

## CRITICAL ITEMS LIST

REFERENCE DESIGNATOR HET-17  
 NAME / QUANTITY Gimbal Assy./1  
 DRAWING REFERENCE MDC-2062

PROJECT HST  
 CRU NAME / QUANTITY Seed Flight Tether Assy. 1  
 CRU PART NUMBER W011-10064-02

PAGE 1 OF 5  
 SUBSYSTEM TOOLS  
 EFFECTIVITY ALLOWTEERS

U.S. Gov't

FAILURE MODE NUMBER HST-HET-17-2	CRITICALITY 1U/2	FAILURE EFFECT	RETENTION RATIONALE																		
<b>FUNCTION</b> Provides semi-flexible/semi-rigid tether for tethering and positioning the HST PFR during EVA translation		<b>CRU ITEM</b> SRT loses rigidity while in use. SRT and HST PFR become loose in PFL bay.	<p>I. Design Feature to Minimize the Chance of the Failure Mode</p> <p>A. Design All HST tool were designed to an ultimate structural safety factor of 1.4</p> <p>B. Tolerances Sufficient tolerances are used in the gimbal assy design to prevent loosening by expansion and contraction of material due to temperature extremes.</p> <p>C. Materials - Major Components</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1. Eye, Cable</td> <td style="width: 20%;">10159-20389-01</td> <td style="width: 30%;">GRES 15-5 PH H1050</td> </tr> <tr> <td>2. Pin, Coupling</td> <td>10159-20373-01</td> <td>Custom 455 H1000</td> </tr> <tr> <td>3. Cone, Wedge</td> <td>S024MD2441-02</td> <td>316 SS</td> </tr> <tr> <td>4. Swagless Terminal</td> <td>S024MD2441-01</td> <td>316 SS</td> </tr> <tr> <td>5. Shoulder Screw, Headless</td> <td>10159-20247-01</td> <td>GRES 15-5 PH H1050</td> </tr> <tr> <td>6. End Effector</td> <td>10159-20244-01</td> <td>GRES 15-5 PH H1050</td> </tr> </table> <p>M. Testing and Analysis</p> <p>A. Acceptance Testing</p> <p>I. PDA</p> <p>A full pre-delivery acceptance (PDA) test will be performed on the tools before they are delivered to JSC for the beginning of the certification process. The PDA will verify that the gimbal assy is operating correctly and that the assembly is clean.</p>	1. Eye, Cable	10159-20389-01	GRES 15-5 PH H1050	2. Pin, Coupling	10159-20373-01	Custom 455 H1000	3. Cone, Wedge	S024MD2441-02	316 SS	4. Swagless Terminal	S024MD2441-01	316 SS	5. Shoulder Screw, Headless	10159-20247-01	GRES 15-5 PH H1050	6. End Effector	10159-20244-01	GRES 15-5 PH H1050
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<b>FAILURE MODE AND CAUSE</b> <b>MODE</b> Gimbal assy. disassembles or comes loose from the load generating box.		<b>MISSION</b> None																			
<b>CAUSE(S)</b> 1) Coupling pin backs out releasing gimbal assy. 2) Screw retaining swagless terminal backs out 3) Adjusting nut releases PFR socket		<b>CREW / VEHICLE</b> Possible damage to orbiter and/or EMU.																			
<b>REMAINING SCREENS</b> A - Pass B - Pass C - Pass	<b>REMAINING PATHS</b> 1.) Gimbal tool shall retain the loose piece and act as the cord.	<b>INTERFACE</b> None																			
<b>MISSION PHASE</b>	<b>CORRECTIVE ACTION TIMES</b>																				
	TIME TO EFFECT	TIME TO CORRECT																			
EVA	Minutes	Seconds																			

PREPARED BY: J. F. PARK

REVISION: BASIC

SUPERSSEING DATE: NONE

DATE: 4/10/00

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## CRITICAL ITEMS LIST

REFERENCE DESIGNATOR HET-17  
 NAME / QUANTITY Gimbal Assy./1  
 DRAWING REFERENCE W158-20842

PROJECT HST  
 LRU NAME / QUANTITY Semi-Rigid Tether Assy./2  
 LRU PART NUMBER 18104-10054-02

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 SUBSYSTEM TDRS  
 EFFECTIVITY ALL ORBITERS

