch assembly design to prevent jamming by expansion and contraction of material due to temperature extremes.  C. Materials - Major Components  1. Space Pin: Avitank P/N 56790  2. Door Latch: 6061-T6511, 7075-T7351, CRES 15-5 PH 1050  II. Testing and Analysis  A. Acceptance Testing  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 pin and latches 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 pin and latch will withstand the vibration loads.
<b>FAILURE MODE AND CAUSE MODE</b> Cannot secure door(s) for re-entry.  <b>CAUSE(S)</b>  1.) Door latches will not operate. 2.) Cannot install or lock pin pins. 3.) Door strike is missing (Assumption: situation existed where the EVA crew had to remove the non-captured type bolts from one of the strikes and lost one of the bolts).			
<b>REUNDACY SCREENS</b> A - Pass B - N/A C - Pass	<b>REPAIRING PATHS</b> 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.	<b>MISSION</b> Mission objectives are complete.	
<b>MISSION PHASE</b>		<b>CREW / VEHICLE</b> Possible damage to the orbiter if the door(s) become loose in the payload bay during re-entry.	
<b>CORRECTIVE ACTION TIMES</b>		<b>INTERFACE</b> None.	
		Time to inspect	Time to correct
<b>EVA</b>		Hours	Minutes

PREPARED BY: J. F. PARK

REVISION: 04/00

SUPERSEDING DATE: NONE

DATE: 2/98

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## CRITICAL ITEMS LIST

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 SUBSYSTEM TOOL BOX  
 EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: TBA-1  
 NAME / QUANTITY: BOX DOOR (2)  
 DRAWING REFERENCE: 18101-00201(LT/20202(RT))

PROJECT: HST  
 LRU NAME / QUANTITY: BOX DOOR (2)  
 LRU PART NUMBER: 18101-00201-01(LT/20202-01(RT))

FAILURE MODE NUMBER HST-TBA-2-2	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE																							
<b>FUNCTION</b>  The tool box RTLT doors enclose the box, contain all equipment within the box as well as serve as a storage location for some tools.		<b>END ITEM</b> Cannot secure the box door(s) for reentry.  <b>MISSION</b> Mission objectives are complete.  <b>CREW / VEHICLE</b> Possible damage to the orbiter if the door (s) become loose in the payload bay during reentry.  <b>INTERFACE</b> None	<b>DESIGN</b> A. <u>Acceptance Testing (continued)</u>  The following vibration levels are per SMD memo ES-42-82-134:  <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th>Frequency (Hz)</th> <th>Slope (dB/oct.)</th> <th>Constant Level G<sup>2</sup>/Hz</th> <th>Overall G rms</th> </tr> </thead> <tbody> <tr> <td>20-80</td> <td>+3.0</td> <td rowspan="3" style="text-align: center;">.04</td> <td rowspan="3" style="text-align: center;">8.1</td> </tr> <tr> <td>80-350</td> <td rowspan="2" style="text-align: center;">-3.0</td> </tr> <tr> <td>350-2000</td> </tr> <tr> <td>20-45</td> <td>+10.0</td> <td rowspan="2" style="text-align: center;">.06</td> <td rowspan="2" style="text-align: center;">7.7</td> </tr> <tr> <td>45-600</td> <td rowspan="2" style="text-align: center;">-6.0</td> </tr> <tr> <td>600-2000</td> <td rowspan="3" style="text-align: center;">-6.0</td> <td rowspan="3" style="text-align: center;">.05</td> <td rowspan="3" style="text-align: center;">7.0</td> </tr> <tr> <td>20-70</td> </tr> <tr> <td>70-600</td> </tr> </tbody> </table> 3. <u>Pip Pin Program</u>  All Pip Pins used in the HST hardware will be exposed to a separate dedicated acceptance test program to assure the project that the pip pins are at acceptable conditions which will help prevent a failure on-orbit. Space pins do not require any cleaning procedures.  a. <u>Thermal</u> An ambient pressure cold cycle temperature test will be performed to verify that the actuation of the pip pin is possible at the missions cold temperature.  b. <u>Vibration</u> All pip pins will be vibration tested to standard acceptance level vibration loads to screen for any workmanship defects.	Frequency (Hz)	Slope (dB/oct.)	Constant Level G <sup>2</sup> /Hz	Overall G rms	20-80	+3.0	.04	8.1	80-350	-3.0	350-2000	20-45	+10.0	.06	7.7	45-600	-6.0	600-2000	-6.0	.05	7.0	20-70	70-600
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<b>FAILURE MODE AND CAUSE MODE</b>  Cannot secure doors for reentry.  <b>CAUSE(S)</b>  1.) Door latches will not operate. 2.) Cannot install or lock pip pins. 3.) Door strike is missing (Assumption: situation existed where the EVA crew had to remove the non-captured type bolts from one of the strikes and lost one of the bolts).																										
<b>REDUNDANCY SCREENS</b>  A - Pass B - N/A C - Pass	<b>REMAINING PATHS</b>  1.) Remove doors by removing the cont. 7/16 in. hex head bolts from the door hinges and from the check bar attachment location to the doors.																									
<b>MISSION PHASE</b>  EVA		<b>CORRECTIVE ACTION TIMES</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">CORRECTIVE ACTION TIMES</th> </tr> <tr> <th>TIME TO EFFECT</th> <th>TIME TO CORRECT</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1 hour</td> <td style="text-align: center;">Minutes</td> </tr> </tbody> </table>		CORRECTIVE ACTION TIMES		TIME TO EFFECT	TIME TO CORRECT	1 hour	Minutes																	
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PREPARED BY: J. F. PARR

