

CRITICAL ITEMS LIST

ASSY NOMENCLATURE: HOUSING ASSEMBLY

SYSTEM: CREW ESCAPE SYSTEM

REVISION:

ASSY P/N: SED27101409

SUBSYSTEM: POLE CREW ESCAPE SYSTEM

PAGE 43 OF 70

FMEA		NAME, QTY & DRAWING REF DESIGNATION	QTY	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
REF	REV					
7.1.1		GUIDE ASSEMBLY SED27101279	2Y1R	<p>7.1.1 Mode: Spring assembly fails to deploy</p> <p>Cause: • Contamination • Spring jammed</p>	Unable to deploy primary pole if ratchet assembly fails	<p>1. Design Features. The design features which minimize the probability of this failure mode are:</p> <p>a. The guide assembly components are fabricated of materials not conducive to corrosion. The materials used were reviewed and approved by the Materials Branch. Fracture critical components were subjected to the activities of a formal fracture control plan, LEMSCO document 25076.</p> <p>b. The center guide is fabricated of AL 6061-T6S1 aluminum in accordance with specification MW-1-700/6; the guide flange of 304 stainless steel plate, in accordance with QQ-5-763; the cone assembly of AL 6061-T6S1 in accordance with QQ-A-225/8; and the spring of 17-7PH stainless steel in accordance with AMS 5673, condition CH900.</p> <p>c. The steel components were passivated, and aluminum components were analyzed after liquid dye penetrant inspection, no cracks were permissible.</p> <p>d. Lockite thread locking compound is used to secure threaded fasteners during assembly, and the guide flange subassembly was attached to the end cap with screws secured by 8521044E3 lock nuts.</p>

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PAGE 44 OF 78

FMEA		NAME, QTY & DRAWING REF DESIGNATION	CRITY	FAILURE MODE AND CAUSE	FAILURE EFFECT/IMPACT	RATIONALE FOR ACCEPTANCE
REF	REV					
7.1.1		GUIDE ASSEMBLY SED27101229	2/1R	<p>7.1.1 Mode: Spring assembly fails to deploy</p> <p>Cause: • Contamination • Spring jammed</p>	<p>Unable to deploy primary pole if ratchet assembly fails</p>	<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"> • Duration: 3 minutes/axis • Levels: 20 - 80 Hz, increasing 3dB/Octave 80 - 350 Hz at 0.04g²/Hz 350 - 2000 Hz, decreasing 3dB/Octave <p>(2) Functional test (prior to and after AVT)</p> <ul style="list-style-type: none"> • Initial process, controlled PCES deployment and recocking • Noncontrolled deployment with equivalent aerodynamic loads on pole lip • Manual deployment with ratchet assembly <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"> • Duration: 5 times AVT, 15 minutes/axis • Levels: 20 - 80 Hz, increasing 3dB/Octave 80 - 350 Hz, at 0.067g²/Hz 350 - 2000 Hz, decreasing 3dB/Octave <p>(2) Functional test (after QAVT)</p> <ul style="list-style-type: none"> • Controlled deployment and recocking of PCES • Noncontrolled deployment with equivalent aerodynamic loads on the pole lip

PREPARED BY: A. HEISKALA

SUPERSEDING DATE:

APPROVED BY: J. PELLISCHEN

DATE:

PCES-44

ATTACHMENT -
Page 89 of 115

CRITICAL ITEMS LIST

ASSY NOMENCLATURE: HOUSING ASSEMBLY

ASSY P/N: 5ED27101409

SYSTEM: CREW ESCAPE SYSTEM

REVISION:

SUBSYSTEM: POLE CREW ESCAPE SYSTEM

PAGE 45 OF 70

FMEA		NAME, QTY & DRAWING REF DESIGNATION	CRITY	FAILURE MODE AND CAUSE	FAILURE EFFECT OR IMO/HEM	RATIONALE FOR ACCEPTANCE															
REF	REV																				
7.1.1		GUIDE ASSEMBLY 5ED27101279	2/1A	<p>7.1.1 Mode: Spring assembly fails to deploy</p> <p>Cause: • Contamination • Spring jammed</p>	<p>Unable to deploy primary pole if ratchet assembly fails</p>	<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"> • Duration: Segment dependent (48 minutes/axis). • Levels: 20 - 150 Hz, increasing 6dB/Octave 150 - 1000 Hz, at 0.03g²/Hz 1000 - 2000 Hz, decreasing 6dB/Octave <p>(4) Life cycle tests:</p> <ul style="list-style-type: none"> • 14 controlled deployments • 6 noncontrolled deployments (which stroke the energy absorbers) <p>(5) Thermal testing (by analyses):</p> <ul style="list-style-type: none"> • Ground operations: 35 to 120°F • Normal operations: 65 to 90°F • Ascent/entry transients: 95°F maximum peak • Ferry flight: Not applicable, PCE5 will be removed from Orbiter • Launch/landing emergency escapes via PCE5: 12 to 75°F • Temperature (structure): 120°F maximum <p>(6) Fungus (by analysis)</p> <ul style="list-style-type: none"> • Non-nutrient to fungi in accordance with MIL-STD-8100, method 508.3 or materials adequately treated (refer to MF0004-014C, paragraph 3.1.1.c) 	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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PREPARED BY: R. HEISKALA

