

# CRITICAL ITEMS LIST

ASSY NOMENCLATURE: TRIGGER ASSEMBLY

SYSTEM: CREW ESCAPE SYSTEM

REVISION:

ASSY P/N: SED27101362

SUBSYSTEM: POLE CREW ESCAPE SYSTEM

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FMEA		NAME, QTY & DRAWING REF DESIGNATION	CRITY	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
REF	REV					
3.1.2		TRIGGER ASSEMBLY (1), SED27101362	I/1	3.1.2 Mode: Fails to release pole  Cause: • Contamination • Corrosion	Unable to deploy pole	<p>1. Design Features. The design features which minimize the probability of this failure mode are:</p> <p>a. The trigger assembly is fabricated with components not conducive to corrosion.</p> <p>b. The trigger and trigger rod are fabricated of inconel 718 material, specification AMS 5662. The trigger bracket and bracket ears are fabricated of 6061-T65 aluminum, specification QQ-A-250/11. The lever assembly, switch cover, trigger pin, and leaf springs are fabricated from steel, also in accordance with AMS specifications. The aluminum parts are anodized and the inconel rod steel parts are passivated after machining. All fasteners used during the assembly and installation process were selected in compliance with the 1.4 factor of safety.</p> <p>c. Cover plates are placed over inspection ports in the PCEs housing to prevent entry of contamination to the trigger assembly components that interface with the primary and extension poles. The PCEs is stowed in the Orbiter crew cabin which is maintained clean and free of contamination that would affect the trigger assembly external components.</p> <p>d. All fasteners are torqued in accordance with engineering design requirements, and internal parts are installed with vibratite and/or self-locking inserts.</p> <p>e. The trigger assembly was designed to a safety factor of 1.4.</p>

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REF	REV					
3	1.2	TRIGGER ASSEMBLY (1), 5ED27101362	1/1	<p>3.1.2 Mode: Fails to release pole</p> <p>Cause:</p> <ul style="list-style-type: none"> <li>• Contamination</li> <li>• Corrosion</li> </ul>	Unable to deploy pole	<p>2. Testing/Analyses.</p> <p>a. <u>Acceptance Tests.</u></p> <p>[1] Acceptance vibration test (AVT)</p> <ul style="list-style-type: none"> <li>• Duration: 3 minutes/axis</li> <li>• Levels: 20 - 80 Hz, increasing 3dB/Octave 80 - 350 Hz at 0.04g<sup>1/3</sup>/Hz 350 - 2000 Hz, decreasing 3dB/Octave</li> </ul> <p>[2] Functional test (prior to and after AVT).</p> <ul style="list-style-type: none"> <li>• Initial process, controlled PCES deployment and recocking</li> <li>• Noncontrolled deployment with equivalent aerodynamic loads on pole tip</li> <li>• Manual deployment with ratchet assembly</li> </ul> <p>b. <u>Certification Tests.</u> (These tests were performed at the system level.)</p> <p>[1] Qualification acceptance vibration tests (QAVT)</p> <ul style="list-style-type: none"> <li>• Duration: 5 times AVT, 15 minutes/axis</li> <li>• Levels: 20 - 80 Hz, increasing 3dB/Octave 80 - 350 Hz, at 0.067g<sup>1/3</sup>/Hz 350 - 2000 Hz, decreasing 3dB/Octave</li> </ul> <p>[2] Functional test (after QAVT)</p> <ul style="list-style-type: none"> <li>• Controlled deployment and recocking of PCES</li> <li>• Noncontrolled deployment with equivalent aerodynamic loads on the pole tip</li> </ul>