REVISION: 0000

SUPERSEDING DATE: NONE

DATE: 05/83

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## CRITICAL ITEMS LIST

PAGE 3 OF 4  
SUBSYSTEM: TOOL BOX  
EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: TBA-2  
NAME / QUANTITY: BOX DOOR (3)  
DRAWING REFERENCE: 98194-20001(LT)/20002(RT)

PROJECT: HST  
LRU NAME / QUANTITY: BOX DOOR (3)  
LRU PART NUMBER: 18481-20001-01(LT)/20002-01(RT)

FAILURE MODE NUMBER HST-TBA-2-2	CRITICALITY 1F/2	FAILURE EFFECT	RETENTION RATIONALE
<b>FUNCTION</b> The tool box RT/LT doors enclose the box, contain all equipment within the box as well as serve as a stowage location for some tools.		<b>END ITEM</b> Cannot secure the box door(s) for reentry.  <b>MISSION</b> Mission objectives are complete.  <b>CREW / VEHICLE</b> Possible damage to the orbiter if the door (s) become loose in the payload bay during reentry.  <b>INTERFACE</b> None	<b>REGION</b>  A. <u>Acceptance Testing (continued)</u>  3. Pip Pin Program (continued)  c. <u>Functional</u> All pip pins will be functionally operated and operator loads recorded prior to and immediately after all acceptance level testing to determine if there has been any adverse effects due to the test environment.  B. <u>Certification Testing</u>  1. Thermal Vacuum  The Tool Box will be exposed to the following thermal vacuum environment. Pip pin and latch actuation, and contingency bolt release 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 <sup>-5</sup> Torr  2. <u>Functionals</u>  The tool box components like the pip pins and door latches will be functionally operated prior to and immediately after all certification test to verify that the test environment does not degrade the hardware performance.
<b>FAILURE MODE AND CAUSE MODE</b>  Cannot secure doors for reentry.  <b>CAUSE(S)</b>  1.) Door latches will not operate. 2.) Cannot install or lock pip pins. 3.) Door strike is missing (Assumption: situation existed where the EVA crew failed to remove the row-captured type bolts from one of the strikes and lost one of the bolts).			
<b>REDUNDANCY SCHEMES</b>  A - Pass B - N/A C - Pass	<b>REPAIRING PARTS</b>  1.) Remove doors by removing the conl. 7/16 in. hex head bolts from the door hinges and from the check bar attachment location to the doors.		
<b>MISSION PHASE</b>		<b>CORRECTIVE ACTION TIMES</b>	
		TIME TO EFFECT	TIME TO CORRECT
EVA		Hours	Minutes

