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Health Percentage Evaluation for Satellite Electrical Power System Based on Linear Stresses Accumulation Damage Theory

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Abstract : To meet the demands of long-life and high-intelligence for satellites, the electrical power system should be provided with self-health condition evaluation capability. Any over-stress events in operations should be recorded. Based on Linear stresses accumulation damage theory, accumulative damage analysis was performed on thermal-mechanical-electrical united stresses for three components including the solar array, the batteries and the power conditioning unit. Then an overall health percentage evaluation model for satellite electrical power system was built. To obtain the accurate quantity for system health percentage, an automatic feedback closed-loop correction method for all coefficients in the evaluation model was present. The evaluation outputs could be referred as taking earlier fault-forecast and interventions for Ground Control Center or Satellites self.

Keywords : satellite electrical power system, health percentage, linear stresses accumulation damage, evaluation model
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