

### CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: HPA-1  
 NAME / QUANTITY: MFR Latches  
 DRAWING REFERENCE: CBS-108,107,108

PROJECT: HST  
 LRU NAME / QUANTITY: HST PFR/APC Assembly  
 LRU PART NUMBER: SED 36119206-001/503

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 SUBSYSTEM: N/A  
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-HPA-1-2	CRITICALITY 2/2	FAILURE EFFECT	RETENTION RATIONALE
<b>FUNCTION</b> MFR latches provide a latching mechanism for stowing the HST PFR on APC for launch/landing and on-orbit.		<b>END ITEM</b> Unable to stow the HST PFR on APC.	I. <b>Design Feature to Minimize the Chance of the Failure Mode</b> A. <b>Design</b> All MFR latches were designed to an ultimate structural safety factor of 1.4. B. <b>Tolerances</b> Sufficient tolerances were used in the MFR latches design to prevent inadvertent movement by contraction of material due to temperature extremes. C. <b>Materials - Major Components</b> See material list (Table B-2). II. <b>Testing and Analysis</b> A. <b>Acceptance Testing</b> 1. PIA A full pre-installation acceptance (PIA) test was performed on each MFR latch before it is delivered to GSFC or KSC to support flight. The PIA s verify that the MFR latches are functioning within tolerances and that the assembly is clean.
<b>FAILURE MODE AND CAUSE MODE</b> Latch fails to close, cannot stow the HST-PFR.		<b>MISSION</b> None.	
<b>CAUSE(S)</b> 1) Piece part failure (i.e. bushings). 2) Contamination. 3) Galling or binding.		<b>CREW / VEHICLE</b> None.	
<b>REDUNDANCY SCREENS</b> A - N/A B - N/A C - N/A	<b>REMAINING PATHS</b> None.	<b>INTERFACE</b> HST-PFR	
<b>MISSION PHASE</b>	<b>CORRECTIVE ACTION TIMES</b>		
	<b>TIME TO EFFECT</b>	<b>TIME TO CORRECT</b>	
EVA	Hours	None	

PREPARED BY: J. F. PARK

REVISION: Rev. A

SUPERSEDING DATE: March 1990

DATE: 10/21/93

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### CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: HPA-1  
 NAME / QUANTITY: MFR Latches  
 DRAWING REFERENCE: CRD-106,107,108

PROJECT: HST  
 LRU NAME / QUANTITY: HST PFR/APC Assembly  
 LRU PART NUMBER: S&D 3011B235-501/503

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 SUBSYSTEM: N/A  
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-HPA-1-2	CRITICALITY 2/2	FAILURE EFFECT	RETENTION RATIONALE					
<b>FUNCTION</b> MFR latches provide a latching mechanism for stowing the HST PFR on APC for launch/landing and on-orbit.		<b>END ITEM</b> Unable to stow the HST PFR on APC.  <b>MISSION</b> None.  <b>CREW / VEHICLE</b> None.  <b>INTERFACE</b> HST-PFR	<b>B. Certification Testing</b>  1. Thermal Vacuum  The MFR Latches were exposed to a cold (-132°F) and hot (+224°F) temperatures at a vacuum (1x10 <sup>-5</sup> Torr) environment. This test was used to check the tolerances of the linkages. The operational requirement was -90°F (Ref. JSC-23550 for cold test and MTV test at JSC on 7/29/84 for hot)  2. Functionals  The HST PFR was functionally operated prior to and immediately after all acceptance/certification tests to verify that the test environment did not degrade the hardware performance. (reference Grumman test procedure 380-94.01)  2. Vibration  The MFR latches were exposed to qualification level vibration loads during their initial development. The test verified that the MFR latches were free of manufacturing defects and tolerance problems. (Reference Grumman Document number 380-96.01 (7/7/83)).					
<b>FAILURE MODE AND CAUSE</b> <b>MODE</b> Latch fails to close, cannot stow the HST-PFR.  <b>CAUSE(S)</b>  1) Piece part failure (i.e. bushings) 2) Contamination 3) Galling or binding.								
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TIME TO EFFECT	TIME TO CORRECT							
EVA	Hours							
	None							

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### CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: HPA-1  
 NAME / QUANTITY: MFR Latches  
 DRAWING REFERENCE: CBS-104,107,108