PREPARED BY: J. F. PARK

REVISION: BA10C

SUPERSEDING DATE: NONE

DATE: 10/93

## CRITICAL ITEMS LIST

PAGE 4 OF 8  
SUBSYSTEM: TOOL BOX  
EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: TBA-2  
NAME / QUANTITY: BOX DOOR (2)  
DRAWING REFERENCE: 10181-20011(L)/20003(UT)

PROJECT: HBT  
LRI NAME / QUANTITY: BOX DOOR (2)  
LRI PART NUMBER: 10181-20011-01(L)/20003-01(UT)

FAILURE MODE NUMBER HST-TBA-2-2	CRITICALITY 1FV2	FAILURE EFFECT	RETENTION RATIONALE
<b>FUNCTION</b> 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.		<b>END ITEM</b> Cannot secure the box door(s) for reentry.	<b>DESIGN</b>  C. <u>Qualification Analysis</u> The latch assembly will be analyzed to the following induced environments to verify that the assembly can withstand the environment levels:  1. Requirements Source  a. <u>Shock</u> - Functional NSTS-07700 VOL. XIV  b. <u>Vibration (R.L. Levels)</u> - Acoustics NSTS-07700 VOL. XIV - Modal JSC-14048  c. <u>Structures</u> - UB (fs = 2 D) NSTS-07700 VOL. XIV - Fracture NSTS-07700 VOL. XIV  d. <u>Acceleration</u> - Flight MF0004-014D - Crash MIL-S10-810, Method 518, Procedure 1  e. <u>Temperature</u> - Hot (+250°F) HST S/AD (10181-10081A)
<b>FAILURE MODE AND CAUSE MODE</b>  Cannot secure doors for reentry.  <b>CAUSE(S)</b>  1.) Door latches will not operate. 2.) Cannot install or lock pin pins. 3.) Door strike is missing (Assumption: situation existed where the EVA crew had to remove the non-captured type bolts from one of the strikes and lost one of the bolts).		<b>MISSION</b> Mission objectives are complete.	
<b>REDUNDANCY SCREENS</b> A - Pass B - N/A C - Pass		<b>REPAIRING PATHS</b> 1.) Remove doors by removing the cont. 7/16 in. hex head bolts from the door hinges and from the check bar attachment location to the doors.	
<b>MISSION PHASE</b>		<b>CORRECTIVE ACTION TIMES</b> TIME TO EFFECT      TIME TO CORRECT	
<b>EVA</b>		Hours      Minutes	
		<b>CREW / VEHICLE</b> Possible damage to the orbiter if the door (s) become loose in the payload bay during reentry.	
		<b>INTERFACE</b> None	

PREPARED BY: J.F. PARK

REVISION: 0A0C

SUPERSEDING DATE: NONE

DATE: 01/93

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## CRITICAL ITEMS LIST

PAGE 6 OF 6  
SUBSYSTEM: TOOL BOX  
EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: TBA-2  
NAME / QUANTITY: BOX DOOR (2)  
DRAWING REFERENCE: 10101-20201(LT)/20202(RT)

PROJECT: HST  
LRI NAME / QUANTITY: BOX DOOR (2)  
LRI PART NUMBER: 10101-20201 OR LT/20202 OR (RT)

