

CIL  
EMU CRITICAL ITEMS LIST

12/24/91 SUPERSRDS 01/02/90

ANALYST:

Page: 1  
Date: 12/02/91

NAME P/R QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
ELECTRICAL POWER HARNESS, ITEM 151 ----- 6V70P151-4 (1)	2/1R	<p>PSI/PNO: Electrical short to ground in EVC Powerline.</p> <p>CAUSE: Cable chaffing against connector shell or shield. Improper connector strain relief.</p>	<p>END ITEM: Short circuit across battery.</p> <p>GPE INTERFACE: Loss of all power to EMU and excessive battery current draw. Condition will cause PC trace in DCM return line to fuse open.</p> <p>MISSION: Loss of use of one EMU. Terminates EVA.</p> <p>CREW/VEHICLE: None for single failure. Possible crew loss with loss of SOP.</p>	<p>A. Design - Short circuits in any of the circuits in the Item 151 harness is minimized by the following: Conductors are hand potted in Stycoast 2651 in the area that they interface the metal backshells to minimize their movement and chance of shorting to the backshell. The conductors are strain relieved at the connector/harness interface with a molded rubber backshell. This minimizes the effects of cable tension on the individual conductors. Conductors are sheathed within a woven Kevlar outer layer. This holds the cables together to share any loading. #22 and #24 AWG Teflon jacketed wires provide electrical and mechanical properties which help prevent breakage. Each connector/adapter ring interface is locked in place to prevent rotation by a combined mechanical and adhesive lock.</p> <p>B. Test - Component Acceptance: The harness is acceptance tested per the following tests of AT-EMU-151 to insure there are no workmanship problems which would cause actual or potential short circuits. Pull Test - This test subjects each connector/harness interface to a specific pull test (9 pounds) designed to exceed any stress encountered in actual use. The insulation resistance between each conductor and the ground circuit is measured during the test to insure there is no shorting. The test is followed by a continuity check of each conductor path to insure there are no open circuits.</p> <p>PDR: The EVC power/battery sense (+) line is checked during the Audio test portion of PLSS PDR testing per para. 4.0 of SEMU-60-D10.</p> <p>Certification: This item has completed the 15 year structural vibration and shock certification requirements during 10/83. Engineering Changes 42806-527-2 (insulation resistance check during Pull Test ) and 42806-663 (remove crimp splices) have been incorporated and certified by test since this configuration was certified.</p> <p>C. Inspection -</p>

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	2/1R	151PM18:		<p>During harness manufacturing, the following inspections are performed to insure there are no short circuits.</p> <p>Visual inspection of conductors prior to potting operations to insure there are no damaged conductors and that the conductors are routed properly.</p> <p>Visual inspection of the harness prior to and after rubber boot molding process to insure there are no damaged conductors which could cause a short circuit.</p> <p>In-process electrical checkout of the harness before and after potting and molding to insure there are no short circuits.</p> <p>Visual inspection of the conductors prior to application of the outer sheath to insure there are no damaged conductors that could cause a short circuit.</p>

D. Failure History -

The following MDR's were issued for item 151 due to short circuits:

J-EMU-151-0003 (6-27-84)

The harness failed dielectric Acceptance testing.

Investigation determined the cause of the failure to be an intermittent short circuit between the warning tone line and the P3 connector body. This was due to improper strain relief of the wire which allowed it to come in contact with the connector adapter ring. The wire installation was broken when the rubber backshell was molded to the connector.

J-EMU-151-004 (6/12/85)

J-EMU-151-005 (6/12/85)

Both failures occurred during an STA Aircraft Power Supply functional test. The failures were caused by a short circuit between the EVC power/battery sense (+) line and case ground (connector body). The failure caused the null return line in the ADR to fuse open. The failure investigation found that a crimp splice within the molded backshell was not sufficiently covered by shrink tubing. The exposed portion of the crimp was allowed to come in contact with the connector body.

Corrective Action:

Class I EC 42806-527-2 created the SV789151-3 harness configuration by adding a connector pull test requirement to the acceptance test requirements. Class I EC 42806-865 created the SV789151-4 harness configuration by eliminating the two splices in the PP connector, to prevent them from

CIL  
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Page: 3  
 Date: 12/02/91

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	2/4R	ISSUING:		shorting to case.

E. Ground Turnaround -  
 Tested per CEMU-R-001, pre-flight EMU Communications  
 Checkout.

f. Operational Use -  
 Crew Response -  
 PREEVA: Trouble shoot problem. Consider third EMU if  
 available. If no success, terminate EVA prep.  
 EVA: Miss loss of fuel, comm and CMS data occurs, open helmet  
 purge valve and deactivate EMU power. Terminate EVA.  
 Training -  
 Standard training covers this failure mode.  
 Operational Considerations -  
 EVA checklist procedures verify hardware integrity and  
 systems operational status prior to EVA. Real time Data  
 System allows ground monitoring of EMU systems. Flight  
 rules define go/no go criteria related to EMU battery power.