PROJECT: HST  
 LRU NAME / QUANTITY: HST PFR/PC Assembly  
 LRU PART NUMBER: SED 30110298-001501

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 SUBSYSTEM: N/A  
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER HST-HPA-1-2	CRITICALITY 2/2	FAILURE EFFECT	RETENTION RATIONALE																																							
<b>FUNCTION</b> MFR latches provide a latching mechanism for stowing the HST PFR on APC for launch/landing and on-orbit.		<b>END ITEM</b> Unable to stow the HST PFR on APC.	<b>C. Certification Analysis</b> All MFR Latch components were analyzed to the following induced environments to verify that the assembly can withstand the environment levels:  <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">1. Requirements</th> <th style="text-align: left;">Source</th> <th style="text-align: left;">Data</th> </tr> </thead> <tbody> <tr> <td colspan="3"><b>a. Shock</b></td> </tr> <tr> <td>- Functional</td> <td>NSTS-07700 VOL. XIV</td> <td>20g's 11ms saw tooth</td> </tr> <tr> <td colspan="3"><b>b. Vibration</b></td> </tr> <tr> <td>- Random</td> <td>NSTS-07700 VOL. XIV</td> <td>(ref. 360-98 01 Vib. Report)</td> </tr> <tr> <td colspan="3"><b>c. Structures</b></td> </tr> <tr> <td>- Ult. (fs = 2.0)</td> <td>NSTS-07700 VOL. XIV</td> <td>(OK for STS-61 Bay 10 Port input loads from Rockwell International)</td> </tr> <tr> <td colspan="3"><b>Loads:</b></td> </tr> <tr> <td></td> <td style="text-align: center;"><u>Translation</u></td> <td style="text-align: center;"><u>Rotational</u></td> </tr> <tr> <td></td> <td style="text-align: center;">x = 8.8</td> <td style="text-align: center;">Mx = 225.1</td> </tr> <tr> <td></td> <td style="text-align: center;">y = 14.4</td> <td style="text-align: center;">My = 71.6</td> </tr> <tr> <td></td> <td style="text-align: center;">z = 10.3</td> <td style="text-align: center;">Mz = 73.8</td> </tr> <tr> <td>- Fracture</td> <td>NSTS-07700 VOL. XIV</td> <td>OK per Math-90-079</td> </tr> </tbody> </table>	1. Requirements	Source	Data	<b>a. Shock</b>			- Functional	NSTS-07700 VOL. XIV	20g's 11ms saw tooth	<b>b. Vibration</b>			- Random	NSTS-07700 VOL. XIV	(ref. 360-98 01 Vib. Report)	<b>c. Structures</b>			- Ult. (fs = 2.0)	NSTS-07700 VOL. XIV	(OK for STS-61 Bay 10 Port input loads from Rockwell International)	<b>Loads:</b>				<u>Translation</u>	<u>Rotational</u>		x = 8.8	Mx = 225.1		y = 14.4	My = 71.6		z = 10.3	Mz = 73.8	- Fracture	NSTS-07700 VOL. XIV	OK per Math-90-079
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### CRITICAL ITEMS LIST

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SUBSYSTEM: N/A  
EFFECTIVITY: ALL ORBITERS

REFERENCE DESIGNATOR: HPA-1  
NAME / QUANTITY: MFR Latches  
DRAWING REFERENCE: CDS-108, 107, 109

PROJECT: HST  
LRU NAME / QUANTITY: HST PFR/APC Assembly  
LRU PART NUMBER: QED 30110205-081503

FAILURE MODE NUMBER HST-HPA-1-2	CRITICALITY 2/2	FAILURE EFFECT	RETENTION RATIONALE
<b>FUNCTION</b> MFR latches provide a latching mechanism for stowing the HST PFR on APC for launch/landing and on-orbit.		<b>END ITEM</b> Unable to stow the HST PFR on APC.  <b>MISSION</b> None.  <b>CREW / VEHICLE</b> None.  <b>INTERFACE</b> HST-PFR	III. Inspection  A. Manufacturing 1. The MFR Latch components were inspected at final assembly completion for conformance to their applicable drawings.  B. Assembly 1. MFR Latches were cleaned and inspected to the levels described in JSC 5322B. Once cleaned, the MFR Latches were bagged to prevent any contamination from entering the unit.  C. Testing 1. The hardware was fully inspected for any signs of loose parts as a part of the prepost functional tests performed prior to and immediately after all certification and acceptance tests (reference Gurnman test procedure 380-94.01).
<b>FAILURE MODE AND CAUSE</b> <b>MODE</b> Latch fails to close, cannot stow the HST-PFR.  <b>CAUSE(S)</b> 1) Piece part failure (i.e. bushings) 2) Contamination 3) Galling or binding.			
<b>REUNDANCY SCREENS</b> A - N/A B - N/A C - N/A	<b>REMAINING PATHS</b> None		
<b>MISSION PHASE</b> EVA	<b>CORRECTIVE ACTION TIMES</b> TIME TO EFFECT: Hours TIME TO CORRECT: None		

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### CRITICAL ITEMS LIST

REFERENCE DESIGNATOR: HPA-1  
 NAME / QUANTITY: MFR Latches  
 DRAWING REFERENCE: CND-156, 157, 158

PROJECT: HST  
 LRU NAME / QUANTITY: HST PFR/APC Assembly  
 LRU PART NUMBER: BED 30119295-581/583

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 SUBSYSTEM: N/A  
 EFFECTIVITY: ALL ORBITERS

FAILURE MODE NUMBER	CRITICALITY	FAILURE EFFECT	RETENTION RATIONALE
HST-HPA-1-2	2/2		
<b>FUNCTION</b> MFR latches provide a latching mechanism for stowing the HST PFR on APC for launch/landing and on-orbit.		<b>END ITEM</b> Unable to stow the HST PFR on APC.  <b>MISSION</b> None.  <b>CREW / VEHICLE</b> None.  <b>INTERFACE</b> HST-PFR	IV. Failure History A. None, HST PFR flew on STS-31, but was not used during the mission.  V. Operations A. <u>Effects of Failure</u> Unable to stow the HST PFR for landing. Hardware must be jettisoned.  B. <u>Crew Actions</u> None  C. <u>Training</u> Crew must be tethered during operation in the HST PFR  D. <u>Mission Constraints</u> None  E. <u>Inflight Check-Outs</u> None
<b>FAILURE MODE AND CAUSE MODE</b> Latch fails to close, cannot stow the HST-PFR.  <b>CAUSE(S)</b> 1) Piece part failure (i.e. bushings) 2) Contamination 3) Galling or binding			
<b>REDUNDANCY SCREENS</b> A - N/A B - N/A C - N/A	<b>REMAINING PATHS</b> None		
<b>MISSION PHASE</b> EVA	<b>CORRECTIVE ACTION TIMES</b> TIME TO EFFECT: Hours TIME TO CORRECT: None		

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