FAILURE MODE NUMBER HST-TBA-2-2	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE		
<b>FUNCTION</b> The tool box RT/LT doors enclose the box, contain all equipment within the box as well as serve as a stowage location for some tools.		<b>END ITEM</b> Cannot secure the box door(s) for reentry.  <b>MISSION</b> Mission objectives are complete.  <b>CREW / VEHICLE</b> Possible damage to the orbiter if the door (s) become loose in the payload bay during reentry.	<b>DESIGN</b>  NI. Inspection  A. Manufacturing  1. The latch assembly and strike assembly 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.  3. The pip pin will be inspected upon delivery.  D. Assembly  1. Exterior assemblies will be cleaned and inspected to the levels described in section 3.53.5 of the HST S/AD (10101-10081A). Once cleaned, the tool box will be completely bagged to prevent any contamination from entering the latch assembly.  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 prepost functional tests performed prior to and immediately after all major certification and acceptance testing.		
<b>FAILURE MODE AND CAUSE MODE</b>  Cannot secure doors for reentry.  <b>CAUSE(S)</b>  1.) Door latches will not operate. 2.) Cannot install or lock pip pins. 3.) Door strike is missing (Assumption: situation existed where the EVA crew had to remove the non-captured type bolts from one of the strikes and lost one of the bolts).					
<b>REUNDANCY DECREASES</b>  A - Pass B - N/A C - Pass	<b>REMAINING PARTS</b>  1.) Remove doors by removing the cent. 7/16 in. hex head bolts from the door hinges and from the check bar attachment location to the doors.				
<b>MISSION PHASE</b>  EVA	<b>CORRECTIVE ACTION TIMES</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">TIME TO EFFECT</th> <th style="width: 50%;">TIME TO CORRECT</th> </tr> <tr> <td style="text-align: center;">Hours</td> <td style="text-align: center;">Minutes</td> </tr> </table>			TIME TO EFFECT	TIME TO CORRECT
TIME TO EFFECT	TIME TO CORRECT				
Hours	Minutes				
		<b>INTERFACE</b> None			

PREPARED BY: J. F. PARK

REVISION: BASIC

SUPERSEDED DATE: NONE

DATE: 02/2/92

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## CRITICAL ITEMS LIST

PAGE 6 OF 8  
 SUBSYSTEM: TOOL BOX  
 EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: TBA-2  
 NAME / QUANTITY: BOX DOOR (3)  
 DRAWING REFERENCE: 1918-30201(LT/2002(W))

PROJECT: HST  
 LRU NAME / QUANTITY: BOX DOOR (3)  
 LRU PART NUMBER: 1918-30201-01(LT/2002-01(R))

FAILURE MODE NUMBER HST-TBA-2-2	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE		
<b>FUNCTION</b> 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.		<b>END ITEM</b> Cannot secure the box door(s) for reentry.  <b>MISSION</b> Mission objectives are complete.  <b>CREW / VEHICLE</b> Possible damage to the orbiter if the door (s) become loose in the payload bay during reentry.  <b>MISPLACED</b> None	<b>DESIGN</b>  IV. Failure History  A. There have been no failures associated with the latch assembly.  V. Operations  A. <u>Effects of Failure</u> Cannot secure the door(s) for reentry.  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 bolt at the door hinges and the check bar attachment location.  C. <u>Training</u> As part of the certification testing, crews will evaluate the redundant systems during the thermal vacuum tests. Additional training will occur in the WETF. The crew will be trained to use a captured hex head socket when the door strike bolts are removed.  D. <u>Mission Constraints</u> All contents within the box will have to be removed once the doors are taken off.  E. <u>Initial Check-Out</u> None.		
<b>FAILURE MODE AND CAUSE</b>  <b>MODE</b>  Cannot secure doors for reentry.  <b>CAUSE(S)</b>  1.) Door latches will not operate. 2.) Cannot install or lock pin. 3.) Door strike is missing (Assumption: situation existed where the EVA crew had to remove the non-captured type bolts from one of the strikes and lost one of the bolts).					
<b>REDUNDANCY SCREENS</b>  A - Pass B - N/A C - Pass	<b>REMAINING PATHS</b>  1.) Remove doors by removing the conl. 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. P. PARK

REVISION: BANC

SUPERSEDING DATE: NONE

DATE: 3/93

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