U.S. Gov't

FAILURE MODE NUMBER HST-HET-17-2	CRITICALITY 1R/2	FAILURE EFFECT	RETENTION RATIONALE				
<b>FUNCTION</b> Provides semi-flexible/semi-rigid tether for tethering and positioning the HST PFR during EVA translation		<b>END ITEM</b> SRT loses rigidity while in use SRT and HST PFR become loose in PL bay.  <b>MISSION</b> None  <b>CREW / VEHICLE</b> Possible damage to orbiter and/or EMU.  <b>INTERFACE</b> None	<b>B Certification Testing</b>  <b>I Thermal Vacuum</b>  The SRT will be exposed to the following thermal vacuum environment Gimbal Assy functioning will be a part of the test plan.  <b>a Temperature</b> - Cold Side Only (amb to -90°F)  <b>b Pressure</b> - ATM to 1x10 <sup>-5</sup> Torr  <b>c Interface</b>  - The flight SRT will be M-checked with a PFR				
<b>FAILURE MODE AND CAUSE</b> <b>MODE</b> Gimbal Assy. piece part disassembles or comes loose from the load generating box. <b>CAUSE(S)</b>  1.) Coupling pin backs out releasing gimbal Assy. 2.) Screw retaining swagless terminal backs out 3.) Adjusting nut releases PFR socket							
<b>REUNDANCY SCREENS</b> A - Pass B - Pass C - Pass	<b>REMAINING PATHS</b> 1.) Gimbal foot shall retain the loose pieces and act as the cord.						
<b>MISSION PHASE</b>	<b>CONNECTIVE 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>EVA</td> <td>Minutes</td> </tr> <tr> <td></td> <td>Seconds</td> </tr> </table>			TIME TO EFFECT	TIME TO CORRECT	EVA	Minutes
TIME TO EFFECT	TIME TO CORRECT						
EVA	Minutes						
	Seconds						

PREPARED BY J. F. PARK

REVISION BASIC

SUPERSEDING DATE: NONE

DATE 01/03

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U.S. Gov't

### CRITICAL ITEMS LIST

REFERENCE DESIGNATION: HET-17  
 NAME / QUANTITY: Gimbal Assy/1  
 DRAWING REFERENCE: 10659-28242

PROJECT: HST  
 LRU NAME / QUANTITY: Serv-Flight Tether Assy/1  
 LRU PART NUMBER: 10611-10084-03

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 SUBSYSTEM: TOOLS  
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-HET-17-2	CRITICALITY IR/2	FAILURE EFFECT	RETENTION RATIONALE
<b>FUNCTION</b> Provides semi-flexible/semi-rigid tether for tethering and positioning the HST PFR during EVA translation		<b>END ITEM</b> SRT loses rigidity while in use SRT and HST PFR become loose in P/L bay.	<b>B. Certification Testing (continued)</b> 2. Functionals The SRT 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> Gimbal Assy piece part disassembles or comes loose from the load generating box.			
<b>CAUSES:</b> 1) Coupling pin backs out releasing gimbal Assy. 2) Screw retaining swagless terminal backs out 3) Adjusting nut releases PFR socket		<b>MISSION</b> None	<b>C. Certification Analysis</b> The SRT will be analyzed to the following induced environments to verify that the assembly can withstand the environment levels
<b>REDDUNDANCY SCREENING</b> A - Pass B - Pass C - Pass			
<b>REMARKS</b> 1.) Gimbal tool shall retain the loose pieces and act as the cord.		<b>CREW / VEHICLE</b> Possible damage to orbiter and/or EMU.	1. Requirements Source a. <b>Shock</b> - Functional NSTS-07700 VOL. XIV b. <b>Vibration (FR Levels)</b> - Acoustics NSTS-07700 VOL. XIV c. <b>Structures</b> - UH (Is + 2 G) NSTS 07700 VOL. XIV - Fracture NSTS-07700 VOL. XIV d. <b>Acceleration</b> - Flight MF0004-014D - Crash MIL-STD-810, Meth 516, Proced 1 e. <b>Temperature</b> - Hot (+250°F) HST S/AD (10181-10081A) - Cold (-90°F) HST S/AD (10181-10081A)
<b>MISSION PHASE</b> EVA			
<b>CORRECTIVE ACTION TIMES</b> TIME TO EFFECT      TIME TO CORRECT		<b>INTERFACE</b> None	
Minutes                      Seconds			

PREPARED BY: A.F. PARK

REVISION: 04/80

SUPERSEDING DATE: NONE

DATE: 6/16/90

HST-HET - 9

## CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: HET-17  
 NAME / QUANTITY: Gimbal Assy/1  
 DRAWING REFERENCE: 1049-2841

PROJECT: HSI  
 ITEM NAME / QUANTITY: Semi-Rigid Inher Ass'y.2  
 LRU PART NUMBER: 10101-1105407