SUPERSEDING DATE

APPROVED BY: J. PEINCHER

ATTACHMENT
Page 90

CRITICAL ITEMS LIST

ASSY NOMENCLATURE: HOUSING ASSEMBLY

SYSTEM: CREW ESCAPE SYSTEM

REVISION:

ASSY P/N: SED27101400

SUBSYSTEM: POLE CREW ESCAPE SYSTEM

PAGE 46 OF 70

FMEA		NAME, QTY & DRAWING REF DESIGNATION	CRITY	FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
REF	REV					
7.1.1		GUIDE ASSEMBLY SED27101279	ZIR	<p>7.1.1 Mode: Spring assembly fails to deploy</p> <p>Cause: • Contamination • Spring jammed</p>	Unable to deploy primary pole if ratchet assembly fails	<p>(7) Humidity (by analysis) • The PCES materials list was analyzed to certify compliance with MF0004-014, paragraph 3.1.1.e</p> <p>(8) Salt spray (by analysis) • The PCES materials list was analyzed to certify compliance with MF0004-014, paragraph 3.3.3.7.</p> <p>(9) Sand/dust (by analysis):</p> <ul style="list-style-type: none"> • Sand <ul style="list-style-type: none"> - diameter 0.0031 to 0.039 inches - suspended sand 1.2 lbs. per cubic ft. - wind speed 33 ft/sec - hardness 7 to 8 Moh scale • Dust <ul style="list-style-type: none"> - diameter 0.000019 to 0.003 inches - suspended dust 3.7 to 0.7 lb/cu ft - wind speed 33 ft/sec - hardness 7 to 8 Moh scale <p>(10) Additional certification tests/analyses</p> <ul style="list-style-type: none"> • Transportation - packaging, shock, and vibration: Packaging designed and protective procedures developed in accordance with FED-STD-101 • On/off cycle life test (by testing): PCES deployed 20 times, refer to (4) above • Transient vibration (by analysis) • Structural fatigue (by analysis) • Corrosion: (by analysis) • Handling shock, crash shock, and landing shock (by analyses) • Acceleration and cabin atmosphere (by analysis) • Full life and limited life certification (by analysis) <p>c. <u>Turnaround Testing</u> Each PCES is subjected to a controlled functional deployment test, per OMASD requirements, every 10 missions or every 2 years, whichever occurs first. This test will evaluate the performance of the guide assembly</p>

PREPARED BY R. HEISKALA

SUPERSEDING DATE

APPROVED BY I. PELISCHER

DATE

PCES 46

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 ATTACHMENT
 PAGE 91 OF 1

CRITICAL ITEMS LIST

ASSY NOMENCLATURE: HOUSING ASSEMBLY

SYSTEM: CREW ESCAPE SYSTEM

REVISION:

ASSY P/N: SED27101409

SUBSYSTEM: POLE CREW ESCAPE SYSTEM

PAGE 47 OF 70

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REF	REV					
7.1.1		GUIDE ASSEMBLY SED27101279	2/1R	7.1.1 Mode: Spring assembly fails to deploy Cause: • Contamination • Spring jammed	Unable to deploy primary pole if ratchet assembly fails	<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&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. The spring and guide assembly components were fabricated of aerospace approved materials and assembled by trained technicians. QA inspections performed during the fabrication, assembly, testing, and acceptance process verified:</p> <ol style="list-style-type: none"> (1) Use of correct, approved materials (2) Dimensional tolerances specified on design drawings (3) Removal of all burrs and sharp edges (4) Cleaning of parts and assemblies in accordance with JSC Manual 5322, paragraph 7.1.3 to level GC (5) Inspection of surfaces assuring proper surface preparation prior to the application of special surface coatings. (6) Liquid dye penetrant inspection in accordance with MIL-STD-6886 after machining, with no cracks permissible

PREPARED BY: R. NEISKALA

SUPERSEDING DATE:

APPROVED BY: T. PERCISIK

ATTACHMENT
Page 92 of 92

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REVISION:
 PAGE 48 OF 70

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REF	REV					
7.1.1		GUIDE ASSEMBLY SED27101279	Z/IR	<p>7.1.1 Mode: Spring assembly fails to deploy</p> <p>Cause:</p> <ul style="list-style-type: none"> • Contamination • Spring jammed 	<p>Unable to deploy primary pole if ratchet assembly fails</p>	<p>(7) Anodizing of aluminum surfaces as specified on engineering drawings, passivating of iron and steel components, as defined by drawings.</p> <p>(8) Proper installation of components, torquing of threaded fasteners, controlled application of thread locking compounds, alignment, and fitting of the spring in the guide assembly in accordance with drawing requirements.</p> <p>(9) Proper spring and guide assembly functional performance in accordance with TP's instructions, visual inspection, and proper packaging of the PCES for transport.</p> <p>d. <u>Turnaround</u> The PCES end item is removed after each flight and 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 contamination, and performance of controlled deployment tests, and recocking</p> <p>4. <u>Failure History</u>. The PCES guide 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 if ratchet assembly fails to deploy primary pole</p> <p>b. <u>Crew Action</u> None.</p> <p>c. <u>Crew Training</u> Not applicable</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>

PREPARED BY: J. HEISKALA

SUPERSEDING DATE:

APPROVED BY: E. PELUSCHEK

DATE

PCES 48