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FMEA		NAME, QTY & DRAWING REF DESIGNATION	CRIT'Y	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE															
REF	REV																				
3.1.2		TRIGGER ASSEMBLY (1), SED27101362	1/1	3.1.2 Mode: Fails to release pole  Cause: • Contamination • Corrosion	Unable to deploy pole	<p>(3) Flight random vibration tests, 48 minutes/axis, in 4 segments as follows</p> <table border="1"> <thead> <tr> <th>Segment No.</th> <th>No. of Missions</th> <th>Vibration Duration/Axis</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>6</td> <td>173 sec.</td> </tr> <tr> <td>2</td> <td>19</td> <td>548 sec.</td> </tr> <tr> <td>3</td> <td>25</td> <td>720 sec.</td> </tr> <tr> <td>4</td> <td>50</td> <td>1440 sec.</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>• Duration: Segment dependent (48 minutes/axis).</li> <li>• Levels: 20 - 150 Hz, increasing 6dB/Octave 150 - 1000 Hz, at 0.03g<sup>2</sup>/Hz 1000 - 2000 Hz, decreasing 6dB/Octave</li> </ul> <p>(4) Life cycle tests.</p> <ul style="list-style-type: none"> <li>• 14 controlled deployments</li> <li>• 6 noncontrolled deployments (which stroke the energy absorbers)</li> </ul> <p>(5) Thermal testing (by analysis).</p> <ul style="list-style-type: none"> <li>• Ground operations: 35 to 120°F</li> <li>• Normal operations: 65 to 90°F</li> <li>• Ascent/entry transients: 95°F maximum peak</li> <li>• Ferry flight: Not applicable, PCES will be removed from Orbiter</li> <li>• Launch/landing emergency escapes via PCES: 12 to 75°F</li> <li>• Temperature (structure): 120°F maximum</li> </ul> <p>(6) Fungus (by analysis)</p> <ul style="list-style-type: none"> <li>• Non-nutrient to fungi in accordance with MIL-STD-810D, method 508.3 or materials adequately (refer to MF0004-D14C, paragraph 3.1.1.c)</li> </ul>	Segment No.	No. of Missions	Vibration Duration/Axis	1	6	173 sec.	2	19	548 sec.	3	25	720 sec.	4	50	1440 sec.
Segment No.	No. of Missions	Vibration Duration/Axis																			
1	6	173 sec.																			
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REF	REV															
3	1	TRIGGER ASSEMBLY (1), SED27101362	1/1	<p>3.1.2 Mode: Fails to release pole</p> <p>Cause:</p> <ul style="list-style-type: none"> <li>• Contamination</li> <li>• Corrosion</li> </ul>	Unable to deploy pole	<p>(7) Humidity (by analysis)</p> <ul style="list-style-type: none"> <li>• The PCE5 materials list was analyzed to certify compliance with MF0004-014, paragraph 3.1.1.e.</li> </ul> <p>(8) Salt spray (by analysis)</p> <ul style="list-style-type: none"> <li>• The PCE5 materials list was analyzed to certify compliance with MF0004-014, paragraph 3.1.3.7</li> </ul> <p>(9) Sand/dust (by analysis)</p> <table border="0"> <tr> <td>• Sand</td> <td>• Dust</td> </tr> <tr> <td>- diameter 0.0031 to 0.039 inches</td> <td>- diameter 0.000039 to 0.003 inches</td> </tr> <tr> <td>- suspended sand 1.2 lbs. per cubic ft.</td> <td>- suspended dust 3.7 to 0.7 lb./cu. ft.</td> </tr> <tr> <td>- wind speed 33 ft/sec</td> <td>- wind speed 33 ft/sec</td> </tr> <tr> <td>- hardness 7 to 8 Moh scale</td> <td>- hardness 7 to 8 Moh scale</td> </tr> </table> <p>(10) Additional certification tests/analyses:</p> <ul style="list-style-type: none"> <li>• Transportation - packaging, shock, and vibration: Packaging designed and protective procedures developed in accordance with FED-STD-101</li> <li>• Drift-off cycle life test (by testing): PCE5 deployed 20 times, refer to (4) above</li> <li>• Transient vibration (by analysis)</li> <li>• Structural fatigue (by analysis)</li> <li>• Corrosion: (by analysis)</li> <li>• Handling shock, crash shock, and landing shock (by analyses)</li> <li>• Acceleration and cabin atmosphere (by analysis)</li> <li>• Full life and limited life certification (by analysis)</li> </ul> <p>• <u>Turnaround Testing</u>: Each PCE5 is subjected to a controlled functional deployment test, per OIGRSD requirements, every 10 missions or every 2 years, whichever occurs first</p>	• Sand	• Dust	- diameter 0.0031 to 0.039 inches	- diameter 0.000039 to 0.003 inches	- suspended sand 1.2 lbs. per cubic ft.	- suspended dust 3.7 to 0.7 lb./cu. ft.	- wind speed 33 ft/sec	- wind speed 33 ft/sec	- hardness 7 to 8 Moh scale	- hardness 7 to 8 Moh scale
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312		TRIGGER ASSEMBLY (1). SED27101362	1/1	3.1.2 Mode: Fails to release pole  Cause: • Contamination • Corrosion	Unable to deploy pole	<p>3. Inspection/QA/Manufacturing</p> <p>a. All PCES fabrication, assembly, and test activities were performed under the jurisdiction of the NASA JSC Quality Assurance (QA) Division in accordance with JSCM 5312 SR&amp;QA Manual Requirements. QA surveillance was provided for procurement, planning, processing, fabrication, assembly, certification testing, and acceptance testing. Mandatory inspection points were employed at appropriate points in the fabrication, assembly and acceptance process.</p> <p>b. Receiving inspection verified that materials provided by suppliers were as identified on the procurement documents, and that data was provided attesting to the traceability and acceptability of materials and components received from suppliers.</p> <p>c. All of the trigger assembly components were fabricated of aerospace approved materials by trained technicians. QA inspections performed during the fabrication, assembly, testing, and acceptance process verified:</p> <ol style="list-style-type: none"> <li>(1) Use of correct, approved materials</li> <li>(2) Cleaning of parts and assemblies in accordance with JSC Manual 5322, paragraphs 7.1.3 to level GC</li> <li>(3) Inspection of surfaces assuring proper surface preparation prior to application of special surface coating processes</li> <li>(4) Anodizing of aluminum surfaces as specified on engineering drawings, passivating of inconnel and steel components, as defined by drawings</li> <li>(5) Proper installation and handling of components and controlled application of lubricant and thread locking compounds in accordance with drawing requirements</li> </ol>

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REF	REV				END ITEM	
3.1.2		TRIGGER ASSEMBLY (1), SED27101362	1/1	3.1.2 Mode: Fails to release pole  Cause: • Contamination • Corrosion	Unable to deploy pole	<p>(6) Trigger assembly functional performance in accordance with TPS instructions, visual inspection for damage, and proper packaging for transport.</p> <p>d. <u>Turnaround</u> The PCES end item is removed after each flight and the trigger is visually inspected, per OMRSD requirements, prior to reinstallation for each mission. The 2 year inspections include visual examination for signs of deterioration or damage and corrosion, and performance of controlled deployment tests, and recocking</p> <p>4. <u>Failure History</u>. The trigger assembly is a newly designed hardware item and has no failure history</p> <p>5. <u>Operational Use</u>.</p> <p>a. <u>Operational Effect of Failure</u> Probable loss of crew</p> <p>b. <u>Crew Action</u>. None</p> <p>c. <u>Crew Training</u> Crew is trained in the proper use of the equipment.</p> <p>d. <u>Mission Constraints</u> None. Mission would be terminated prior to use of this equipment</p> <p>e. <u>In-Flight Checkout</u> None</p>

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DATE:

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