

CIL
EMU CRITICAL ITEMS LIST

12/26/91 SUPERSEDES 01/02/90

ANALYST:

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Date: 12/05/91

NAME P/N QTY	UNIT	FAILURE MODE & CAUSE	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
FAN/SEPARATOR/ PUMP/MOTOR ASSEMBLY, ITEM 123 ----- SV707994-8 (1)	2/1R	123EM71: Shorted, high current draw. CAUSE: Electrical short to ground in the electrical wiring between the power input connector and the underspeed power current relay.	END ITEM: Battery (490) shorted to ground. Loss of EMU power. GFE INTERFACE: EMU electrical components: fan/pump (123), sensors, CNS, etc. Inoperative. MISSION: Termination of EVA. Loss of use of one EMU. CREW/VEHICLE: None for single failure. Possible loss of crew with loss of SOP.	A. Design - Power wiring from the motor connector is routed directly to the main power relay thus minimizing probability of inadvertent shorting or grounding to other circuits. The wire from the connector to the relay is M22759/11-22 which is #22AGW alloy plated copper, teflon coated to provide the required insulation resistance. Semiconductor failure is minimized through the use of high reliability capacitors (level S) and resistors (level R) are used and are qualified to the requirements of their respective MIL specs and thermal shocked per condition B of MIL-S10-202 Method 107. The transistors and diodes are qualified to the requirements of MIL-S-19500 and receive the burn-in of JARNAV level parts per the applicable methods, 903B, 1039, and 104B, of MIL-S10-750. The electronic components are operating within the power derating requirements of GWS 7804. The printed circuit boards are fiberglass/epoxy per MIL-P-13949 Type GF or polyimide per MIL-P-13949 type B1 and manufactured per MSFC-S10-154. Parts mounting and soldering is per MSFC-S10-134 and MS5300.4 (3A-1). The board assemblies are hard mounted to the motor case to provide a thermal transfer path between the board heatsinks and the case to direct heat away from the electronic components. The board assemblies are also conformal coated per MIL-A-46146 Dow Corning RTV 3140 for environmental protection. Electrical connectors are environmentally sealed to prevent damage due to contamination and humidity. The Hall sensors are hermetically sealed to prevent damage due to contamination, humidity and pressure fluctuations. B. Test - Component Acceptance Test - The item is performance tested again in the EVA conditions, and the maximum current is 4.7 amps. FOR Test per SEMU-60-010 - The item is performance tested in the EVA mode and the PRESS mode. For the various set conditions in the EVA mode, the motor current shall be 4.5 amps maximum and 4.7 amps maximum in the PRESS mode set conditions. Certification Test - The item completed 10,000 hours of operation and 8400 on/off

12/24/91 SUPERSEDES 01/02/90

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2/10 123FN11:

cycles exceeding the 15 year certification requirement by more than a factor of three. The 15 year structural vibration, electrical vibration and design shock was completed 12/84. The following engineering changes have been incorporated and certified since this configuration was certified: 42806-342-55 (change power consumption requirement - more amps), 42806-406 (incorporate Nitronic 60 Retaining Nut), 42806-424 (seal cup change to assure a good weld), 42806-818 (Water pump changes 10X inspection in areas susceptible to contamination more break edges and deburring operations to close QRP J-EMU-123-010), 42806-934 (change bearing, limited life requirements.

C. Inspection -

All wires used in the assembly are 100% inspected for proper assembly and for nicks, cuts and other faults which might cause a short to ground. The motor current is checked at initial build-up then after boards have been wired, after stacking, after assembly of cover, and after all assembly and testing is completed. Both HSD gov't NIP's exist on the final current check.

D. Failure History -

EMU-125-0006 (1-11-80) High current draw due to de-magnetization of rotor. Corrective action improved handling and storage.
W-EMU-123-0005 (4-23-83) High motor current caused by high fan current. Engineering changes 42806-328 and 42806-264 increased the allowable motor current and reduced the voltage at the DCW output.

E. Ground Turnaround -

Tested per FEMU-R-001, Fan/Pump/Separator QPN Check during EMU Checkout in Orbiter (V1103-02).

F. Operational Use -

Crew Response - PreEVA: Trouble shoot problem, if no success, consider EMU 3 if available, EMU go for SCU without fan. PostEVA: Open helmet purge valve until helmet can be defied. When loss of EMU electrical power detected.

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ANALYSIS:

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NAME P/W Q/N	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
	2/YR	125FNU1:		deactivate EMU battery power, open helmet purge valve and terminate EVA. Training - Standard EMU training covers this failure mode. Operational Considerations - flight rules define go/no go criteria related to ventilation flow and CO2 control. EVA checklist procedures verify hardware integrity and systems operational status prior to EVA. Real Time Data Systems allow ground monitoring of EMU systems.