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 SUBSYSTEM: TOOLS  
 EFFECTIVITY: ALL ORBIT

FAILURE MODE NUMBER HST-HET-17-2	CRITICALITY IR/2	FAILURE EFFECT	RETENTION RATIONALE		
<b>FUNCTION</b> Provides semi flexible/semi-rigid tether for tethering and positioning the HSI PFR during EVA translation		<b>END ITEM</b> SRT loses rigidity while in use SRT and HSI PFR become loose in P/L bay  <b>MISSION</b> None  <b>CREW / VEHICLE</b> Possible damage to orbiter and/or EMU  <b>INTERFACE</b> None	<b>III. Inspection</b>  <b>A. Manufacturing</b> 1. The SRT 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.  <b>B. Assembly</b> 1. The SRT will be cleaned and inspected to the levels described in JSC 53221. Once cleaned, the tool will be bagged for shipment to the KSC to prevent any contamination from entering the tool.  <b>C. Testing</b> 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.		
<b>FAILURE MODE AND CAUSE MODE</b> Gimbal Assy. piece part disassembles or comes loose from the load generating box.  <b>CAUSE(S)</b> 1.) Coupling pin backs out releasing gimbal Assy. 2.) Screw retaining swagless terminal backs out 3.) Adjusting nut releases PFR socket					
<b>REUNDANCY SCREENS</b> A - Pass B - Pass C - Pass	<b>REMAINING PATHS</b> 1.) Gimbal boot shall retain the loose pieces and act as the cord.				
<b>MISSION PHASE</b> EVA	<b>CORRECTIVE ACTION TIMES</b> <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;">Minutes</td> <td style="text-align: center;">Seconds</td> </tr> </tbody> </table>			TIME TO EFFECT	TIME TO CORRECT
TIME TO EFFECT	TIME TO CORRECT				
Minutes	Seconds				

PREPARED BY J.F. PARK

REVISION 043C

SUPERSEDING DATE: NONE

DATE 02/93

HST-HET - 10

### CRITICAL ITEMS LIST

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 SUBSYSTEM TOOLS  
 EFFECTIVITY ALL ORDN

REFERENCE SIGNATURE HET-17  
 NAME / ORGANITY Gimbal Assy./1  
 DRAWING REFERENCE 10156-20042

PROJECT HST  
 IIR/NAME / ORGANITY Semi-Rigid Latch Assy./2  
 IIR/PART NUMBER 10151-18054-02

FAILURE MODE NUMBER HST-HET-17-2	CRITICALITY IR2	FAILURE EFFECT	RETENTION RATIONALE			
<b>FUNCTION</b> Provides semi-flexible/semi-rigid tether for latching and positioning the HST PFR during EVA translation		<b>END ITEM</b> SRT loses rigidity while in use SRT and HST PFR become loose in P/L bay.	IV. Failure History A. There have been no failures associated with the SRT V. Operations A. <u>Effects of Failure</u> Loss of SRT rigidity and piece part release of the SRT gimbal Assy. and HST PFR, possible damage to the orbiter. B. <u>Crew Actions</u> Crew will have to physically restrain the HST PFR and restore it in another manner C. <u>Training</u> None D. <u>Mission Constraints</u> Loss of one HST PFR, no constraint to the mission E. <u>In Flight Check-Outs</u> None			
<b>FAILURE MODE AND CAUSE</b> <b>MODE</b> Gimbal Assy. piece part disassembles or comes loose from the load generating box. <b>CAUSE(S)</b> 1.) Coupling pin backs out releasing gimbal Assy. 2.) Screw retaining swagless terminal backs out 3.) Adjusting nut releases PFR socket		<b>MISSION</b> None				
<b>REDUNDANCY SCREENS</b> A - Pass B - Pass C - Pass	<b>REPAIRING PATHS</b> 1.) Gimbal tool shall retain the loose pieces and act as the cord.	<b>CREW / VEHICLE</b> Possible damage to orbiter and/or EMU.				
<b>MISSION PHASE</b> EVA	<b>CORRECTIVE ACTION TIMES</b> <table border="1"> <tr> <th>TIME TO EFFECT</th> <th>TIME TO CORRECT</th> </tr> <tr> <td>Minutes</td> <td>Seconds</td> </tr> </table>	TIME TO EFFECT		TIME TO CORRECT	Minutes	Seconds
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Minutes	Seconds					

PREPARED BY: J.F. PARK      REVISION: BASIC      SUPERSEDED DATE: NONE      DATE: 8/19/83

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FMEA ACIL for the HST EVA Tools, JSC-37687 A

